



DILLON
CONSULTING

TOWN OF OSOYOOS

2023 District Sanitary Landfill Annual Report

Final Report



May 2024

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May 2, 2024

Town of Osoyoos
11500 115th St, Box 3010
Osoyoos, BC
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Attention: Jared Brounstein
Director of Operations

Town of Osoyoos Landfill – Annual Operations and Environmental Monitoring Report

Dear Mr. Brounstein:

Dillon Consulting Limited (Dillon) is pleased to provide the Town of Osoyoos (Town) with the 2023 Annual Operations and Environmental Monitoring Report.

The 2023 Annual Operations and Environmental Monitoring Report has been prepared in accordance with the 2016 BC Landfill Criteria for Municipal Solid Waste (Landfill Criteria) and the Landfill's Operational Certificate MR 15273 (OC).

Sincerely,

DILLON CONSULTING LIMITED

A handwritten signature in blue ink that reads "Alyssa Hooge".

Alyssa Hooge, B.Sc.
Project Manager

Our file: 24-7727



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Introduction

The Osoyoos Landfill (Landfill or Site) is operated under Operational Certificate (OC) MR-15273, issued by the Ministry of Water, Land and Air Protection in March 2002. The OC requires the operator to submit an operational and environmental annual report for each 12-month period. This report fulfills the annual operational and environmental monitoring reporting requirements as outlined in Section 4.6 of the OC for 2023.

2.0 Site and Regulatory Setting

2.1 Site Description

The Landfill (Photo 1) is owned by the Town of Osoyoos (Town). The Site is located at 17250 146 Avenue, approximately 3 km north of the municipal boundary and 1.5 km west of Highway 97 in Osoyoos, BC. The Site is located in the Regional District of the South Okanagan (RDOS).

The Landfill is situated on two parcels of land, Lot 993 Plan 22982 and Lot 829 Plan 5102, both located within District Lot 2450s. The Site can be accessed via 146 Ave which is paved all the way up to the Landfill entrance. Lot 829 was used as the original landfilling location. In 1972, Lot 993 was leased from the Province for additional municipal waste landfilling. The Landfill has an operational footprint of approximately 14 hectares.

The Site is comprised of a municipal solid waste (MSW) landfill and a hauled liquid waste facility. The hauled liquid waste facility is authorized under separate permit issued by the Ministry of

Environment and Climate Change Strategy (MOECC) permit under the provisions of the *Environmental Management Act*.

Since 2001, the Landfill has comprised of two stages. Stage 1 covers the northeast area of the Site and Stage 2 covers the southeast area of the Site. The Stage 1 filling area's airspace was completely utilized in December 2010 and Stage 2 was commenced operations the following month. Stage 2 has remained the active filling zone for the past 13 years.



Photo 1: Landfill Site Entrance

2.2 Landfill Operation and Management

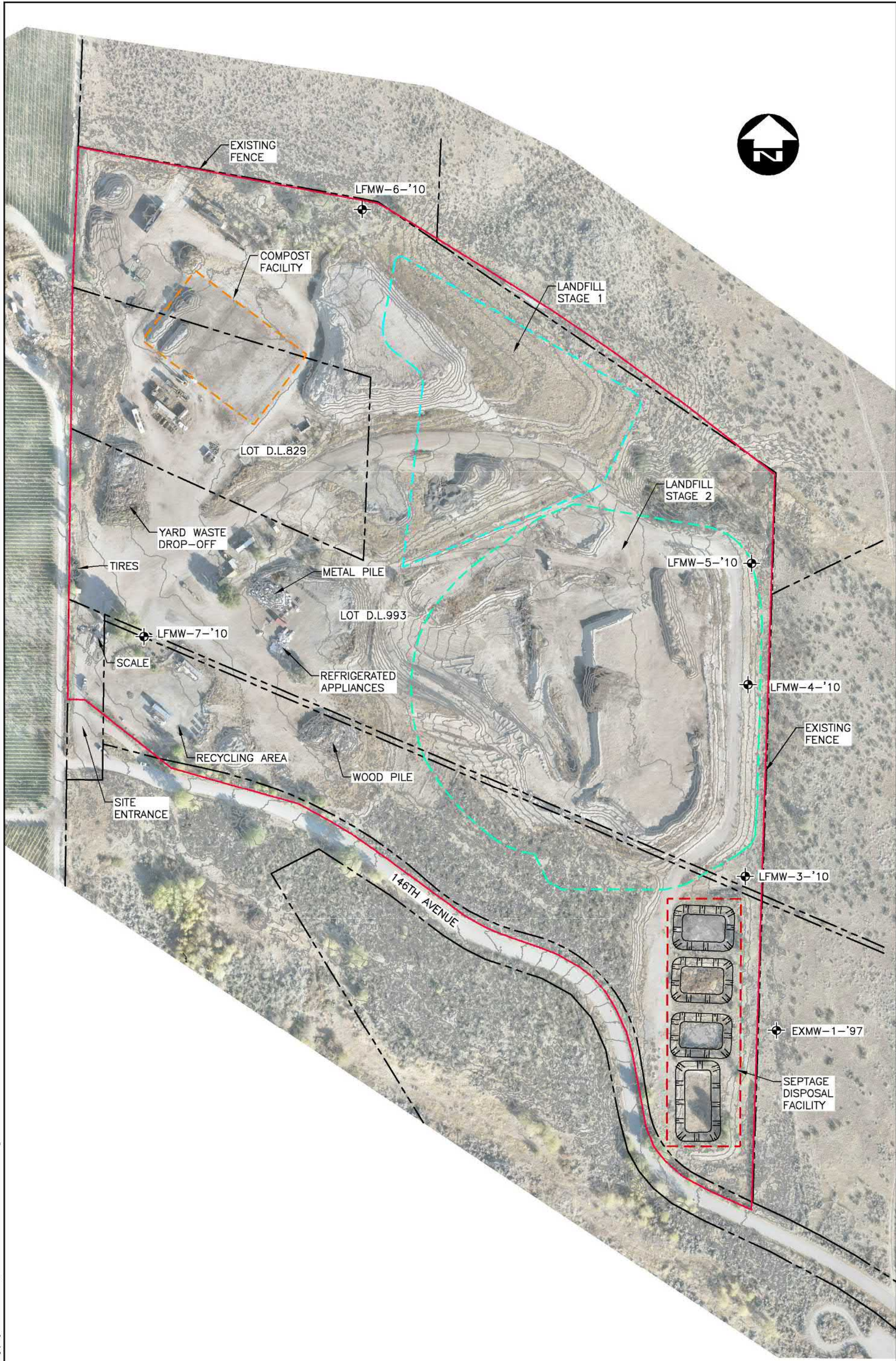
The Landfill contains of the following waste disposal and diversion activities:

- An active landfilling area;
- Composting of yard and garden waste, as well as compostable construction waste;
- Hauled liquid waste disposal;
- Public drop-off area for certain recyclables under Recycle BC;
- Collection of other recyclables materials including, used oil drop-off, white goods, scrap metal, batteries, and tires; and
- Storage area for divertible materials, including recycled demolition, land-clearing and construction waste.

The Site has a 40 ft scale for all inbound and outbound transactions. All waste materials received at the Site are recorded by the scale attendant using Autoscale data management software. The Site is surrounded by a perimeter fence and security is managed via a locking gate at the Site entrance.

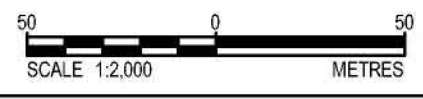
The Site is currently operated by a private contractor, Environmental 360 Solutions (Previously Whissell Contracting) (Site Operator). The current Site Operator has operated the Landfill since 2021. The Site Operator is responsible for the overall management of the Site including placing and compacting waste, placing cover materials signage, traffic control, and managing the public drop-off and compost facility. Vector management and regular site inspections are also under the responsibility of the Site Operator. Records of the litter collected by the contractor has been documented. The Site Operator is responsible for the onsite dust management from road use and landfill operations. The Town is responsible for staffing and managing the scale house and collecting tipping fees.

The existing site conditions are shown in Figure 1. The approximate filling area utilized in 2023 is outlined in Figure 2.



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TOPOGRAPHIC AERIAL SURVEY
AS OF SEPTEMBER 2021




DILLON
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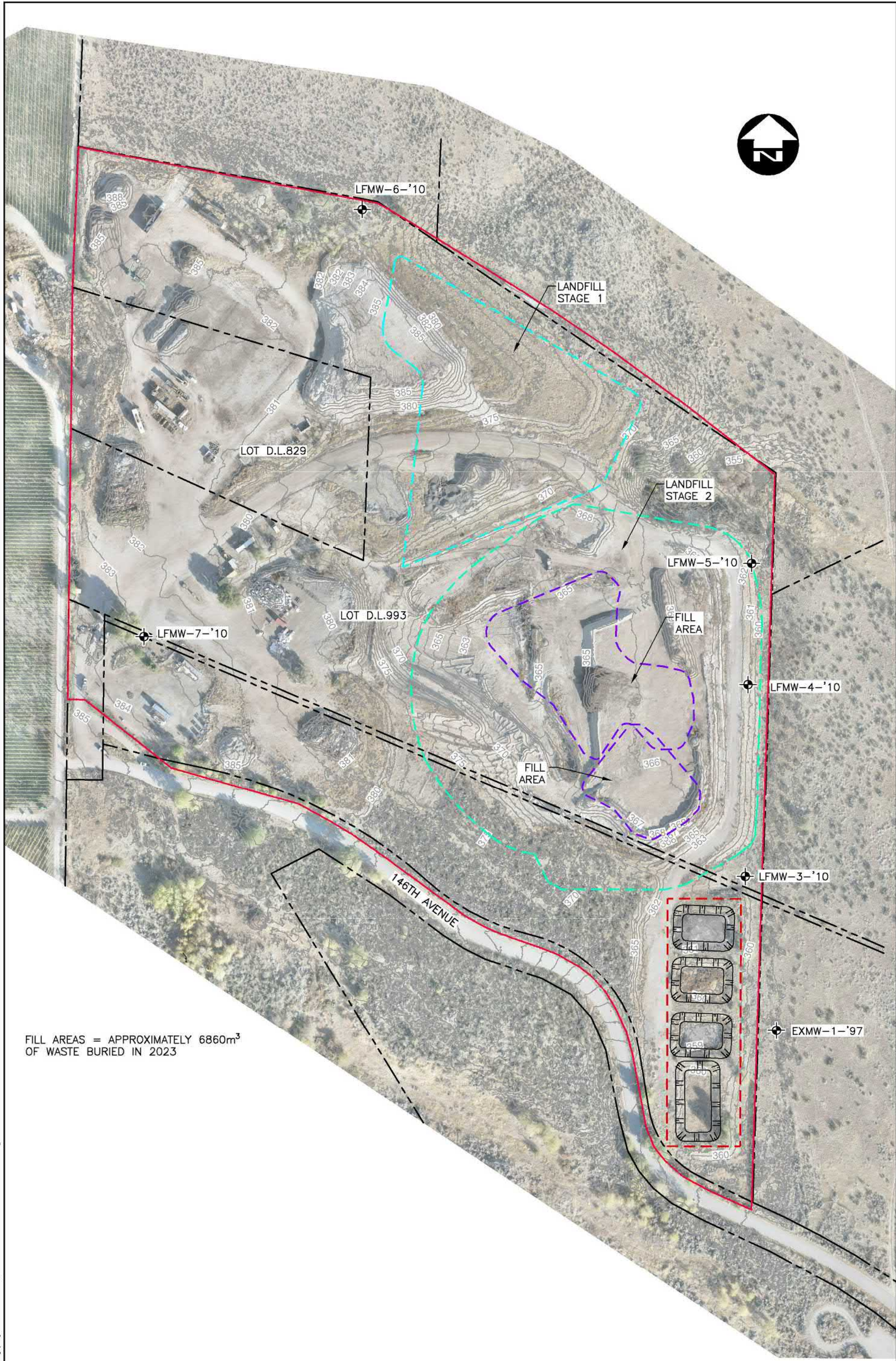
DATE **APRIL 2024**

PROJECT
TOWN OF OSOYOOS 2023 ANNUAL REPORT

TITLE
SITE MAP

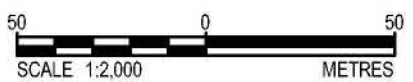
PROJECT NO.
24-7727

FIGURE NO.
1



FILL AREAS = APPROXIMATELY 6860m³
OF WASTE BURIED IN 2023

TOPOGRAPHIC AERIAL SURVEY
AS OF SEPTEMBER 2021



DATE **APRIL 2024**

PROJECT **TOWN OF OSOYOOS 2023 ANNUAL REPORT**

TITLE **FILL AREAS**

PROJECT NO. **24-7727**

FIGURE NO. **2**

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2.2.1 Composting Operations

Composting operations at the Landfill began in 2008 after the installation of a 2 km water service pipe from a nearby irrigation system (No. 8) to the Landfill. The supply of constant non-potable water has allowed the Landfill to run an organics composting operations consisting of an engineered 60 mm High Density Polyethylene (HDPE) liner with 150 mm pit run sand on either side and sump to manage leachate from composting operations. The composting design production capacity is less than 5,000 tonnes of compost per year.

The composting facility is operated under Organics Matter Recycling Regulation number 109610 issued by the MOECC. This registration authorizes the facility to process organic matter to produce compost.

The compost created at the Landfill is derived from yard waste and untreated and unprocessed wood residuals to meets the Environmental Organic Matter Recycling Regulations definition of a Class A compost. The Class A compost is distributed to the public for a per tonnage fee as defined in the Towns "Waste Management Services and Regulation Bylaw No. 1370, 2020".

Compost management documents such as temperature readings, watering, and turning records are collected monthly. All generated Class-A compost must be maintained a minimum internal windrow temperature of 55 C for a minimum of 15 consecutive days.

There is no environmental monitoring program specific to the compost facility. The groundwater monitoring undertaken for the Landfill, as presented above, also serves to identify impacts (if any) from the on-site composting operations.

Any leachate generated as part of the composting operations is collected in a leachate sump located at the southwest corner of the impermeable compost pad and is recirculated into the compost windrows, as needed. Leachate quantities are minimal due to the semi-arid climate of the Site. Leachate quantities from the composting facility are not measured or calculated.

2.3 Regulatory Setting

The Landfill is operated under OC MR-15273, issued by the Ministry of Water, Land and Air Protection in March 2002 (Appendix A) under the provisions of the *Environmental Management Act*. Under Section 4.6 of the OC, the Operational Certificate holder is required to submit an operational and environmental annual report for each 12-month period. This report fulfills the operational and environmental monitoring reporting requirements, and captures major works and projects completed in 2023.

The annual operations and monitoring reporting requirements for the Landfill as outlined in Section 4.6 of the OC include the following:

- (a) Total volume and/or weight of waste discharged into the landfill for the year, along with documentation of the method used to quantify the waste discharged.

- (b) Service population and waste discharge rate for the year (in tonnes per capita per year) and a trend analysis with a comparison to the 1996 baseline waste discharge rate of 1.2 tonnes per capita per year;
- (c) Remaining site life and capacity;
- (d) Operational plan for next 12 months including any proposed changes to the Operations and Closure Plan;
- (e) A compilation, interpretation and trend analysis of the receiving environment monitoring data prepared by a suitably qualified professional;
- (f) Review of the closure plan and associated estimated costs, for the purposes of establishing the closure fund required in Section 4.8; and
- (g) Any other data relevant to this Operational Certificate.

Under the OC, the annual operation and monitoring report is to be submitted to the Regional Waste Manager by March 1st of each calendar year. On February 12, 2024, the Town notified the MOECC that the annual report submission would be submitted by April 15, 2024. The MOECC confirmed the receipt of the notification.

The hauled liquid waste facility is authorized under Permit 14804 issued by the MOECC permit. The permit authorizes discharge effluent to the ground from municipal septic tank and sewage holding tank pumpage sources located in or near Osoyoos, BC. The annual report for the liquid waste facility is prepared and submitted separately from the Landfill's annual report (Appendix B).

The Landfill is authorized to dispose of municipal solid waste and other wastes as allowed by the regional waste manager. These 'other wastes' have been outlined in the Town's Waste Management Services and Regulation Bylaw No. 1370, 2020 (Appendix C).

Waste Summary

The Landfill receives waste from the Town of Osoyoos and Electoral Area A. Annual totals account for all waste received at the Landfill.

Waste tonnages received by the Landfill have been quantified using the Site's scale data. Table 1 presents the results of the waste categories received at the Landfill in 2023. A summary of historical tonnage data from 2014 to 2023 is provided in Appendix D. Definitions for various waste categories are detailed in the Town's Waste Management Services and Regulation Bylaw No. 1370, 2020 in Appendix C.

Table 1: 2023 Waste Tonnage Summary (Tonnes)

Waste Category	2023
Total Tonnage – Landfilled¹	
Municipal Waste ²	2,139
Commercial Waste ³	1,870
Construction Waste B (drywall or asphalt shingles)	97
Construction Waste - Mixed	0
Puncture Vines	2
Invasive Weeds (puncture vine, tumbleweed, etc.)	10
Biosolids	0
Total Landfilled	4,118
Total Tonnage – Diverted	
Construction Waste A (conc, rubble, asphalt, etc.)	255
Total Diverted	255
Total Tonnage – Recycled⁴	
Batteries	0
Metals (white goods, scrap metal, 80% metal or more)	18
Tires	13
Refrigerators ⁵	25
Propane Tanks ⁶	-
Total Recycled	55
Total Tonnage - Composted	
Construction Waste C (white wood, lumber, stump, compost, etc.)	115
Yard Waste ⁷	1,392
Total Composted	1,507
Total Material Received at Landfill	5,933

¹ The landfilled category refers to materials that have been buried in an active landfill cell or established controlled waste area.

² Municipal waste includes waste categories residential waste from residential pick-up, mixed load waste from public drop-off, municipal waste, and land clearing and demolition waste.

³ Commercial waste includes waste categories mixed load commercial waste and commercial waste.

⁴ Recycled category refers to materials stored within the limits of the Landfill site until such time that these materials are salvaged and/or recycled by others (Batteries, Metals, Tires, Refrigerators, and Propane Tanks).

⁵ The tonnage of refrigerators received is based on an estimated per unit refrigerator weight of 75kg as per guidance from the Major Appliance Recycling Roundtable (MARR).

⁶ Propane tanks are recycled and not included in annual totals.

⁷ Yard Waste includes waste categories Curbside pickup of Yard and Garden Waste, Free Chippable and Compostable, Free Compostable (fruit or vegetables)

3.1 Types and Quantities of Waste

Waste categories at the Landfill are broken up by landfilled waste, diverted materials, recycled materials, composted materials, and clean cover materials.

3.1.1 Landfilled Waste

Waste that is not recycled or diverted for on-site use is disposed of at the active face area of the Landfill. This waste includes municipal solid waste, asbestos containing materials, commercial waste, construction & demolition waste, controlled waste and land clearing waste. Table 2 summarizes the Landfilled materials in 2023.

In 2023, approximately 4,118 tonnes of waste were landfilled in the active cell (Stage 2). This is approximately a 1.8% increase in waste landfilled from the 2022 reported tonnage of 4,045 tonnes. This is approximately a 3.6% decrease in waste landfilled compared to the 10-year average of 4,274 tonnes per year.

Table 2: Landfilled Waste Category Breakdown

Municipal Waste	Tonnes
Municipal Waste (Town & Contractor pickup)	1,263.63
Residential Waste	169.91
Mixed Load Residential Waste	704.65
Demolition and Land Clearing	0.33
Total	2,138.52
Commercial Waste	Tonnes
Mixed Load Commercial Waste	372.34
Commercial Waste	1,497.56
Total	1,869.90
Construction Waste (Non-Diverted)	Tonnes
Construction Waste B (drywall or asphalt shingles)	97.45
Mixed Load Construction Waste	0.00
Total	97.45
Other Landfilled Waste	Tonnes
Asbestos	10.06
Invasive Weeds (puncture vine, tumbleweed, etc.)	2.06
Total	12.12
Total Landfilled Waste	Tonnes
	4,117.99

3.1.2 Diverted Materials

There was a total of 255 tonnes of materials diverted at the Landfill in 2023. Divertible materials are categorized as any materials redirected from landfill disposal to be utilized in a meaningful way for site operations or salvage. Diverted materials do not include recyclable materials with a defined end of life program or strategy in place. Divertible materials at the Landfill include:

- Divertible construction waste with site operational utility. Such as concrete, asphalt and other crushable materials which may be used as structural fill or for road construction (Construction Waste B).

3.1.3 Recycled Materials

Recorded recycled materials at a Landfill include:

- Metals – Type A (white goods, 80% metal or more);
- Metals – Type B (scrap metal);
- Tires;
- Refrigerators;
- Propane tanks; and
- Agricultural plastics.

In 2023, a total of 55 tonnes of recyclable materials were received at the Landfill.

The landfill also accepts the following materials at the public drop-off area:

- Tin and aluminum cans, trays and foil;
- Glass bottles and jars;
- Newspapers and flyers;
- Corrugated cardboard other than waxed or plastic coated cardboard;
- Mixed paper including magazines, books, catalogues, writing and computer paper;
- Boxboard and heavy paper other than waxed or coated cartons or foil gift wrap;
- All plastics (except Styrofoam); and
- Or any other materials the Town and/or Recycle BC deems suitable for collection.

Quantities of these materials are not recorded by the Landfill.

3.1.4 Composted Materials

The Landfill accepts yard and garden wastes, as well as compostable construction waste, for composting at the Site's compost facility. Compostable materials accepted include:

- Yard and garden waste; and
- Compostable construction waste (white wood, lumber, stump, compost, etc).

The total annual compost sales tonnage for 2023 was 158 tonnes of Class A compost. A summary of the historical compost sales is provided in Table 3.

Table 3: Compost Sales and Cover Materials Received

Waste Category	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Compost Sales	-	-	-	-	-	-	321	181	204	158

3.1.5 Cover Materials

All cover materials are tracked as it arrives at the Site. Cover materials may contain dirt, gravel, sand or clay and are used to meet the active cells daily cover needs. Overall, there were a recorded 1,415 tonnes of clean cover materials received at the Landfill in 2023. Historical clean cover materials are provided in Table 4 for years 2014 to 2023. These materials are not tracked in the total waste summary. Materials are stored and used as necessary for daily cover and sometimes mixed with other sources of alternative daily cover.

Table 4: Cover Materials Received

Waste Category	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Clean Cover Material	1,531	175	1,430	1,718	8,116	2,040	3,451	836	1,096	1,415

3.2 Prohibited Materials

In compliance with Section 3.2 of the OC and the Town's Waste Management Services and Regulation Bylaw No. 1370, 2020", the Landfill does not accept the following prohibited wastes:

- Special Wastes, other than those specifically authorized in the Special Waste Regulation;
- Biomedical waste as defined in the document *Guidelines for the Management of Biomedical Waste in Canada* (CCME, February 1992); and
- Liquids or semisolid wastes which contain free liquid, except as otherwise authorized by the Hauled Liquid Waste Facility Permit 14804.

3.3 Controlled Waste

Controlled waste is received at the Landfill. Control waste is defined in the Town's Waste Management Services and Regulation Bylaw No. 1370, 2020 as hazardous waste, liquid waste and refuse which is approved for disposal at the Site, such materials may require special handling and disposal techniques to avoid creating health hazards, nuisances or environmental pollution.

As per Section 3.3 of the OC, the Landfill may accept low level contaminated soil that is below the contamination threshold set in Section 41.1 of the Provincial Hazardous Waste Regulation at the landfill for use as daily cover, intermediate cover, construction of roads or for immediate disposal.

3.3.1 Asbestos

Asbestos containing materials generated from MSW sources such as residential, commercial or institutional, is accepted at the Landfill as controlled waste. Asbestos received at the Landfill is immediately buried with a minimum of 0.5 meters of cover material following its placement in the controlled cell.

Asbestos waste disposal at the Landfill is guided by the BC Hazardous Waste Regulations Section-40 (management of waste asbestos). In 2023, there was a total of 10.06 tonnes of asbestos containing materials received and buried at the Landfill in 2023.

3.4 Hauled Liquid Waste

Hauled liquid wastes tonnage is recorded at the Landfill, which includes effluent accepted for disposal at the hauled liquid waste facility. The hauled liquid waste facility is operated separately from the under the Provincial Ministry of Environment Lands and Parks Permit PE14804. The maximum authorized rate of discharge is 5,400 m³ per year for the liquid waste facility. The historical tonnage of hauled liquid waste received at the Site is provided in Table 5.

Table 5: Hauled Liquid Waste at the Osoyoos Landfill (2014 to 2023) (Tonnes)

Waste Category	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Hauled Liquid Waste	2,084	1,920	2,021	2,352	2,119	2,680	3,160	4,579	5,108	2,802

Service Population and Per Capita Generation Rates

As required by Section 4.6 of the OC, the service population and waste disposal rate in per tonnes per capita for 2023 was determined. Table 6 presents a summary of the estimated service population and waste disposal rate for the Town of Osoyoos and Electoral Area A for years 2011 to 2050. This waste disposal rate does not include materials recycled, composted, clean cover material and hauled liquid waste.

Population data for each year was obtained from BC Stat and Statistics Canada Census Profile, where possible. For years without population data, population was interpolated between the known years. The estimated population growth rates from the BC Statistics Population Estimates & Projections for British Columbia were used to estimate population for years 2023 to 2050¹.

For years 2011 to 2023, per capita annual waste disposal rates were calculated from the known waste tonnages for the estimated service population. For years postdating 2023, a 5-year average (2019 to 2023) was calculated to estimate waste disposal tonnages at the Landfill. The average per capita disposal rate was estimated to be 550 kg per capita (0.55 tonnes/capita), which is a comparable value to the average RDOS value of 0.568 kg per capita².

¹ BC Stats. *Population Estimates and Projections for British Columbia BC* (<https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-estimates>) Accessed on February 21, 2024.

² Province of British Columbia. *Environmental Reporting BC. (2023). Municipal Solid Waste Disposal in B.C. (1990-2021). State of Environment Reporting. Ministry of Environment and Climate Change Strategy, British Columbia, Canada.*

Table 6: Service Population and Waste Disposal Rates of Osoyoos and Electoral Area A

Year	Population				Waste Disposal	
	Town of Osoyoos	Electoral Area A	Total	Estimated Growth Rate	Landfilled Waste (Tonnes)	Waste Disposal Rate ²
2011 ¹	4,845	1,892	6,737	-	6,538	0.97
2012	4,886	1,885	6,771	0.50%	5,201	0.77
2013	4,927	1,878	6,805	0.50%	4,293	0.63
2014	4,968	1,872	6,840	0.51%	4,305	0.63
2015	5,009	1,865	6,874	0.50%	4,093	0.6
2016 ¹	5,050	1,858	6,908	0.49%	4,054	0.59
2017	5,151	1,914	7,065	2.27%	4,057	0.57
2018	5,252	1,970	7,222	2.22%	4,898	0.68
2019	5,354	2,027	7,381	2.20%	4,232	0.57
2020	5,455	2,083	7,538	2.13%	4,167	0.55
2021 ¹	5,556	2,139	7,695	2.08%	4,597	0.60
2022	5,657	2,195	7,852	2.50%	4,045	0.52
2023	5,798	2,250	8,048	2.50%	4,118	0.51
2024	5,868	2,277	8,145	1.20%	4,480	0.55
2025	5,944	2,306	8,251	1.30%	4,539	0.55
2026	6,016	2,334	8,350	1.20%	4,593	0.55
2027	6,100	2,367	8,467	1.40%	4,657	0.55
2028	6,155	2,388	8,543	0.90%	4,699	0.55
2029	6,247	2,424	8,671	1.50%	4,770	0.55
2030	6,316	2,451	8,766	1.10%	4,822	0.55
2031	6,411	2,487	8,898	1.50%	4,895	0.55
2032	6,487	2,517	9,005	1.20%	4,953	0.55
2033	6,585	2,555	9,140	1.50%	5,028	0.55
2034	6,677	2,591	9,268	1.40%	5,098	0.55
2035	6,757	2,622	9,379	1.20%	5,159	0.55
2036	6,845	2,656	9,501	1.30%	5,226	0.55
2037	6,934	2,690	9,624	1.30%	5,294	0.55
2038	7,052	2,736	9,788	1.70%	5,384	0.55
2039	7,136	2,769	9,905	1.20%	5,449	0.55
2040	7,229	2,805	10,034	1.30%	5,520	0.55
2041	7,309	2,836	10,145	1.10%	5,580	0.55
2042	7,396	2,870	10,266	1.20%	5,647	0.55
2043	7,493	2,907	10,400	1.30%	5,721	0.55
2044	7,560	2,933	10,493	0.90%	5,772	0.55
2045	7,681	2,980	10,661	1.60%	5,864	0.55



Year	Population				Waste Disposal	
	Town of Osoyoos	Electoral Area A	Total	Estimated Growth Rate	Landfilled Waste (Tonnes)	Waste Disposal Rate ²
2046	7,788	3,022	10,810	1.40%	5,947	0.55
2047	7,897	3,064	10,962	1.40%	6,030	0.55
2048	8,000	3,104	11,104	1.30%	6,108	0.55
2049	8,104	3,145	11,249	1.30%	6,188	0.55
2050	8,210	3,185	11,395	1.30%	6,268	0.55

¹Years with Census Year for Population count. (Environmental Reporting BC. 2023. Municipal Solid Waste Disposal in B.C. (1990-2021). State of Environment Reporting, Ministry of Environment and Climate Change Strategy, British Columbia, Canada.)

²A 5-year average (2019 to 2023) per-capita waste generation rate was used for population projections for years 2024 to 2050.

5.0

Remaining Site Life and Capacity

The Site lifespan and remaining capacity was estimated using volumetric calculations from the 2022 Osoyoos Landfill Annual Operations and Monitoring Report and the estimated waste disposal rates presented in Section 4.0 for the Town and Electoral Area A. Table 7 presents a summary of the estimated available airspace the Landfill for years 2011 to 2050 and estimated lifespan for Stage 2.

Table 7: Landfill Stage 2 Lifespan Calculation

Year	Population		Waste Disposal		Landfill Airspace	
	Total	Estimated Growth Rate	Landfilled Waste (Tonnes)	Waste Disposal Rate	Airspace utilized (m ³)	Available Airspace (m ³)
2011	6,737	-	6,538	0.97	9,262	-
2012	6,771	0.50%	5,201	0.77	7,368	-
2013	6,805	0.50%	4,293	0.63	6,082	-
2014	6,840	0.51%	4,305	0.63	6,099	-
2015	6,874	0.50%	4,093	0.6	5,799	-
2016	6,908	0.49%	4,054	0.59	5,743	-
2017	7,065	2.27%	4,057	0.57	5,746	-
2018	7,222	2.22%	4,898	0.68	6,938	-
2019	7,381	2.20%	4,232	0.57	5,994	-
2020	7,538	2.13%	4,167	0.55	5,903	-
2021	7,695	2.08%	4,597	0.60	6,514	-
2022	7,852	2.50%	4,045	0.52	5,731	207,641
2023	8,048	2.50%	4,118	0.51	5,883	201,758
2024	8,145	1.20%	4,480	0.55	6,400	195,358
2025	8,251	1.30%	4,539	0.55	6,484	188,874
2026	8,350	1.20%	4,593	0.55	6,561	182,313
2027	8,467	1.40%	4,657	0.55	6,653	175,659
2028	8,543	0.90%	4,699	0.55	6,713	168,946
2029	8,671	1.50%	4,770	0.55	6,814	162,132
2030	8,766	1.10%	4,822	0.55	6,889	155,243
2031	8,898	1.50%	4,895	0.55	6,992	148,251
2032	9,005	1.20%	4,953	0.55	7,076	141,175
2033	9,140	1.50%	5,028	0.55	7,182	133,993
2034	9,268	1.40%	5,098	0.55	7,283	126,710
2035	9,379	1.20%	5,159	0.55	7,370	119,340
2036	9,501	1.30%	5,226	0.55	7,466	111,874
2037	9,624	1.30%	5,294	0.55	7,563	104,311
2038	9,788	1.70%	5,384	0.55	7,692	96,620

Year	Population		Waste Disposal		Landfill Airspace	
	Total	Estimated Growth Rate	Landfilled Waste (Tonnes)	Waste Disposal Rate	Airspace utilized (m ³)	Available Airspace (m ³)
2039	9,905	1.20%	5,449	0.55	7,784	88,836
2040	10,034	1.30%	5,520	0.55	7,885	80,951
2041	10,145	1.10%	5,580	0.55	7,972	72,979
2042	10,266	1.20%	5,647	0.55	8,067	64,911
2043	10,400	1.30%	5,721	0.55	8,172	56,739
2044	10,493	0.90%	5,772	0.55	8,246	48,493
2045	10,661	1.60%	5,864	0.55	8,378	40,115
2046	10,810	1.40%	5,947	0.55	8,495	31,620
2047	10,962	1.40%	6,030	0.55	8,614	23,006
2048	11,104	1.30%	6,108	0.55	8,726	14,280
2049	11,249	1.30%	6,188	0.55	8,839	5,440
2050	11,395	1.30%	6,268	0.55	8,954	-3,514

¹ Total airspace calculated by TRUE Consulting in December 2022, based on an aerial survey completed in September of the same year. The total airspace was calculated to be approximately 207,641 m³.

For years following 2023, airspace consumption is based on the 5-year average per capita disposal rate for years 2019 to 2023 (0.55 tonnes per capita). In lieu of site-specific data, a waste density of 700 kg/m³ was assumed based on the Landfill's target waste compaction rate. The waste to cover ratio was assumed at 4:1.

On December 31, 2023, the total airspace remaining is estimated to be approximately 201,761 m³. Current projections estimate that Stage 2 of the Landfill will be consumed by 2050. An updated aerial survey of the Site is expected to be completed in 2024.

6.0 Operations and Maintenance

6.1 Non-Compliance with Operational Certificate

There was one non-compliance item identified by the MOECC within the 2023 calendar year. Table 8 provides a summary of the non-compliance and corrective action taken.

Table 8: 2023 Non-Compliance Items and Actions Taken

Non-Compliance Report Date	Description of Non-Compliance	Actions Taken
June 14, 2023	Exposed litter and dust control from MOECC inspection report IR 210374.	<ol style="list-style-type: none"> Revised the afterhours waste handling practices to reduce the amount of uncovered waste being generated while equipment is inactive. Procured an additional 40 yard roll off bin for use during peak waste generating seasons to minimize bin overflow.

6.2 Complaints

No complaints were received in 2023 for the Site. It was noted that no formal complaints log for the Site has been implemented by the Town. It is recommended a formal tracking system is implemented to improve complaint tracking and response records for the Landfill.

6.3 Site Inspections

The Site Operator conducted monthly Site inspections in 2023 of cover integrity, vegetation health, undesirable plants species, erosion, settlement, and nuisance issues. In 2023, the Site Operator noted issues with windblown litter. The issue was corrected. An invasive plant (Puncture Vine) was also noted on Site during inspections. The invasive plant was hand pulled and double bagged and placed in the active face.

6.4 Operational Plan for Next 12 Months

All upcoming operational plans for 2024 for site operations, including reporting, operational changes, surveys, and environmental assessments are provided in Table 9.

Table 9: Operation Plan for Next 12 Months

Operational Item	Description
Update to the 2018 DOCP	As per Section 10.3 of the BC Ministry of Environment Landfill Criteria for Municipal Solid Waste, June 2016 (BC Landfill Criteria), the Landfill's DOCP shall be reviewed and updated as needed at least once every five years. The last DOCP was completed in 2018 and is scheduled to be updated in 2024. As part of update, the 2018 landfill closure cost estimates will be reviewed for the purpose of establishing a closure and post-closure fund as per Section 8 of the BC Landfill Criteria.
Updated Site Topographic Survey	An updated topographic survey is scheduled in 2024 to provide updated contour data for the upcoming site designs and fill planning. It is anticipated that this survey will be completed by a drone flyover.
Hydrogeology and Hydrology Characterization Report	A Hydrogeology and Hydrology Characterization Report will be undertaken in 2024. The Report will be conducted as per Section 10.1 of the BC Landfill Criteria.
Landfill Conformance Review	In conjunction with the DOCP, a landfill conformance review will be conducted as per Section 2.2 of the BC Landfill Criteria in 2024 to assess the site's compliance with BC Landfill Criteria and the Landfill's OC.

7.0

Closure Plans

There were no closure works performed in 2023.



Environmental Monitoring Program

Environmental monitoring protocols currently implemented for the Landfill are detailed in the Environmental Monitoring Plan (EMP) (Appendix E), developed by Dillon in 2022. The EMP was submitted to the MOECC for review and approval on April 3, 2024.

The EMP summarizes the environmental monitoring and reporting requirements for the three facilities operating at the Site including:

- Landfill, operating under Operational Certificate MR-15273;
- Hauled liquid waste facility, operating under Permit 14804; and
- Compost facility, operating under Registration 109610.

Landfill monitoring requirements specified in the EMP include:

- Annual vegetation monitoring to determine if any environmental impacts are occurring;
- Monthly monitoring of the water levels in the six on-site groundwater monitoring wells;
- Groundwater quality sampling completed twice annually (in April and September);
- Data quality assurance in accordance with the terms and conditions of the *Environmental Data Quality Regulation* (EQDA), including the collection of duplicate samples at a rate of ten percent, as well as providing the quality control information generated by the applicable laboratory;
- Comparison of groundwater results to the BC Approved and Working Water Quality Guidelines (WQG) and Guidelines for Canadian Drinking Water Quality (GCDWQ); and
- Annual reporting including compilation, interpretation and trend analysis of the receiving environmental monitoring data prepared by a suitable qualified professional, to be included as part of the Landfill Annual Report.

The results of the groundwater monitoring program at the Landfill are provided in Appendix F. Annual vegetation monitoring are provided in Section 6.3. Annual monitoring results from Hauled Liquid Waste Facility are provided in Appendix B. As discussed in Section 3.3 of the EMP, no environmental monitoring programs were specified for the compost facility, groundwater monitoring undertaken for the Landfill discussed above serves to identify any potential impacts from the on-site composting operations.

This groundwater monitoring program report included in Appendix F fulfills the environmental groundwater monitoring reporting requirements for 2023 as outlined in Section 4.6(e) [“A compilation, interpretation and trend analysis of the receiving environment monitoring data prepared by a suitably qualified professional”] of the OC.

Landfill Gas Generation Assessment

The Landfill is classified as a regulated landfill as per the Section 4(5) of the British Columbia Ministry of Environment's Landfill Gas Management Regulation (LFG Regulation). The last landfill gas (LFG) Generation Assessment Report was completed in 2019. As per Section 15(1)(ii) of the LFG Regulation, a 5-year LFG assessment renewal was required to be completed in 2023. A supplementary LFG assessment that estimates the quantity of methane generated at the Landfill in each of the 5 calendar years preceding 2023 has been provided in Appendix G.

The Landfill's methane production tonnage for 2024 is estimated at 214 tonnes CH₄, below the LFG Regulation threshold of 1,000 tonnes or more of methane generated that requires a landfill to prepare a landfill gas management facilities design plan. The Town will provide subsequent landfill gas assessment reports every 5-years as outlined in the LFG Regulation or earlier if requested by the MOECC. The next scheduled LFG generation assessment is due by March 31 of 2029.

References

- BC Ministry of Environment. Landfill Criteria for Municipal Solid Waste, Second Edition (2016).
- BC Environmental Management Act. Landfill Gas Management Regulation, B.C Reg. 391 (2008).
- BC Environmental Management Act. Hazardous Waste Regulation, B.C Reg. 63/88, Section 40 (2022).
- BC Environmental Management Act. Hazardous Waste Regulation, B.C Reg. 63/88, Section 41 (2022).
- Town of Osoyoos. Operational Certificate No. MR 15273
- Town of Osoyoos Bylaw No. 1370, “Waste Management Services and Regulation Bylaw” (2020).
- TRUE Consulting. Osoyoos Landfill Design/Operations/Closure Plan (2018)
- BCStats, Population Estimates & projections for British Columbia (2024). Sourced from <https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-estimate>

Appendix A

Operational Certificate



MINISTRY OF WATER, LAND AND
AIR PROTECTION

**OPERATIONAL CERTIFICATE
MR 15273**

*Under the provisions of the Waste Management Act and in accordance with the Approved
Regional District of Okanagan-Similkameen Solid Waste Management Plan,*

Town of Osoyoos

PO Box 3010

Osoyoos, British Columbia

VOH 1VO

is authorized to manage municipal solid waste and to discharge residual solid waste to the ground at a sanitary landfill facility located on 146th Avenue, Osoyoos, approximately 7 km northwest of Osoyoos, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the *Waste Management Act* and may result in prosecution.

This Operational Certificate does not authorise entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorised by the owner of such lands or works. The responsibility for obtaining such authority shall rest with the Operational Certificate holder. This Operational Certificate is issued pursuant to the provisions of the *Waste Management Act* to ensure compliance with Section 54 of that statute, which makes it an offence to discharge waste without proper authorisation. It is also the responsibility of the Operational Certificate holder to ensure that all activities conducted under this authorisation are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This Operational Certificate supersedes all previous authorizations issued under the authority of the Waste Management Act.

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

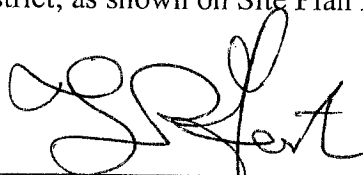
1. AUTHORIZED DISCHARGES

- 1.1 This authorization applies to the discharge of solid waste to a sanitary landfill known as the Osoyoos Landfill. The Environmental Monitoring System (EMS) reference number for this discharge is **E212323**.
- 1.1.1 The authorized discharge is municipal solid waste and other wastes as allowed by the Regional Waste Manager.
- 1.1.2 The works authorized are a sanitary landfill and related appurtenances located approximately as shown on the attached Site Plan A.
- 1.1.3 The discharge originates generally from the Osoyoos area of the Regional District of Okanagan-Similkameen.
- 1.1.4 The legal description of the location of the authorized landfill facility is Lot 993 Plan 22982 and Lot 829 Plan 5102, both in District Lot 2450s, and that portion of District Lot 2450s lying south of Lot 993 Plan 2298 to the Old Richter Pass Road, Similkameen Division of Yale District, as shown on Site Plan A.
- 1.2 The discharge of emissions to the air to which this Sub-Section is applicable is the burning of wood residues. The EMS reference number for this discharge is **E212325**.

The authorization to open burn shall expire on December 31, 2002, after which time open burning shall be strictly prohibited.

Prior to the expiration of the authorization to open burn, the following shall apply.

- 1.2.1 The type of wood residues which may be burned shall be from municipal sources and is restricted to brush and untreated wood, but excluding stumps.
- 1.2.2 The maximum duration of each open burn shall be limited to the period between dawn and dusk of a single day.
- 1.2.3 The maximum authorized volume of wood residues to be burned is that which can successfully be burned in a single dawn to dusk time period in any number of separate piles.
- 1.2.4 The location from which the wood residues discharge originates is generally the Osoyoos area.
- 1.2.5 The location of the source of discharge is legally described as Lot 993 Plan 22982 and Lot 829 Plan 5102, both in District Lot 2450s, and that portion of District Lot 2450s lying south of Lot 993 Plan 2298 to the Old Richter Pass Road, Similkameen Division of Yale District, as shown on Site Plan A.



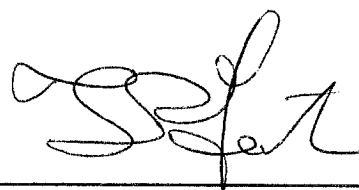
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Assistant Regional Waste Manager

2. DESIGN AND PERFORMANCE REQUIREMENTS

2.1 Operations and Closure Plan

An *Operations and Closure Plan* shall be submitted to the Regional Waste Manager. The *Operations and Closure Plan* shall be prepared by a qualified professional, knowledgeable in the field of landfill design, operation and closure and licensed to practice in British Columbia. The *Operations and Closure Plan* shall include at least the following:

- (a) Anticipated total waste volumes and tonnage and the estimated life of the landfill;
- (b) A landfill cell development and filling plan, outlining procedures for the placement, compaction and covering of wastes
- (c) Litter, odour, dust, rodent and nuisance wildlife control measures;
- (d) A screening plan, e.g.: vegetative or berm;
- (e) A perimeter fencing plan to control access;
- (f) Contingency plans & notification procedures in the event of an emergency;
- (g) Training procedures for operators
- (h) A final cover design including the thickness and permeability of barrier layers and drainage layers, topsoil requirements, vegetative cover and erosion prevention controls;
- (i) A topographic plan showing the final elevation contours of the landfill and surface water diversion and drainage controls;
- (j) A plan and implementation schedule for monitoring the receiving environment groundwater, surface water, landfill gas, erosion and settlement throughout the remaining life of the landfill and for a minimum post-closure period of 25 years;
- (k) A plan and implementation schedule for operation of any required pollution abatement engineering such as landfill gas or leachate collection, management and treatment works for the remaining life of the landfill and a minimum post-closure period of 25 years;
- (l) A forecast of the cost of completed closure and post-closure activities, plus a reasonable contingency, for the purposes of determining a schedule of reserve funds or security to be collected each year until landfill closure;
- (m) A proposed end use of the property after closure;
- (n) Procedures for notifying the public about the closure and about alternative waste disposal facilities; and
- (o) Any other site specific concerns as identified by the Regional Waste Manager.



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Operation of this landfill is to be in substantial accordance with the *Operations and Closure Plan*. If there should be any inconsistency between this Operational Certificate and the *Operations and Closure Plan*, this Operational Certificate shall take precedence.

Written notification shall be provided to the Regional Waste Manager prior to implementing any changes to the *Operations and Closure Plan*. Should circumstances warrant, a revision or addition to the *Operations and Closure Plan* may be required by the Regional Waste Manager.

2.2 Maintenance of Works, Emergency Procedures and Non-Compliance Reporting

2.2.1 The Operational Certificate holder shall regularly inspect the landfill and related pollution control works, designated areas for managing recyclable materials or controlled substances and maintain them in good working order.

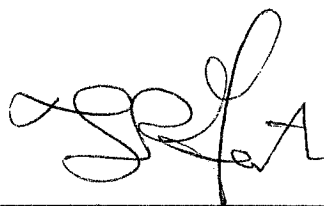
2.2.2 In the event of an emergency or condition beyond the control of the Operational Certificate holder that prevents the continued operation of the authorized works and/or continued performance of the prescribed methods of operation, the Operational Certificate holder shall immediately notify the Regional Waste Manager and take appropriate action.

Specific requirements of the Operational Certificate may be suspended for such time as the emergency exists or as otherwise directed by the Regional Waste Manager provided that:

- (a) The Operational Certificate holder can demonstrate the exercise of due diligence in relation to the process, operation or event which has caused the emergency, and that the emergency has occurred notwithstanding this exercise of due diligence;
- (b) The Regional Waste Manager has been immediately notified of the emergency; and
- (c) The Operational Certificate holder is proceeding with due diligence to correct the emergency condition.

2.3 Public Health Safety and Nuisance

The landfill shall be operated in a manner such that it will not become a significant threat to public health or safety, or a public nuisance is created with respect to, landfill gas, unauthorized access, roads, traffic, noise, dust, litter, vectors, or wildlife attraction.



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2.4 Surface Water Diversion

Discharge of municipal solid waste into water is prohibited. The Operational Certificate holder shall construct and maintain adequate surface water and groundwater diversion works to minimize surface water run-off and groundwater seepage from entering the landfill.

2.5 Property Boundary

The buffer zone between any municipal solid waste discharged and the property boundary is to be at least 50 metres, of which the 15 metres closest to the property boundary must be reserved for natural or landscaped screening (berms or vegetative screens). Depending on adjacent land use and environmental factors, buffer zones of less than 50 metres, but not less than 15 metres, may be authorised by the Regional Waste Manager.

2.6 Setbacks

The distance between the discharged municipal solid waste and the nearest surface water is to be a minimum of 100m. The distance between the discharged municipal solid waste and the nearest residence, water supply intake, hotel, restaurant, food-processing facility, school, church or public park is to be a minimum of 300 metres. Greater or lesser separation distances may be authorised by the Regional Waste Manager where justified.

Accordingly, the Operational Certificate holder shall initiate action immediately to obtain or reserve those lands within the buffer area, or otherwise negotiate an agreement with adjacent property owners, to ensure the buffer lands are adequately protected and reserved for the future.

2.7 Ground and Surface Water Quality Impairment

The landfill must be operated in a manner such that ground or surface water quality does not decrease beyond that specified by the British Columbia Water Quality Guidelines, or other appropriate criteria as may be specified by the Regional Waste Manager, at or beyond the landfill property boundary.

If excursions result to the specified water quality criteria, the Regional Waste Manager 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 subject to the authorization of the Regional Waste Manager.



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2.8 Landfill Gas Management

Combustible gas concentrations shall not exceed the lower explosive limit in soils at the property boundary or 25% of the lower explosive limit at or in on-site or off-site structures.

In accordance with the Provincial Landfill Criteria for Municipal Solid Waste, an assessment of the emissions of non-methane organic compounds (NMOCs) is required for landfills exceeding a total capacity of 100,000 tonnes. If NMOCs are determined to exceed 150 tonnes/year, landfill gas recovery and management systems will be required and shall be designed, installed and operational within 3 years. If NMOCs are projected to be less than 150 tonnes/year for the operating life of the landfill, an assessment for the need of passive gas venting will be required.

Accordingly, the Operational Certificate holder is directed to submit to the Regional Waste Manager a Landfill Gas Management Plan on or before October 1, 2003. The Landfill Gas Management Plan may consider actual site-specific measurements for determining the actual rate of NMOCs emissions. In the event that active gas recovery systems are not required, the Landfill Gas Management Plan shall evaluate the need for passive gas venting. The Landfill Gas Management Plan shall provide a design and an implementation schedule for any required works and measures for the management and recovery of landfill gas.

The Landfill Gas Management Plan is subject to the approval of the Regional Waste Manager. The Regional Waste Manager may require revisions to the Landfill Gas Management Plan where warranted.

2.9 Final Cover

Final cover for landfill sites is to consist of a minimum of 1 metre of low permeability ($<1 \times 10^{-5}$ cm/s) compacted soil plus a minimum of 0.15 metre of topsoil with suitable vegetation established. The depth of the topsoil layer should be related to the type of vegetation proposed (i.e. rooting depth). Soils of higher permeability may be authorized based on leachate generation potential at the landfill site. Final cover is to be constructed with slopes between 4% and 33% with appropriate run-on/run-off drainage controls and erosion controls. Additional design elements may be necessary due to site specific conditions and the presence of management systems for leachate and landfill gas. Completed portions of the landfill are to progressively receive final cover during the active life of the landfill.



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3. OPERATIONAL REQUIREMENTS

3.1 Landfill Supervision and Access

A suitably trained landfill operator shall be present on-site at all times during operating hours. The operator shall be familiar with the requirements of the Operational Certificate and the specifications of the approved *Operations and Closure Plan*.

Perimeter fencing, gates and/or barriers shall be installed where necessary to prevent unauthorized access to the site by vehicles. All access points are to have locking gates, and all gates are to be locked during non-operating hours to prevent unauthorized access. Properly designed and maintained public waste disposal and/or recyclable material bins situated outside the main gate may be provided for after hours use.

3.2 Prohibited Wastes

3.2.1 The disposal of the following types of wastes is strictly prohibited:

- a) Special Wastes other than those specifically authorized in the *Special Waste Regulation*
- b) Biomedical waste as defined in the document *Guidelines for the Management of Biomedical Waste in Canada* (CCME, February 1992)
- c) Liquids or semisolid wastes which contain free liquid, except as otherwise authorized by the Waste Management Act Permit PE-14804



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3.2.2 The disposal of the following wastes is prohibited unless specifically authorized by the Regional Waste Manager:

- a) Automobiles, white goods, other large metallic objects and tires
- b) Dead animals and slaughter house, fish hatchery and farming wastes or cannery wastes and by-products

Burial of these wastes in dedicated locations (i.e. avoiding co-disposal) at a landfill site may be authorized by the Regional Waste Manager only if there is no other viable alternative such as treatment/disposal, recycling, reprocessing or composting. The specific location of the disposal shall be recorded to allow ready access to the waste should corrective or further action pertaining to the management of these wastes be required by the Ministry at some time in the future.

3.3 Hydrocarbon Contaminated Soils

The deposit of hydrocarbon contaminated soils below the *Special Waste Regulation* criteria is authorized at this landfill subject to the following conditions:

- 3.3.1 Soil contaminated with hydrocarbons shall be deposited in layers less than 0.3 meters; and
- 3.3.2 Soil contaminated with hydrocarbons shall be deposited a minimum of 1.2 meters above the seasonal high groundwater level and a minimum of 2.0 meters below the final grade of the landfill to prevent the impact on groundwater and any future vegetation on the site.

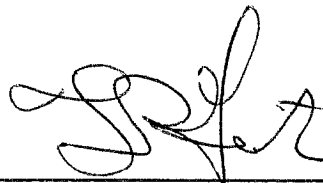
3.4 Ozone Depleting Substances

Release of ozone depleting substances from the storage, handling and disposal of used appliances, equipment, or any material containing ozone depleting substances is strictly prohibited in accordance with the requirements of the *Ozone Depleting Substances Regulation*.

3.5 Designated Areas

Maintain areas for the separation, handling and storage of recyclable or reusable materials where applicable.

When a separated recyclable material is a special waste it is to be stored and managed in accordance with the *Special Waste Regulation*.



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3.6 Scavenging

Scavenging of waste is to be prevented. The salvaging of wastes should be encouraged by providing areas and facilities for separation of recyclable or reusable materials.

3.7 Dust Control

Dust created within the landfill property is to be controlled, using methods and materials acceptable to the Regional Waste Manager, such that it does not cause a public nuisance.

3.8 Waste Compaction and Covering

Wastes are to be spread in thin layers (0.6 m or less) on the working face and compacted. The working face area should be minimized as much as possible. A compacted layer of cover material of at least 0.15 metre of soil or functionally equivalent depth of other cover material, as authorized by the Regional Waste Manager, is to be placed on all exposed solid waste at the end of each day of operation. If the landfill should operate continuously 24 hours per day, 0.15 m of cover material is to be applied at a frequency authorized by the Regional Waste Manager. Under specific circumstances, such as during bear season, the Regional Waste Manager may specify more stringent cover requirements. During periods of extreme weather conditions, such as those that cause the ground to freeze, an exemption to the normal cover requirements may be authorized by the Regional Waste Manager.

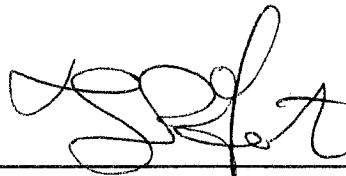
An intermediate cover consisting of a compacted layer of at least 0.30 metre of soil or functionally equivalent depth of other cover material is to be placed where no additional solid waste has been deposited or will be deposited within a period of 30 days.

3.9 Litter Control

Litter is to be controlled by compacting the waste, minimizing the working face area, applying cover, providing litter control fences and instituting a regular litter pickup and general good housekeeping program or any other measures required by the Regional Waste Manager.

3.10 Vectors

Vectors are to be controlled by the application of cover material at a specified frequency or by other control measures as required and authorized by the Regional Waste Manager.



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3.11 Wildlife

The landfill is to be operated so as to minimize the attraction of wildlife such as bears and birds by applying cover at required frequencies and instituting a good housekeeping program. Further control measures, such as bear control fences, and bird control devices, may be specified by the Regional Waste Manager.

3.12 Fire Protection

Adequate fire fighting equipment is to be available to extinguish surface or underground fires. Recyclables and reusable materials are to be stored in such a manner to not constitute a fire hazard.

3.13 Open Burning

The controlled open burning operation is authorized until December 31, 2002, at which time all open burning shall cease. The time limited authorization to open burn is subject to the following conditions:

- 3.13.1** The maximum duration of each open burn event shall be limited to the period between dawn to dusk of a single day, after which time the fire shall be extinguished. In order to limit the smoke that will be created from having to extinguish a fire, the wood residue to be burned shall be stacked in piles of a size that may be consumed by the fire in the dawn to dusk time frame.
- 3.13.2** The open burn shall not be initiated until the Venting Index for the Okanagan Valley is classified as "good". The Venting Index may be obtained from the information line at 250-861-7480.
- 3.13.3** Additional authorizations for open burning may be required from other government agencies. In particular, the Operational Certificate holder shall ensure that the necessary authorizations have been obtained from the British Columbia Forest Service and any applicable municipal authority.
- 3.13.4** The wood residues shall be segregated from the municipal solid waste and sorted to ensure that there are no unacceptable materials in the burn pile(s). Unacceptable materials are those that will produce unacceptable emissions or will not fully incinerate within the dawn to dusk time period of the burn and includes tires, plastics, insulation, asphalt shingles, putrescible waste, stumps, metal hulks, animal carcasses and the like. The wood waste shall be piled in a manner that will promote rapid and hot combustion.



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- 3.13.5** The open burn shall be conducted on ground that has not been previously landfilled, and a minimum 15 meter setback is to be maintained between the discharged municipal solid waste and burn area. A minimum 15 meter combustible free zone or firebreak shall be maintained around the burn area.
- 3.13.6** The Operational Certificate holder shall ensure that full time supervision shall be provided until the open burn is complete, that is, until there is no smoke and no further danger of fire exists). Suitable equipment is to be available to promote rapid and hot combustion of the wood residue pile(s).
- 3.13.7** Suitable equipment shall be available for extinguishing fires to prevent them from spreading to surrounding areas and to extinguish the fire at dusk. Such devices may include a pressurized water supply, chemical type fire extinguishers, or an earth stockpile. If an earth stockpile is used for fire control, earth-moving equipment shall be available at the site during the burning.
- 3.13.8** The residue of combustion shall be monitored to ensure it has cooled to ambient temperature prior to incorporating into the adjacent landfill.



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4. MONITORING AND REPORTING REQUIREMENTS

4.1 Receiving Environment Monitoring

The Operational Certificate holder shall submit for the approval of the Regional Waste Manager a monitoring program design. The monitoring program design shall be prepared by an engineer or geoscientist who is knowledgeable in the field of hydrogeology, experienced in modeling and evaluating the environmental impact from landfill sites, and licensed to practice in the province of BC. The monitoring program design shall recommend the location of monitoring wells and devices and a monitoring program sufficient to determine the environmental impact from the landfill, including groundwater contamination from landfill leachate and potential impacts from the generation of landfill gas.

Upon approval, the monitoring wells and devices specified in the monitoring program design shall be installed under the direction of the design professional and the monitoring program shall be undertaken as specified.

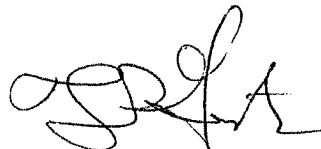
As-constructed drawings, sealed by the design professional, of the monitoring wells and devices shall be submitted to the Regional Waste Manager. The drawings shall include elevations relative to a common datum, and a scaled site location plan indicating the landfill footprint, associated works and all existing monitoring wells and devices.

The receiving environment monitoring devices shall be adequately secured and maintained, including provisions to ensure protection from damage due to vehicles or vandalism.

The Operational Certificate holder shall maintain records of all monitoring program data and analyses available for inspection. Data from monitoring and analyses shall be submitted to the Regional Waste Manager annually as part of the annual report required under **Section 4.6**. The adequacy of the monitoring program shall be reviewed at least annually and any revisions to the monitoring program shall be outlined in the annual report. On the basis of the information submitted in the annual report, routine inspections and any other information related to the effect of the discharge on the receiving environment, the Regional Waste Manager may vary the frequency, location, and/or analyses of any or all components of the receiving environment monitoring program.

4.2 Vegetation Monitoring

Inspect vegetation during the growing season in the vicinity of the landfill at least once per year to determine if any environmental impacts are occurring.



T.R. Forty, P.Eng.
Assistant Regional Waste Manager

4.3 Sampling and Analytical Procedures

The receiving environment sampling and monitoring shall be carried out in accordance with the appropriate procedures listed in the table below. Alternative test methods may be used only where authorized by the Regional Waste Manager. Test methods for parameters not listed below are subject to the approval of the Regional Waste Manager.

LIQUID EFFLUENTS, SURFACE WATER, GROUND WATER, SOILS, SEDIMENTS, VEGETATIVE MATTER:		
Parameter	Sampling Procedure	Analytical Procedure
Metals Nutrients Organics Toxicity	British Columbia Field Sampling Manual for Continuous Monitoring plus the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 1996 or most recent edition	British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials, 1994 or most recent edition and supplements

The above manuals are available from Queen's Printer Publications Centre, P.O. Box 9452, Stn. Prov. Govt, Victoria, BC, V8W 9V7 (1-800-663-6105 or (250)387-4609).

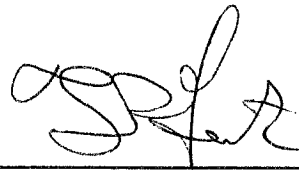
Proper care should be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination and breakage.

4.4 Environmental Monitoring System (EMS) Sites

The receiving environment monitoring program will take into consideration existing ground and surface water monitoring sites that were previously established by the Ministry. The Operational Certificate holder shall provide precise latitude and longitude values for each of the EMS sites monitored and for any additional sites that are required.

4.5 Data Quality Assurance

The Operational Certificate holder is required to follow the terms and conditions of the *Environmental Data Quality Assurance Regulation (EQDA)*, or other legislation which may be in effect at the time. The EQDA specifies ten percent of the samples collected shall be duplicated to provide data quality assurance. Quality control information generated by the laboratory while analyzing parameters required by this Operational Certificate shall also be provided with the data required to be reported.



T.R. Forty, P.Eng.
Assistant Regional Waste Manager

4.6 Annual Report

The Operational Certificate holder shall submit an annual operations and monitoring report to the Regional Waste Manager by **March 1st** of each calendar year. The annual report shall include the following information:

- (a) Total volume and/or weight of waste discharged into the landfill for the year, along with documentation of the method used to quantify the waste discharged;
- (b) Service population and waste discharge rate for the year (in tonnes per capita per year) and a trend analysis with a comparison to the 1996 baseline waste discharge rate of 1.2 tonnes per capita per year;
- (c) Remaining site life and capacity;
- (d) Operational plan for next 12 months including any proposed changes to the *Operations and Closure Plan*;
- (e) A compilation, interpretation and trend analysis of the receiving environment monitoring data prepared by a suitably qualified professional;
- (f) Review of the closure plan and associated estimated costs, for the purposes of establishing the closure fund required in **Section 4.8**; and
- (g) Any other data relevant to this Operational Certificate.

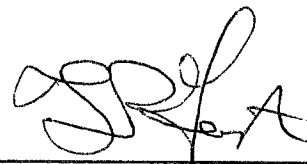
4.7 Format of Submission

Monitoring and/or reporting information shall be submitted in an electronic and/or printed format which is suitable for review by the public and/or other government agencies and is satisfactory to the Regional Waste Manager.

4.8 Closure Fund

The Operational Certificate holder shall provide for the funding of operations at and beyond closure by establishing a closure fund. The ultimate value of the closure fund shall meet or exceed the estimated closure and post-closure costs as outlined in the *Operations and Closure Plan* and updated in the annual report, plus a reasonable contingency for any remediation which may be required.

The Operational Certificate holder shall determine and ensure that the closure fund is adequate by preparing annually a financial statement of the fund which shall be made available to the Regional Waste Manager upon request. The financial statement shall report the accrued capital, interest and additions to the fund for the previous year, and shall review the sufficiency of the fund and the rate of accrual in consideration of the projected costs of closure and post-closure obligations.



T.R. Forty, P.Eng.
Assistant Regional Waste Manager

4.9 Declaration of Landfill

Landfills sited on titled land must register a covenant that the property was used for the purpose of waste disposal as a charge against the title to the property as provided for under Section 215.1 of the *Land Title Act*. Landfills located on crown land are to have a "notation on file" registered that the property was used for the purpose of waste disposal.

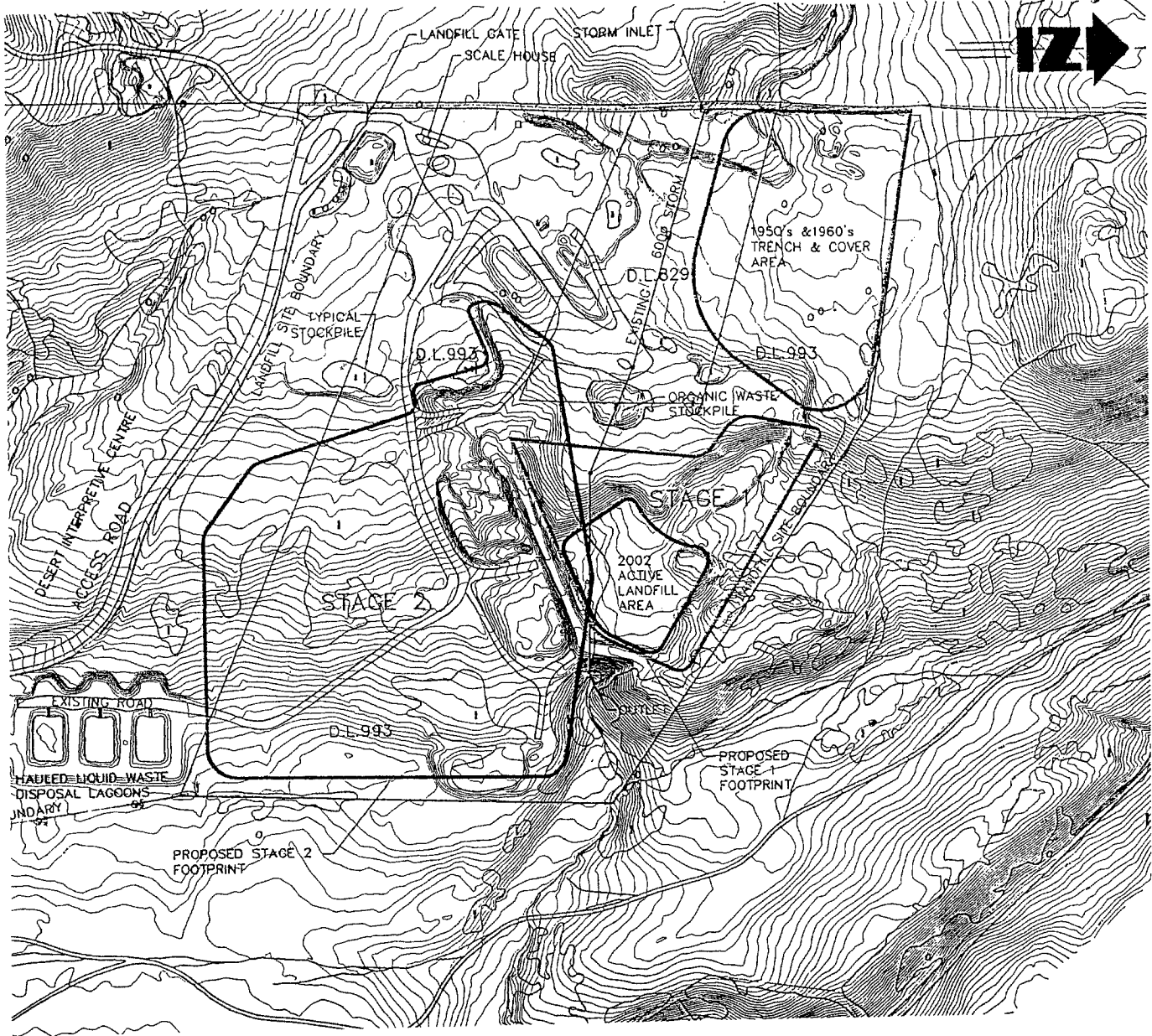
4.10 Buildings and Structures

The construction of buildings and other structures on landfills containing putrescible wastes is not recommended for a minimum period of 25 years after closure due to concerns about combustible gas and excessive settlement. Such activity will only be considered and /or authorized after an investigation and report by qualified persons. The report is to be submitted for authorization to the Regional Waste Manager prior to initiating construction activities.

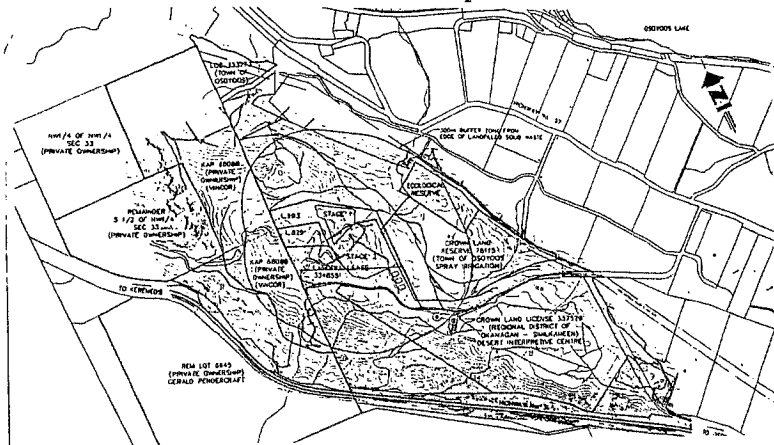


T.R. Forty, P.Eng.
Assistant Regional Waste Manager

SITE PLAN A



Location Map



Scale: NTS

Operational Certificate No.: MR-15273

Date:

March 26, 2007

T.R. Forty, P.Eng.

Assistant Regional Waste Manager

Appendix B

Hauled Liquid Waste 2023 Annual Report



2023 HAULED LIQUID WASTE REPORT

Town of Osoyoos

PE - 14804

*Prepared by Kelly McDonald,
Utilities Superintendent
and Derek Hesketh,
Operations Technician*

Hauled Liquid Waste Quantities

The Waste Management Permit PE 14804 has the following provisions with respect to flow:

- The maximum authorized rate of discharge is 5,400m³ per year which is 14.8m³ per day averaged over a calendar year (Section 1.1.1).
- Provide and maintain a suitable flow measurement device and record the volume of effluent volume discharged over a 24-hour period (Section 3.1a).

All materials, including trucked liquid waste, discharged at the Osoyoos landfill are weighed at the scale at the landfill entrance. It is assumed that the density of hauled liquid waste is approximately equivalent to 721 kg/m³.

The Town has historically provided monthly totals, this is summarized for the year 2023 in the following chart:

Hauled Liquid Waste Chart (m³)

January	351
February	110
March	158
April	306
May	346
June	330
July	384
August	545
September	302
October	428
November	400
December	51
TOTAL	3711

Total annual hauled liquid waste volumes accepted at the Town of Osoyoos landfill for the period 2000 to 2023 inclusive are summarized as follows.

Annual Comparison:

YEAR	ANNUAL VOLUME (M ³)
2000	2976
2001	3973
2002	8809
2003	8488
2004	6434
2005	6399
2006	7663
2007	9934
2008	6880
2009	6129
2010	4851
2011	5362
2012	5225
2013	2622
2014	2084
2015	1920
2016	2021
2017	2352
2018	2119
2019	2680
2020	3160
2021	4579
2022	5108
2023	3711

Sludge Disposal

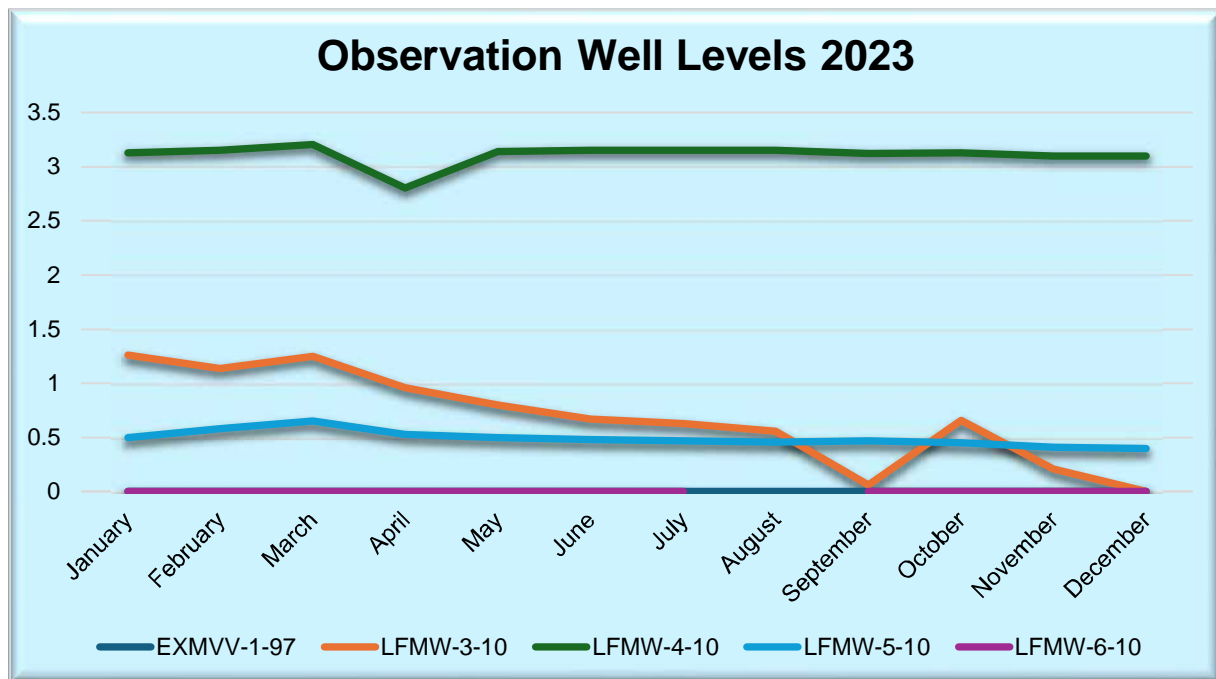
**No Sludge was removed in 2023.*

Groundwater Levels

Groundwater levels observed in wells:

Well ID (Metres)	January	February	March	April	May	June	July	August	September	October	November	December
EXMVV-1-97	0	0	0	0	0	0	0	0	0	0	0	0
LFMW-3-10	1.26	1.14	1.25	0.96	0.8	0.67	0.63	0.56	0.06	0.66	0.21	0
LFMW-4-10	3.13	3.15	3.2	2.8	3.14	3.15	3.15	3.15	3.12	3.13	3.1	3.1
LFMW-5-10	0.5	0.58	0.65	0.53	0.5	0.48	0.47	0.46	0.47	0.45	0.41	0.4
LFMW-6-10	0	0	0	0	0	0	0	0	0	0	0	0
LFMW-7-10	Well Damaged											

Level Chart 2023:



Sampling

Groundwater Analyses were conducted on wells LFMW 4 – 10 to LFMW 7 – 10. These were not the wells specified in the permit, our Operators are now educated on which observation wells are specified. An effluent grab sample was taken in December, but unfortunately the wrong parameters were specified by us. Additionally, not all the parameters specified for groundwater samples were tested for. ***In 2024 the schedule will be followed as per 3.1.2. of our permit, this was missed in 2023 due to staff changes.***

Shown below are results for the two nearest observation wells in relation to the liquid waste ponds:

Parameter	Apr-23		Sep-23	
Obs. Well	MW-5-10'	MW-7-10'	MW-5-10'	MW-7-10'
Conductivity				
pH				
Chloride	255	3.06	266	3.56
Nitrate	9.68	<.01	9.61	<.01
Nitrite	<.01	<.01	<.01	<.01
Ammonia	0.163	0.059	0.114	0.051
Kjeldahl				
Total Nitrogen				
Total Phosphorus				
Dissolved Phosphorus	0.0084	0.0185	0.0105	0.0218
Orthophosphate				
E-coli				
Fecal Coliform				

**All lab results are attached in the appendix.*



December 6, 2023

Tracking Number: 416924
Authorization Number: 14804

REGISTERED MAIL

TOWN OF OSOYOOS
8707 Main Street
Osoyoos, BC V0H 1V0

Dear Permittee:

Enclosed is Amended Permit 14804 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the permit. An annual fee will be determined according to the Permit Fees Regulation.

This permit 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 permittee. This permit is issued pursuant to the provisions of the *Environmental Management Act* to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the permittee 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.

When a spill or the risk of a spill occurs, the responsible person (spiller) must report it immediately by calling 1-800-663-3456 in accordance with the Spill Reporting Regulation. More information is available at: gov.bc.ca/reportaspill

Pursuant to Section 16 of the *Environmental Management Act*, the director has amended authorization 14804.

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 permit will be carried out by staff from the Environmental Protection Division's Regional Operations Branch. Plans, data and reports pertinent to the permit are to be submitted by email or electronic transfer to the Director, designated Officer, or as further instructed.

Please be reminded that the director may, for the protection of the environment in accordance with Section 16 of the *Environmental Management Act*, require the permittee to do one or more of the following at any time:

- repair, alter, remove, improve or add to existing works, or construct new works, and submit plans and specifications for works specified in this authorization.
- conduct monitoring, and may specify procedures for monitoring and analysis, and procedures or requirements respecting the handling, treatment, transportation, discharge or storage of waste.
- provide security in the amount and form, and subject to the conditions, specified by the director.
- conduct studies and report information in accordance with the specifications of the director.
- recycle certain wastes and recover certain reusable resources, including energy potential from wastes, in accordance with the specifications of the director.
- submit copies of reports and notifications to specified Indigenous Groups, within specified timelines, in accordance with the specifications of the director.

For more information about how the Ministry will assess compliance with your permit please refer to gov.bc.ca/environmentalcompliance.

For more information about how to make changes to your permit and to access waste discharge amendment forms and guidance, please refer to gov.bc.ca/wastedischarge-authorizations.

Yours truly,



Liz Archibald, P.Ag.
for Director, *Environmental Management Act*
Authorizations – Community, IPM, & Agrifood



**MINISTRY OF ENVIRONMENT
AND CLIMATE CHANGE
STRATEGY**

PERMIT

14804

Under the Provisions of the Environmental Management Act

TOWN OF OSOYOOS

**8707 Main Street
Osoyoos, BC V0H 1V0**

Is authorized to discharge effluent to the ground from municipal septic tank and sewage holding tank pumpage sources located in or near Osoyoos, British Columbia, subject to the requirements listed below.

Contravention of any of these requirements is a violation of the Environmental Management Act and may lead to prosecution.

This Authorization supersedes and replaces all previous versions of Permit 14804 issued under Section 14 of the Environmental Management Act.

General Provisions

Where this Authorization provides that the director may require an action to be carried out, the permittee must carry out the action in accordance with the requirements of the director.

Publication of Documents

The Ministry of Environment and Climate Change Strategy publishes Regulatory Documents on its website for the purpose of research, public education and to provide transparency in the administration of environmental laws. The permittee acknowledges

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(most recent)

Liz Archibald, P.Ag.
for Director, *Environmental Management Act*
Authorizations - South Region

that the Province may publish any Regulatory Documents submitted by the permittee, excluding information that would be exempted from disclosure if the document was disclosed pursuant to a request under section 5 of the Freedom of Information and Protection of Privacy Act, and the permittee consents to such publication by the Province.

1.1 **Authorized Source**

This section applies to the discharge of effluent to a septage facility. The site reference number for this discharge is E227435.

- 1.1.1 The maximum rate of discharge is 5400 m³ per year, which is 14.8 m³/day, averaged over a calendar year.
- 1.1.2 The authorized discharge period is continuous.
- 1.1.3 The characteristics of the discharge must not exceed the following parameters:

Carbonaceous Biochemical Oxygen Demand
Maximum: 220 mg/L

Total Suspended Solids
Maximum: 220 mg/L

- 1.1.4 The discharge is authorized from Authorized Works, which are four infiltration basins, weight scale and related appurtenances approximately located as shown on Site Plan A.
- 1.1.5 The location of the sources from which the discharge originates is Osoyoos and the adjacent area.
- 1.1.6 The location of the point of discharge is a portion of Lot 993 of District Lot 2450s, Plan 22982, together with that part of District Lot 2450s, SDYD as shown on Crown Lease 334855 as shown on Site Plan
- 1.1.7 The permittee must not discharge under this Authorization unless the Authorized Works are complete and fully operational.

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for Director, *Environmental Management Act*
Authorizations - South Region

2. GENERAL REQUIREMENTS

2.1 Maintenance of Works

The permittee must regularly inspect the Authorized Works, and maintain them in good working order.

The permittee must maintain a record of inspections and maintenance and any shut down periods of the Authorized Works.

2.2 Emergency Procedures

In the event of an emergency or other condition which prevents normal operation of the Authorized Works or leads to an unauthorized discharge, the permittee must take remedial action immediately to restore the normal operation of the Authorized Works and to prevent any unauthorized discharges. The permittee must immediately report the emergency or other condition and the remedial action that has and will be taken to the EnvironmentalCompliance@gov.bc.ca email address or as otherwise instructed by the director.

2.3 Bypasses

The permittee must not allow any discharge authorized by this Authorization to bypass the Authorized Works, except with the prior written approval of the director.

2.4 Infiltration Basins

The permittee must operate the infiltration basin such that:

- a) there is no overflow from the infiltration basin to the surrounding environment; and
- b) surface drainage is diverted away from the infiltration basin; and
- c) a minimum Freeboard of 50 centimeters must be maintained on each infiltration basin.

2.5 Sludge Disposal

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for Director, *Environmental Management Act*
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The permittee must dispose of any residue removed from the infiltration basins in a manner authorized by the director, or as authorized by regulation under the Environmental Management Act.

Record each occasion and the estimated amount of sludge removed from the infiltration basins.

2.6 **Odour Control**

Should objectionable odours, attributable to the operation of the authorized works, occur beyond the property on which the authorized works are located, the permittee must undertake measures or additional works to reduce odour to acceptable levels.

2.7 **Access Road**

The permittee must ensure that reasonable, all-weather access to the designated area for discharge is maintained at all times.

2.8 **Site Security**

- a) Installation of perimeter fencing and gates shall be complete prior to the commencement of discharge.
- b) Gates shall be locked to prevent unauthorized access during non-operating Hours.

2.9 **Signs**

A sign must be erected and maintained at the main entrance to the site which identifies the following: site name, owner and operator, 24-hour emergency contact phone number and address, hours of operation, tipping fees (if applicable) and prohibition of hazardous wastes.

3. **MONITORING REQUIREMENTS**

3.1 Discharge Monitoring

3.1.1 Determination of Effluent Volume

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The permittee must estimate the daily volume of effluent discharged by the weight of incoming effluent at the landfill entrance.

3.1.2 Effluent Grab Sampling

The permittee must collect grab samples in April and September of the effluent from the infiltration basin (E227435). The location of effluent grab sampling is shown in Site Plan A. The permittee must collect sample (s) as per Section 3.3, 3.4 and 3.5 and obtain analysis of the sample (s) for the following parameters:

Parameter	Sample Type	Sample Frequency
5-day Carbonaceous Biological Oxygen Demand, mg/L	Grab	Semi-annual (April and September)
Conductivity, µs/cm		
pH		
Chloride, mg/L		
Nitrate nitrogen, mg/L		
Ammonia nitrogen, mg/L		
E. coli, MPN/100ml		
Fecal Coliform, MPN/100mL		
Total Suspended Solids, mg/L		

3.2 Groundwater Monitoring and Sampling

3.2.1 Groundwater Level

The permittee must maintain a groundwater monitoring program that consists of measuring the water level, on a monthly basis in monitoring wells MW²-1-97 (E227436) and LFMW-3-10²(E332891) wells as show on Site Plan A.

3.2.2 Groundwater Analyses

The permittee must obtain samples of the groundwater of the monitoring wells MW²-1-97 (E227436) and LFMW-3-10²(E332891) as follow:

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Parameter	Sample Type	Sample Frequency
Conductivity, $\mu\text{s}/\text{cm}$	Grab	Semi-annual (April and September)
pH		
Chloride, mg/L		
Nitrate nitrogen, mg/L		
Nitrite nitrogen, mg/L		
Ammonia nitrogen, mg/L		
Kjeldahl nitrogen, mg/L		
Total nitrogen, mg/L		
Total phosphorus, mg/L		
Dissolved phosphorus, mg/L		
Ortho-phosphate, mg/L		
E. coli, MPN/100mL		
Fecal Coliform, MPN/100mL		

The permittee must collect sample (s) as per Section 3.3, 3.4 and 3.5 on a semi-annual basis. The approximate locations of groundwater monitoring wells are as shown in Site Plan A.

3.3 Sampling Procedures

The permittee must carry out sampling in accordance with the procedures described in the "British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 2013 Edition (Permittee)" or most recent edition, or by alternative procedures as authorized by the director.

A copy of the above manual is available on the Ministry web page at <https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance/bc-field-sampling-manual>.

3.4 Analytical Procedures

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(most recent)



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for Director, *Environmental Management Act*
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The permittee must carry out analyses in accordance with procedures described in the "British Columbia Environmental Laboratory Manual (2020)", or the most recent edition or by alternative procedures as authorized by the director.

A copy of the above manual is available on the ministry web page at <https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance/bc-environmental-laboratory-manual>.

3.5 **Quality Assurance**

a) The permittee must obtain from the analytical laboratory(ies) their precision, accuracy and blank data for each sample set submitted by the permittee and an evaluation of the data acceptability, based on criteria set by such laboratory.

b) The permittee must submit samples to analytical laboratory(ies) that meet the definition of a qualified laboratory under the Environmental Data Quality Assurance Regulation.

4. **REPORTING REQUIREMENTS**

The Permittee must collect and maintain data of analyses and effluent volume estimates required under this Authorization for inspection by a designated officer upon request.

4.1 **Annual Reporting**

The Permittee must prepare an annual report in respect to the previous calendar year. The first annual report must be submitted to the director by **March 1st, 2024**. The Permittee must make submissions in respect of each subsequent year by **March 1st** of each year. The annual report must include, but not be limited to:

- i. A statement outlining the number of exceedances of permitted discharges that occurred during the reporting period, the dates of each such exceedance, an explanation as to the cause of the exceedances, and a description of the measures taken by the Permittee to rectify the cause of each such exceedance. If no exceedances occurred over the reporting period, the required statement must indicate that no exceedances of permitted discharges occurred during the reporting period;

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- ii. A review and interpretation of the discharge and groundwater monitoring data for the preceding calendar year;
- iii. A graphical analysis with interpretation of any trends in monitoring results;
- iv. All laboratory reports of data collected under this authorization;
- v. Records of daily effluent discharge volume estimates;
- vi. A summary of all quality assurance/quality control (QA/QC) issues during the calendar year;
- vii. An evaluation of the performance of the Authorized Works.
- viii. Sludge management records;

The Permittee must submit the Annual Report by email to the Ministry's Routine Environmental Reporting Submission Mailbox (RERSM) at envauthorizationsreporting@gov.bc.ca or as otherwise instructed by the director.

For guidelines on how to properly name the files and email subject lines or for more information visit the Ministry website:

https://www2.gov.bc.ca/assets/gov/environment/waste-management/waste-discharge-authorization/datamart/rersm_naming_convention.pdf.

4.2 **Non-compliance Notification**

The permittee must immediately notify the director by email at EnvironmentalCompliance@gov.bc.ca or as otherwise instructed by the director of any non-compliance with the requirements of this Authorization and must immediately take remedial action to remedy any effects of such non-compliance.

4.3 **Non-compliance Reporting**

The permittee must, within 30 days of any non-compliance event, submit to the director a written report that includes, but is not necessarily limited to, the following:

- a) all relevant test results obtained by the permittee related to the non-compliance,
- b) an explanation of the most probable cause(s) of the non-compliance, and
- c) a description of remedial action planned and/or taken by the permittee to prevent similar non-compliance(s) in the future.

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The permittee must submit all non-compliance reporting required to be submitted under this section by email to the Ministry's Compliance Reporting Submission Mailbox (CRSM) at EnvironmentalCompliance@gov.bc.ca or as otherwise instructed by the director. For guidelines on how to report a non-compliance or for more information visit the Ministry website:
<https://www2.gov.bc.ca/gov/content?id=076C5CA3ABD342A784CC49EC78CBAE12>

5. **GLOSSARY**

Capitalized terms referred to in this authorization are defined in the attached Glossary. Other terms used in this authorization have the same meaning as those defined in the Environmental Management Act and applicable regulations.

5.1 **"Authorized Works"**

"Authorized Works" means Authorized Works as stated in Section 1.1.4;

5.2 **"Freeboard"**

"Freeboard" means the difference in elevation between the contained liquid level and the top of the berm structure at its lowest point.

5.4 **"Province"**

"Province" means His Majesty the King in right of British Columbia;

5.5 **"Regulatory Document"**

"Regulatory Document" means any document that the permittee is required to provide to the director or the Province pursuant to:

(i) this Authorization;

(ii) any regulation made under the Environmental Management Act that regulates the facility described in this Authorization or the discharge of waste from that facility; or

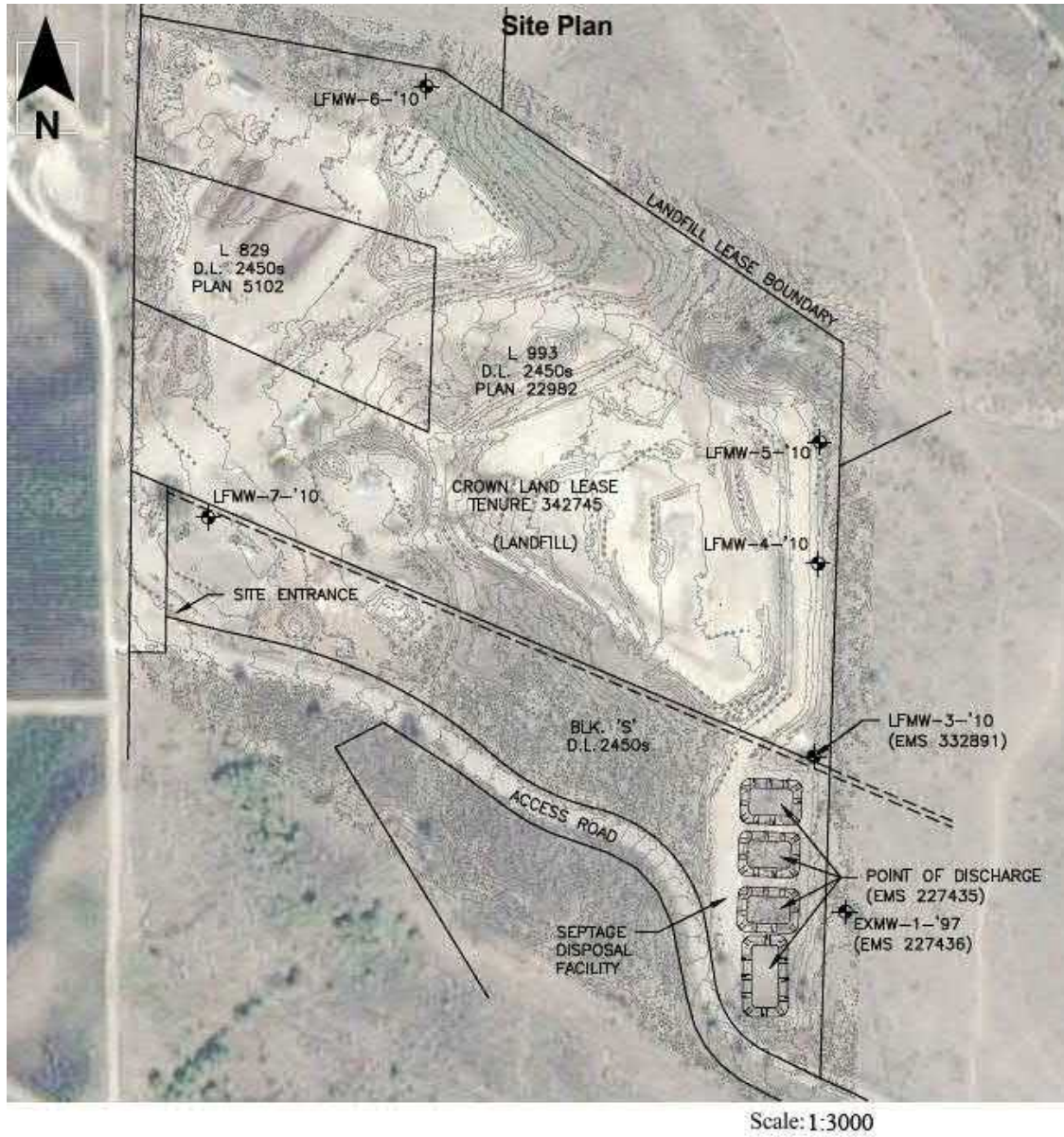
(iii) any order issued under the Environmental Management Act directed against the permittee that is related to the facility described in this Authorization or the discharge of waste from that facility;

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Site Plan A

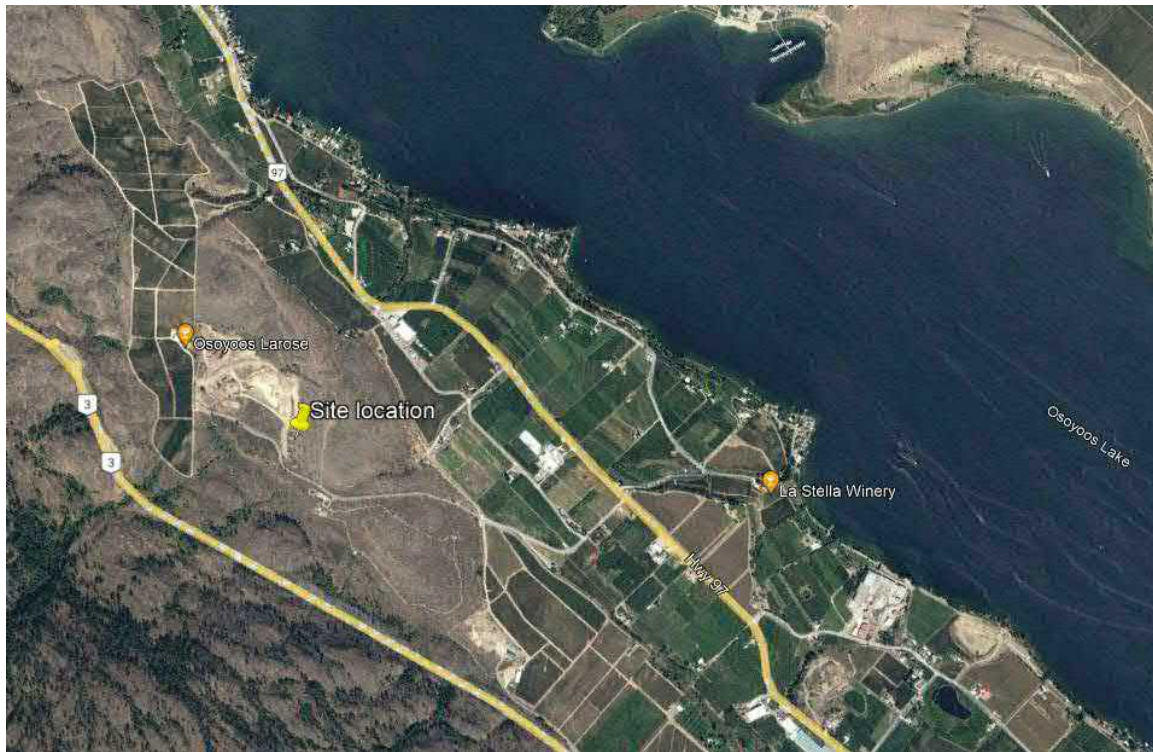


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Date amended:
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Location Map



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for Director, *Environmental Management Act*
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CERTIFICATE OF ANALYSIS

REPORTED TO Osoyoos, Town of
PO Box 3010
OSOYOOS, BC V0H 1V0

ATTENTION Kelly McDonald

PO NUMBER WB Groundwater (Comp)
PROJECT WB Groundwater (Comp)

PROJECT INFO

WORK ORDER 23D2210

RECEIVED / TEMP 2023-04-20 15:00 / NA
REPORTED 2023-04-26 13:05

COC NUMBER No Number

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

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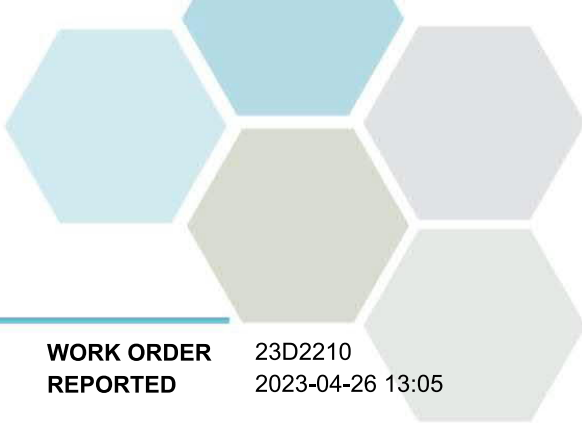
If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

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TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2210
2023-04-26 13:05

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-8-10 (23D2210-01) Matrix: Water Sampled: 2023-04-19 08:25						FILT, PRES

Anions

Chloride	40.5	AO ≤ 250	0.10	mg/L	2023-04-22	
Nitrate (as N)	5.21	MAC = 10	0.010	mg/L	2023-04-22	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	

Calculated Parameters

Hardness, Total (as CaCO3)	2140	None Required	2.50	mg/L	N/A	
Nitrate+Nitrite (as N)	5.21	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0062	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	5590	N/A	2.0	mg/L	2023-04-24	

Total Metals

Calcium, total	690	None Required	0.20	mg/L	2023-04-25	RS1
Magnesium, total	101	None Required	0.010	mg/L	2023-04-25	RS1
Sodium, total	56.9	AO ≤ 200	0.10	mg/L	2023-04-25	RS1

MW-DP-10-21 (23D2210-02) | Matrix: Water | Sampled: 2023-04-19 08:40

FILT, PRES

Anions

Chloride	167	AO ≤ 250	0.10	mg/L	2023-04-22	
Nitrate (as N)	14.7	MAC = 10	0.010	mg/L	2023-04-22	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	

Calculated Parameters

Hardness, Total (as CaCO3)	334	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	14.7	N/A	0.100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	0.062	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	1.15	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	16.0	N/A	2.0	mg/L	2023-04-24	

Total Metals

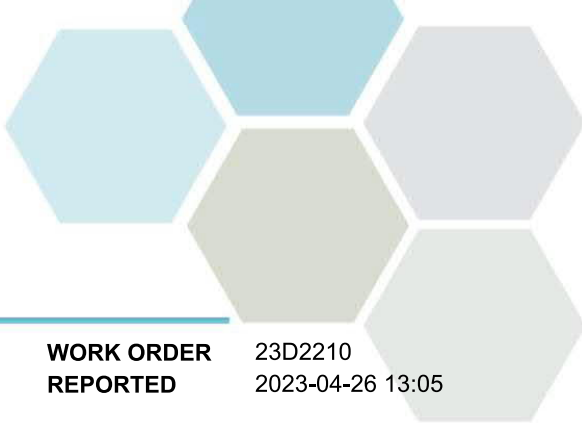
Calcium, total	96.1	None Required	0.20	mg/L	2023-04-25	
Magnesium, total	22.8	None Required	0.010	mg/L	2023-04-25	
Sodium, total	139	AO ≤ 200	0.10	mg/L	2023-04-25	

MW-2-01 (23D2210-03) | Matrix: Water | Sampled: 2023-04-19 08:55

FILT, PRES

Anions

Chloride	212	AO ≤ 250	0.10	mg/L	2023-04-22	
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TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2210
2023-04-26 13:05

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-2-01 (23D2210-03) Matrix: Water Sampled: 2023-04-19 08:55, Continued						FILT, PRES

Anions, Continued

Nitrate (as N)	18.0	MAC = 10	0.010	mg/L	2023-04-22	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	

Calculated Parameters

Hardness, Total (as CaCO3)	442	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	18.0	N/A	0.100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0409	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	7.6	N/A	2.0	mg/L	2023-04-24	

Total Metals

Calcium, total	132	None Required	0.20	mg/L	2023-04-25	
Magnesium, total	27.1	None Required	0.010	mg/L	2023-04-25	
Sodium, total	99.3	AO ≤ 200	0.10	mg/L	2023-04-25	

MW-9-10 (23D2210-04) | Matrix: Water | Sampled: 2023-04-19 09:25

FILT, PRES

Anions

Chloride	2.05	AO ≤ 250	0.10	mg/L	2023-04-22	
Nitrate (as N)	0.137	MAC = 10	0.010	mg/L	2023-04-22	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	

Calculated Parameters

Hardness, Total (as CaCO3)	144	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	0.137	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0772	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	3.6	N/A	2.0	mg/L	2023-04-24	

Total Metals

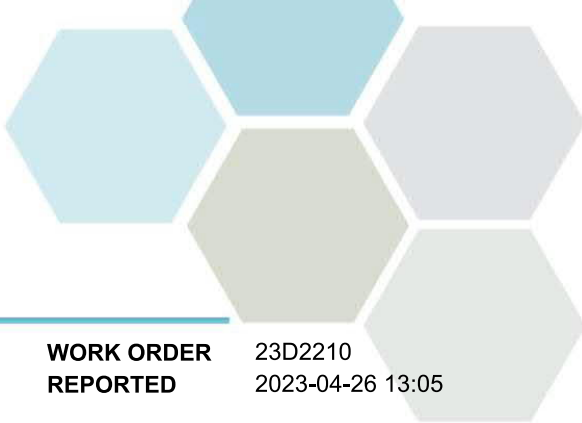
Calcium, total	41.1	None Required	0.20	mg/L	2023-04-25	
Magnesium, total	10.1	None Required	0.010	mg/L	2023-04-25	
Sodium, total	16.6	AO ≤ 200	0.10	mg/L	2023-04-25	

MW-1-01 (23D2210-05) | Matrix: Water | Sampled: 2023-04-19 09:35

FILT, PRES

Anions

Chloride	18.1	AO ≤ 250	0.10	mg/L	2023-04-22	
Nitrate (as N)	0.025	MAC = 10	0.010	mg/L	2023-04-22	



TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2210
2023-04-26 13:05

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-1-01 (23D2210-05) Matrix: Water Sampled: 2023-04-19 09:35, Continued						FILT, PRES

Anions, Continued

Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	
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Calculated Parameters

Hardness, Total (as CaCO3)	511	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	0.0250	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0124	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	2.8	N/A	2.0	mg/L	2023-04-24	

Total Metals

Calcium, total	122	None Required	0.20	mg/L	2023-04-25	
Magnesium, total	50.2	None Required	0.010	mg/L	2023-04-25	
Sodium, total	40.4	AO ≤ 200	0.10	mg/L	2023-04-25	

MW-7-10 (23D2210-06) | Matrix: Water | Sampled: 2023-04-19 09:50

FILT, PRES

Anions

Chloride	3.06	AO ≤ 250	0.10	mg/L	2023-04-22	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2023-04-22	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	

Calculated Parameters

Hardness, Total (as CaCO3)	249	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	0.059	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0185	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	94.2	N/A	2.0	mg/L	2023-04-24	

Total Metals

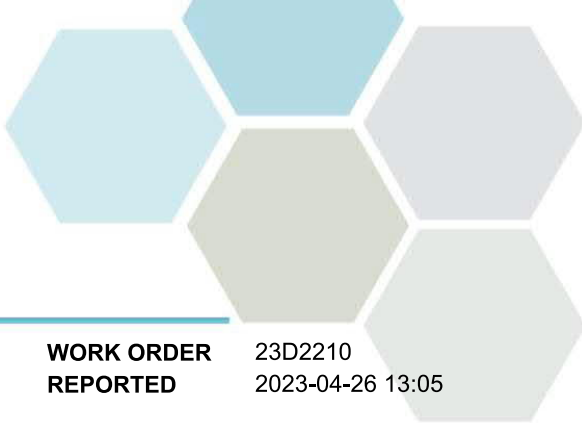
Calcium, total	64.6	None Required	0.20	mg/L	2023-04-25	
Magnesium, total	21.3	None Required	0.010	mg/L	2023-04-25	
Sodium, total	12.5	AO ≤ 200	0.10	mg/L	2023-04-25	

MW-5-10 (23D2210-07) | Matrix: Water | Sampled: 2023-04-19 10:35

FILT, PRES

Anions

Chloride	255	AO ≤ 250	0.10	mg/L	2023-04-22	
Nitrate (as N)	9.68	MAC = 10	0.010	mg/L	2023-04-22	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	



TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2210
2023-04-26 13:05

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-5-10 (23D2210-07) Matrix: Water Sampled: 2023-04-19 10:35, Continued						FILT, PRES

Calculated Parameters

Hardness, Total (as CaCO3)	562	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	9.68	N/A	0.0100	mg/L	N/A	

General Parameters

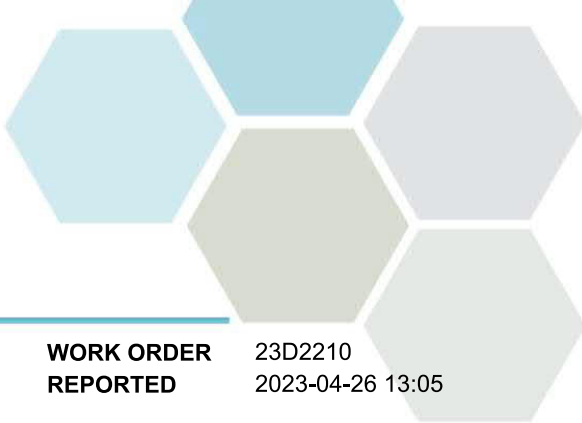
Ammonia, Total (as N)	0.163	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0084	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	15.0	N/A	2.0	mg/L	2023-04-24	

Total Metals

Calcium, total	152	None Required	0.20	mg/L	2023-04-25	
Magnesium, total	43.9	None Required	0.010	mg/L	2023-04-25	
Sodium, total	123	AO ≤ 200	0.10	mg/L	2023-04-25	

Sample Qualifiers:

- FILT The sample has been filtered for Diss phos in the laboratory. Results may not reflect conditions at the time of sampling.
- PRES Sample has been preserved for Diss phos in the laboratory and the holding time has been extended.
- RS1 The Reporting Limits for this sample have been raised due to high analyte concentration and/or matrix interference.



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2210
2023-04-26 13:05

Analysis Description	Method Ref.	Technique	Accredited	Location
Ammonia, Total in Water	SM 4500-NH3 G* (2021)	Automated Colorimetry (Phenate)	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Phosphorus, Total Dissolved in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2021)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	✓	Kelowna
Solids, Total Suspended in Water	Solids in Water, Filtered / SM 2540 D* (2020)	Solids in Water, Filtered / Gravimetry (Dried at 103-105C)	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

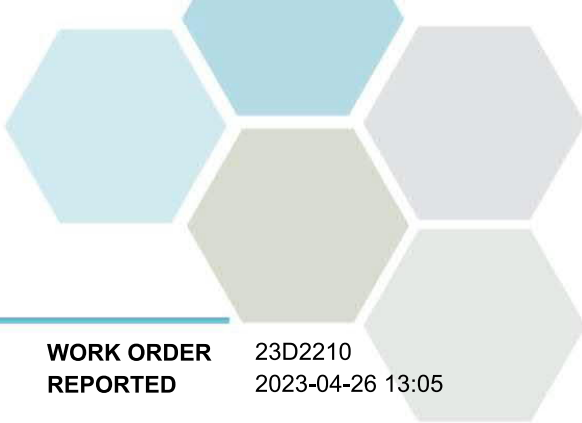
Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

[Guidelines for Canadian Drinking Water Quality \(Health Canada, September 2022\)](#)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2210
2023-04-26 13:05

General Comments:

The results in this report apply to the received samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. CarO will dispose of all samples within 30 days of sample receipt, unless otherwise agreed. The quality control (QC) data is available upon request

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: bwhitehead@caro.ca

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline(s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.



CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0	WORK ORDER	23D2214
ATTENTION	Kelly McDonald	RECEIVED / TEMP REPORTED	2023-04-20 15:00 / NA 2023-04-26 13:04
PO NUMBER	WB Groundwater (Comp)	COC NUMBER	No Number
PROJECT	WB Groundwater (Comp)		
PROJECT INFO			

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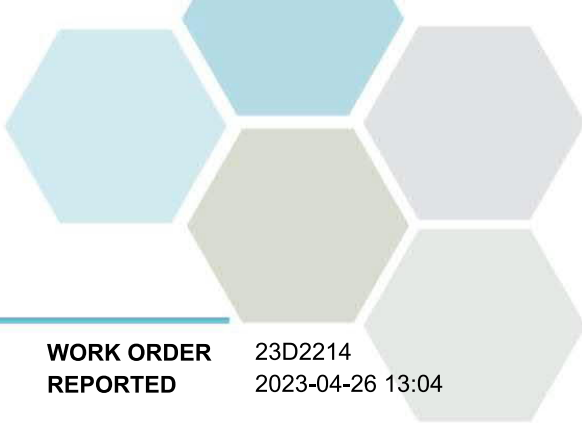
If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

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TEST RESULTS

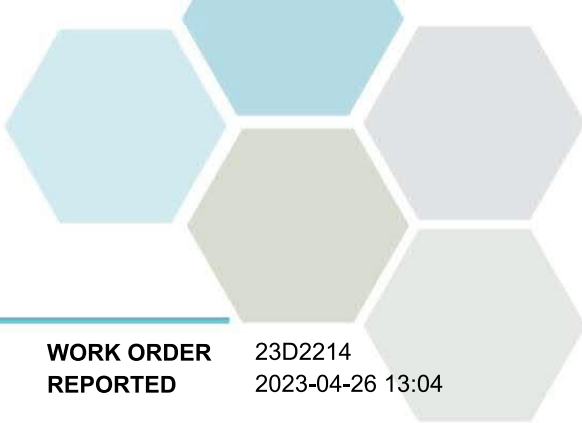
REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2214
2023-04-26 13:04

Analyte	Result	Guideline	RL Units	Analyzed	Qualifier
LFMW-4-10 (23D2214-01) Matrix: Water Sampled: 2023-04-19 11:05					FILT, PRES
Anions					
Chloride	33.1	AO ≤ 250	0.10 mg/L	2023-04-24	
Nitrate (as N)	< 0.010	MAC = 10	0.010 mg/L	2023-04-21	
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	2023-04-21	
Calculated Parameters					
Hardness, Total (as CaCO3)	538	None Required	0.500 mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100 mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	< 0.050	None Required	0.050 mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0147	N/A	0.0050 mg/L	2023-04-24	
Solids, Total Suspended	780	N/A	2.0 mg/L	2023-04-24	
Total Metals					
Calcium, total	136	None Required	0.20 mg/L	2023-04-25	
Magnesium, total	48.1	None Required	0.010 mg/L	2023-04-25	
Sodium, total	41.5	AO ≤ 200	0.10 mg/L	2023-04-25	

Sample Qualifiers:

FILT The sample has been filtered for Diss phos in the laboratory. Results may not reflect conditions at the time of sampling.
PRES Sample has been preserved for Diss phos in the laboratory and the holding time has been extended.



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2214
2023-04-26 13:04

Analysis Description	Method Ref.	Technique	Accredited	Location
Ammonia, Total in Water	SM 4500-NH3 G* (2021)	Automated Colorimetry (Phenate)	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Phosphorus, Total Dissolved in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2021)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	✓	Kelowna
Solids, Total Suspended in Water	Solids in Water, Filtered / SM 2540 D* (2020)	Solids in Water, Filtered / Gravimetry (Dried at 103-105C)	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

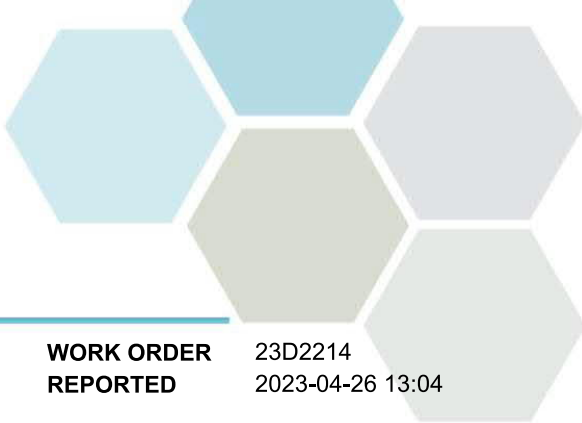
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mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

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APPENDIX 1: SUPPORTING INFORMATION

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WB Groundwater (Comp)

WORK ORDER REPORTED 23D2214
2023-04-26 13:04

General Comments:

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CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0	WORK ORDER	23I2325
ATTENTION	Kelly McDonald	RECEIVED / TEMP REPORTED	2023-09-19 16:33 / 11.9°C 2023-09-26 12:51
PO NUMBER	WB Groundwater (Comp)	COC NUMBER	No Number
PROJECT	WB Groundwater (Comp)		
PROJECT INFO			

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Authorized By:

Brent Whitehead
Account Manager

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#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7 | #108 4475 Wayburne Drive Burnaby, BC V5G 4X4



TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23I2325
2023-09-26 12:51

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-8-10 (23I2325-01) Matrix: Water Sampled: 2023-09-19 08:00						FILT, PRES

Anions

Chloride	28.6	AO ≤ 250	0.10	mg/L	2023-09-20	
Nitrate (as N)	6.00	MAC = 10	0.010	mg/L	2023-09-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-09-20	

Calculated Parameters

Hardness, Total (as CaCO3)	1300	None Required	1.00	mg/L	N/A	
Nitrate+Nitrite (as N)	6.00	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-09-25	
Phosphorus, Total Dissolved	0.0054	N/A	0.0050	mg/L	2023-09-22	
Solids, Total Suspended	114	N/A	2.0	mg/L	2023-09-22	

Total Metals

Calcium, total	435	None Required	0.20	mg/L	2023-09-23	RS1
Magnesium, total	51.7	None Required	0.010	mg/L	2023-09-23	RS1
Sodium, total	42.5	AO ≤ 200	0.10	mg/L	2023-09-23	RS1

MW-9-10 (23I2325-02) | Matrix: Water | Sampled: 2023-09-19 08:15

FILT, PRES

Anions

Chloride	1.69	AO ≤ 250	0.10	mg/L	2023-09-20	
Nitrate (as N)	0.132	MAC = 10	0.010	mg/L	2023-09-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-09-20	

Calculated Parameters

Hardness, Total (as CaCO3)	144	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	0.132	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-09-25	
Phosphorus, Total Dissolved	0.0780	N/A	0.0050	mg/L	2023-09-22	
Solids, Total Suspended	4.8	N/A	2.0	mg/L	2023-09-22	

Total Metals

Calcium, total	41.6	None Required	0.20	mg/L	2023-09-23	
Magnesium, total	9.62	None Required	0.010	mg/L	2023-09-23	
Sodium, total	16.5	AO ≤ 200	0.10	mg/L	2023-09-23	

MW-1-01 (23I2325-03) | Matrix: Water | Sampled: 2023-09-19 08:30

FILT, PRES

Anions

Chloride	12.9	AO ≤ 250	0.10	mg/L	2023-09-20	
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TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23I2325
2023-09-26 12:51

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-1-01 (23I2325-03) Matrix: Water Sampled: 2023-09-19 08:30, Continued						FILT, PRES

Anions, Continued

Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2023-09-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-09-20	

Calculated Parameters

Hardness, Total (as CaCO3)	654	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-09-25	
Phosphorus, Total Dissolved	0.0077	N/A	0.0050	mg/L	2023-09-22	
Solids, Total Suspended	162	N/A	2.0	mg/L	2023-09-22	

Total Metals

Calcium, total	158	None Required	0.20	mg/L	2023-09-23	
Magnesium, total	63.0	None Required	0.010	mg/L	2023-09-23	
Sodium, total	42.4	AO ≤ 200	0.10	mg/L	2023-09-23	

MW-7-10 (23I2325-04) | Matrix: Water | Sampled: 2023-09-19 08:50

FILT, PRES

Anions

Chloride	3.56	AO ≤ 250	0.10	mg/L	2023-09-20	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2023-09-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-09-20	

Calculated Parameters

Hardness, Total (as CaCO3)	222	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	0.051	None Required	0.050	mg/L	2023-09-25	
Phosphorus, Total Dissolved	0.0218	N/A	0.0050	mg/L	2023-09-22	
Solids, Total Suspended	11.6	N/A	2.0	mg/L	2023-09-22	

Total Metals

Calcium, total	58.3	None Required	0.20	mg/L	2023-09-23	
Magnesium, total	18.5	None Required	0.010	mg/L	2023-09-23	
Sodium, total	13.3	AO ≤ 200	0.10	mg/L	2023-09-23	

MW-5-10 (23I2325-05) | Matrix: Water | Sampled: 2023-09-19 09:15

FILT, PRES

Anions

Chloride	266	AO ≤ 250	0.10	mg/L	2023-09-20	
Nitrate (as N)	9.61	MAC = 10	0.010	mg/L	2023-09-21	

TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23I2325
2023-09-26 12:51

Analyte	Result	Guideline	RL Units	Analyzed	Qualifier
MW-5-10 (23I2325-05) Matrix: Water Sampled: 2023-09-19 09:15, Continued					FILT, PRES
Anions, Continued					
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	2023-09-21	
Calculated Parameters					
Hardness, Total (as CaCO3)	587	None Required	0.500 mg/L	N/A	
Nitrate+Nitrite (as N)	9.61	N/A	0.0100 mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	< 0.050	None Required	0.050 mg/L	2023-09-25	
Phosphorus, Total Dissolved	0.0148	N/A	0.0050 mg/L	2023-09-22	
Solids, Total Suspended	21.2	N/A	2.0 mg/L	2023-09-22	
Total Metals					
Calcium, total	164	None Required	0.20 mg/L	2023-09-23	
Magnesium, total	43.2	None Required	0.010 mg/L	2023-09-23	
Sodium, total	123	AO ≤ 200	0.10 mg/L	2023-09-23	

LFMW-4-10 (23I2325-06) | Matrix: Water | Sampled: 2023-09-19 09:45

FILT, PRES

Anions					
Chloride	31.7	AO ≤ 250	0.10 mg/L	2023-09-21	
Nitrate (as N)	< 0.010	MAC = 10	0.010 mg/L	2023-09-21	
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	2023-09-21	
Calculated Parameters					
Hardness, Total (as CaCO3)	448	None Required	0.500 mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100 mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	0.114	None Required	0.050 mg/L	2023-09-25	
Phosphorus, Total Dissolved	0.0105	N/A	0.0050 mg/L	2023-09-22	
Solids, Total Suspended	4800	N/A	2.0 mg/L	2023-09-22	CST2, RA5
Total Metals					
Calcium, total	115	None Required	0.20 mg/L	2023-09-23	
Magnesium, total	39.1	None Required	0.010 mg/L	2023-09-23	
Sodium, total	35.2	AO ≤ 200	0.10 mg/L	2023-09-23	

Sample Qualifiers:

- CST2 Sample contains fast setting very fine sediment
- FILT The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
- PRES Sample has been preserved for TDP in the laboratory and the holding time has been extended.
- RA5 The sample cannot be accurately quantified due to matrix interference. Result is Semi-Quantitative.
- RS1 The Reporting Limits for this sample have been raised due to high analyte concentration.



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23I2325
2023-09-26 12:51

Analysis Description	Method Ref.	Technique	Accredited	Location
Ammonia, Total in Water	SM 4500-NH3 G* (2021)	Automated Colorimetry (Phenate)	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Phosphorus, Total Dissolved in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2021)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	✓	Kelowna
Solids, Total Suspended in Water	Solids in Water, Filtered / SM 2540 D* (2020)	Solids in Water, Filtered / Gravimetry (Dried at 103-105C)	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

[Guidelines for Canadian Drinking Water Quality \(Health Canada, September 2022\)](#)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 2312325
2023-09-26 12:51

General Comments:

The results in this report apply to the received samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Caro will dispose of all samples within 30 days of sample receipt, unless otherwise agreed. The quality control (QC) data is available upon request

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: bwhitehead@caro.ca

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline(s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.



CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0	WORK ORDER	23L1629
ATTENTION	Kelly McDonald	RECEIVED / TEMP REPORTED	2023-12-12 16:45 / 9.8°C 2023-12-20 08:21
PO NUMBER	Wastewater	COC NUMBER	No Number
PROJECT	Wastewater- PE12214		
PROJECT INFO			

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry



It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve



Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here: <https://www.caro.ca/terms-conditions>

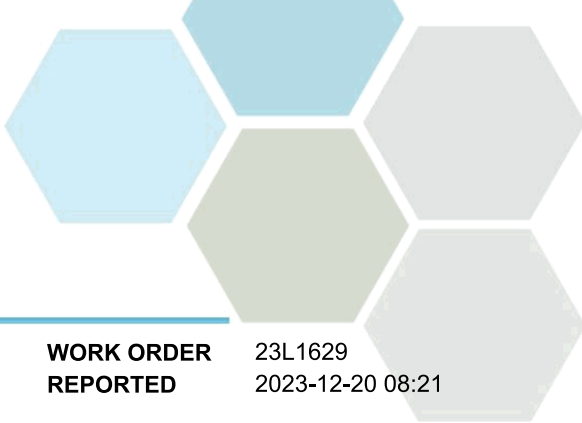
If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

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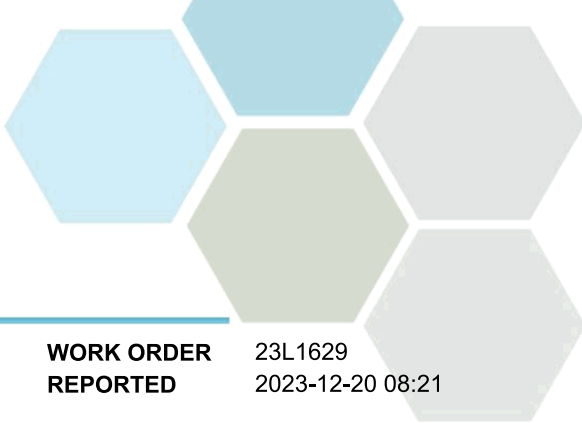


TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
Wastewater- PE12214

WORK ORDER REPORTED 23L1629
2023-12-20 08:21

Analyte	Result	RL	Units	Analyzed	Qualifier
E105001 Sewer Site (23L1629-01) Matrix: Water Sampled: 2023-12-12 08:15					
<i>General Parameters</i>					
BOD, 5-day Carbonaceous	12.9	2.0	mg/L	2023-12-19	
Solids, Total Suspended	21.3	2.0	mg/L	2023-12-19	



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Osoyoos, Town of
Wastewater- PE12214

WORK ORDER REPORTED 23L1629
2023-12-20 08:21

Analysis Description	Method Ref.	Technique	Accredited	Location
Biochemical Oxygen Demand, Carbonaceous in Water	SM 5210 B (2019)	Dissolved Oxygen Meter	✓	Kelowna
Solids, Total Suspended in Water	Solids in Water, Filtered / SM 2540 D* (2020)	Solids in Water, Filtered / Gravimetry (Dried at 103-105C)	✓	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
mg/L	Milligrams per litre
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

General Comments:

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Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline(s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.

Appendix C

Waste Management Services and Regulations Bylaw

**TOWN OF OSOYOOS
BYLAW NO. 1370**

A bylaw to establish and set regulations for services to collect and dispose of solid waste and recyclable materials within the Town of Osoyoos

WHEREAS:

- A. The *Community Charter* authorizes a municipality to provide any service that the council considers necessary or desirable;
- B. Council may regulate, prohibit and impose requirements in relation to a municipal service; and
- C. Council believes it is desirable to provide services for collecting solid waste, disposal of solid waste and noxious, offensive or unwholesome substances, and solid recyclable materials, and to impose mandatory participation in such services from certain classes of residential properties;

NOW THEREFORE, the council of the Town of Osoyoos, in open meeting assembled, **ENACTS AS FOLLOWS:**

Citation

- 1. This bylaw may be cited for all purposes as “Waste Management Services and Regulation Bylaw No. 1370, 2020”.

Definitions

- 2. In this Bylaw:

“*Assessed*” means to evaluate and determine the quality, extent, significance of a material based on established empirical and measurable standards which regulates the requirements to handle, transport or sort the material set forth by Local Government, Provincial and Federal law.

“*Bulk Receptacle*” means a waste container for the containment of solid waste.

“*Cart*” means a wheeled receptacle that:

- a. is allocated to a Residence by the Town; and
- b. is intended for Automated Collection of Garbage, Recycling and/or Organics.

“Construction Mixed Load” means *“Mixed Load” “Solid Waste”* produced through new construction, building or putting together associated with buildings, structures, or other types of real property.

“Compostable Waste Sales”, means Marketable organic waste including but not limited to:

- a. Prunings;
- b. Wood Waste;
- c. Processed Organics;
- d. Yard and Garden Waste;
- e. Agricultural Organic Material;
- f. Solid Waste

“Controlled Waste”, means certain Hazardous Waste, liquid waste, and refuse which is approved for disposal at the Osoyoos Landfill site but which, because of its inherent nature and quantity, may require special handling and disposal techniques to avoid creating health hazards, nuisances, or environmental pollution. Controlled Waste includes, but is not limited to:

- (a) water containing soil, sand, gravel, other non-hazardous solids, sewage solids, trace levels of petroleum products, and/or grease, including;
 - (i) pumpings from parking lot drainage sumps;
 - (ii) pumpings from domestic septic tanks;
 - (iii) pumpings from laundry lint traps;
 - (iv) pumpings from sumps which collect runoff from vehicle washing facilities only, but not from facilities used for maintenance or lubrication of automobile components or where solvents or sandblasting are employed for removal of paint, grease, or oil;
- (b) screenings from municipal sewage treatment plants and pump stations;
- (c) waste sludge from municipal sewage treatment plants and pump stations;
- (d) condemned foods;
- (e) waste asbestos;
- (f) food processing wastes;
- (g) dead animals.

“Dead Animals”, means dead animals, or portions thereof, equal to or greater than five (5) kilograms in weight.

“Demolition and Renovation Mixed Load” means *“Mixed Load” “Solid Waste”* produced through the indiscriminate reduction of a human-made structure or the act of improvement, through remodeling, refurbishing or restoring of buildings, structures, or other types of real property.

“Director” means the person appointed by council as the Director of Operations and includes employees, contractors or agents working under the supervision of the Director for the purpose of administering or enforcing this bylaw and shall also include the following officers of the municipality: Chief Administrative Officer, Director of Finance and Director of Corporate Services.

“Garbage” excludes all Recyclable Waste and includes, but is not necessarily limited to food wastes, market wastes, combustibles such as leather and yard trimmings; noncombustibles such as crockery, dirt, ashes from fireplaces and on-site incinerators, street sweepings; bulky wastes such as furniture, refrigerators, tires and stumps; construction and demolition refuse such as pipe, concrete, lumber, and wire; all arising from domestic, commercial, industrial, institutional or municipal activities.

“Hazardous Waste” means gaseous, liquid and solid waste which because of its inherent nature and quantity requires special disposal techniques to avoid creating health hazards, nuisances or environmental pollution. Hazardous Wastes are toxins or poisons, corrosives, irritants, strong sensitizers, flammables, explosives, infectious wastes, condemned foods, etc. Flammable wastes exclude plastics, paper, paper products and the like.

“Ignitable” means having the properties of:

- (a) flammable gas;
- (b) flammable liquid, or
- (c) flammable solids, substances liable to spontaneous combustion or substances that on contact with water emit flammable gases

as defined in the Special Waste Regulation.

“Landfill” means the Osoyoos Sanitary Landfill, located on Lot 829, Plan 5102, D.L. 2450S and a portion of Lot 993, Plan 22982, D.L. 2450S, SDYD at 146th Avenue, approximately 5 km northwest of the Osoyoos Town Centre.

“Large Item” means a mattress, box spring, fridge, stove, dishwasher, couch, table or similar household appliance or furniture item.

“Mixed Load” means a load containing two or more of the *“Solid Waste”*, as designated in the Town of Osoyoos Fees and Charges Bylaw as amended from time to time.

“Oversize Tires” means assorted means assorted agricultural, industrial and OTR (Off the Road) TIRES with Thread Codes C,E,G,L, IND & NHS as defined by the Tire Stewardship B.C., Schedule “A.”

“Person” means an individual, a body corporate, a firm partnership, association or any other legal entity or an employee or agent thereof.

“Prohibited Waste” means gaseous liquid and solid waste not acceptable for land filling at the Osoyoos Landfill. Prohibited Waste includes, but is not limited to:

- (a) liquids, except as permitted herein;
- (b) empty waste containers unless they are crushed, shredded or similarly reduced in volume to the maximum practical extent;
- (c) ignitable wastes;
- (d) reactive waste;
- (e) radioactive waste;
- (f) hazardous waste except as permitted herein;
- (g) special waste, excluding waste asbestos;
- (h) garbage that is on fire or smoldering.

“Radioactive Waste” means waste containing a prescribed substance as defined in the “Atomic Energy Control Act” in sufficient quantity or concentration to require a license for possession or use under that Act and regulations made under the Act.

“Reactive” means waste which is:

- (a) explosive, oxidizing, or so unstable that it readily undergoes violent change in the presence of air or water;
- (b) generates toxic gases, vapours, or fumes by itself or when mixed with water; or;
- (c) polymerizes in whole or in part by chemical action and causes damage by generating heat or increasing in volume

as defined in the Special Wastes Regulation.

“Recyclable Gypsum Board and Wallboard” means construction off-cuts and scraps of gypsum board or wallboard, and used gypsum board or wallboard that is uncontaminated by materials other than paint or wallpaper and removed during renovation or deconstruction.

“Recyclable Materials” includes:

- (a) Tin and aluminum cans, trays and foil
- (b) Glass bottles and jars
- (c) Newspapers and flyers
- (d) Corrugated cardboard other than waxed or plastic coated cardboard
- (e) Mixed paper including magazines, books, catalogues, writing and computer paper
- (f) Boxboard and heavy paper other than waxed or coated cartons or foil gift wrap
- (h) All plastics (except Styrofoam)
- (i) Or any other materials the Town and/or Recycle BC deems suitable for collection

“Solid Waste” means garbage and controlled waste suitable for landfilling at the Osoyoos Landfill site but excluding Prohibited Waste;

“Special Waste” means any chemical, compound, mixture, substance or article which is defined as such in the Special Waste Regulation.

“Special Waste Regulation” means a regulation of the Province of British Columbia under the *Waste Management Act* and/or the most current Special Waste Regulation issued by the Province of British Columbia.

“Tire” means the outer pneumatic rubber covering of wheels including but not limited to PLT (Passenger Light Truck), MT (Motor Truck) and large off road Tires.

“Town” means the Town of Osoyoos.

“Trade Waste” means any and all rejected, abandoned or discarded matter including but not limited to wrapping materials, sweepings, and all inflammable materials of a like nature resulting from the operation of a commercial/industrial premise but does not include “Approved Recycling List” items noted in Section 4 or Special Waste.

“Waste Asbestos” means waste containing friable asbestos fibres or asbestos dust as defined in the Special Waste Regulation.

“Yard Waste” includes prunings, leaves, clippings and other compostable items originating from the yards of residential properties.

Services Established

3. There is hereby established in the Town of Osoyoos, a municipal service to collect residential solid waste (“Garbage Service”) and a service to collect residential recyclable materials (“Recycling Service”) from those classes of residential dwelling units described in this Bylaw (hereinafter collectively called the “Services”).

Recycling Service

4. The Recycling Service consists of regularly-scheduled collection of prescribed “Recyclable Materials” plus an annual collection of Large Items in accordance with the following regulations:
 - (a) The materials eligible for recycling are as defined by Recycle BC and the Statement of Work as signed by the Town of Osoyoos for Curbside Collection.
 - (b) Recyclable Materials shall be placed out for collection in a “Cart” by 7:00 A.M. on days and in locations designated by the Director.
 - (c) Sharp objects must be wrapped in a manner, which will prevent accident or injury to the recycle collection workers.
 - (d) Carts shall be filled such that the Recyclable Materials are fully contained within each receptacle; with the exception of bundled, flatten cardboard.
 - (e) Clear Blue Bags or Clear Bags may only be used for shredded paper.
 - (f) During the annual collection of Large Items, a maximum of two such items may be placed out for collection by each residential unit.
 - (g) For the purpose of determining eligibility for recycling collection, properties are classified into the following categories:
 - (i) “Mandatory Curbside Recycling Collection Properties” include:
 - (1) a detached dwelling unit;
 - (2) properties which contain one single family dwelling;
 - (3) apartment with less that five dwelling units,

- (4) properties which contain one duplex dwelling;
 - (5) properties which contain a multiple dwelling unit with less than five dwelling units in total;
 - (6) mobile home; and
 - (7) churches.
- (ii) "Ineligible Curbside Recycling Properties" include:
- (1) vacant properties;
 - (2) properties which contain five or more dwelling units in total.
 - (3) properties which contain apartment buildings with more than five or more dwelling units;
 - (4) properties which contain a commercial unit such as a restaurant, café, store, hotel, motel, campsite, office block, retail or service business;
 - (5) properties that contain a residential dwelling unit or multiple dwelling unit located in a building or on a property with a commercial unit;
 - (6) mobile home parks;
 - (7) properties that contain an industrial unit such as warehouse, factory and wholesale business;
 - (8) properties that contain an agricultural and institutional operation.
- (iii) All owners and occupiers of Mandatory Recycling Collection Properties must pay for and participate in the Recycling Service.
- (iv) Owners and occupiers of Ineligible Recycling Collection Properties must arrange for their own collection and disposal of Recyclable Waste and may not participate in the Recycling Service.
- (v) Recyclable waste placed out for collection must originate from the Mandatory Recycling Collection Properties that are included in this service. Recyclable Waste originating from Ineligible Recycling Properties or from outside the Town are not eligible for Recycling Services.

Garbage Service

5. The Garbage Service consists of regularly-scheduled collection of residential garbage plus a spring and fall collection of Yard Waste in accordance with the following regulations:
- (a) Garbage shall be placed out for collection in garbage bags, reusable garbage containers or Carts by 7:00 A.M. on days and in locations designated by the Director.
 - (b) All garbage tendered for collection must be securely tied, bagged or placed in containers such that the gross weight of any bundle, bag or container does not exceed 20 kilograms.

- (c) Sharp objects must be placed in containers or wrapped in a manner, which will prevent accident or injury to the garbage collection workers.
- (d) Subject to subsection (6), the maximum amount of garbage collected from any residential dwelling unit on any collection day shall not exceed one container, with a total volume not greater than 80 litres.
- (e) Garbage amounts in excess of those prescribed by subsection (5) shall not be collected unless they have attached thereto one or more tags supplied by the Town to authorize their collection. Each tag shall allow the collection of one container, containing not more than 80 litres of additional garbage.
- (f) During Yard Waste collection events, such waste must be bagged (kraft yard waste bags only), bundled or placed in clearly marked reusable containers such that the gross weight of each bundle or container not exceed 20 kilograms.
- (g) For the purpose of determining eligibility for garbage collection, properties are classified into the following categories:
 - (i) “Mandatory Garbage Collection Properties” include:
 - (1) a detached dwelling unit;
 - (2) properties which contain one single family dwelling;
 - (3) apartment with less than five dwelling units,
 - (4) properties which contain one duplex dwelling;
 - (5) properties which contain a multiple dwelling unit with less than five dwelling units in total;
 - (6) mobile home; and
 - (7) churches.
 - (ii) “Ineligible Garbage Collection Properties” include:
 - (1) vacant properties;
 - (2) properties which contain five or more dwelling units in total.
 - (3) properties which contain apartment buildings with more than five or more dwelling units;
 - (4) properties which contain a commercial unit such as a restaurant, café, store, hotel, motel, campsite, office block, retail or service business;
 - (5) properties that contain a residential dwelling unit or multiple dwelling unit located in a building or on a property with a commercial unit;
 - (6) mobile home parks;
 - (7) properties that contain a industrial unit such as warehouse, factory and wholesale business;
 - (8) properties that contain an agricultural and institutional operation.

- (h) All owners and occupiers of Mandatory Garbage Collection Properties must pay for and participate in the Garbage Services.
- (i) Owners and occupiers of Ineligible Garbage Collection Properties must arrange for their own collection and disposal of solid wastes and may not participate in the Garbage Service.
- (j) Regulations for Waste Receptacles
 - (i) All Owners and occupiers shall thoroughly drain all garbage or trade waste before placing it in receptacles and no garbage or trade waste of a semi-liquid consistency shall be collected from any premises whatsoever.
 - (ii) All bulk receptacles shall be maintained in a clean and sanitary condition. The Receptacle Owner shall be responsible for repairs, painting and general maintenance of the solid waste bulk receptacles. All bulk receptacles shall be cleaned by the Owner a minimum of once per year.
 - (iii) All garbage receptacles shall be kept within the confines of an Occupant's property, where reasonably possible.
 - (iv) Bulk receptacles must be located on a paved or concrete surface, provided at the expense of the occupant.
 - (v) All garbage receptacles shall be accessible for collection, located at the owner or occupier's property line, either adjacent to the sidewalk or road shoulder, on all designated collection days. All solid waste receptacles not accessible or not meeting the accessibility criteria, on designated collection days, shall not be collected until the next regularly scheduled collection. Absentee homeowners must arrange to have the waste receptacles put out on the designated collection day or take their waste to the Landfill.
- (k) If disposal of Special Waste is required, an owner or occupier must contact the Ministry of Water, Land and Air Protection to receive regulations for disposal and permission to do so as regulated by the Waste Management Act.

Landfill Service

- 6. No person shall, in depositing refuse at a Disposal Site:
 - (a) deposit a Recycled Waste;
 - (b) deposit a Prohibited Waste;
 - (c) deposit Solid Waste except as directed by regulations for the use of the Disposal Site;

- (d) drive a vehicle anywhere on the Disposal Site except on roads provided by the Town for that purpose unless otherwise instructed;
 - (e) act in a manner contrary to the posted site regulations;
 - (f) motor vehicles entering the Sanitary Landfill shall have their loads adequately covered and secured to prevent materials from blowing, bouncing or falling off the vehicle while in transit. An adequate cover is a tarpaulin, other overlay, or container that is used to confine the material to the vehicle or all materials must be contained within intact secured closed garbage bags or container.
7. Controlled Waste will not be accepted for disposal at the Landfill without written approval from the Director. This requirement may be waived at the option of the Director if the Director determines that special handling and disposal techniques are not required to dispose of the Controlled Waste. Controlled Waste for which special handling and disposal techniques are required are subject to a Special Disposal Fee as determined by the Director, which is based on actual cost of disposing of the Controlled Waste.
 8. All persons within the Town of Osoyoos shall utilize the service established by the Landfill.
 9. Person from the Town of Osoyoos, Electoral Areas "A & C" of the Regional District of Okanagan Similkameen and the Town of Oliver may deposit controlled waste at the liquid waste handling facility within the Landfill.

Fees

10. The applicable fees for Recycling Service, Garbage Service, Landfill Services are set out in Schedule A, attached to and forming part of this bylaw. All fees are per residential dwelling unit, regardless of size unless otherwise noted.

Due dates for fee payment

11. Subject to section 12, fees for Recycling and Garbage Services are payable not later than the property tax due date and cover the calendar year from January 1 to December 31 of the year they are assessed.

Pro-rated services

12. Properties which become eligible for receiving Recycling Service or Garbage Service part way through a year, shall be charged a pro-rated fee for this service, which shall be due on the property tax due date or within 30 days of their eligibility for service, whichever occurs later.

Penalties

- 13. Fees not paid by the due date will incur a 10% penalty.
- 14. Any person who contravenes any provision of this bylaw, commits an offence and is punishable in accordance with the Offence Act and shall be liable on conviction to a fine or penalty of not less than two hundred dollars (\$200.00) nor more than five thousand dollars (\$5,000.00).

Unpaid amounts transferred to taxes

- 15. Fees and accrued penalties not paid by December 31 of any year shall be transferred to arrears taxes.

No refunds

- 16. No credit or refund shall be given on any charges or fees prescribed by this bylaw.

Severance

- 17. If a section, subsection, sentence, clause or phrase of this Bylaw is for any reason held to be invalid by the decision of a Court in competent jurisdiction, such decision shall not affect the validity of the remaining portions of this Bylaw.

Repeal of old bylaws

- 18. Waste Management Services and Regulations Bylaw No. 1309, 2015 and all amendments thereto are hereby repealed.

Read a first time, as amended, this 9th day of December, 2020.

Read a second and third time, this 9th day of December, 2020.

Adopted on the 21st day of December, 2020.

Original signed by Mayor Sue McKortoff

Original signed by Brianne Hillson

Mayor

Corporate Administration Officer

SCHEDULE A – To Waste Management Services and Regulations Bylaw No. 1370, 2020

Garbage Collection and Recycle Collection	\$170.50 / residential dwelling / year
Garbage Tags	\$2.50 / tag to collect up to 80 litres of garbage in one container.
Landfill Tipping Fees	\$114.99 per tonne, with a minimum charge of \$6.50, which must be paid to the designated landfill operator before exiting the facility.
Assessed Demolition and Renovation Mixed Load	\$525.00 per tonne, with a \$25.00 minimum charge.
Non-Assessed Demolition and Renovation Mixed Load	\$730.00 per tonne, with a \$50.00 minimum charge.
Construction Mixed Load	\$730.00 per tonne, with a \$50.00 minimum charge.
Controlled Waste	\$210.00 per tonne, for all items other than septic tank liquid waste, with a \$50.00 minimum charge.
Recyclable Gypsum Board	\$115.00 per tonne, with a \$10.00 minimum charge.
Tires (not oversized)	Free
Oversized Tires	\$525.00 per tonne.
Tires with Rims	\$3.00 per Tire with rim.
Yard Waste	Tipping fees are waived on Type “A” compostables and chippables under 5” for loads weighing 100 kg or less, loads over 100 kg are charged \$60.00 per tonne for the portion of the load over weight, with a \$6.50 minimum charge.
Compostable Waste Sales	\$60.00 per tonne (volumes less than 5 tonnes) and \$30.00 per tonne (volumes greater than 5 tonnes) as measured by weight on the scale provided at the site by the Town of Osoyoos with a minimum charge of \$6.50.
Prepaid Landfill Tipping Fees	Persons may prepay tipping fees by depositing an amount of not less than \$200.00 with the Town of Osoyoos.
Appliance Charge at Landfill	\$15.00 per appliance containing Freon.
Mattresses & Box-springs	\$15.00 per mattress of any size and \$15.00 per box-spring of any size.
Liquid Waste Handling Facility Fee	\$40.50 per tonne.

Depositing of Recyclable Waste

Fee for depositing loads containing more than 1% Recyclable or Compostable Waste in non-compliance areas:
\$10.00 or double the normal Landfill Tipping Fees.

Non adherence to Section 6(f)

\$10.00 or double the normal Landfill Tipping Fees for loads not adequately covered and secured, whichever is greater.

Appendix D

Historical Waste Summary

Summary of Monthly Waste Quantities for 2023 (Tonnes)

Categories	January	February	March	April	May	June	July	August	September	October	November	December	Total
Construction Waste A (conc, rubble, asphalt, etc.)	15.98	11.63	12.8	16.5	21.66	7	17.15	8.68	13.26	120.98	0.19	8.88	254.71
Construction Waste B (drywall or asphalt shingles)	1.93	9.55	3.58	4.33	3.82	8.71	17.08	15.75	11.03	14.84	3.87	2.96	97.45
Construction Waste C (white wood, lumber, stump, compost, etc.)	4.69	39.84	13.41	8.45	15.23	5.32	4.27	3.24	1.75	13.71	2.08	3.17	115.16
Mixed Load Construction Waste	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed Load Commercial Waste	24.37	24.75	25.15	45.3	27.79	12.18	16.03	21.49	26.74	58.93	71.5	18.11	372.34
Mixed Load Residential Waste	31.5	32.77	49.78	60.73	71.21	55.05	66.83	64.7	84.04	82.11	66.87	39.06	704.65
Metals (white goods, scrap metal, 80% metal or more)	0.37	2.17	0.77	5.2	1.09	2.61	0.85	1.65	0.87	0.74	0.66	0.54	17.52
Tires	0.05	0.1	0.48	0.03	0.56	1.28	0.47	1.17	0.12	3.78	4.81	0	12.85
Commercial Waste	106.51	72.18	113.28	106.17	131.48	142	154.17	198.72	162.37	128.66	90.03	91.99	1,497.56
Municipal Waste (Town & Contractor pickup)	100.56	57.81	89.53	125.44	156.75	99.75	142.88	135.18	98.95	114.97	76.95	64.86	1,263.63
Gravel from Road Construction	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential Waste	9.19	7.61	9.25	12.35	18.16	26.75	19.35	18.38	17.64	13.41	8.74	9.08	169.91
Yard & Garden Waste - Curbside pick-up (compost)	0	0	26.66	37.85	71.58	44.17	35.32	31.8	38.83	74.17	0.92	0	361.3
Free Chippable & Compostable	15.53	22.36	60.47	88.96	119.68	98.52	85.84	62.89	68.36	162.56	68.75	26.61	880.53
Free Compostable (fruit or vegetables)	7.55	0.01	0	0	0	0.47	69.94	54.03	8.94	2.42	6.83	0	150.19
Demolition and Land Clearing	0	0	0	0.33	0	0	0	0	0	0	0	0	0.33
Recycled DLC	0	0	0	0	0	0	0	0	0	0	0	0	0
Asbestos	1.45	0.88	1.12	0.58	3.63	0	1.15	0	1.12	0	0.13	0	10.06
Puncture Vine	0	0	0.3	0	0.05	0.02	0.78	0.57	0.21	0	0.13	0	2.06
Refrigerators ¹ (by # of units)	5	9	52	51	32	42	30	56	20	12	14	8	331 units (25 tonnes)
Biosolids	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	324.68	290.66	458.58	563.22	674.69	545.83	662.11	674.25	554.23	803.28	416.46	273.26	5,935.25

¹ The tonnage of refrigerators received is based on an estimated per unit refrigerator weight of 75kg as per guidance from the Major Appliance Recycling Roundtable (MARR).

Waste Tonnage Summary (2014 to 2023) (Tonnes)

Waste Category	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total Tonnage – Landfilled¹										
Municipal Waste ²	1,768	1,696	1,888	1,969	2,790	1,917	2,124	2,391	2,330	2,139
Commercial Waste ³	2,177	1,966	2,075	2,037	1,949	2,181	1,961	2,107	1,638	1,870
Construction Waste B (drywall or asphalt shingles)	238	357	67	43	55	29	48	58	50	97
Construction Waste - Mixed	0	34	15	1	85	14	22	6	0	0
Invasive Weeds (puncture vine, tumbleweed, etc.) ⁴	-	-	-	-	-	-	-	-	0	2
Asbestos	122	40	9	7	19	91	12	33	27	10
Biosolids	0	0	0	0	0	0	0	2	0	0
Total Landfilled	4,305	4,093	4,054	4,057	4,898	4,232	4,167	4,597	4,045	4,118
Total Tonnage - Diverted										
Construction Waste A (concrete, asphalt, etc.)	1,037	239	595	3,199	4,635	582	1,757	1,143	489	255
Total Diverted	1,037	239	595	3,199	4,635	582	1,757	1,143	489	255
Total Tonnage – Recycled⁵										
Batteries	0	0	0	0	0	0	0	0	0	0
Metals (white goods, scrap metal, 80% metal or more)	21	25	27	27	33	31	33	26	16	18
Tires	0	5	4	5	6	5	5	3	6	13
Refrigerators ⁶	26	19	23	23	26	29	26	28	17	25
Propane Tanks ⁷	-	-	-	-	-	-	-	-	-	-
Recycled DLC	0	16	57	36	88	73	105	134	56	0
Total Recycled	47	65	111	91	153	138	169	191	95	55
Total Tonnage - Composted										
Const Waste C (white wood, lumber, stump, compost, etc)	159	190	193	226	169	214	256	128	72	115
Yard Waste ⁸	849	866	1058	1043	969	916	928	1090	1062	1,392
Invasive Weeds (puncture vine, tumbleweed, etc.) ⁴	0	16	2	2	1	6	4	6	-	-
Total Composted	1,008	1,072	1,253	1,271	1,139	1,136	1,188	1,224	1,134	1,507

¹ The landfilled category refers to materials that have been buried in an active landfill cell or established controlled waste area.

² Municipal waste includes waste categories residential waste from residential pick-up, mixed load waste from public drop-off, municipal waste, and land clearing and demolition waste.

³ Commercial waste includes waste categories mixed load commercial waste and commercial waste.

⁴ For years 2014 to 2021, invasive weeds were included under total composted tonnages. For 2022 and 2023, invasive weeds are included under the total landfilled tonnages to reflect actual landfilling practices.

⁵ Recycled category refers to materials stored within the limits of the Landfill site until such time that these materials are salvaged and/or recycled by others (Batteries, Metals, Tires, Refrigerators, and Propane Tanks).

⁶ The tonnage of refrigerators received is based on an estimated per unit refrigerator weight of 75kg as per guidance from the Major Appliance Recycling Roundtable (MARR).

⁷ Propane tanks are recycled and not included in annual totals.

⁸ Yard Waste includes waste categories Curbside pickup of Yard and Garden Waste, Free Chippable and Compostable, Free Compostable (fruit or vegetables).

Appendix E

Environmental Monitoring Plan



TOWN OF OSOYOOS

Environmental Monitoring Plan

Town of Osoyoos & District Sanitary Landfill



November 25, 2022

Town of Osoyoos
8707 Main Street, Box 3010
Osoyoos, British Columbia
VOH 1V0

Attention: Mr. Jared Brounstein
Director of Operations

Town of Osoyoos – Environmental Monitoring Plan

Dillon Consulting Limited (Dillon) is pleased to submit to the Town of Osoyoos (Town) the enclosed Report documenting the Town of Osoyoos Environmental Monitoring Plan to assist the Town in fulfilling their regulatory monitoring and reporting requirements.

The report summarizes the environmental monitoring and reporting requirements for the landfill, hauled liquid waste facility, and compost facility operating at the Site.

If you should have any questions or concerns regarding the contents of this report please direct them to Elisabeth Mance at emance@dillon.ca or by calling 902-450-5015, ext. 5063.

Sincerely,

DILLON CONSULTING LIMITED

Elisabeth Mance, P.Eng.
Environmental Engineer

EM:kk

Our file: 22-4376

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Dillon Consulting
Limited

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Figure 1: Town of Osoyoos and District Sanitary Landfill

Tables

Table 1: Monitoring Wells

Table 2: Monthly Monitoring Requirements

Appendices

- A Stratigraphic Logs
- B Operational Certificate MR 15273
- C Permit PE 14804

1.0

Introduction

Dillon Consulting Limited (Dillon) was retained by the Town of Osoyoos (the Town) to develop an Environmental Monitoring Plan (EMP) for the Town of Osoyoos and District Sanitary Landfill (Site). The EMP summarizes the environmental monitoring and reporting requirements for the three facilities operating at the Site, as follows:

- Landfill, operating under Operational Certificate MR 15273 (OC);
- Hauled liquid waste facility, operating under Permit 14804; and
- Compost facility, operating under Registration 109610.

The EMP is intended as a tool to assist the Town in fulfilling their regulatory monitoring and reporting requirements for the three facilities by summarizing monitoring protocols, schedule, and details in one reference document.

Any changes to the environmental monitoring programs or infrastructure for the three facilities should prompt an update of this plan.

1.1

Site Overview

The Site is located approximately 3 km north of the municipal boundary and 1.5 km west of Highway 97 in Osoyoos, BC (**Figure 1**). Environmental monitoring infrastructure at the Site comprises six groundwater monitoring wells, as summarized in **Table 1** and as illustrated on **Figure 1**.

Table 1: Monitoring Wells

Monitoring Well	Top of Casing	Base	Northing	Easting
EXMW-1-'97	359.577	359.800	5436715.552	315818.076
LFWM-3-'10	359.871	359.201	5436801.491	315800.680
LFMW-4-'10	358.411	357.741	5436908.687	315802.288
LFWM-5-'10	359.270	358.600	5436976.356	315804.245
LFMW-6-'10	382.419	381.499	5437174.161	315586.691
LFMW-7-'10	383.197	382.557	5436935.496	315464.741

Stratigraphic logs for the monitoring wells are included as **Appendix A**.

2.0

Monitoring Protocols

The following British Columbia Ministry of Environment and Climate Change Strategy (BC MOECCS) documents provide sampling protocols for environmental monitoring:

- “Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills” (1996);
- “British Columbia Field Sampling Manual: 2013 - For Continuous Monitoring and the Collection of Air, Air Emission, Water, Wastewater, Soil, Sediment and Biological Samples” (2013); and
- “British Columbia Environmental Laboratory Manual” (2015).

In order to ensure that representative groundwater samples are obtained from the monitoring wells, the following sampling protocols should be applied:

- Record the static water level of each monitoring well;
- Prior to the collection of the groundwater sample, purge each well of the standing volume of water. The objective of purging is to remove groundwater from the well until a representative sample of the formation groundwater is obtained. This is generally achieved by the removal of three to five times the volume of standing water in the well [United States Environmental Protection Act (USEPA) Convention]. In general, purging is considered complete once sediment-free groundwater is obtained and the specific conductance, temperature, and pH of the groundwater is stabilized;
- Collect groundwater in the appropriate laboratory-supplied sample containers and preserve as required; and
- Samples are to be packed on ice and submitted under a chain of custody to an accredited analytical laboratory certified for environmental analysis by the BC MOECCS, respecting sample hold times.

3.0 Environmental Monitoring

The following section outlines the environmental monitoring requirements for the three on-site facilities: the landfill, the hauled liquid waste facility, and the compost facility. An “at-a-glance” summary of the monthly monitoring requirements is included as **Table 2** following the text.

3.1 Landfill

A monitoring program for the landfill is required under Section 4 of the OC (**Appendix B**). The program includes annual vegetation monitoring, monthly water levels, biannual groundwater sampling, and reporting.

3.1.1 Vegetation Monitoring

Vegetation in the vicinity of the landfill is to be inspected at least once per year to determine if any environmental impacts are occurring.

3.1.2 Water Levels

Water levels in the six on-site monitoring wells are to be recorded on a monthly basis.

3.1.3 Groundwater Quality

Groundwater is to be sampled twice annually, in April and September. The water is to be analysed for the following analytes: chloride, sulfate, nitrate nitrogen, nitrite nitrogen, dissolved organic carbon (DOC), total kjeldahl nitrogen, pH, total dissolved solids, total hardness, nitrogen, nitrate+nitrite as nitrogen, total nitrogen, dissolved metals (aluminum, arsenic, boron, cadmium, chromium, cobalt, iron, lead, manganese, mercury, molybdenum, potassium, selenium, sodium, and zinc).

3.1.4 Data Quality Assurance

As per the OC, monitoring must be undertaken following the terms and conditions of the Environmental Data Quality Assurance Regulation (EQDA), or other legislation which may be in effect at the time. The EQDA specifies ten percent of the samples collected shall be duplicated to provide data quality assurance. Quality control information generated by the laboratory while analyzing parameters required by the OC shall also be provided with the data required to be reported.

3.1.5 Criteria and Compliance

The applicable criteria for groundwater quality are provided in the British Columbia Approved and Working Water Quality Guidelines. The results of the groundwater monitoring program have also historically been compared to the Guidelines for Canadian Drinking Water Quality (GCDWQ).

As per the OC, the landfill must be operated in a manner such that ground or surface water quality does not decrease beyond the applicable criteria at or beyond the landfill property boundary.

3.1.6 Annual Reporting

As per Section 4.6 of the OC, reporting associated with the EMP will be included as part of the Landfill Annual Report, and will include a compilation, interpretation and trend analysis of the receiving environmental monitoring data prepared by a suitable qualified professional.

3.2 Hauled Liquid Waste Facility

As indicated above, the hauled liquid waste facility is operated under Permit PE 14804 (**Appendix C**). A monitoring program for the facility is required under Section 3 of the Permit. The current program includes monthly water levels, biannual wastewater sampling, biannual groundwater sampling, and reporting.

3.2.1 Water Levels

Water levels in monitoring wells MW-1-'97 and LFMW3-'10, as shown on **Figure 1**, are to be recorded on a monthly basis.

3.2.2 Wastewater Quality

The wastewater from the infiltration basins is to be sampled twice annually, in April and September. The water from the grab samples is to be analysed for the following analytes: BOD₅, suspended solids, conductivity, pH, chloride, nitrate nitrogen, ammonia nitrogen, total coliform and fecal coliform.

3.2.3 Groundwater Monitoring

Groundwater in monitoring wells MW-1-'97 and LFMW3-'10 is to be sampled twice annually, in April and September. The water is to be analysed for the following analytes: conductivity, pH, chloride, nitrate nitrogen, nitrite nitrogen, ammonia nitrogen, kjeldahl nitrogen, total nitrogen, total phosphorous, dissolved phosphorous, ortho-phosphate, total coliform and fecal coliform.

3.2.4 Annual Reporting

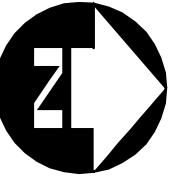
As per Section 3.8 of the Permit, reporting associated with the EMP will be included as part of the Hauled Liquid Waste Facility Annual Report, and will include a summary of the results of the monitoring programs, data interpretation and trend analyses by a suitable qualified professional.

3.3 Compost Facility

The compost facility operates under Registration 109610. There is no environmental monitoring program specific to the compost facility. The groundwater monitoring undertaken for the landfill, as presented above, also serves to identify impacts (if any) from the on-site composting operations.

Any leachate generated as part of the composting operations is collected in a leachate sump located at the southwest corner of the impermeable compost pad and is recirculated into the compost windrows as needed. Leachate quantities are minimal due to the arid climate of the Site. In the unlikely event that leachate must be removed from the Site for disposal, the volume, dates, analytical data, and end disposal location of the leachate should be recorded and kept on file.

Figures



SITE ENTRANCE

LFMW-7-'10

COMPOST FACILITY

LFMW-6-'10

LANDFILL STAGE 1

LANDFILL STAGE 2

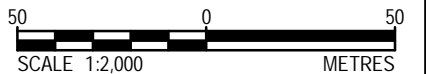
SEPTAGE DISPOSAL FACILITY

EXMW-1-'97

LFMW-3-'10

LFMW-4-'10

LFMW-5-'10



PROJECT	ENVIRONMENTAL MONITORING PLAN
TITLE	TOWN OF OSOYOOS & DISTRICT SANITARY LANDFILL
DATE	OCTOBER 2022

PROJECT NO.	22-4376
FIGURE NO.	1

File Name: c:\pw\working directory\projects_2022\dillon_501r\dms33524\224376-02-site-fig1_environmental monitoring plan.dwg

Tables

Table 2: Monthly Monitoring Requirements



Facility	Monitoring Requirement	Locations	Total	Analytical Parameters	January	February	March	April	May	June	July	August	September	October	November	December
Landfill	Vegetation Monitoring	Vicinity of landfill	NA	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Water Levels	EXMW-1-'97, LFWM-3-'10, LFWM-4-'10, LFWM-5-'10, LFWM-6-'10, and LFWM-7-'10	6	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Groundwater Quality	EXMW-1-'97, LFWM-3-'10, LFWM-4-'10, LFWM-5-'10, LFWM-6-'10, and LFWM-7-'10	7 (6 monitoring wells + duplicate sample)	chloride, sulfate, nitrate nitrogen, nitrite nitrogen, DOC, total kjeldahl nitrogen, pH, total dissolved solids, total hardness, nitrogen, nitrate+nitrite as nitrogen, total nitrogen, dissolved metals (aluminum, arsenic, boron, cadmium, chromium, cobalt, iron, lead, manganese, mercury, molybdenum, potassium, selenium, sodium, and zinc).				✓						✓		
Hauled Liquid Waste Facility	Water Levels	MW-1-'97 and LFWM3-'10	2	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Wastewater Quality	Infiltration basins	1 (grab sample)	BOD ₅ , suspended solids, conductivity, pH, chloride, nitrate nitrogen, ammonia nitrogen, total coliform and fecal coliform.				✓					✓			
	Groundwater Quality	MW-1-'97 and LFWM3-'10	2	conductivity, pH, chloride, nitrate nitrogen, nitrite nitrogen, ammonia nitrogen, kjeldahl nitrogen, total nitrogen, total phosphorous, dissolved phosphorous, ortho-phosphate, total coliform and fecal coliform.				✓					✓			

Appendix A

Stratigraphic Logs

WELL TAG NUMBER: MW 1-97
 OWNER: TOWN OF OSOYOOS
 DRILLER: SANDWELL
 WELL LOCATION: OSOYOOS LANDFILL
 WELL USE: MONITORING

CONSTRUCTION METHOD: HOLLOW STEM AUGER
 DEPTH: 15.70 m DIAMETER: 25 mm
 OSOYOOS COORDINATES:
 ELEVATION: T.O.C.=357.98m; BASE=342.28
 CONSTRUCTION DATE (yy/mm/dd): 97/03/26

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SCREEN LOCATION	DEPTH (m)	
0.0		LOOSE-COMPACT, FINE-MEDIUM SAND WITH TRACE SILT		0.0	
1.0					1.0
2.0					2.0
3.0				LOOSE LIGHT BROWN FINE SAND	3.0
4.0				COMPACT BROWN SILTY SAND	4.0
5.0					5.0
6.0				COMPACT LIGHT BROWN FINE SAND	6.0
7.0					7.0
8.0				COMPACT INTERLAYERED FINE TO MEDIUM SAND, SOME SILT AND STIFF GREY CLAY SEAMS WITH TRACE SAND LENSES	8.0
9.0				COMPACT LIGHT BROWN FINE SAND WITH SILT LAYERS AND STIFF GREY CLAY, SOME SILT SEAMS.	9.0
10.0					10.0
11.0				COMPACT LIGHT BROWN FINE SAND WITH TRACE SILT	11.0
12.0					12.0
13.0				STIFF INTERLAYERED BROWN GREY SILTY CLAY AND BROWN SILT WITH SOME CLAY	13.0
14.0				FIRM GREY COMPACT BROWN SAND AND GRAVEL SILTY CLAY	14.0
15.0		FIRM GREY INTERLAYERED SILT, SOME CLAY AND SILTY CLAY SOME FINE SAND LENSES AND OCCAISIONAL SILTY, CLAYEY COARSE SAND & GRAVEL SEAMS	15.0		
16.0			16.0		
17.0			17.0		
18.0			18.0		
19.0			19.0		
20.0			20.0		
21.0			21.0		
22.0			22.0		
23.0			23.0		
24.0			24.0		
25.0			25.0		
26.0			26.0		
27.0			27.0		
28.0			28.0		
29.0			29.0		
30.0			30.0		
31.0			31.0		
32.0			32.0		
33.0			33.0		


WELL TAG NUMBER: LFMW 3-10
 OWNER: TOWN OF OSOYOOS
 DRILLER: LEN FAASSE (GROUND SOURCE DRILLING)
 WELL LOCATION: OSOYOOS LANDFILL
 WELL USE: MONITORING

CONSTRUCTION METHOD: DTH HAMMER
 DEPTH: 25.0 m DIAMETER: 100 mm
 OSOYOOS COORDINATES:
 ELEVATION: T.O.C.=359.871; BASE=359.201
 CONSTRUCTION DATE (yy/mm/dd): 10/10/02

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SCREEN LOCATION	DEPTH (m)
0.0				0.0
1.0		MEDIUM COARSE BROWN SAND		1.0
2.0				2.0
3.0				3.0
4.0				4.0
5.0		LIGHT BROWN SILTY SAND		5.0
6.0				6.0
7.0				7.0
8.0				8.0
9.0				9.0
10.0				10.0
11.0				11.0
12.0		MEDIUM COARSE BROWN SAND		12.0
13.0				13.0
14.0				14.0
15.0				15.0
16.0				16.0
17.0				17.0
18.0		LIGHT BROWN SILTY SAND W. OCCASIONAL CLAY SEAMS		18.0
19.0				19.0
20.0				20.0
21.0				21.0
22.0				22.0
23.0		GREY DAMP CLAY/SILT		23.0
24.0				24.0
25.0		25.0		
26.0		26.0		
27.0		27.0		
28.0		28.0		
29.0		29.0		
30.0		30.0		
31.0		31.0		
32.0		32.0		
33.0		33.0		




































WELL TAG NUMBER: LFMW 4-10
 OWNER: TOWN OF OSOYOOS
 DRILLER: LEN FAASSE (GROUND SOURCE DRILLING)
 WELL LOCATION: OSOYOOS LANDFILL
 WELL USE: MONITORING

CONSTRUCTION METHOD: DTH HAMMER
 DEPTH: 21.3 m DIAMETER: 100 mm
 OSOYOOS COORDINATES:
 ELEVATION: T.O.C.=358.411; BASE=357.741
 CONSTRUCTION DATE (yy/mm/dd): 10/10/02

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SCREEN LOCATION	DEPTH (m)
0.0				0.0
1.0		MEDIUM COARSE BROWN SAND		1.0
2.0				2.0
3.0				3.0
4.0				4.0
5.0				5.0
6.0				6.0
7.0				7.0
8.0				8.0
9.0				9.0
10.0				10.0
11.0				11.0
12.0				12.0
13.0				13.0
14.0				14.0
15.0				15.0
16.0				16.0
17.0				17.0
18.0				18.0
19.0				19.0
20.0				20.0
21.0			21.0	
22.0			22.0	
23.0			23.0	
24.0			24.0	
25.0			25.0	
26.0			26.0	
27.0			27.0	
28.0			28.0	
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30.0			30.0	
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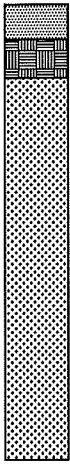
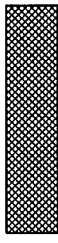
WELL TAG NUMBER: LFMW 5-10
 OWNER: TOWN OF OSOYOOS
 DRILLER: LEN FAASSE (GROUND SOURCE DRILLING)
 WELL LOCATION: OSOYOOS LANDFILL
 WELL USE: MONITORING

CONSTRUCTION METHOD: DTH HAMMER
 DEPTH: 17.4 m DIAMETER: 100 mm
 OSOYOOS COORDINATES:
 ELEVATION: T.O.C.=359.270; BASE=358.670
 CONSTRUCTION DATE (yy/mm/dd): 10/10/03

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SCREEN LOCATION	DEPTH (m)
0.0		COMPOST MATERIAL		0.0
1.0				1.0
2.0				2.0
3.0				3.0
4.0				4.0
5.0		MEDIUM COARSE BROWN SAND		5.0
6.0				6.0
7.0				7.0
8.0				8.0
9.0				9.0
10.0				10.0
11.0		SMALL GRAVELS, COARSE SANDS & SMALL CLAY SEAMS		11.0
12.0				12.0
13.0				13.0
14.0		WET FINE SANDS & BROWN SILTS		14.0
15.0				15.0
16.0				16.0
17.0				17.0
18.0				18.0
19.0				19.0
20.0				20.0
21.0				21.0
22.0				22.0
23.0				23.0
24.0				24.0
25.0				25.0
26.0				26.0
27.0				27.0
28.0				28.0
29.0				29.0
30.0				30.0
31.0				31.0
32.0				32.0
33.0				33.0



WELL TAG NUMBER: LFMW 6-10
 OWNER: TOWN OF OSOYOOS
 DRILLER: LEN FAASSE (GROUND SOURCE DRILLING)
 WELL LOCATION: OSOYOOS LANDFILL
 WELL USE: MONITORING

CONSTRUCTION METHOD: DTH HAMMER
 DEPTH: 10.0 m DIAMETER: 100 mm
 OSOYOOS COORDINATES:
 ELEVATION: T.O.C.=382.419; BASE=381.499
 CONSTRUCTION DATE (yy/mm/dd): 10/10/02

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SCREEN LOCATION	DEPTH (m)
0.0		SILT FILL		0.0
1.0		HOUSEHOLD GARBAGE		1.0
2.0				2.0
3.0		STIFF BROWN CLAY		3.0
4.0			4.0	
5.0			5.0	
6.0			6.0	
7.0			7.0	
8.0			8.0	
9.0			9.0	
10.0			10.0	
11.0			11.0	
12.0			12.0	
13.0		13.0		
14.0		14.0		
15.0		15.0		
16.0		16.0		
17.0		17.0		
18.0		18.0		
19.0		19.0		
20.0		20.0		
21.0		21.0		
22.0		22.0		
23.0		23.0		
24.0		24.0		
25.0		25.0		
26.0		26.0		
27.0		27.0		
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29.0		29.0		
30.0		30.0		
31.0		31.0		
32.0		32.0		
33.0		33.0		

WELL TAG NUMBER: LFMW 7-10
 OWNER: TOWN OF OSOYOOS
 DRILLER: LEN FAASSE (GROUND SOURCE DRILLING)
 WELL LOCATION: OSOYOOS LANDFILL
 WELL USE: MONITORING

CONSTRUCTION METHOD: DTH HAMMER
 DEPTH: 7.3 m DIAMETER: 100 mm
 OSOYOOS COORDINATES:
 ELEVATION: T.O.C.=383.197; BASE=382.557
 CONSTRUCTION DATE (yy/mm/dd): 10/10/03

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SCREEN LOCATION	DEPTH (m)
0.0		DAMP CLAY FILL		0.0
1.0				1.0
2.0		COARSE BROWN SANDS		2.0
3.0				3.0
4.0			4.0	
5.0		DAMP CLAY TILL	5.0	
6.0			6.0	
7.0		BEDROCK	7.0	
8.0			8.0	
9.0			9.0	
10.0			10.0	
11.0			11.0	
12.0			12.0	
13.0			13.0	
14.0			14.0	
15.0			15.0	
16.0			16.0	
17.0			17.0	
18.0			18.0	
19.0			19.0	
20.0			20.0	
21.0			21.0	
22.0			22.0	
23.0			23.0	
24.0			24.0	
25.0			25.0	
26.0			26.0	
27.0			27.0	
28.0			28.0	
29.0			29.0	
30.0			30.0	
31.0			31.0	
32.0			32.0	
33.0			33.0	

PROJECT: Landfill
 PROJECT LOCATION: Osoyoos, B.C.
 PROJECT NUMBER: 972-4022
 Sampler Hammer: 63.5 kg., Drop 0.76m.

RECORD OF BOREHOLE MW 1

BORING DATE: March 26, 1997
 BORING LOCATION: See Figure 2

SHEET: 2 OF 2

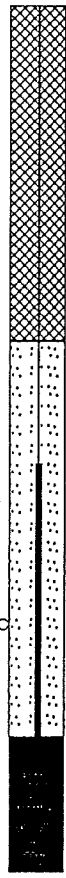
DATUM:

BOREHOLE TYPE: Hollow Stem



DEPTH SCALE (m)	SOIL PROFILE			SAMPLES					PENETRATION RESISTANCE BLOWS/0.3m				PIEZOMETER OR STANDPIPE INSTALLATION
	DESCRIPTION	STRATA PLOT	ELEV	NUMBER	TYPE	BLOWS / 0.15m.	N	OTHER TESTS	WATER CONTENT, PERCENT				
			DEPTH						Wp	W	Wi		
10	CONTINUED FROM PREVIOUS PAGE												
11	Compact light brown fine SAND with trace silt.	[Dotted pattern]		9	DO	4,7,9	16						
12													
13	Stiff interlayered brown grey silty CLAY and brown SILT with some clay.	[Diagonal hatching]	344.67 13.31	10	DO	6,11,10	21						
14	Compact brown SAND and GRAVEL.	[Dotted pattern]	344.28 13.70 344.08	11	DO	10,5,6	11						
15	Firm grey silty CLAY.	[Diagonal hatching]	13.90										
15	Firm grey interlayered SILT, some clay and silty CLAY with trace to some brown fine sand lenses and occasional silty, clayey coarse sand and gravel seams.	[Diagonal hatching]	343.38 14.60	12	DO	1,3,4	7						
15		[Diagonal hatching]		13	DO	4,5,6	11						
16	END OF HOLE		342.28 15.70										
17													
18													
19													
20													

April 18/97
 #16 Frac Sand
 25mm Dia. Slotted PVC
 Bentonite Seal



DRILL RIG: Auger
 DRILLING CONTRACTOR: Sandwell
 DRILLER: R.H.

LOGGED: A.R.
 CHECKED: J.F.
 DATE: April 18, 1997

PROJECT: Landfill
 PROJECT LOCATION: Osoyoos, B.C.
 PROJECT NUMBER: 972-4022
 Sampler Hammer: 63.5 kg., Drop 0.76m.

RECORD OF BOREHOLE MW 2

BORING DATE: March 26, 1997
 BORING LOCATION: See Figure 2

SHEET: 1 OF 2

DATUM:

BOREHOLE TYPE: Hollow Stem



DEPTH SCALE (m)	SOIL PROFILE		SAMPLES					PENETRATION RESISTANCE BLOWS/0.3m		PIEZOMETER OR STANDPIPE INSTALLATION
	DESCRIPTION	STRATA PLOT	ELEV	NUMBER	TYPE	BLOWS / 0.15m.	N	OTHER TESTS	WATER CONTENT, PERCENT Wp ——— W ——— Wt	
			DEPTH							
0	GROUND SURFACE		358.63 0.00							
1	Loose brown fine SAND with trace silt.			1	DO	3,4,3	7			<i>Now Destroyed</i>
2										
3	Compact light brown fine SAND with occasional brown fine sand, some silt seam.		355.63 3.00							25mm Solid PVC
4				2	DO	2,4,6	10			
5										
6									Bentonite and Cutting	
7				3	DO	4,8,6	14			
8			350.13 8.50							
9				4	DO	4,8,10	18			
10	Compact interlayered light brown fine SAND and brown fine to medium SAND with some grey silty CLAY seams and brown fine sand lenses.		348.53 10.10							
	CONTINUED ON NEXT PAGE			5	DO	4,8,9	17			

DRILL RIG: Auger
 DRILLING CONTRACTOR: Sandwell
 DRILLER: R.H.

Golder Associates

LOGGED: A.R.
 CHECKED: J.F.
 DATE: April 18, 1997

PROJECT: Landfill
 PROJECT LOCATION: Osoyoos, B.C.
 PROJECT NUMBER: 972-4022
 Sampler Hammer: 63.5 kg., Drop 0.76m.

RECORD OF BOREHOLE MW 2

BORING DATE: March 26, 1997
 BORING LOCATION: See Figure 2

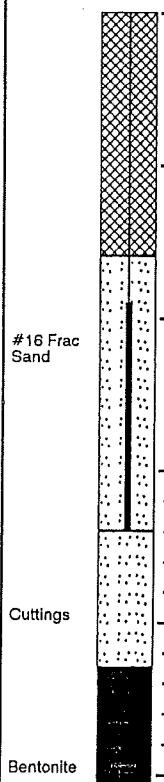
SHEET: 2 OF 2

DATUM:

BOREHOLE TYPE: Hollow Stem



DEPTH SCALE (m)	SOIL PROFILE			SAMPLES				PENETRATION RESISTANCE BLOWS/0.3m		PIEZOMETER OR STANDPIPE INSTALLATION
	DESCRIPTION	STRATA PLOT	ELEV	NUMBER	TYPE	BLOWS / 0.15m.	N	OTHER TESTS	WATER CONTENT, PERCENT Wp -----○----- Wi	
			DEPTH							
10	CONTINUED FROM PREVIOUS PAGE									
11										
12	Compact light brown fine SAND.			5	DO	4,8,9	17			
13			345.53 13.10							
14	Firm grey silty CLAY interlayered with grey brown SILT, some clay and trace light brown fine sand lenses.			6	DO	3,7,9	16			
15			344.03 14.60							
15	Firm to stiff blue grey SILT with some clay.			7	DO	1,2,2	4			
15			343.53 15.10							
15	END OF HOLE			8	DO	1,3,5	8			
16										
17										
18										
19										
20										



DRILL RIG: Auger
 DRILLING CONTRACTOR: Sandwell
 DRILLER: R.H.

Golder Associates

LOGGED: A.R.
 CHECKED: J.F.
 DATE: April 18, 1997

Appendix B

Operational Certificate MR 15273



MINISTRY OF WATER, LAND AND
AIR PROTECTION

OPERATIONAL CERTIFICATE
MR 15273

*Under the provisions of the Waste Management Act and in accordance with the Approved
Regional District of Okanagan-Similkameen Solid Waste Management Plan,*

Town of Osoyoos

PO Box 3010

Osoyoos, British Columbia

VOH 1VO

is authorized to manage municipal solid waste and to discharge residual solid waste to the ground at a sanitary landfill facility located on 146th Avenue, Osoyoos, approximately 7 km northwest of Osoyoos, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the *Waste Management Act* and may result in prosecution.

This Operational Certificate does not authorise entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorised by the owner of such lands or works. The responsibility for obtaining such authority shall rest with the Operational Certificate holder. This Operational Certificate is issued pursuant to the provisions of the *Waste Management Act* to ensure compliance with Section 54 of that statute, which makes it an offence to discharge waste without proper authorisation. It is also the responsibility of the Operational Certificate holder to ensure that all activities conducted under this authorisation are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This Operational Certificate supersedes all previous authorizations issued under the authority of the Waste Management Act.

T.R. Forty, P.Eng.
Assistant Regional Waste Manager

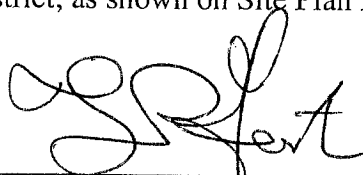
1. AUTHORIZED DISCHARGES

- 1.1 This authorization applies to the discharge of solid waste to a sanitary landfill known as the Osoyoos Landfill. The Environmental Monitoring System (EMS) reference number for this discharge is **E212323**.
- 1.1.1 The authorized discharge is municipal solid waste and other wastes as allowed by the Regional Waste Manager.
- 1.1.2 The works authorized are a sanitary landfill and related appurtenances located approximately as shown on the attached Site Plan A.
- 1.1.3 The discharge originates generally from the Osoyoos area of the Regional District of Okanagan-Similkameen.
- 1.1.4 The legal description of the location of the authorized landfill facility is Lot 993 Plan 22982 and Lot 829 Plan 5102, both in District Lot 2450s, and that portion of District Lot 2450s lying south of Lot 993 Plan 2298 to the Old Richter Pass Road, Similkameen Division of Yale District, as shown on Site Plan A.
- 1.2 The discharge of emissions to the air to which this Sub-Section is applicable is the burning of wood residues. The EMS reference number for this discharge is **E212325**.

The authorization to open burn shall expire on December 31, 2002, after which time open burning shall be strictly prohibited.

Prior to the expiration of the authorization to open burn, the following shall apply.

- 1.2.1 The type of wood residues which may be burned shall be from municipal sources and is restricted to brush and untreated wood, but excluding stumps.
- 1.2.2 The maximum duration of each open burn shall be limited to the period between dawn and dusk of a single day.
- 1.2.3 The maximum authorized volume of wood residues to be burned is that which can successfully be burned in a single dawn to dusk time period in any number of separate piles.
- 1.2.4 The location from which the wood residues discharge originates is generally the Osoyoos area.
- 1.2.5 The location of the source of discharge is legally described as Lot 993 Plan 22982 and Lot 829 Plan 5102, both in District Lot 2450s, and that portion of District Lot 2450s lying south of Lot 993 Plan 2298 to the Old Richter Pass Road, Similkameen Division of Yale District, as shown on Site Plan A.



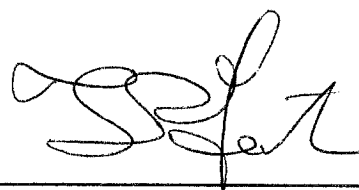
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Assistant Regional Waste Manager

2. DESIGN AND PERFORMANCE REQUIREMENTS

2.1 Operations and Closure Plan

An *Operations and Closure Plan* shall be submitted to the Regional Waste Manager. The *Operations and Closure Plan* shall be prepared by a qualified professional, knowledgeable in the field of landfill design, operation and closure and licensed to practice in British Columbia. The *Operations and Closure Plan* shall include at least the following:

- (a) Anticipated total waste volumes and tonnage and the estimated life of the landfill;
- (b) A landfill cell development and filling plan, outlining procedures for the placement, compaction and covering of wastes
- (c) Litter, odour, dust, rodent and nuisance wildlife control measures;
- (d) A screening plan, e.g.: vegetative or berm;
- (e) A perimeter fencing plan to control access;
- (f) Contingency plans & notification procedures in the event of an emergency;
- (g) Training procedures for operators
- (h) A final cover design including the thickness and permeability of barrier layers and drainage layers, topsoil requirements, vegetative cover and erosion prevention controls;
- (i) A topographic plan showing the final elevation contours of the landfill and surface water diversion and drainage controls;
- (j) A plan and implementation schedule for monitoring the receiving environment groundwater, surface water, landfill gas, erosion and settlement throughout the remaining life of the landfill and for a minimum post-closure period of 25 years;
- (k) A plan and implementation schedule for operation of any required pollution abatement engineering such as landfill gas or leachate collection, management and treatment works for the remaining life of the landfill and a minimum post-closure period of 25 years;
- (l) A forecast of the cost of completed closure and post-closure activities, plus a reasonable contingency, for the purposes of determining a schedule of reserve funds or security to be collected each year until landfill closure;
- (m) A proposed end use of the property after closure;
- (n) Procedures for notifying the public about the closure and about alternative waste disposal facilities; and
- (o) Any other site specific concerns as identified by the Regional Waste Manager.



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Operation of this landfill is to be in substantial accordance with the *Operations and Closure Plan*. If there should be any inconsistency between this Operational Certificate and the *Operations and Closure Plan*, this Operational Certificate shall take precedence.

Written notification shall be provided to the Regional Waste Manager prior to implementing any changes to the *Operations and Closure Plan*. Should circumstances warrant, a revision or addition to the *Operations and Closure Plan* may be required by the Regional Waste Manager.

2.2 Maintenance of Works, Emergency Procedures and Non-Compliance Reporting

2.2.1 The Operational Certificate holder shall regularly inspect the landfill and related pollution control works, designated areas for managing recyclable materials or controlled substances and maintain them in good working order.

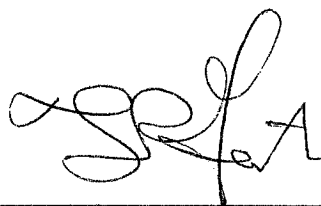
2.2.2 In the event of an emergency or condition beyond the control of the Operational Certificate holder that prevents the continued operation of the authorized works and/or continued performance of the prescribed methods of operation, the Operational Certificate holder shall immediately notify the Regional Waste Manager and take appropriate action.

Specific requirements of the Operational Certificate may be suspended for such time as the emergency exists or as otherwise directed by the Regional Waste Manager provided that:

- (a) The Operational Certificate holder can demonstrate the exercise of due diligence in relation to the process, operation or event which has caused the emergency, and that the emergency has occurred notwithstanding this exercise of due diligence;
- (b) The Regional Waste Manager has been immediately notified of the emergency; and
- (c) The Operational Certificate holder is proceeding with due diligence to correct the emergency condition.

2.3 Public Health Safety and Nuisance

The landfill shall be operated in a manner such that it will not become a significant threat to public health or safety, or a public nuisance is created with respect to, landfill gas, unauthorized access, roads, traffic, noise, dust, litter, vectors, or wildlife attraction.



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2.4 Surface Water Diversion

Discharge of municipal solid waste into water is prohibited. The Operational Certificate holder shall construct and maintain adequate surface water and groundwater diversion works to minimize surface water run-off and groundwater seepage from entering the landfill.

2.5 Property Boundary

The buffer zone between any municipal solid waste discharged and the property boundary is to be at least 50 metres, of which the 15 metres closest to the property boundary must be reserved for natural or landscaped screening (berms or vegetative screens). Depending on adjacent land use and environmental factors, buffer zones of less than 50 metres, but not less than 15 metres, may be authorised by the Regional Waste Manager.

2.6 Setbacks

The distance between the discharged municipal solid waste and the nearest surface water is to be a minimum of 100m. The distance between the discharged municipal solid waste and the nearest residence, water supply intake, hotel, restaurant, food-processing facility, school, church or public park is to be a minimum of 300 metres. Greater or lesser separation distances may be authorised by the Regional Waste Manager where justified.

Accordingly, the Operational Certificate holder shall initiate action immediately to obtain or reserve those lands within the buffer area, or otherwise negotiate an agreement with adjacent property owners, to ensure the buffer lands are adequately protected and reserved for the future.

2.7 Ground and Surface Water Quality Impairment

The landfill must be operated in a manner such that ground or surface water quality does not decrease beyond that specified by the British Columbia Water Quality Guidelines, or other appropriate criteria as may be specified by the Regional Waste Manager, at or beyond the landfill property boundary.

If excursions result to the specified water quality criteria, the Regional Waste Manager 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 subject to the authorization of the Regional Waste Manager.



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2.8 Landfill Gas Management

Combustible gas concentrations shall not exceed the lower explosive limit in soils at the property boundary or 25% of the lower explosive limit at or in on-site or off-site structures.

In accordance with the Provincial Landfill Criteria for Municipal Solid Waste, an assessment of the emissions of non-methane organic compounds (NMOCs) is required for landfills exceeding a total capacity of 100,000 tonnes. If NMOCs are determined to exceed 150 tonnes/year, landfill gas recovery and management systems will be required and shall be designed, installed and operational within 3 years. If NMOCs are projected to be less than 150 tonnes/year for the operating life of the landfill, an assessment for the need of passive gas venting will be required.

Accordingly, the Operational Certificate holder is directed to submit to the Regional Waste Manager a Landfill Gas Management Plan on or before October 1, 2003. The Landfill Gas Management Plan may consider actual site-specific measurements for determining the actual rate of NMOCs emissions. In the event that active gas recovery systems are not required, the Landfill Gas Management Plan shall evaluate the need for passive gas venting. The Landfill Gas Management Plan shall provide a design and an implementation schedule for any required works and measures for the management and recovery of landfill gas.

The Landfill Gas Management Plan is subject to the approval of the Regional Waste Manager. The Regional Waste Manager may require revisions to the Landfill Gas Management Plan where warranted.

2.9 Final Cover

Final cover for landfill sites is to consist of a minimum of 1 metre of low permeability ($<1 \times 10^{-5}$ cm/s) compacted soil plus a minimum of 0.15 metre of topsoil with suitable vegetation established. The depth of the topsoil layer should be related to the type of vegetation proposed (i.e. rooting depth). Soils of higher permeability may be authorized based on leachate generation potential at the landfill site. Final cover is to be constructed with slopes between 4% and 33% with appropriate run-on/run-off drainage controls and erosion controls. Additional design elements may be necessary due to site specific conditions and the presence of management systems for leachate and landfill gas. Completed portions of the landfill are to progressively receive final cover during the active life of the landfill.



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3. OPERATIONAL REQUIREMENTS

3.1 Landfill Supervision and Access

A suitably trained landfill operator shall be present on-site at all times during operating hours. The operator shall be familiar with the requirements of the Operational Certificate and the specifications of the approved *Operations and Closure Plan*.

Perimeter fencing, gates and/or barriers shall be installed where necessary to prevent unauthorized access to the site by vehicles. All access points are to have locking gates, and all gates are to be locked during non-operating hours to prevent unauthorized access. Properly designed and maintained public waste disposal and/or recyclable material bins situated outside the main gate may be provided for after hours use.

3.2 Prohibited Wastes

3.2.1 The disposal of the following types of wastes is strictly prohibited:

- a) Special Wastes other than those specifically authorized in the *Special Waste Regulation*
- b) Biomedical waste as defined in the document *Guidelines for the Management of Biomedical Waste in Canada* (CCME, February 1992)
- c) Liquids or semisolid wastes which contain free liquid, except as otherwise authorized by the Waste Management Act Permit PE-14804



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3.2.2 The disposal of the following wastes is prohibited unless specifically authorized by the Regional Waste Manager:

- a) Automobiles, white goods, other large metallic objects and tires
- b) Dead animals and slaughter house, fish hatchery and farming wastes or cannery wastes and by-products

Burial of these wastes in dedicated locations (i.e. avoiding co-disposal) at a landfill site may be authorized by the Regional Waste Manager only if there is no other viable alternative such as treatment/disposal, recycling, reprocessing or composting. The specific location of the disposal shall be recorded to allow ready access to the waste should corrective or further action pertaining to the management of these wastes be required by the Ministry at some time in the future.

3.3 Hydrocarbon Contaminated Soils

The deposit of hydrocarbon contaminated soils below the *Special Waste Regulation* criteria is authorized at this landfill subject to the following conditions:

- 3.3.1 Soil contaminated with hydrocarbons shall be deposited in layers less than 0.3 meters; and
- 3.3.2 Soil contaminated with hydrocarbons shall be deposited a minimum of 1.2 meters above the seasonal high groundwater level and a minimum of 2.0 meters below the final grade of the landfill to prevent the impact on groundwater and any future vegetation on the site.

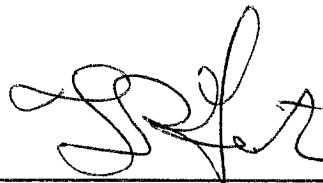
3.4 Ozone Depleting Substances

Release of ozone depleting substances from the storage, handling and disposal of used appliances, equipment, or any material containing ozone depleting substances is strictly prohibited in accordance with the requirements of the *Ozone Depleting Substances Regulation*.

3.5 Designated Areas

Maintain areas for the separation, handling and storage of recyclable or reusable materials where applicable.

When a separated recyclable material is a special waste it is to be stored and managed in accordance with the *Special Waste Regulation*.



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3.6 Scavenging

Scavenging of waste is to be prevented. The salvaging of wastes should be encouraged by providing areas and facilities for separation of recyclable or reusable materials.

3.7 Dust Control

Dust created within the landfill property is to be controlled, using methods and materials acceptable to the Regional Waste Manager, such that it does not cause a public nuisance.

3.8 Waste Compaction and Covering

Wastes are to be spread in thin layers (0.6 m or less) on the working face and compacted. The working face area should be minimized as much as possible. A compacted layer of cover material of at least 0.15 metre of soil or functionally equivalent depth of other cover material, as authorized by the Regional Waste Manager, is to be placed on all exposed solid waste at the end of each day of operation. If the landfill should operate continuously 24 hours per day, 0.15 m of cover material is to be applied at a frequency authorized by the Regional Waste Manager. Under specific circumstances, such as during bear season, the Regional Waste Manager may specify more stringent cover requirements. During periods of extreme weather conditions, such as those that cause the ground to freeze, an exemption to the normal cover requirements may be authorized by the Regional Waste Manager.

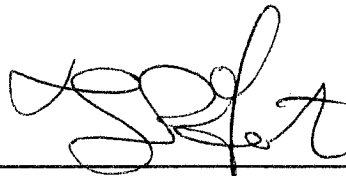
An intermediate cover consisting of a compacted layer of at least 0.30 metre of soil or functionally equivalent depth of other cover material is to be placed where no additional solid waste has been deposited or will be deposited within a period of 30 days.

3.9 Litter Control

Litter is to be controlled by compacting the waste, minimizing the working face area, applying cover, providing litter control fences and instituting a regular litter pickup and general good housekeeping program or any other measures required by the Regional Waste Manager.

3.10 Vectors

Vectors are to be controlled by the application of cover material at a specified frequency or by other control measures as required and authorized by the Regional Waste Manager.



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3.11 Wildlife

The landfill is to be operated so as to minimize the attraction of wildlife such as bears and birds by applying cover at required frequencies and instituting a good housekeeping program. Further control measures, such as bear control fences, and bird control devices, may be specified by the Regional Waste Manager.

3.12 Fire Protection

Adequate fire fighting equipment is to be available to extinguish surface or underground fires. Recyclables and reusable materials are to be stored in such a manner to not constitute a fire hazard.

3.13 Open Burning

The controlled open burning operation is authorized until December 31, 2002, at which time all open burning shall cease. The time limited authorization to open burn is subject to the following conditions:

- 3.13.1** The maximum duration of each open burn event shall be limited to the period between dawn to dusk of a single day, after which time the fire shall be extinguished. In order to limit the smoke that will be created from having to extinguish a fire, the wood residue to be burned shall be stacked in piles of a size that may be consumed by the fire in the dawn to dusk time frame.
- 3.13.2** The open burn shall not be initiated until the Venting Index for the Okanagan Valley is classified as "good". The Venting Index may be obtained from the information line at 250-861-7480.
- 3.13.3** Additional authorizations for open burning may be required from other government agencies. In particular, the Operational Certificate holder shall ensure that the necessary authorizations have been obtained from the British Columbia Forest Service and any applicable municipal authority.
- 3.13.4** The wood residues shall be segregated from the municipal solid waste and sorted to ensure that there are no unacceptable materials in the burn pile(s). Unacceptable materials are those that will produce unacceptable emissions or will not fully incinerate within the dawn to dusk time period of the burn and includes tires, plastics, insulation, asphalt shingles, putrescible waste, stumps, metal hulks, animal carcasses and the like. The wood waste shall be piled in a manner that will promote rapid and hot combustion.



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- 3.13.5** The open burn shall be conducted on ground that has not been previously landfilled, and a minimum 15 meter setback is to be maintained between the discharged municipal solid waste and burn area. A minimum 15 meter combustible free zone or firebreak shall be maintained around the burn area.
- 3.13.6** The Operational Certificate holder shall ensure that full time supervision shall be provided until the open burn is complete, that is, until there is no smoke and no further danger of fire exists). Suitable equipment is to be available to promote rapid and hot combustion of the wood residue pile(s).
- 3.13.7** Suitable equipment shall be available for extinguishing fires to prevent them from spreading to surrounding areas and to extinguish the fire at dusk. Such devices may include a pressurized water supply, chemical type fire extinguishers, or an earth stockpile. If an earth stockpile is used for fire control, earth-moving equipment shall be available at the site during the burning.
- 3.13.8** The residue of combustion shall be monitored to ensure it has cooled to ambient temperature prior to incorporating into the adjacent landfill.



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4. MONITORING AND REPORTING REQUIREMENTS

4.1 Receiving Environment Monitoring

The Operational Certificate holder shall submit for the approval of the Regional Waste Manager a monitoring program design. The monitoring program design shall be prepared by an engineer or geoscientist who is knowledgeable in the field of hydrogeology, experienced in modeling and evaluating the environmental impact from landfill sites, and licensed to practice in the province of BC. The monitoring program design shall recommend the location of monitoring wells and devices and a monitoring program sufficient to determine the environmental impact from the landfill, including groundwater contamination from landfill leachate and potential impacts from the generation of landfill gas.

Upon approval, the monitoring wells and devices specified in the monitoring program design shall be installed under the direction of the design professional and the monitoring program shall be undertaken as specified.


As-constructed drawings, sealed by the design professional, of the monitoring wells and devices shall be submitted to the Regional Waste Manager. The drawings shall include elevations relative to a common datum, and a scaled site location plan indicating the landfill footprint, associated works and all existing monitoring wells and devices.

The receiving environment monitoring devices shall be adequately secured and maintained, including provisions to ensure protection from damage due to vehicles or vandalism.

The Operational Certificate holder shall maintain records of all monitoring program data and analyses available for inspection. Data from monitoring and analyses shall be submitted to the Regional Waste Manager annually as part of the annual report required under **Section 4.6**. The adequacy of the monitoring program shall be reviewed at least annually and any revisions to the monitoring program shall be outlined in the annual report. On the basis of the information submitted in the annual report, routine inspections and any other information related to the effect of the discharge on the receiving environment, the Regional Waste Manager may vary the frequency, location, and/or analyses of any or all components of the receiving environment monitoring program.

4.2 Vegetation Monitoring

Inspect vegetation during the growing season in the vicinity of the landfill at least once per year to determine if any environmental impacts are occurring.



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4.3 Sampling and Analytical Procedures

The receiving environment sampling and monitoring shall be carried out in accordance with the appropriate procedures listed in the table below. Alternative test methods may be used only where authorized by the Regional Waste Manager. Test methods for parameters not listed below are subject to the approval of the Regional Waste Manager.

LIQUID EFFLUENTS, SURFACE WATER, GROUND WATER, SOILS, SEDIMENTS, VEGETATIVE MATTER:		
Parameter	Sampling Procedure	Analytical Procedure
Metals Nutrients Organics Toxicity	British Columbia Field Sampling Manual for Continuous Monitoring plus the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 1996 or most recent edition	British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials, 1994 or most recent edition and supplements

The above manuals are available from Queen's Printer Publications Centre, P.O. Box 9452, Stn. Prov. Govt, Victoria, BC, V8W 9V7 (1-800-663-6105 or (250)387-4609).

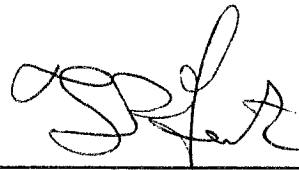
Proper care should be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination and breakage.

4.4 Environmental Monitoring System (EMS) Sites

The receiving environment monitoring program will take into consideration existing ground and surface water monitoring sites that were previously established by the Ministry. The Operational Certificate holder shall provide precise latitude and longitude values for each of the EMS sites monitored and for any additional sites that are required.

4.5 Data Quality Assurance

The Operational Certificate holder is required to follow the terms and conditions of the *Environmental Data Quality Assurance Regulation (EQDA)*, or other legislation which may be in effect at the time. The EQDA specifies ten percent of the samples collected shall be duplicated to provide data quality assurance. Quality control information generated by the laboratory while analyzing parameters required by this Operational Certificate shall also be provided with the data required to be reported.



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4.6 Annual Report

The Operational Certificate holder shall submit an annual operations and monitoring report to the Regional Waste Manager by **March 1st** of each calendar year. The annual report shall include the following information:

- (a) Total volume and/or weight of waste discharged into the landfill for the year, along with documentation of the method used to quantify the waste discharged;
- (b) Service population and waste discharge rate for the year (in tonnes per capita per year) and a trend analysis with a comparison to the 1996 baseline waste discharge rate of 1.2 tonnes per capita per year;
- (c) Remaining site life and capacity;
- (d) Operational plan for next 12 months including any proposed changes to the *Operations and Closure Plan*;
- (e) A compilation, interpretation and trend analysis of the receiving environment monitoring data prepared by a suitably qualified professional;
- (f) Review of the closure plan and associated estimated costs, for the purposes of establishing the closure fund required in **Section 4.8**; and
- (g) Any other data relevant to this Operational Certificate.

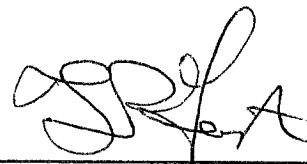
4.7 Format of Submission

Monitoring and/or reporting information shall be submitted in an electronic and/or printed format which is suitable for review by the public and/or other government agencies and is satisfactory to the Regional Waste Manager.

4.8 Closure Fund

The Operational Certificate holder shall provide for the funding of operations at and beyond closure by establishing a closure fund. The ultimate value of the closure fund shall meet or exceed the estimated closure and post-closure costs as outlined in the *Operations and Closure Plan* and updated in the annual report, plus a reasonable contingency for any remediation which may be required.

The Operational Certificate holder shall determine and ensure that the closure fund is adequate by preparing annually a financial statement of the fund which shall be made available to the Regional Waste Manager upon request. The financial statement shall report the accrued capital, interest and additions to the fund for the previous year, and shall review the sufficiency of the fund and the rate of accrual in consideration of the projected costs of closure and post-closure obligations.



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4.9 Declaration of Landfill

Landfills sited on titled land must register a covenant that the property was used for the purpose of waste disposal as a charge against the title to the property as provided for under Section 215.1 of the *Land Title Act*. Landfills located on crown land are to have a "notation on file" registered that the property was used for the purpose of waste disposal.

4.10 Buildings and Structures

The construction of buildings and other structures on landfills containing putrescible wastes is not recommended for a minimum period of 25 years after closure due to concerns about combustible gas and excessive settlement. Such activity will only be considered and /or authorized after an investigation and report by qualified persons. The report is to be submitted for authorization to the Regional Waste Manager prior to initiating construction activities.



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Appendix C

Permit PE 14804



MINISTRY OF ENVIRONMENT,
LANDS AND PARKS

PERMIT
PE 14804

Under the Provisions of the Waste Management Act

Town of Osoyoos
Box 3010
Osoyoos, British Columbia
V0H 1V0

is authorized to discharge effluent to the ground from municipal sources located in Osoyoos, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the Waste Management Act and may result in prosecution.

1. AUTHORIZED DISCHARGES

- 1.1** This subsection applies to the discharge of effluent from municipal septic tank and sewage holding tank pumpage sources in the Osoyoos and adjacent area. The site reference number for this discharge is E227435.
- 1.1.1** The maximum authorized rate of discharge is 5400 m³ per year which is 14.8 m³ per day, averaged over a calendar year.
- 1.1.2** The characteristics of the effluent are typical municipal septic tank and sewage holding tank pumpage. For the purposes of Permit fee calculations, the characteristics of the effluent are considered to be BOD₅ = 220 mg/L and suspended solids = 220 mg/L.
- 1.1.3** The authorized works are infiltration basins, and related appurtenances approximately located as shown on attached Site Plan A.

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- 1.1.4 The authorized works must be complete and in operation by March 31, 1998.
- 1.1.5 The location of the facilities from which the discharge originates is Osoyoos and the adjacent area.
- 1.1.6 The location of the point of discharge is a portion of Lot 993 of District Lot 2450s, Plan 22982, together with that part of District Lot 2450s, SDYD as shown on Crown Lease 334855, as shown on the attached Site Plan A.

2. GENERAL REQUIREMENTS

2.1 Maintenance of Works and Emergency Procedures

The permittee shall inspect the pollution control works regularly and maintain them in good working order. In the event of an emergency or condition beyond the control of the permittee which prevents continuing operation of the approved method of pollution control, the permittee shall immediately notify the Regional Waste Manager and take appropriate remedial action.

2.2 Bypasses

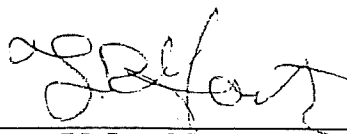
The discharge of effluent which has bypassed the designated treatment works is prohibited unless the approval of the Regional Waste Manager is obtained and confirmed in writing.

2.3 Process Modifications

The permittee shall notify the Regional Waste Manager prior to implementing changes to any process that may affect the quality and/or quantity of the discharge. The approval of the Regional Waste Manager shall be received prior to implementing the process modifications.

2.4 Plans - New Works

Plans and specifications of the works authorized in Subsection 1.1 shall be submitted to the Regional Waste Manager and the managers' approval obtained before construction commences. The works shall be constructed in accordance with such plans.



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2.5 Access Road

The Permittee shall ensure that reasonable, all-weather access to the designated areas for discharge is maintained at all times.

2.6 Site Security

- a) Installation of perimeter fencing and gates shall be complete prior to the commencement of discharge.
- b) Gates shall be locked to prevent unauthorized access during non-operating hours.

2.7 Signs

A suitable sign shall be erected and maintained at the main entrance to the site which identifies the following: site name, owner and operator, 24 hour emergency contact phone number and address, hours of operation, tipping fees (if applicable) and prohibition of special wastes.

2.8 Operational Plan

Submit for approval to the Regional Waste Manager, on or before June 1, 1998, an operational plan including all operational aspects of the facility and an emergency contingency plan.

2.9 Sludge Wasting and Disposal

In the event the sludge is not composted and utilized as a usable product, the sludge wasted from the works shall be disposed of to a site and in a manner authorized by the Regional Waste Manager.

2.10 Spillage

No spillage is to occur outside the bounds of the infiltration basin area.

2.11 Odour

Should odours become objectionable, additional works shall be provided if so directed by the Regional Waste Manager.

2.12 Wildlife and Vector Control

Additional requirements may be specified by the Regional Waste Manager to resolve problems of wildlife or vector attraction.

2.13 Freeboard

A minimum freeboard of 50 centimetres (20 inches) shall be maintained on each infiltration basin.

2.14 Surface Drainage

Surface drainage shall be intercepted and diverted away from the works.

2.15 Groundwater Monitoring Wells

- a) Maintain the groundwater monitoring wells including provisions to ensure protection from damage due to vehicles or vandalism.
- b) Groundwater monitoring wells are to be covered with lockable caps, fitted with locks all keyed alike, and a key is to be provided to the Regional Waste Manager.

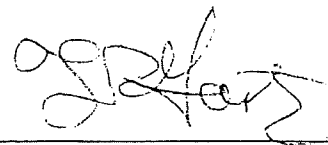
2.16 Composting

Any composting of sludge shall be in accordance with the *Guidelines for the Disposal of Domestic Sludge Under the Waste Management Act*, hereinafter called the Guidelines.

3. MONITORING AND REPORTING REQUIREMENTS

3.1 Flow Measurement

- a) Provide and maintain a suitable flow measurement system and record the volume of effluent volume discharged over a 24-hour period.
- b) Record each occasion and the estimated amount of sludge removed from the infiltration basins and whether the sludge was composted or disposed.



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3.2 Water Levels

Measure the water level, on a monthly basis, in monitoring wells BH1 (EMS 227436) and BH2 (EMS 227437) as shown on the attached Site Plan A.

3.3 Wastewater Quality

The Permittee shall install a suitable sampling facility and obtain a semi-annual grab sample in April and September of the wastewater from the infiltration basins. Obtain analyses of the sample for the following:

BOD₅, suspended solids, conductivity, pH, chloride, nitrate nitrogen, ammonia nitrogen, total coliform and fecal coliform.

3.4 Groundwater Quality

The Permittee shall install a suitable sampling facility and obtain semi-annual grab samples in April and September of the groundwater in monitoring wells BH1 (EMS 227436) and BH2 (EMS 227437) as shown on the attached Site Plan A. Obtain analyses of the above samples for the following:

conductivity, pH, chloride, nitrate nitrogen, nitrite nitrogen, ammonia nitrogen, kjeldahl nitrogen, total nitrogen, total phosphorous, dissolved phosphorous, ortho-phosphate, total coliform and fecal coliform.

3.5 Sampling & Analytical Procedures

- a) Proper care should be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination and breakage.
- b) Three well bore volumes are to be pumped from each monitoring well prior to sample collection.



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- c) The sampling and monitoring requirements specified above shall be carried out by a suitably qualified person, in accordance with the appropriate procedures listed in the table below. Alternative test methods may be used provided that the alternative test methods are authorized by the Regional Waste Manager prior to performing the actual source testing. Test methods for parameters not listed below require the consent of the Regional Waste Manager.

LIQUID EFFLUENTS, SURFACE WATER, GROUND WATER, SOILS, SEDIMENTS, VEGETATIVE MATTER:		
Parameter	Sampling Procedure	Analytical Procedure
Metals Nutrients Organics Toxicity	British Columbia Field Sampling Manual for Continuous Monitoring plus the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples, 1996 Permittee Edition	British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials, March, 1994, Permittee Edition

The above manuals are available from Queen's Printer Publications Centre, P.O. Box 9452, Stn. Prov. Govt, Victoria, BC, V8W 9V7 (1-800-663-6105 or (250)387-4609).

3.6 Changes to Sampling and Monitoring Program

On the basis of findings during routine inspections and any other information related to the effect of the discharge on the receiving environment, the Regional Waste Manager may allow reductions or require additional sampling and monitoring of the discharge and receiving environment.

3.7 Sludge Windrow Composting Reporting

- The end product of the composted sewage sludge shall conform to Schedule A of the Guidelines.
- Submit for review and approval to the Regional Waste Manager a completed Schedule C of the Guidelines at least 1 month prior to the removal of composted sewage sludge from the composting area.
- Submit for review and approval to the Regional Waste Manager a completed Schedule D at least 1 month prior to the removal of composted sewage sludge from the composting area.

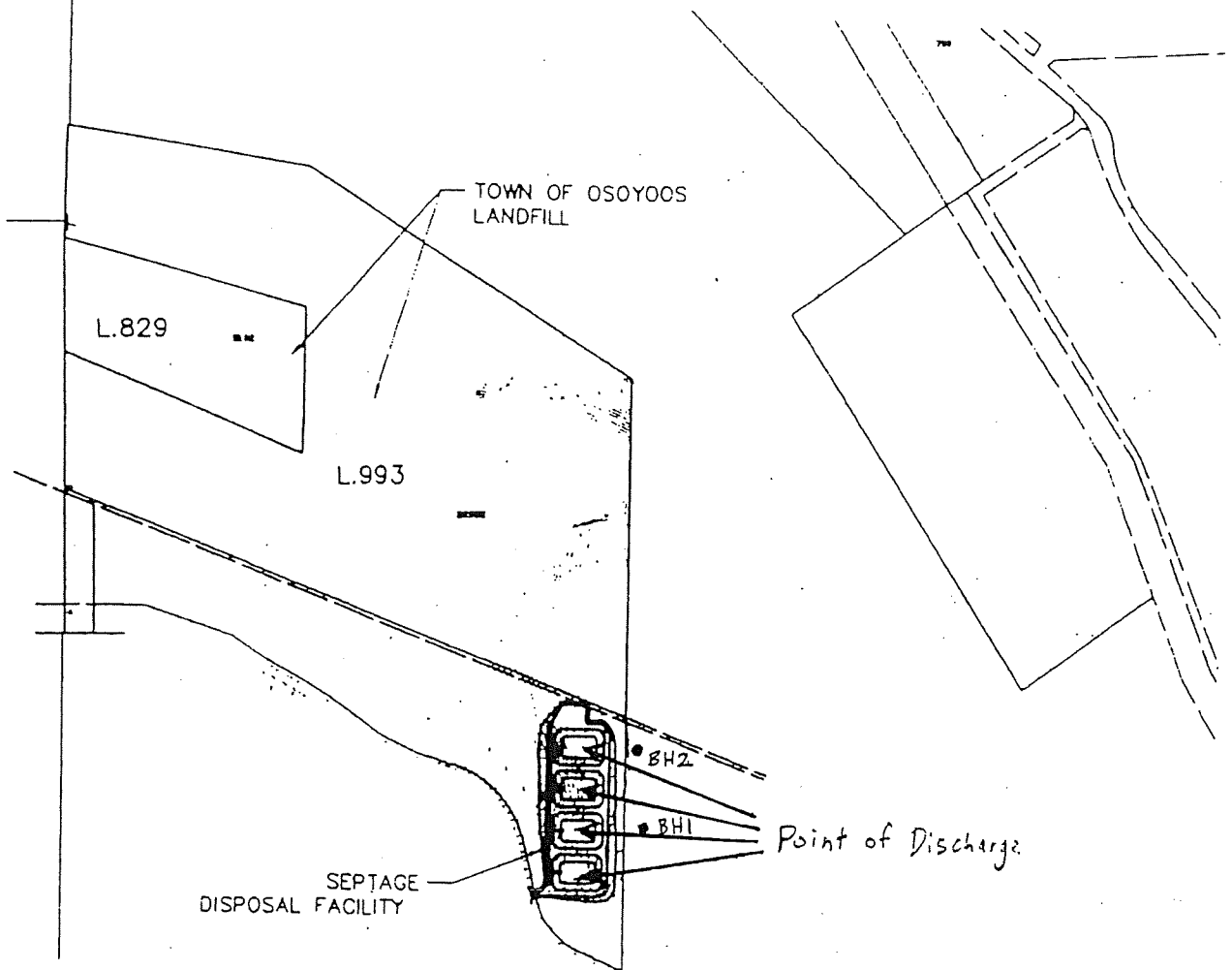


T.R. Forty, P.Eng.
Assistant Regional Waste Manager

3.8 Annual Report

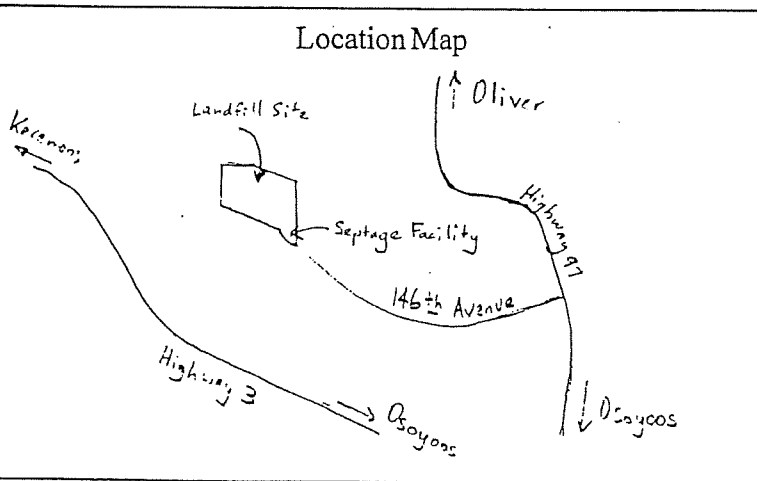
- a) The Permittee shall submit an annual report which includes:
- a summary of the results of all monitoring programs as specified in this permit, data interpretation and trend analyses by a suitably qualified professional; and
 - all documentation and schedules required as part of the Guidelines.
- b) Monitoring data shall be submitted in an electronic and/or printed format which is suitable for review by the public and/or other government agencies and is satisfactory to the Regional Waste Manager.
- c) The first report is due within 60 days of the end of the calendar year.

SITE PLAN A



Note: The location of the point of discharge is a portion of Lot 993 of District Lot 2450s, Plan 22982, together with that part of District Lot 2450s, SDYD as shown on Crown Lease 334855.

Location Map



Scale: 1:5000

Permit No. PE 14804

Date: July 31, 1997

T.R. Forty, P.Eng.

Assistant Regional Waste Manager

Appendix F

2023 Annual Environmental Groundwater Monitoring Report



TOWN OF OSOYOOS

2023 Annual Environmental Groundwater Monitoring Report

Osoyoos & District Sanitary Landfill



May 2, 2024

Town of Osoyoos
8707 Main Street, Box 3010
Osoyoos, British Columbia
V0H 1V0

Attention: Mr. Jared Brounstein
Director of Operations

Town of Osoyoos – 2023 Annual Environmental Monitoring Report

Dear Mr. Brounstein:

Dillon Consulting Limited (Dillon) is pleased to submit to the Town of Osoyoos (Town) the enclosed 2023 Environmental Groundwater Monitoring Report for the Osoyoos & District Sanitary Landfill.

The report summarizes the environmental monitoring completed in accordance with the 2016 BC Landfill Criteria for Municipal Solid Waste (Landfill Criteria) and the Landfill's Operational Certificate MR 15273 (OC). It is understood that the Annual Operations and Environmental Monitoring Report shall be submitted to the BC Ministry of Environment and Climate Change Strategy (MOECC).

Sincerely,

DILLON CONSULTING LIMITED



EGBC Permit to Practice
1003422

May 21, 2024

Bim Dissanayake, P.Eng.
Associate

Our file: 24-7727

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Dillon Consulting
Limited

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- A Laboratory Certificates of Analysis
- B Trend Analysis Calculations



1.0 Introduction

Dillon Consulting Limited (Dillon) was retained by the Town of Osoyoos (the Town) to prepare an annual report for the Osoyoos & District Sanitary Landfill (herein referred to as “the Landfill”) in accordance with the Operational Certificate MR 15273 (OC) and the 2016 BC Landfill Criteria for Municipal Solid Waste (Landfill Criteria). The Landfill is located at 146th Avenue, Osoyoos, approximately 7 kilometres (km) northwest of Osoyoos, British Columbia. The landfill is operated under Operational Certificate (OC) MR-15273, issued by the Ministry of Water, Land and Air Protection in March 2002. The OC requires the operator to submit an operational and environmental annual report for each 12-month period.

This report fulfills the environmental groundwater monitoring reporting requirements for 2023 as outlined in Section 4.6(e) [“A compilation, interpretation and trend analysis of the receiving environment monitoring data prepared by a suitably qualified professional”] of the OC, and is to be appended to the Osoyoos Landfill 2023 Annual Operations and Environmental Monitoring Report.

1.1 Background

Environmental monitoring protocols currently implemented for the Landfill are detailed in the Environmental Monitoring Plan (EMP) (Appendix E of the Osoyoos Landfill 2023 Annual Operations and Environmental Monitoring Report.), developed by Dillon in 2022. The EMP summarizes the environmental monitoring and reporting requirements for the three facilities operating at the Site including:

- Landfill, operating under Operational Certificate MR-15273;
- Hauled liquid waste facility, operating under Permit 14804; and
- Compost facility, operating under Registration 109610.

Landfill monitoring requirements specified in the EMP include:

- Annual vegetation monitoring to determine if any environmental impacts are occurring;
- Monthly monitoring of the water levels in the six on-site groundwater monitoring wells;
- Groundwater quality sampling completed twice annually (in April and September) for the analysis of:
 - General chemistry parameters (chloride, sulfate, nitrogen (N), nitrate (as N), nitrite (as N), dissolved organic carbon (DOC), total kjeldahl nitrogen (TKN), pH, total dissolved solids (TDS), total hardness, nitrate+nitrite (as N) and dissolved metals [aluminum (Al), arsenic (As), boron (B), cadmium (Cd), chromium (Cr), cobalt (Co), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), molybdenum (Mo), potassium (K), selenium (Se), sodium (Na), and zinc(Zn)];
- Data quality assurance in accordance with the terms and conditions of the *Environmental Data Quality Regulation* (EQDA), including the collection of duplicate samples at a rate of ten percent, as well as providing the quality control information generated by the applicable laboratory;

- Comparison of groundwater results to the BC Approved and Working Water Quality Guidelines (WQG) and Guidelines for Canadian Drinking Water Quality (GCDWQ); and
- Annual reporting including compilation, interpretation and trend analysis of the receiving environmental monitoring data prepared by a suitable qualified professional, to be included as part of the Landfill Annual Report.

The subject of this report is specific to the groundwater monitoring program at the Landfill; annual vegetation monitoring will be included in the Osoyoos Landfill 2023 Annual Operations and Environmental Monitoring Report, along with the appended reporting requirements of the hauled liquid waste facility. As discussed in Section 3.3 of the EMP, no environmental monitoring programs were specified for the compost facility, groundwater monitoring undertaken for the Landfill discussed above serves to identify any potential impacts from the on-site composting operations.

1.2 Scope of Work

Dillon's scope of work for the Annual Environmental Monitoring Report portion of the Osoyoos Landfill 2023 Annual Operations and Environmental Monitoring Report included the following:

- Review and interpretation of results of the environmental monitoring program;
- Data tabulation, comparison to the applicable regulatory criteria, interpretation, trend analysis and graphs using relevant historical data;
- Identification of current or predicted future non-compliance with performance criteria; and
- Conclusions, recommendations and proposed changes to the EMP.

It should be noted that groundwater samples were collected by the Town of Osoyoos staff and laboratory data results were provided to Dillon for the purposes of annual reporting.

1.3 Regulatory Framework

Applicable regulatory criteria for the groundwater sampling program was specified in the 2022 EMP. These criteria included the BC Approved and Working WQGs and the GCDWQs. In addition, as specified in the Landfill Criteria, the Contaminated Sites Regulation (CSR), Generic Numerical Water Standards for the applicable water use(s) as defined in Protocol 21 "Water Use Determination" are applicable to the Landfill since municipal waste landfilling is a specified purpose/ activity in Schedule 2 of the CSR.

Protocol 21 states that groundwater standards for the protection of freshwater aquatic life (FWAL) apply to land located within 0.5 km of the ecologically active zone of a surface water body containing aquatic life, unless it can be demonstrated that the groundwater does not flow to that receiving environment. Since it is not known if the Landfill is located in proximity to potentially ecologically active water bodies (e.g., water-bearing ditch or stream), and Osoyoos Lake is located approximately 800 m downgradient of the Landfill, Schedule 3.2 standards for the protection of FWAL have been conservatively applied. Proximity and/or hydraulic connection to potential freshwater receptors should be confirmed following

any subsequent hydrological or hydrogeological investigations for the Landfill. Standards for the protection of groundwater used for irrigation (IW) or livestock watering (LW) applies where groundwater or surface water at or nearby a site is currently used for irrigation or livestock watering, or where groundwater is used for these purposes 100 m upgradient or 500 m downgradient or cross gradient. IW and LW are not directly applicable to groundwater at the Site since groundwater is not used for IW or LW purposes based on the current and reasonably foreseeable site use. However, LW and IW standards have been applied as a conservative measure since agricultural lands are present proximal to the Landfill to the west, north and east. Standards for the protection of groundwater for use as drinking water (DW) are applicable to the Site. No current drinking water sources have been identified within the vicinity of the Site; however, drinking water standards for the protection of future drinking water use are applicable.

It should be noted that the GCDWQs are designed for application at the end point of drinking water systems (i.e. tap water) and therefore are typically not applicable to groundwater collected from groundwater monitoring wells. However, these have been applied for comparison purposes.

Therefore groundwater quality monitoring results were compared to the following regulatory criteria, where applicable:

- BC CSR 3.2 Generic Numerical Water Standards for the protection of:
 - Freshwater aquatic life;
 - Irrigation;
 - Livestock; and
 - Drinking water.
- BC Approved and Working WQGs:
 - Drinking water;
 - Freshwater aquatic life;
 - Wildlife; and
 - Agriculture – livestock.
- Guidelines for Canadian Drinking Water Quality:
 - Aesthetic objective (AO); and
 - Maximum acceptable concentration.

2.0

Methodology

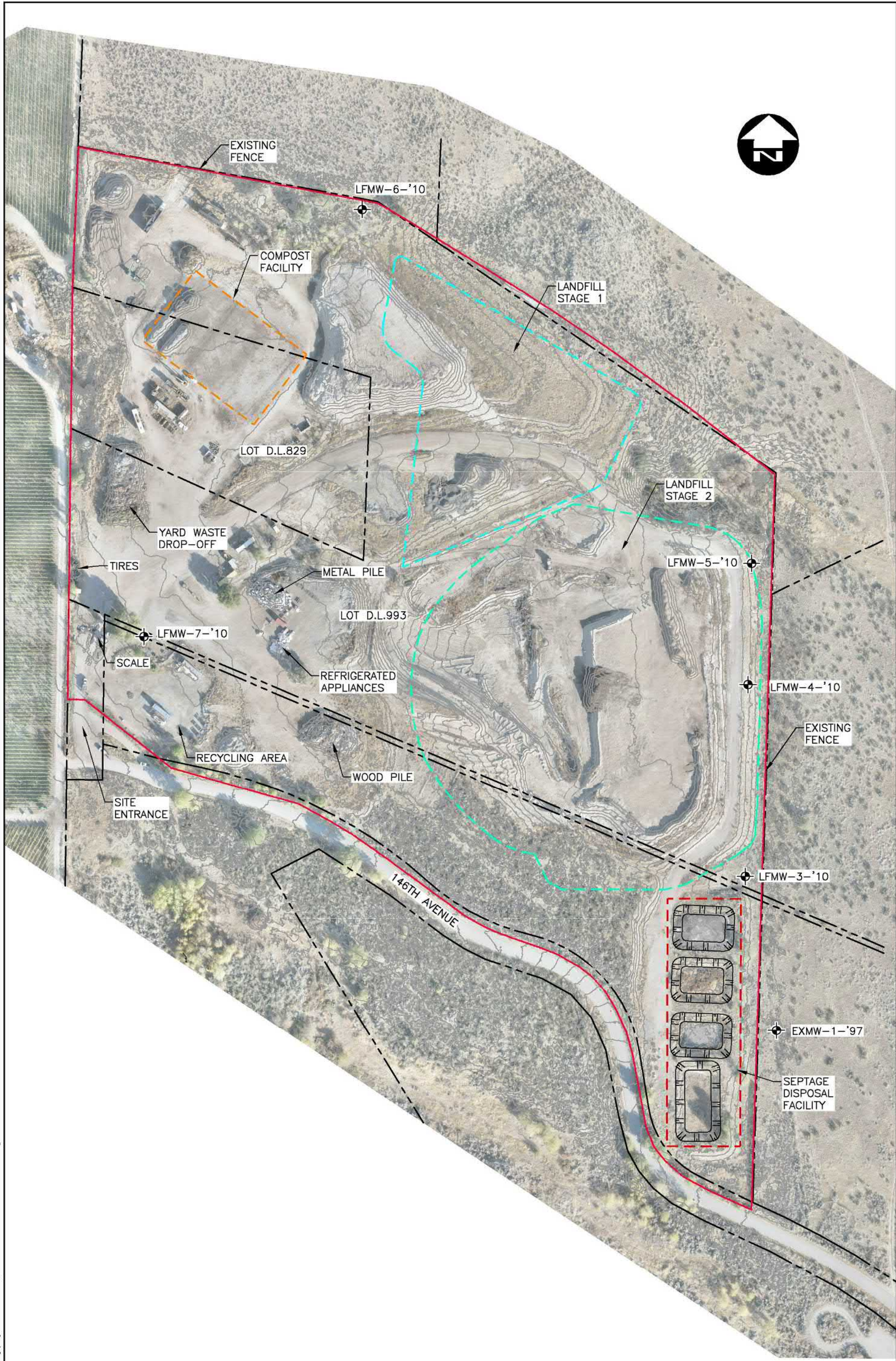
Six groundwater monitoring wells are present at the Landfill for use in monitoring programs, monitoring well elevation and construction details are presented in **Table 2-1** below, and locations are presented on **Figure 1**. Stratigraphic logs are presented in Appendix A of the 2022 EMP (**Appendix E** of the Osoyoos Landfill 2023 Annual Operations and Environmental Monitoring Report).

Table 2-1 – Landfill Monitoring Wells Details

Well ID	Top of Casing Elevation (m asl*)	Base Elevation (m asl*)	Northing	Easting	Monitoring Well Depth (m bgs)
EXMW-1-'97	359.577	359.800	5436715.552	315818.076	15.70
LFWM-3-'10	359.871	359.201	5436801.491	315800.680	25.0
LFMW-4-'10	358.411	357.741	5436908.687	315802.288	21.3
LFWM-5-'10	359.270	358.600	5436976.356	315804.245	17.4
LFMW-6-'10	382.419	381.499	5437174.161	315586.691	10.0
LFMW-7-'10	383.197	382.557	5436935.496	315464.741	7.3

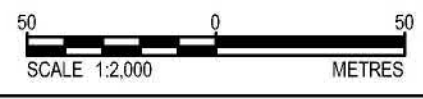
Notes:

m asl* – metres above sea level; elevations provided in historical reports and borehole logs are assumed to be provided in m asl
 m bgs – metres below ground surface



File Name: c:\pw_working_directory\projects\2024\dillon_33\ksidms10193\247727-02-site-con.dwg

TOPOGRAPHIC AERIAL SURVEY
AS OF SEPTEMBER 2021




DILLON
 CONSULTING

DATE **APRIL 2024**

PROJECT
TOWN OF OSOYOOS 2023 ANNUAL REPORT

TITLE
SITE MAP

PROJECT NO.
24-7727

FIGURE NO.
1

2.1 Groundwater Monitoring and Sample Collection

Groundwater water level monitoring and groundwater quality monitoring requirements are described in Sections 3.1.2 and Sections 3.1.3 of the EMP, respectively.

Groundwater monitoring data including monthly water level measurements, annual historic average water levels and groundwater quality laboratory results were provided to Dillon for analysis.

Groundwater samples were collected from LFMW4-10, LFMW-5-10 and LFMW-7-10 in April and September of 2023. Groundwater samples were analysed for chloride, nitrate (as N), nitrite (as N), total hardness, ammonia, total dissolved phosphorous, total suspended solids, total calcium, total magnesium, and total sodium.

Monthly measured water levels were not available for monitoring wells LFMW-1-97 and LFMW-6-10 due to the wells being dry as well as from LFMW-7-10 due to reported damages to the well. Additionally, groundwater quality results were not available for monitoring wells LFMW-1-97 and LFMW-3-10 due to the wells being dry, as well as from LFMW-6-10 due to reported staff shortages.

2.2 Quality Assurance / Quality Control

Quality control requirements are described in Section 3.1.4 of the EMP and prescribes that a minimum of ten percent of the samples collected should be duplicated to provide data quality assurance.

However, the Town reported that no quality control samples were collected in 2023, therefore quality control findings are not discussed in **Section 3.0** below.

2.3 Trend Analysis

In groundwater monitoring applications, statistical inferences about the sampled populations and their parameters are made based upon defensible and representative data sets of appropriate sizes collected from the populations under investigation. Statistical inference, including both estimation and hypothesis testing approaches, is routinely used to identify trends (e.g., upwards, downwards) in contaminant concentrations in groundwater over time.

The Mann-Kendall trend test and estimating slope using the Theil-Sen procedure was performed using ProUCL software to identify trends of contaminants in each monitoring well.

The Mann-Kendall test is a non-parametric test for linear trend, based on the idea that a lack of trend should correspond to a time series plot fluctuating randomly about a constant mean level, with no visually apparent upward or downward pattern. If an increasing trend exists, the sample taken first from any randomly selected pair of measurements should on average have a lower concentration than the measurement collected at a later point.

The Mann-Kendall statistical test is computed by examining possible pairs of measurements in the data set and scoring each pair as follows:

- An earlier measurement less in magnitude than a later one is assigned a value of 1;

- If an earlier value is greater in magnitude than a later sample, the pair is tallied as -1 ; and
- Two identical measurement values are assigned 0.

After scoring each pair in this way and adding up the total to get the Mann-Kendall statistic (S), a positive value of S implies that a majority of the differences between earlier and later measurements are positive, suggestive of an upward trend over time. Likewise, a negative value for S implies that a majority of the differences between earlier and later values are negative, suggestive of a decreasing trend. A value near zero indicates a roughly equal number of positive and negative differences. This would be expected if the measurements were randomly fluctuating about a constant mean with no apparent trend.

To account for randomness and inherent variability in the sample, the Mann-Kendall test is based on the critical ranges of the statistic S likely to occur under stationary conditions. The larger the absolute value of S , the stronger the evidence for a real increasing or decreasing trend.

As documented above the Mann-Kendall procedure is a non-parametric test for a significant slope in a linear regression of the concentration values plotted against time of sampling. But the Mann-Kendall statistic S does not indicate the magnitude of the slope or estimate the trend line itself even when a trend is present. This is slightly different from parametric linear regression, where a test for a significant slope follows naturally from the estimate of the trend line. Even a relatively modest slope can be statistically distinguished from zero with a large enough sample. It is best to first identify whether or not a trend exists, and then determine how steeply the concentration levels are increasing over time for a significant trend. Therefore, a non-parametric alternative to linear regression (the Theil-Sen trend line) was calculated in conjunction with the Mann-Kendall test.

The Mann-Kendall statistical test was computed for chemical parameters that exceeded the applicable criteria of the samples collected in 2023 to identify trends in each monitoring well.

3.0 Findings

3.1 Groundwater Elevations

Monthly groundwater measurements (i.e., height of water column) for 2023 were provided to Dillon. Water table elevations were calculated based on the monitoring well depths and base elevations of the monitoring wells provided in the stratigraphic logs, and are presented in **Table 3-1** below.

Table 3-1 – Monthly Measured Groundwater Elevations

Well ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
EXMW-1-97	DRY												DRY
LFMW-3-10	335.46	335.34	335.45	335.16	335.00	334.87	334.83	334.76	334.26	334.86	334.41	DRY	334.95
LFMW-4-10	339.57	339.59	339.64	339.24	339.58	339.59	339.59	339.59	339.56	339.57	339.54	339.54	339.55
LFMW-5-10	341.70	341.78	341.85	341.73	341.70	341.68	341.67	341.66	341.67	341.65	341.61	341.60	341.69
LFMW-6-10	DRY												DRY
LFMW-7-10	Well damaged in May 2022												N/A

Table Notes:

Groundwater elevation values are provided in metres above sea level

Historical average groundwater elevations provided to Dillon, including the results from 2023, are presented in **Table 3-2** below. The average water level previously reported in 2014 for monitoring well LFMW-4-10 is suspected to be erroneous as the previously reported water level elevation is below the maximum depth of the monitoring well.

Table 3-2 – Historical Average Groundwater Table Elevations

Well ID	2013	2014	2015	2016	2017	2018 ^{#1}	2019	2020	2021	2022	2023
LFMW-1-97	344.01	343.51	343.37	343.33	343.87	344.5	343.89	343.88	343.29	343.07	DRY
LFMW-3-10	338.1	338.73	337.74	338.17	340.72	345.71	344.82	343.4	341.47	338.41	334.95
LFMW-4-10	336.18	305.68 ^{#2}	336.21	336.29	337.83	341.63	341.06	340.13	338.07	336.27	339.55
LFMW-5-10	343.91	344.41	344.27	344.17	344.79	345.5	345.14	344.7	344.32	344.08	341.69
LFMW-6-10	DRY										
LFMW-7-10 ¹	380.34	378.51	377.82	377.93	379.81	379.98	378.42	377.56	378.55	377.69	Damaged

Table notes:

#1 – Average water level results for 2018 are likely not representative of average conditions as only six months of measurements were reportedly collected.

#2 – Average water level results for LFMW-4-10 in 2014 are expected to be erroneous as the average groundwater elevation reported is below the maximum depth of the monitoring well (top of casing 358.4 m asl; depth of well 21.3 m bgs)

Monthly groundwater elevation measurements and average annual historical groundwater elevations are presented on **Figure 3-1** and **Figure 3-2**, respectively. The average of the 2013 and 2015 average annual groundwater elevations was presented for the 2014 LFMW-4-10 value in **Figure 3-2**, due to a suspected error in the reported average elevation for this year, as the provided average groundwater elevation for this year was below the maximum depth of the monitoring well.

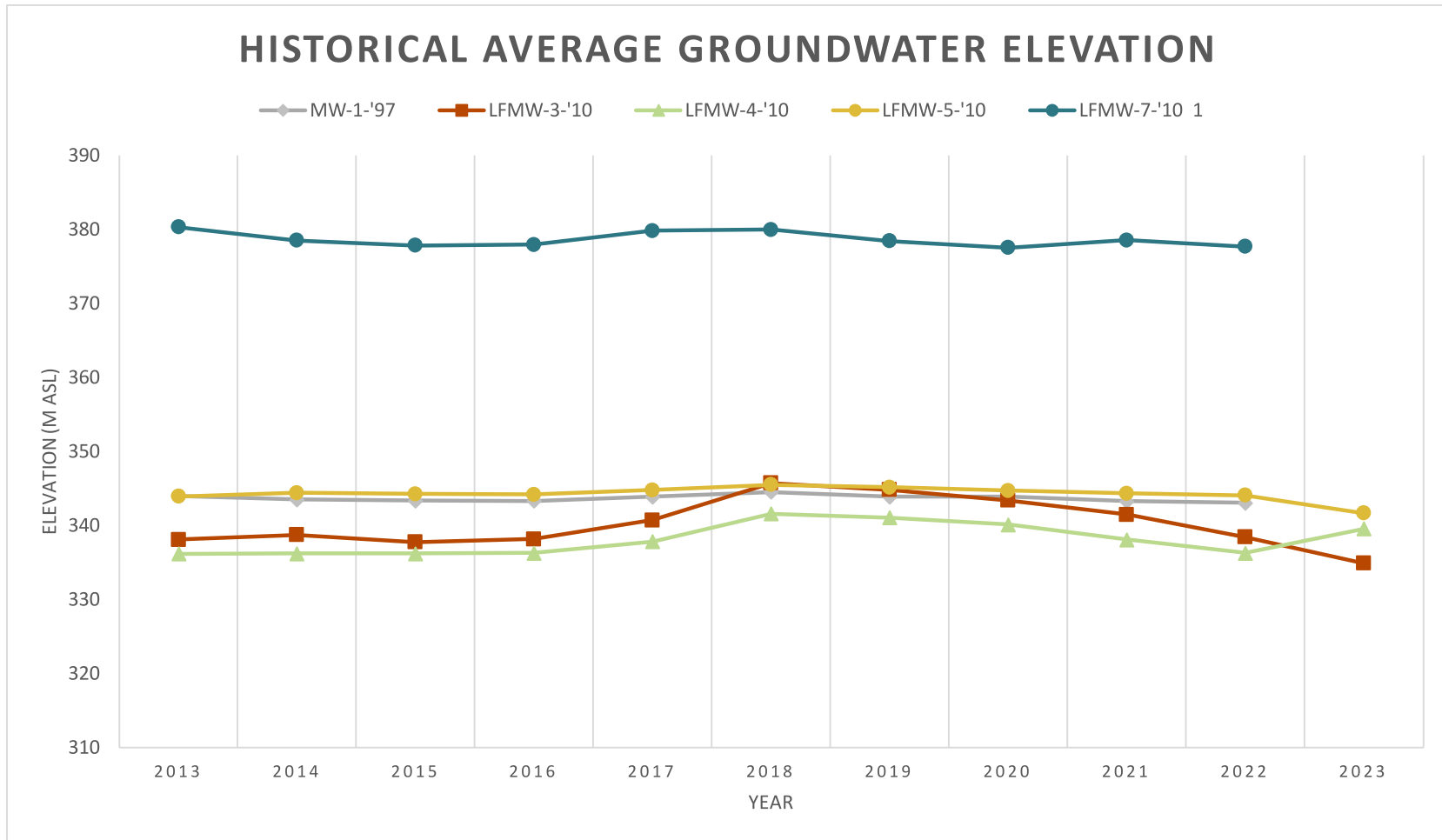
The following observations were made from the calculated groundwater elevations for 2023:

- Water table elevations are generally stable, with LFMW-3-10 showing stronger seasonal variability than LFMW-4-10 and LFMW-5-10;
- The average annual groundwater elevations calculated for LFMW-4-10 and LFMW-5-10 are generally consistent with historical elevations; and
- The average annual groundwater elevation in LFMW-3-10 has been decreasing since 2018.

Figure 3-1 – Monthly Measured Groundwater Elevations



Figure 3-2 – Average Annual Historical Groundwater Elevations



3.2 Groundwater Quality

Analysis for several groundwater parameters specified in the EMP were not present in the analytical data provided to Dillon. Further, groundwater samples were not collected from MW-1-97, MW-3-10 and MW-6-10 in either of the two 2023 groundwater monitoring events. Groundwater parameters required in the EMP, but not analyzed in the 2023 monitoring events included:

- Sulfate;
- DOC;
- TKN;
- pH;
- TDS;
- Total nitrogen; and
- Dissolved metals (Al, As, B, Cd, Cr, Co, Fe, Pb, Mn, Hg, Mo, K, Se, Na, Zn).

A summary of exceedances of the applied regulatory criteria for the available chemistry results are provided in **Table 3-3** below.

Table 3-3 – 2023 Groundwater Monitoring Exceedance Summary

Well ID	Sampling Event	BC CSR Sch. 3.2	BC WQG	CDWQG
LFMW-4-10	April 2023	-	-	-
	September 2023	-	-	-
LFMW-5-10	April 2023	Chloride (255 mg/L) ^{#1}	Nitrate (9.68 mg/L) ^{#2}	Chloride (255 mg/L) ^{#3}
	September 2023	Chloride (266 mg/L) ^{#1}	Nitrate (9.61 mg/L) ^{#2}	Chloride (266 mg/L) ^{#3}
LFMW-7-10	April 2023	-	-	-
	September 2023	-	-	-

Table Notes:

mg/L – milligrams per litre

µg/L – micrograms per litre

#1 – Chloride concentration exceeds the BC CSR 3.2 Standard for DW (250 mg/L) and IW (100 mg/L)

#2 – Nitrate concentration exceeds the BC WQG for FWAL (long term chronic) (3 mg/L)

#3 – Chloride concentration exceeds the CDWQG AO (250 mg/L), no MAC is available

Chloride in groundwater collected from LFMW-5-10 in both the April 2023 and September 2023 sampling events exceeded the BC CSR Schedule 3.2 standard for the protection of DW and IW uses; however, did not exceed the standard for FWAL. Additionally, chloride in groundwater collected from LFMW-5-10 exceeded the CDWQG AO (based on taste and potential for corrosion in drinking water distribution systems). There is no MAC for chloride.

Nitrate in groundwater collected from LFMW-5-10 exceeded the BC WQG for FWAL (long term chronic), however, did not exceed the short term acute guideline.

Potential ammonia exceedances of the BC WQG for FWAL exist for samples collected from LFMW-4-10 and LFMW-5-10, as the guideline for ammonia is parameter dependent (i.e., temperature and pH). Since the temperature and pH values were not provided to Dillon, there is insufficient data to determine if the measured ammonia concentrations exceed BC WQG guidelines.

Exceedances of the applied regulatory criteria were not identified for groundwater collected from LFMW-4-10 and LFMW-7-10 in 2023.

Tabulated groundwater results compared to the applied regulatory criteria are provided in **Table 1 to Table 3** (appended). Laboratory certificates for groundwater analytical results provided to Dillon are provided in **Appendix A**.

3.3 Trend Analysis

The Mann-Kendall statistical test was computed for chemical parameters that exceeded the applicable criteria of the samples collected in 2023 to identify trends in each monitoring well. These parameters included chloride and nitrate in monitoring well LFMW-5-10.

Available chloride and nitrate concentrations in monitoring well LFMW-5-10 from 2012 to 2023 were used for the statistical evaluation. The sample collection dates for each monitoring well are listed **Table 3-4** below.

Table 3-4 – Historical concentrations of Chloride and Nitrate in LFMW-5-10 from 2012 to 2023

Date	Chloride (mg/L)	Nitrate (mg/L)
April 18, 2012	841	33
September 12, 2012	137	104
April 9, 2013	109	103
September 24, 2013	130	110
May 13, 2014	138	1.96
September 2015	217	NC
May 9, 2017	188	0.851
September 12, 2017	136	0.051
April 30, 2019	152	0.058
April 19, 2023	255	9.68
September 19, 2023	266	9.61

Notes:

NC – Not collected

The trend analyses indicated statistically significant evidence of decreasing trend or no trend.

It should be noted that the chloride reported in April 2012 and nitrate concentrations reported in September 2012, April 2013 and September of 2013 were significantly higher than the concentrations measured in the subsequent events.

The 2012 and 2013 landfill annual reports prepared by True Environmental stated that these nitrate concentrations may be reflective of a historic septage disposal lagoon in the immediate vicinity of Well 5-10 which was abandoned in the early 1990's.

No further information was provided for chloride.

Trend analysis calculations are attached in **Appendix B**.

4.0

Conclusions

Water samples were collected from six groundwater monitoring wells location in the Landfill in 2023. The following conclusions were made based on the data provided to Dillon:

- The Landfill operates under OC MR-15273;
- The groundwater quality sampling program twice annually in April and September in accordance with the EMP;
- Water samples were not collected at three of the six required monitoring wells (EXMW-1-97, LFMW-6-10 and LFMW-7-10) due to low water volume and/or damaged wells;
- Groundwater samples were analysed for chloride, nitrate (as N), nitrite (as N), total hardness, ammonia, total dissolved phosphorous, total suspended solids, total calcium, total magnesium, and total sodium;
- The groundwater sampling program completed in 2023 did not include all the parameters listed in Section 3.1.3 of the EMP;
- Only chloride and nitrate exceeded the applicable criteria;
- The trend analyses completed for chloride and nitrate indicated statistically significant evidence of decreasing trend or no trend;
- Field parameters including pH and temperature were not available;
- Field duplicate samples were not collected during the 2023 sampling event;
- Chloride data from 2012 and nitrate data from 2012 and 2013 were significantly higher than the concentrations measured in the subsequent events. Previous reports concluded that these elevated results may be due to historic septage disposal lagoon in the immediate vicinity of Well 5-10 which was abandoned in the early 1990's. The validity of these high results needs to be verified since trend analysis may be significantly distorted if these values are outliers; and
- Groundwater elevations are generally consistent with historically reported annual average elevations.

5.0

Data Gaps and Recommendations

The following data gaps and associated recommendations were identified in the groundwater monitoring program for 2023:

Data Gap	Recommendations
Quality control samples (i.e., blind field duplicates) were not collected	Collection of a minimum of 10% of samples collected should be duplicated (i.e., one field duplicate per monitoring event).
Groundwater quality sampling was not completed at three of the six required monitoring wells due to low water volume and/or damaged wells.	Monitoring wells EXMW-1-97, LFMW-6-10 and LFMW-7-10 should be re-evaluated for effectiveness. Should these wells continue to be dry and/or damaged, the monitoring wells should be replaced and/or repaired.
Several groundwater analyses specified in Section 3.1.3 of the EMP were not completed.	Groundwater samples should be analyzed for the following analytes: chloride, sulfate, nitrogen (N), nitrate (as N), nitrite (as N), DOC, TKN, pH, total dissolved solids, total hardness, nitrate+nitrite (as N) and dissolved metals (Al, As, B, Cd, Cr, Co, Fe, Pb, Mn, Hg, Mo, K, Se, Na, and Zn);
Sampling requirements including the required parameters have not been finalized.	Sampling parameters listed under 4.3 of the OC should be reviewed to ensure regulatory compliance. The EMP should be refined following subsequent groundwater and surface water impact assessments and/or hydrological and hydrogeological studies. An updated EMP should be provided to the MOECC for approval.
Presence of freshwater receptors proximal to the Landfill should be confirmed.	Applicable regulatory criteria should be refined following any groundwater and surface water impact assessments and/or hydrological and hydrogeological studies.
Field parameters including pH and temperature were not available.	As some regulatory criteria (e.g., BC WQGs) are parameter dependent (e.g. ammonia), field collected parameters including pH, temperature, conductivity, dissolved oxygen, turbidity and oxidative-reduction potential should be collected during groundwater monitoring events to allow for interpretation of analytical results.

Tables

Table 1 - Groundwater Analytical Results Compared to BC Water Quality Guidelines
 2023 Annual Environmental Monitoring Report
 Town of Osoyoos District Sanitary Landfill, Osoyoos B.C.



Parameter	Unit	RDL	BC WQG Drinking Water	BC WQG FWAL Long Term Chronic	BC WQG FWAL Short Term Acute	BC WQG Irrigation Long Term Chronic	BC WQG Irrigation Short Term Acute	BC WQG Livestock Long Term Chronic	BC WQG Livestock Short Term Acute	BC WQG Wildlife Short Term Acute	BC Working WQG - Livestock watering	Location	LFMW-4-10		MW-5-10		MW-7-10	
												Date	19 Apr 2023	19 Sep 2023	19 Apr 2023	19 Sep 2023	19 Apr 2023	19 Sep 2023
												Matrix Type	Water	Water	Water	Water	Water	Water
												Sample Type	Normal	Normal	Normal	Normal	Normal	Normal
												Lab Report Number	23D2214	23I2325	23D2210	23I2325	23D2210	23I2325
NA																		
Phosphorus - Total (filtered)	mg/L	0.005	-	-	-	-	-	-	-	-	-	0.0147	0.0105	0.0084	0.0148	0.0185	0.0218	
Cations & Anions																		
Calcium	mg/L	0.2	-	-	-	-	-	1000 ^a	-	-	-	136	115	152	164	64.6	58.3	
Chloride	mg/L	0.1	-	150	600	100	100	600	600	600	-	33.1	31.7	255	266	3.06	3.56	
Magnesium	mg/L	0.01	-	-	-	-	-	-	-	-	-	48.1	39.1	43.9	43.2	21.3	18.5	
Sodium	mg/L	0.1	-	-	-	-	-	-	-	-	-	41.5	35.2	123	123	12.5	13.3	
General Chemistry																		
Hardness as CaCO3 (Measured)	mg/L	0.5	-	-	-	-	-	-	-	-	-	538	448	562	587	249	222	
Ammonia as N	µg/L	50	-	Variable ^b	Variable ^b	-	-	-	-	-	-	<50	114	163	<50	59	51	
Nitrate (as N)	µg/L	10	10,000	3,000	32,800	-	-	-	100,000	100,000	-	<10	<10	9,680	9,610	<10	<10	
Nitrite (as N)	µg/L	10	1,000	20 40 60 80 100 200	60 120 180 240 300 600	-	-	-	10,000	10,000	-	<10	<10	<10	<10	<10	<10	
Nitrite + Nitrate as N	µg/L	10	-	-	-	-	-	-	-	-	-	<10.0	<10.0	9,680	9,610	<10.0	<10.0	
Total Suspended Solids (TSS)	µg/L	2,000	-	-	-	-	-	-	-	-	-	780,000	4,800,000	15,000	21,200	94,200	11,600	

Notes:
 a - Working standard for dissolved analyte
 b - Guidelines are parameter dependent (i.e. pH and temperature), potential exceedances may exist, however field collected measurements of these parameters were not available
 BC WQG - British Columbia Water Quality Guidelines
 mg/L - milligram per litre
 µg/L - microgram per litre
 FWAL - Fresh Water Aquatic Life
 blue - exceeds one or more of the BC WQG
 bold - exceeds one or more Short Term BC WQG standard
 italic - exceeds one or more Long Term BC WQG standard
 RDL - Reportable Detection Limit

Table 1 - Groundwater Analytical Results Compared to BC Water Quality Guidelines
 2023 Annual Environmental Monitoring Report
 Town of Osoyoos District Sanitary Landfill, Osoyoos B.C.



Parameter	Unit	RDL	BC WQG Drinking Water	BC WQG FWAL Long Term Chronic	BC WQG FWAL Short Term Acute	BC WQG Irrigation Long Term Chronic	BC WQG Irrigation Short Term Acute	BC WQG Livestock Long Term Chronic	BC WQG Livestock Short Term Acute	BC WQG Wildlife Short Term Acute	BC Working WQG - Livestock watering	Location
												Date
												Matrix Type
												Sample Type
												Lab Report Number
NA												
Phosphorus - Total (filtered)	mg/L	0.005	-	-	-	-	-	-	-	-	-	
Cations & Anions												
Calcium	mg/L	0.2	-	-	-	-	-	1000 ^a	-	-	-	
Chloride	mg/L	0.1	-	150	600	100	100	600	600	600	-	
Magnesium	mg/L	0.01	-	-	-	-	-	-	-	-	-	
Sodium	mg/L	0.1	-	-	-	-	-	-	-	-	-	
General Chemistry												
Hardness as CaCO3 (Measured)	mg/L	0.5	-	-	-	-	-	-	-	-	-	
Ammonia as N	µg/L	50	-	Variable ^b	Variable ^b	-	-	-	-	-	-	
Nitrate (as N)	µg/L	10	10,000	3,000	32,800	-	-	-	100,000	100,000	-	
Nitrite (as N)	µg/L	10	1,000	20 40 60 80 100 200	60 120 180 240 300 600	-	-	-	10,000	10,000	-	
Nitrite + Nitrate as N	µg/L	10	-	-	-	-	-	-	-	-	-	
Total Suspended Solids (TSS)	µg/L	2,000	-	-	-	-	-	-	-	-	-	

Notes:

- a - Working standard for dissolved analyte
- b - Guidelines are parameter dependent (i.e. pH and temperature), potential exceedances may exist, however field collected measurements of these parameters were not available
- BC WQG - British Columbia Water Quality Guidelines
- mg/L - milligram per litre
- µg/L - microgram per litre
- FWAL - Fresh Water Aquatic Life
- blue - exceeds one or more of the BC WQG
- bold - exceeds one or more Short Term BC WQG standard
- italic - exceeds one or more Long Term BC WQG standard
- RDL - Reportable Detection Limit

Table 2 - Groundwater Analytical Results Compared to BC CSR Schedule 3.2 Standards
 2023 Annual Environmental Monitoring Report
 Town of Osoyoos District Sanitary Landfill, Osoyoos B.C.



Parameter	Unit	RDL	Location			LFMW-4-10		MW-5-10		MW-7-10	
			Date	19 Apr 2023	19 Sep 2023	19 Apr 2023	19 Sep 2023	19 Apr 2023	19 Sep 2023		
			Matrix Type	Water	Water	Water	Water	Water	Water		
			Sample Type	Normal	Normal	Normal	Normal	Normal	Normal		
			Lab Report Number	23D2214	23I2325	23D2210	23I2325	23D2210	23I2325		
			BC CSR Schedule 3.2 - Aquatic Life (Freshwater)	BC CSR Schedule 3.2 - Drinking Water	BC CSR Schedule 3.2 - Irrigation						
NA											
Phosphorus - Total (filtered)	mg/L	0.005	-	-	-	0.0147	0.0105	0.0084	0.0148	0.0185	0.0218
Cations & Anions											
Calcium	mg/L	0.2	-	-	-	136	115	152	164	64.6	58.3
Chloride	mg/L	0.1	1,500	250	100	33.1	31.7	255	266	3.06	3.56
Magnesium	mg/L	0.01	-	-	-	48.1	39.1	43.9	43.2	21.3	18.5
Sodium	mg/L	0.1	-	-	-	41.5	35.2	123	123	12.5	13.3
General Chemistry											
Hardness as CaCO3 (Measured)	mg/L	0.5	-	-	-	538	448	562	587	249	222
Ammonia as N	µg/L	50	18,400 18,500 11,300 3,700 1,310	-	-	<50	114	163	<50	59	51
Nitrate (as N)	µg/L	10	400,000	10,000	-	<10	<10	9,680	9,610	<10	<10
Nitrite (as N)	µg/L	10	200 400 600 800 1,000 2,000	1,000	-	<10	<10	<10	<10	<10	<10
Nitrite + Nitrate as N	µg/L	10	400,000	10,000	-	<10.0	<10.0	9,680	9,610	<10.0	<10.0
Total Suspended Solids (TSS)	µg/L	2,000	-	-	-	780,000	4,800,000	15,000	21,200	94,200	11,600

Notes:

- BC CSR - British Columbia Contaminated Sites Regulation
- mg/L - milligram per litre
- µg/L - microgram per litre
- highlighted - exceeds one or more BC CSR standard
- RDL - Reportable Detection Limit

Table 3 - Groundwater Analytical Results Compared to Canadian Drinking Water Quality Guidelines
 2023 Annual Environmental Monitoring Report
 Town of Osoyoos District Sanitary Landfill, Osoyoos B.C.



Parameter	Unit	RDL	HC Drinking Water Quality Guidelines - AO	HC Drinking Water Quality Guidelines - MAC	Location	LFMW-4-10		MW-5-10		MW-7-10	
					Date	19 Apr 2023	19 Sep 2023	19 Apr 2023	19 Sep 2023	19 Apr 2023	19 Sep 2023
					Matrix Type	Water	Water	Water	Water	Water	Water
					Sample Type	Normal	Normal	Normal	Normal	Normal	Normal
					Lab Report Number	23D2214	23I2325	23D2210	23I2325	23D2210	23I2325
NA											
Phosphorus - Total (filtered)	mg/L	0.005	-	-	0.0147	0.0105	0.0084	0.0148	0.0185	0.0218	
Cations & Anions											
Calcium	mg/L	0.2	-	-	136	115	152	164	64.6	58.3	
Chloride	mg/L	0.1	250	-	33.1	31.7	255	266	3.06	3.56	
Magnesium	mg/L	0.01	-	-	48.1	39.1	43.9	43.2	21.3	18.5	
Sodium	mg/L	0.1	200	-	41.5	35.2	123	123	12.5	13.3	
General Chemistry											
Hardness as CaCO3 (Measured)	mg/L	0.5	-	-	538	448	562	587	249	222	
Ammonia as N	µg/L	50	-	-	<50	114	163	<50	59	51	
Nitrate (as N)	µg/L	10	-	<i>10,000</i>	<10	<10	9,680	9,610	<10	<10	
Nitrite (as N)	µg/L	10	-	<i>1,000</i>	<10	<10	<10	<10	<10	<10	
Nitrite + Nitrate as N	µg/L	10	-	-	<10.0	<10.0	9,680	9,610	<10.0	<10.0	
Total Suspended Solids (TSS)	µg/L	2,000	-	-	780,000	4,800,000	15,000	21,200	94,200	11,600	

Notes:

- HC - Health Canada
- mg/L - milligram per litre
- µg/L - microgram per litre
- AO - aesthetic objective
- MAC - maximum acceptable concentration
- Bold - exceeds HC Drinking Water Aesthetic Guideline
- Italic - exceeds HC Drinking Water maximum acceptable concentration
- RDL - Reportable Detection Limit

Appendix A

Laboratory Certificates of Analysis



CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0	WORK ORDER	23D2214
ATTENTION	Kelly McDonald	RECEIVED / TEMP REPORTED	2023-04-20 15:00 / NA 2023-04-26 13:04
PO NUMBER	WB Groundwater (Comp)	COC NUMBER	No Number
PROJECT	WB Groundwater (Comp)		
PROJECT INFO			

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry



It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve



Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here: <https://www.caro.ca/terms-conditions>

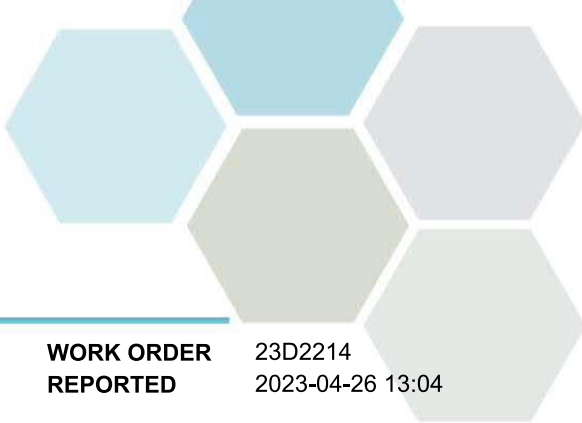
If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

1-888-311-8846 | www.caro.ca

#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7 | #108 4475 Wayburne Drive Burnaby, BC V5G 4X4



TEST RESULTS

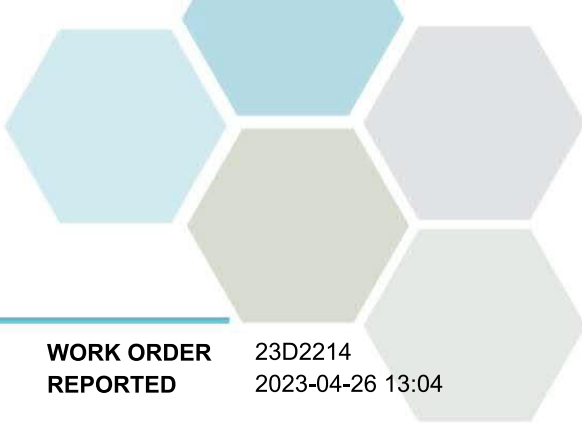
REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2214
2023-04-26 13:04

Analyte	Result	Guideline	RL Units	Analyzed	Qualifier
LFMW-4-10 (23D2214-01) Matrix: Water Sampled: 2023-04-19 11:05					FILT, PRES
Anions					
Chloride	33.1	AO ≤ 250	0.10 mg/L	2023-04-24	
Nitrate (as N)	< 0.010	MAC = 10	0.010 mg/L	2023-04-21	
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	2023-04-21	
Calculated Parameters					
Hardness, Total (as CaCO3)	538	None Required	0.500 mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100 mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	< 0.050	None Required	0.050 mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0147	N/A	0.0050 mg/L	2023-04-24	
Solids, Total Suspended	780	N/A	2.0 mg/L	2023-04-24	
Total Metals					
Calcium, total	136	None Required	0.20 mg/L	2023-04-25	
Magnesium, total	48.1	None Required	0.010 mg/L	2023-04-25	
Sodium, total	41.5	AO ≤ 200	0.10 mg/L	2023-04-25	

Sample Qualifiers:

FILT The sample has been filtered for Diss phos in the laboratory. Results may not reflect conditions at the time of sampling.
PRES Sample has been preserved for Diss phos in the laboratory and the holding time has been extended.



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2214
2023-04-26 13:04

Analysis Description	Method Ref.	Technique	Accredited	Location
Ammonia, Total in Water	SM 4500-NH3 G* (2021)	Automated Colorimetry (Phenate)	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Phosphorus, Total Dissolved in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2021)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	✓	Kelowna
Solids, Total Suspended in Water	Solids in Water, Filtered / SM 2540 D* (2020)	Solids in Water, Filtered / Gravimetry (Dried at 103-105C)	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

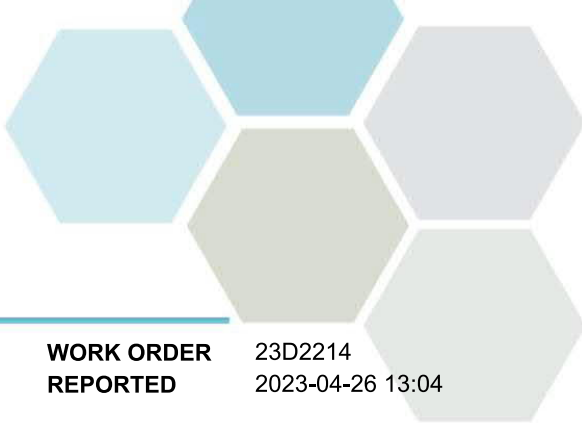
Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

[Guidelines for Canadian Drinking Water Quality \(Health Canada, September 2022\)](#)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2214
2023-04-26 13:04

General Comments:

The results in this report apply to the received samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. CarO will dispose of all samples within 30 days of sample receipt, unless otherwise agreed. The quality control (QC) data is available upon request

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: bwhitehead@caro.ca

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline(s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.



CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0	WORK ORDER	23I2325
ATTENTION	Kelly McDonald	RECEIVED / TEMP REPORTED	2023-09-19 16:33 / 11.9°C 2023-09-26 12:51
PO NUMBER	WB Groundwater (Comp)	COC NUMBER	No Number
PROJECT	WB Groundwater (Comp)		
PROJECT INFO			

Introduction:

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If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

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TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23I2325
2023-09-26 12:51

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-8-10 (23I2325-01) Matrix: Water Sampled: 2023-09-19 08:00						FILT, PRES

Anions

Chloride	28.6	AO ≤ 250	0.10	mg/L	2023-09-20	
Nitrate (as N)	6.00	MAC = 10	0.010	mg/L	2023-09-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-09-20	

Calculated Parameters

Hardness, Total (as CaCO3)	1300	None Required	1.00	mg/L	N/A	
Nitrate+Nitrite (as N)	6.00	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-09-25	
Phosphorus, Total Dissolved	0.0054	N/A	0.0050	mg/L	2023-09-22	
Solids, Total Suspended	114	N/A	2.0	mg/L	2023-09-22	

Total Metals

Calcium, total	435	None Required	0.20	mg/L	2023-09-23	RS1
Magnesium, total	51.7	None Required	0.010	mg/L	2023-09-23	RS1
Sodium, total	42.5	AO ≤ 200	0.10	mg/L	2023-09-23	RS1

MW-9-10 (23I2325-02) | Matrix: Water | Sampled: 2023-09-19 08:15

FILT, PRES

Anions

Chloride	1.69	AO ≤ 250	0.10	mg/L	2023-09-20	
Nitrate (as N)	0.132	MAC = 10	0.010	mg/L	2023-09-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-09-20	

Calculated Parameters

Hardness, Total (as CaCO3)	144	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	0.132	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-09-25	
Phosphorus, Total Dissolved	0.0780	N/A	0.0050	mg/L	2023-09-22	
Solids, Total Suspended	4.8	N/A	2.0	mg/L	2023-09-22	

Total Metals

Calcium, total	41.6	None Required	0.20	mg/L	2023-09-23	
Magnesium, total	9.62	None Required	0.010	mg/L	2023-09-23	
Sodium, total	16.5	AO ≤ 200	0.10	mg/L	2023-09-23	

MW-1-01 (23I2325-03) | Matrix: Water | Sampled: 2023-09-19 08:30

FILT, PRES

Anions

Chloride	12.9	AO ≤ 250	0.10	mg/L	2023-09-20	
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TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23I2325
2023-09-26 12:51

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-1-01 (23I2325-03) Matrix: Water Sampled: 2023-09-19 08:30, Continued						FILT, PRES

Anions, Continued

Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2023-09-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-09-20	

Calculated Parameters

Hardness, Total (as CaCO3)	654	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-09-25	
Phosphorus, Total Dissolved	0.0077	N/A	0.0050	mg/L	2023-09-22	
Solids, Total Suspended	162	N/A	2.0	mg/L	2023-09-22	

Total Metals

Calcium, total	158	None Required	0.20	mg/L	2023-09-23	
Magnesium, total	63.0	None Required	0.010	mg/L	2023-09-23	
Sodium, total	42.4	AO ≤ 200	0.10	mg/L	2023-09-23	

MW-7-10 (23I2325-04) | Matrix: Water | Sampled: 2023-09-19 08:50

FILT, PRES

Anions

Chloride	3.56	AO ≤ 250	0.10	mg/L	2023-09-20	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2023-09-20	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-09-20	

Calculated Parameters

Hardness, Total (as CaCO3)	222	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	0.051	None Required	0.050	mg/L	2023-09-25	
Phosphorus, Total Dissolved	0.0218	N/A	0.0050	mg/L	2023-09-22	
Solids, Total Suspended	11.6	N/A	2.0	mg/L	2023-09-22	

Total Metals

Calcium, total	58.3	None Required	0.20	mg/L	2023-09-23	
Magnesium, total	18.5	None Required	0.010	mg/L	2023-09-23	
Sodium, total	13.3	AO ≤ 200	0.10	mg/L	2023-09-23	

MW-5-10 (23I2325-05) | Matrix: Water | Sampled: 2023-09-19 09:15

FILT, PRES

Anions

Chloride	266	AO ≤ 250	0.10	mg/L	2023-09-20	
Nitrate (as N)	9.61	MAC = 10	0.010	mg/L	2023-09-21	



TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23I2325
2023-09-26 12:51

Analyte	Result	Guideline	RL Units	Analyzed	Qualifier
MW-5-10 (23I2325-05) Matrix: Water Sampled: 2023-09-19 09:15, Continued					FILT, PRES
Anions, Continued					
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	2023-09-21	
Calculated Parameters					
Hardness, Total (as CaCO3)	587	None Required	0.500 mg/L	N/A	
Nitrate+Nitrite (as N)	9.61	N/A	0.0100 mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	< 0.050	None Required	0.050 mg/L	2023-09-25	
Phosphorus, Total Dissolved	0.0148	N/A	0.0050 mg/L	2023-09-22	
Solids, Total Suspended	21.2	N/A	2.0 mg/L	2023-09-22	
Total Metals					
Calcium, total	164	None Required	0.20 mg/L	2023-09-23	
Magnesium, total	43.2	None Required	0.010 mg/L	2023-09-23	
Sodium, total	123	AO ≤ 200	0.10 mg/L	2023-09-23	

LFMW-4-10 (23I2325-06) | Matrix: Water | Sampled: 2023-09-19 09:45

FILT, PRES

Anions					
Chloride	31.7	AO ≤ 250	0.10 mg/L	2023-09-21	
Nitrate (as N)	< 0.010	MAC = 10	0.010 mg/L	2023-09-21	
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	2023-09-21	
Calculated Parameters					
Hardness, Total (as CaCO3)	448	None Required	0.500 mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100 mg/L	N/A	
General Parameters					
Ammonia, Total (as N)	0.114	None Required	0.050 mg/L	2023-09-25	
Phosphorus, Total Dissolved	0.0105	N/A	0.0050 mg/L	2023-09-22	
Solids, Total Suspended	4800	N/A	2.0 mg/L	2023-09-22	CST2, RA5
Total Metals					
Calcium, total	115	None Required	0.20 mg/L	2023-09-23	
Magnesium, total	39.1	None Required	0.010 mg/L	2023-09-23	
Sodium, total	35.2	AO ≤ 200	0.10 mg/L	2023-09-23	

Sample Qualifiers:

- CST2 Sample contains fast setting very fine sediment
- FILT The sample has been filtered for TDP in the laboratory. Results may not reflect conditions at the time of sampling.
- PRES Sample has been preserved for TDP in the laboratory and the holding time has been extended.
- RA5 The sample cannot be accurately quantified due to matrix interference. Result is Semi-Quantitative.
- RS1 The Reporting Limits for this sample have been raised due to high analyte concentration.



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23I2325
2023-09-26 12:51

Analysis Description	Method Ref.	Technique	Accredited	Location
Ammonia, Total in Water	SM 4500-NH3 G* (2021)	Automated Colorimetry (Phenate)	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Phosphorus, Total Dissolved in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2021)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	✓	Kelowna
Solids, Total Suspended in Water	Solids in Water, Filtered / SM 2540 D* (2020)	Solids in Water, Filtered / Gravimetry (Dried at 103-105C)	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

[Guidelines for Canadian Drinking Water Quality \(Health Canada, September 2022\)](#)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 2312325
2023-09-26 12:51

General Comments:

The results in this report apply to the received samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Caro will dispose of all samples within 30 days of sample receipt, unless otherwise agreed. The quality control (QC) data is available upon request

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: bwhitehead@caro.ca

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline(s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.



CERTIFICATE OF ANALYSIS

REPORTED TO	Osoyoos, Town of PO Box 3010 OSOYOOS, BC V0H 1V0	WORK ORDER	23D2210
ATTENTION	Kelly McDonald	RECEIVED / TEMP REPORTED	2023-04-20 15:00 / NA 2023-04-26 13:05
PO NUMBER	WB Groundwater (Comp)	COC NUMBER	No Number
PROJECT	WB Groundwater (Comp)		
PROJECT INFO			

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry



It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve



Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

By engaging our services, you are agreeing to CARO Analytical Service's Standard Terms and Conditions outlined here: <https://www.caro.ca/terms-conditions>

If you have any questions or concerns, please contact me at bwhitehead@caro.ca

Authorized By:

Brent Whitehead
Account Manager

1-888-311-8846 | www.caro.ca

#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7 | #108 4475 Wayburne Drive Burnaby, BC V5G 4X4

TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2210
2023-04-26 13:05

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-8-10 (23D2210-01) Matrix: Water Sampled: 2023-04-19 08:25						FILT, PRES

Anions

Chloride	40.5	AO ≤ 250	0.10	mg/L	2023-04-22	
Nitrate (as N)	5.21	MAC = 10	0.010	mg/L	2023-04-22	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	

Calculated Parameters

Hardness, Total (as CaCO3)	2140	None Required	2.50	mg/L	N/A	
Nitrate+Nitrite (as N)	5.21	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0062	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	5590	N/A	2.0	mg/L	2023-04-24	

Total Metals

Calcium, total	690	None Required	0.20	mg/L	2023-04-25	RS1
Magnesium, total	101	None Required	0.010	mg/L	2023-04-25	RS1
Sodium, total	56.9	AO ≤ 200	0.10	mg/L	2023-04-25	RS1

MW-DP-10-21 (23D2210-02) | Matrix: Water | Sampled: 2023-04-19 08:40

FILT, PRES

Anions

Chloride	167	AO ≤ 250	0.10	mg/L	2023-04-22	
Nitrate (as N)	14.7	MAC = 10	0.010	mg/L	2023-04-22	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	

Calculated Parameters

Hardness, Total (as CaCO3)	334	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	14.7	N/A	0.100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	0.062	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	1.15	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	16.0	N/A	2.0	mg/L	2023-04-24	

Total Metals

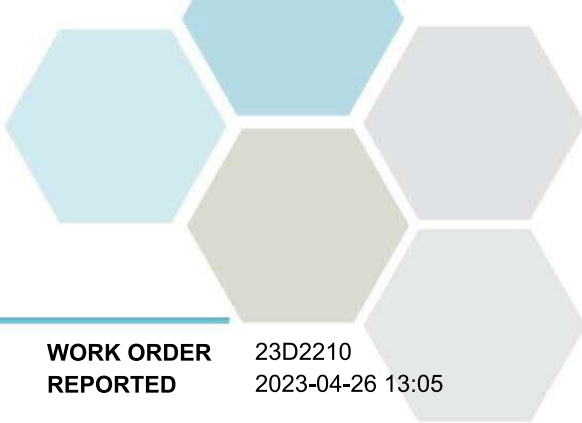
Calcium, total	96.1	None Required	0.20	mg/L	2023-04-25	
Magnesium, total	22.8	None Required	0.010	mg/L	2023-04-25	
Sodium, total	139	AO ≤ 200	0.10	mg/L	2023-04-25	

MW-2-01 (23D2210-03) | Matrix: Water | Sampled: 2023-04-19 08:55

FILT, PRES

Anions

Chloride	212	AO ≤ 250	0.10	mg/L	2023-04-22	
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TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2210
2023-04-26 13:05

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-2-01 (23D2210-03) Matrix: Water Sampled: 2023-04-19 08:55, Continued						FILT, PRES

Anions, Continued

Nitrate (as N)	18.0	MAC = 10	0.010	mg/L	2023-04-22	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	

Calculated Parameters

Hardness, Total (as CaCO3)	442	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	18.0	N/A	0.100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0409	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	7.6	N/A	2.0	mg/L	2023-04-24	

Total Metals

Calcium, total	132	None Required	0.20	mg/L	2023-04-25	
Magnesium, total	27.1	None Required	0.010	mg/L	2023-04-25	
Sodium, total	99.3	AO ≤ 200	0.10	mg/L	2023-04-25	

MW-9-10 (23D2210-04) | Matrix: Water | Sampled: 2023-04-19 09:25

FILT, PRES

Anions

Chloride	2.05	AO ≤ 250	0.10	mg/L	2023-04-22	
Nitrate (as N)	0.137	MAC = 10	0.010	mg/L	2023-04-22	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	

Calculated Parameters

Hardness, Total (as CaCO3)	144	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	0.137	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0772	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	3.6	N/A	2.0	mg/L	2023-04-24	

Total Metals

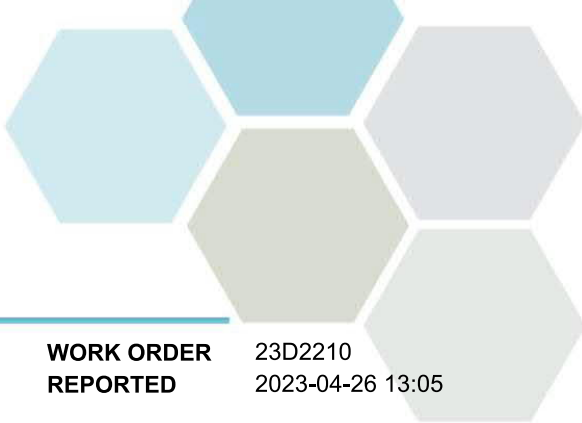
Calcium, total	41.1	None Required	0.20	mg/L	2023-04-25	
Magnesium, total	10.1	None Required	0.010	mg/L	2023-04-25	
Sodium, total	16.6	AO ≤ 200	0.10	mg/L	2023-04-25	

MW-1-01 (23D2210-05) | Matrix: Water | Sampled: 2023-04-19 09:35

FILT, PRES

Anions

Chloride	18.1	AO ≤ 250	0.10	mg/L	2023-04-22	
Nitrate (as N)	0.025	MAC = 10	0.010	mg/L	2023-04-22	



TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2210
2023-04-26 13:05

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-1-01 (23D2210-05) Matrix: Water Sampled: 2023-04-19 09:35, Continued						FILT, PRES

Anions, Continued

Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	
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Calculated Parameters

Hardness, Total (as CaCO3)	511	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	0.0250	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	< 0.050	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0124	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	2.8	N/A	2.0	mg/L	2023-04-24	

Total Metals

Calcium, total	122	None Required	0.20	mg/L	2023-04-25	
Magnesium, total	50.2	None Required	0.010	mg/L	2023-04-25	
Sodium, total	40.4	AO ≤ 200	0.10	mg/L	2023-04-25	

MW-7-10 (23D2210-06) | Matrix: Water | Sampled: 2023-04-19 09:50

FILT, PRES

Anions

Chloride	3.06	AO ≤ 250	0.10	mg/L	2023-04-22	
Nitrate (as N)	< 0.010	MAC = 10	0.010	mg/L	2023-04-22	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	

Calculated Parameters

Hardness, Total (as CaCO3)	249	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	< 0.0100	N/A	0.0100	mg/L	N/A	

General Parameters

Ammonia, Total (as N)	0.059	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0185	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	94.2	N/A	2.0	mg/L	2023-04-24	

Total Metals

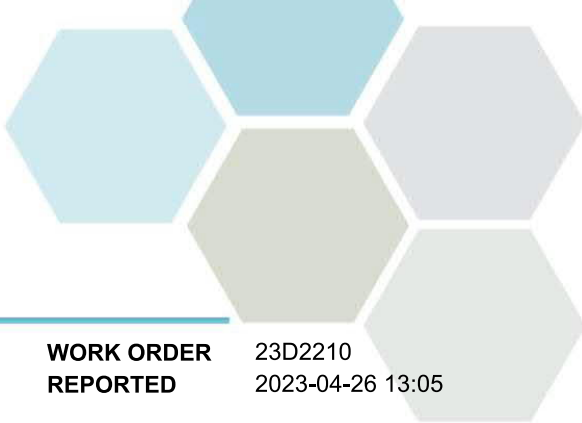
Calcium, total	64.6	None Required	0.20	mg/L	2023-04-25	
Magnesium, total	21.3	None Required	0.010	mg/L	2023-04-25	
Sodium, total	12.5	AO ≤ 200	0.10	mg/L	2023-04-25	

MW-5-10 (23D2210-07) | Matrix: Water | Sampled: 2023-04-19 10:35

FILT, PRES

Anions

Chloride	255	AO ≤ 250	0.10	mg/L	2023-04-22	
Nitrate (as N)	9.68	MAC = 10	0.010	mg/L	2023-04-22	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	2023-04-22	



TEST RESULTS

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2210
2023-04-26 13:05

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
MW-5-10 (23D2210-07) Matrix: Water Sampled: 2023-04-19 10:35, Continued						FILT, PRES

Calculated Parameters

Hardness, Total (as CaCO3)	562	None Required	0.500	mg/L	N/A	
Nitrate+Nitrite (as N)	9.68	N/A	0.0100	mg/L	N/A	

General Parameters

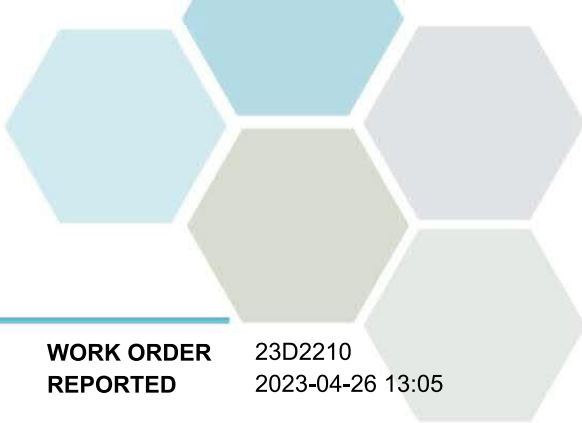
Ammonia, Total (as N)	0.163	None Required	0.050	mg/L	2023-04-23	
Phosphorus, Total Dissolved	0.0084	N/A	0.0050	mg/L	2023-04-24	
Solids, Total Suspended	15.0	N/A	2.0	mg/L	2023-04-24	

Total Metals

Calcium, total	152	None Required	0.20	mg/L	2023-04-25	
Magnesium, total	43.9	None Required	0.010	mg/L	2023-04-25	
Sodium, total	123	AO ≤ 200	0.10	mg/L	2023-04-25	

Sample Qualifiers:

- FILT The sample has been filtered for Diss phos in the laboratory. Results may not reflect conditions at the time of sampling.
- PRES Sample has been preserved for Diss phos in the laboratory and the holding time has been extended.
- RS1 The Reporting Limits for this sample have been raised due to high analyte concentration and/or matrix interference.



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2210
2023-04-26 13:05

Analysis Description	Method Ref.	Technique	Accredited	Location
Ammonia, Total in Water	SM 4500-NH3 G* (2021)	Automated Colorimetry (Phenate)	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
Phosphorus, Total Dissolved in Water	SM 4500-P B.5* (2011) / SM 4500-P F (2021)	Persulfate Digestion / Automated Colorimetry (Ascorbic Acid)	✓	Kelowna
Solids, Total Suspended in Water	Solids in Water, Filtered / SM 2540 D* (2020)	Solids in Water, Filtered / Gravimetry (Dried at 103-105C)	✓	Kelowna
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

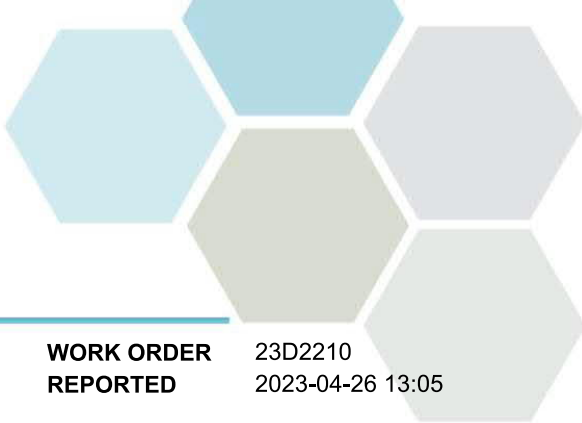
Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

[Guidelines for Canadian Drinking Water Quality \(Health Canada, September 2022\)](#)

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user



APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO PROJECT Osoyoos, Town of
WB Groundwater (Comp)

WORK ORDER REPORTED 23D2210
2023-04-26 13:05

General Comments:

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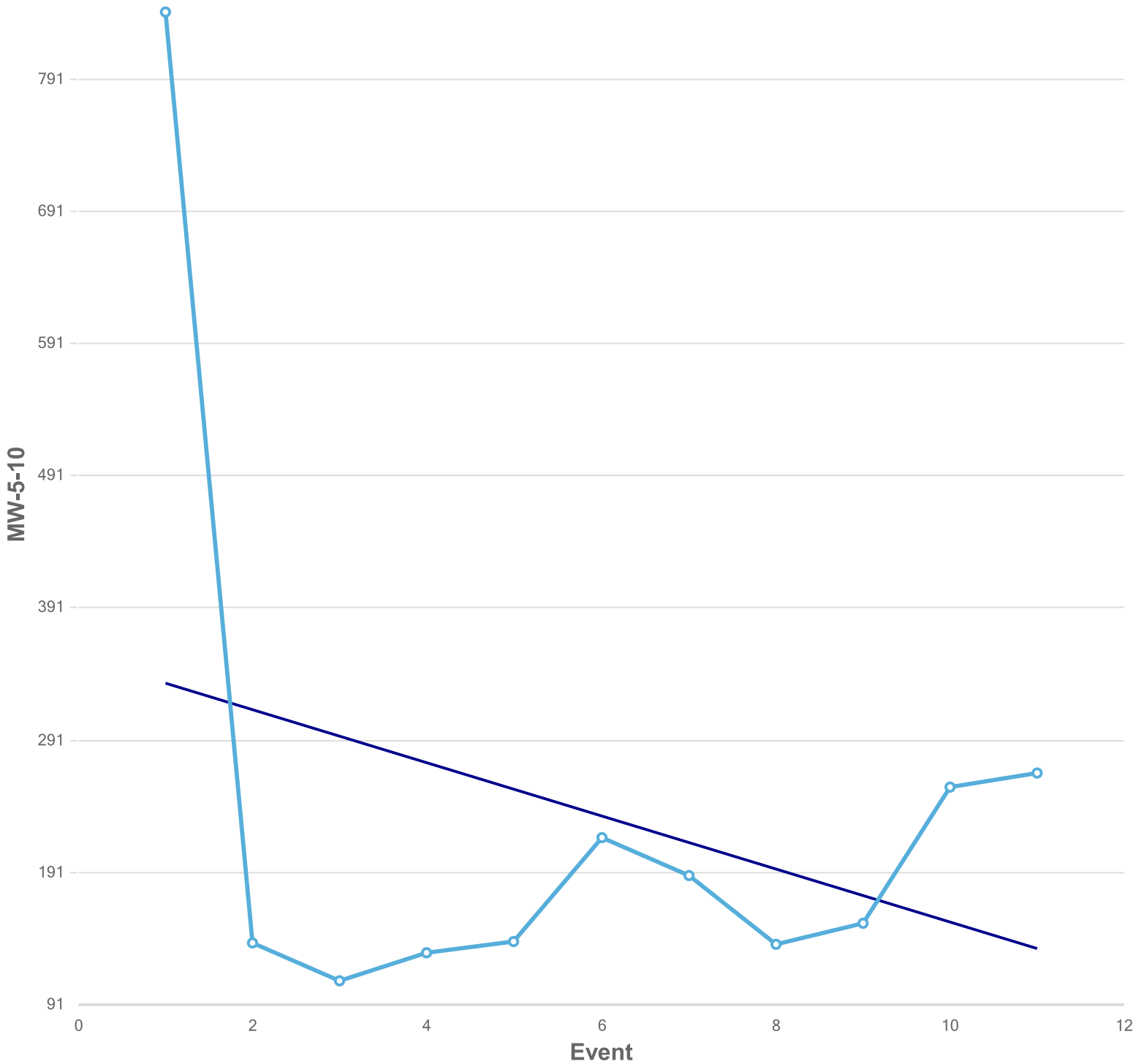
Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: bwhitehead@caro.ca

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline(s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.

Appendix B

Trend Analysis Calculations

Chloride - Mann-Kendall Trend Test



Mann-Kendall Trend Analysis

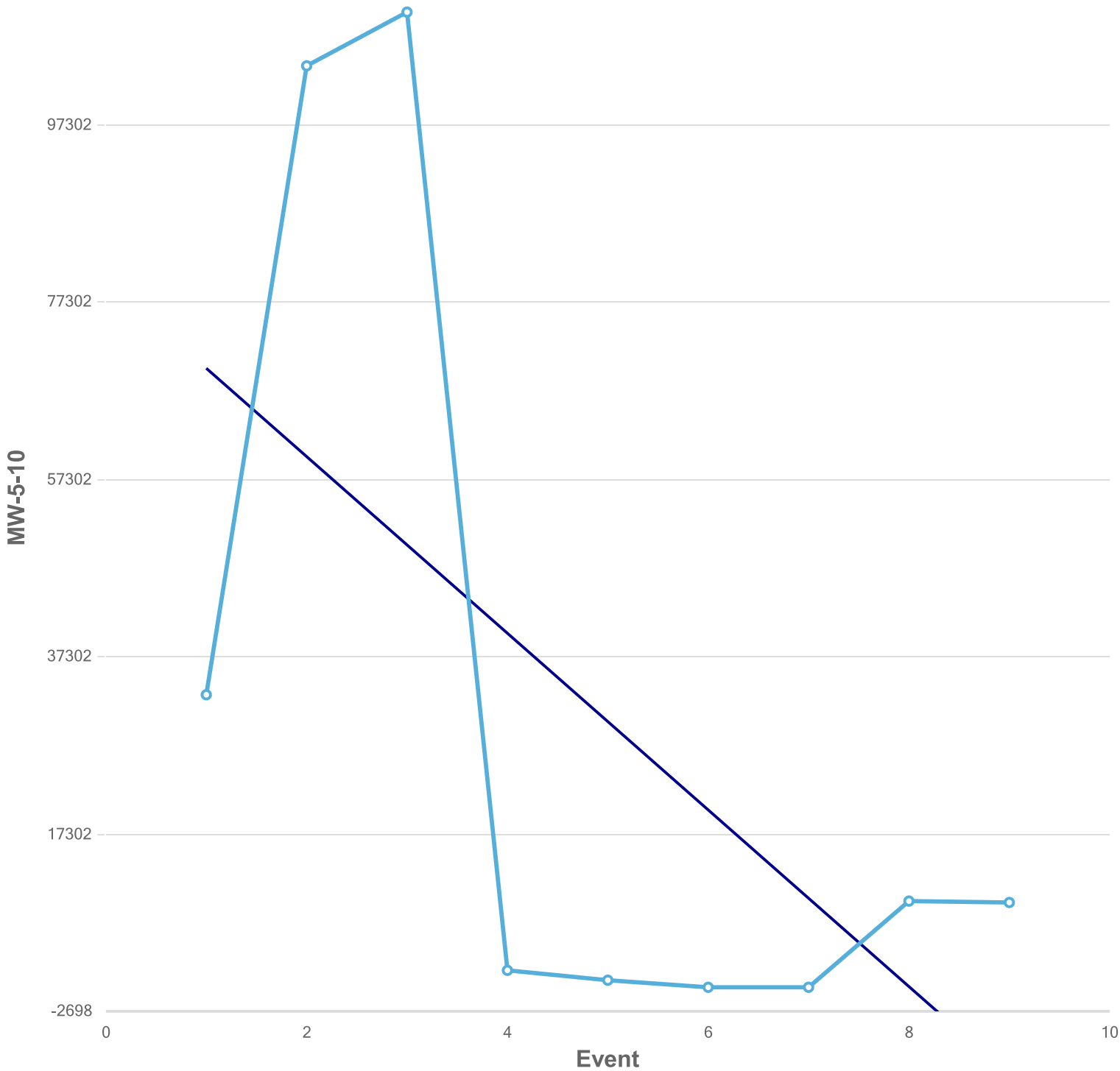
n	11
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	12.8452
Standardized Value of S	1.2456
M-K Test Value (S)	17
Tabulated p-value	0.1090
Approximate p-value	0.1065

OLS Regression Line (Blue)

OLS Regression Slope	-20.1091
OLS Regression Intercept	354.2000

Insufficient statistical evidence of a significant trend at the specified level of significance.

Nitrate - Mann-Kendall Trend Test



Mann-Kendall Trend Analysis

n	9
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	9.5917
Standardized Value of S	-1.1468
M-K Test Value (S)	-12
Tabulated p-value	0.1300
Approximate p-value	0.1257

OLS Regression Line (Blue)

OLS Regression Slope	-9,971.8833
OLS Regression Intercept	79,771.6389

Insufficient statistical evidence of a significant trend at the specified level of significance.

Appendix G

2024 Landfill Gas Generation Assessment



TOWN OF OSOYOOS

Osoyoos Landfill 2024 Landfill Gas Generation Assessment

May 2024

May, 2024

Commercial Confidentiality Statement

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May 2, 2024

Town of Osoyoos
11500 115th St, Box 3010
Osoyoos, BC
V0H 1V0

Attention: Jared Brounstein
Director of Operations

Town of Osoyoos Landfill – 2024 Landfill Gas Assessment Report

Dear First Mr. Brounstein:

Dillon Consulting Limited (Dillon) is pleased to provide the Town of Osoyoos (Town) with a 2024 Landfill Gas Assessment Report for the Osoyoos Landfill (Landfill).

The 2024 Landfill Gas Assessment Report has been prepared in accordance with the BC Landfill Gas Management Regulation BC Reg. 391/2008, BC Landfill Criteria for Municipal Solid Waste (June 2016), Ministry of Environment Landfill Gas Generation Assessment, Procedure Guidelines, and the Landfill's Operational Certificate MR 15273.

Sincerely,

DILLON CONSULTING LIMITED

A handwritten signature in black ink that reads "Alyssa Hooge".

Alyssa Hooge, B.Sc.
Project Manager

Our file: 24-7727



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1.0

Introduction

Dillon Consulting Limited (Dillon) has prepared a Landfill Gas (LFG) Generation Assessment Report (Report) for the Osoyoos Landfill (Landfill or Site) on behalf of the Town of Osoyoos (Town). This report has been prepared in accordance with Landfill Gas Generation Assessment Procedure Guidance Report prepared for the British Columbia (BC) Ministry of Environment by Conestoga-Rovers & Associates (CRA), dated March 2009 (LFG Guidelines), and in accordance with the requirements of the BC Ministry of Environment's Landfill Gas Management Regulation (the Regulation), approved and ordered on December 8, 2008.

The last LFG Generation Assessment Report was completed in 2019. As per Section 15(1)(ii) of the LFG Regulation, a 5-year LFG assessment renewal was required to be completed between January 1 and March 31, 2024. This Report fulfils the requirements of the Section 15 of the LFG Regulation.

1.1

LFG Assessment Requirements

In 2010, the cumulative waste in place at the Landfill was estimated be approximately 129,000 tonnages with an annual tonnage of 6,872 tonnes. As required by the Section 4(5) of the Regulation, the Landfill was required to submit an initial LFG generation assessment and report of the Site in accordance with Section 4(2).

The Report is a supplementary assessment to estimate annual methane generated at the Site and presents the information required by Section 15 and Section 4(3)(b) to (e) of the LFG Regulation.

1.2

Previous LFG Generation Assessment

An initial LFG Generation Assessment Report for the Town of Osoyoos Landfill was submitted to the Ministry of Environment in March 2011. The LFG generation assessment report was updated and submitted in March 2014 to reflect recommendations from the Ministry, which included re-categorizing waste, as the previous estimates were overly conservative. The Landfill's last LFG Generation Assessment was prepared by TRUE Consulting and submitted to the BC Ministry of Environment and Climate Change (MOECC) in April 2019.

A 5-year LFG assessment renewal is required to be completed in 2024 as per Section 15(1)(ii) of the LFG Regulation. The 2019 LFG Generation Assessment estimated a peak methane tonnage of 262 tonnages of annual methane for year 2023. This is less than 1,000 tonnes of annual methane production that requires a LFG Management Design Plan.

Data from the past LFG assessment has been reviewed and utilized in the updated 2024 assessment to provide historical continuity.

2.0

LFG Generation Assessment

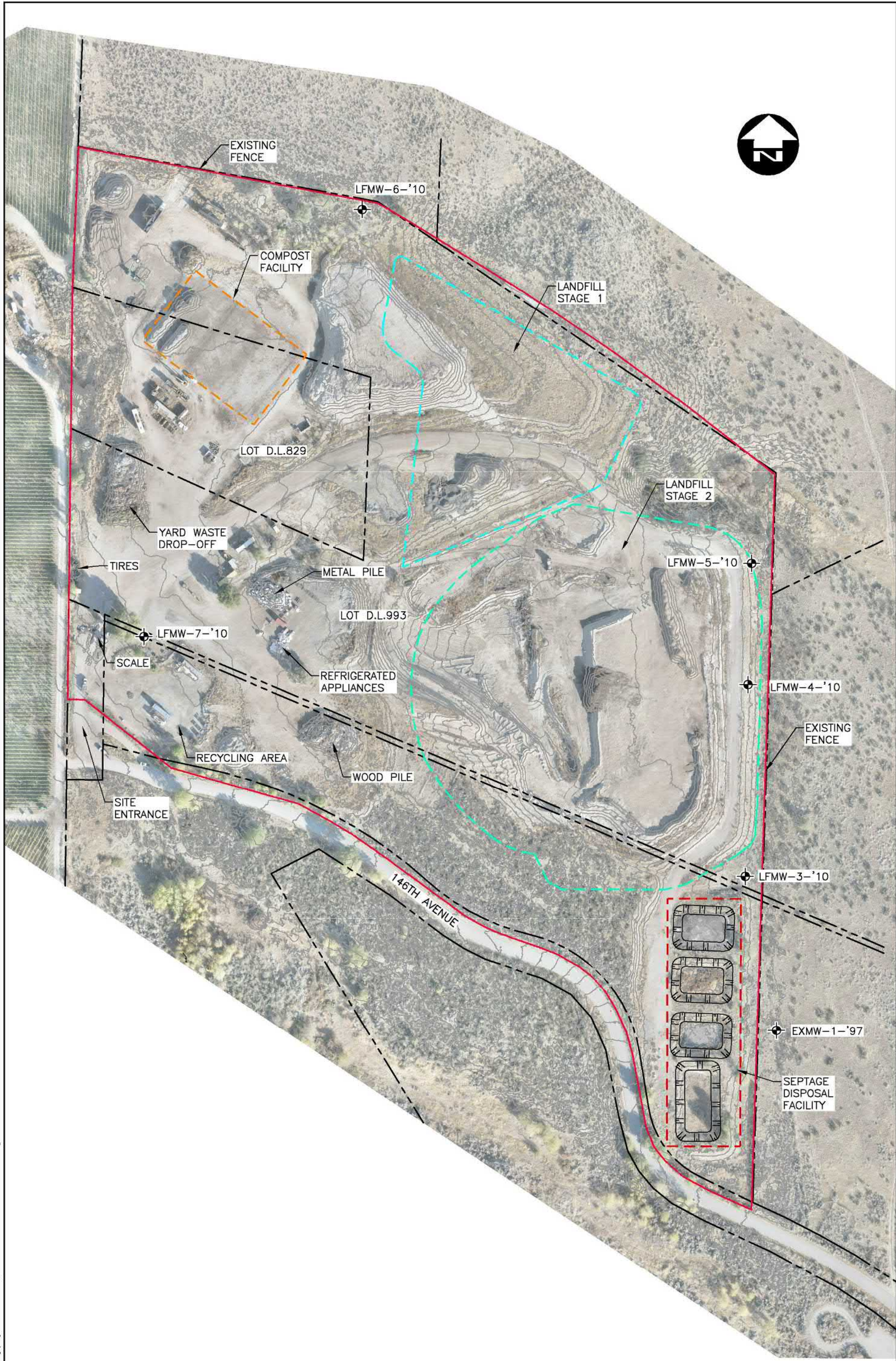
2.1

Landfill Information

The Landfill is owned by the Town and operated by a private contractor. The Site is located at 17250 146 Avenue, approximately 3 km north of the municipal boundary and 1.5 km west of Highway 97 in Osoyoos, BC. The Site is in the Regional District of the South Okanagan (RDOS).

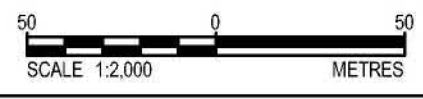
The Site is comprised of a municipal solid waste (MSW) landfill and a hauled liquid waste facility. The hauled liquid waste facility is authorized under separate permit issued by the MOECC permit under the provisions of the *Environmental Management Act*.

The Landfill is situated on two parcels of land, Lot 993 Plan 22982 and Lot 829 Plan 5102, both located within District Lot 2450s. The Landfill has been in operation since the 1950's, at which time the landfilling area was restricted to land parcel DL829. In 1972, Lot 993 was leased from the Province for additional municipal waste landfilling services. The Landfill has an operational footprint of roughly 14 hectares. Since 2001, the Landfill has comprised of two stages. Stage 1 covers the northeast area of the Site and Stage 2 covers the southeast area of the Site. The Stage 1 filling area's airspace was completely utilized by December 2010 and Stage 2 was started the following month. Stage 2 has remained the active filling zone for the past 13 years. The existing site conditions are shown in Figure 1.



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TOPOGRAPHIC AERIAL SURVEY
AS OF SEPTEMBER 2021




DILLON
 CONSULTING

DATE **APRIL 2024**

PROJECT **TOWN OF OSOYOOS 2023 ANNUAL REPORT**

TITLE **SITE MAP**

PROJECT NO. **24-7727**

FIGURE NO. **1**

2.1.1 Waste Generation

As per Section 5.1 of the LFG Guidance Report, this Report includes a table summarizing historical waste mass from the beginning of filling operations and 5-year projections (2024 to 2028).

A scale was constructed at the Osoyoos Landfill in 1995. Scale data was recorded from 1996 onwards. Prior to installation of the scale, waste quantities accepted at the landfill were not documented and waste quantities were estimated based on a per capita generation rate of 0.76 tonnes/capita. Scale data was used to determine landfill disposal quantities for years 1996 to 2023.

For years 2024 to 2028, estimated population growth rates from the BC Statistics Population Estimates & Projections for British Columbia were used to estimate the population¹. A 5-year average (2019 to 2023) was calculated to estimate waste disposal tonnages for years 2024 to 2028. The average per capita disposal rate was estimated to be 550 kg per capita (0.55 tonnes/capita).

Historic waste generation values dating back until 1981 were used to calculate the methane totals and are presented in Appendix A.

2.2 Model Input Parameters Used and Justification

2.2.1 Climate

Water infiltration is a critical factor in the production of methane gas within sanitary landfill. Moisture content assists with the anaerobic breakdown of buried organic matter into LFG. The Town is located in a semi-arid climatic zone and experiences low precipitation rates.

Average precipitation data from Environment Canada's historic climate database for weather station 'Osoyoos West'² (Climate ID 1125865) recorded an average annual precipitation recorded of 322.2 mm per year for years 1981 to 2010. This value was used to determine the methane generation rate values as per Section 4.4 of the LFG Guidelines. Monthly historical average precipitation values are provided in Table 1.

¹ BC Stats. Population Estimates and Projections for British Columbia BC(<https://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-estimates>) Accessed on February 21, 2024.

² Data was sourced from:
(https://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnName&txtStationName=osoyoos&searchMethod=contains&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=1043&disBack=0)

Table 1: Environment Canada Historic Climate Data

1981 to 2010 Canadian Climate Normals Station Data - Osoyoos West													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Rainfall (mm)	14.3	17.7	22.3	24.1	37.1	41.7	24.6	17.3	14.9	18.5	28.2	18.8	279.4
Snowfall (cm)	14.6	4.6	1.7	0.1	0	0	0	0	0	0.1	5.7	17	43.8
Precipitation (mm)	28.8	22.3	24	24.2	37.1	41.7	24.6	17.3	14.9	18.6	33.8	35.8	323.2

2.2.2 Waste Characterization

As per Section 5.1 of the LFG Guidelines, landfilled waste was categorized into the following three categories based on the decomposability of the materials:

- Relatively inert (RI);
- Moderately decomposable (MD); and
- Decomposable (D).

The Landfill does not have a historic waste composition data for landfilled waste to reference for categorization of the Landfill’s waste. For years 2019 to 2023, proxy waste disposal composition data was used to approximate the landfilled waste composition for municipal waste and commercial waste. Commercial waste was assumed to have a similar waste composition to municipal waste for conservative methane generation estimates. Comparable landfills with a similar tonnage received and population serviced were selected. These comparable landfill sites were also identified to not have an active municipal organics collection program in alignment with the Town’s current collections program.

Comparable neighboring municipalities included the Town of Golden, the Town of Oliver (RDOS) and the City of Kelowna (RDOS). These municipalities are comparable in municipal waste collections program, region, climatic zone, and population size (with the exception of Kelowna). The waste characterization studies from these comparable landfills were averaged to estimate the relative breakdown of decomposable waste within the Landfill. The waste categorization for municipal and commercial waste for are provided in Appendix B. Categorization of the remaining landfilled waste includes construction waste and biosolids. A summary of the waste categorization years 2019 to 2023 are provided in Appendix B.

For a conservative estimate, methane generation values for future years 2024 to 2028 were calculated assuming all waste was municipal waste. For years 1981 to 2018, waste quantities and decomposability



categorization were referenced from the 2019 Landfill Gas Generation Assessment Report for the Town of Osoyoos Landfill prepared by TRUE Consulting.

2.2.3 Methane Potential

The methane generation potential (L_0) projects the total amount of methane capable of being produced by a select volume of waste based on the inherit composition of organic matter. The L_0 for the waste characterization categories were assigned as per Table 5.1 in the LFG Guidelines and presented in Table 2. The L_0 values were applied to the waste characterization data.

Table 2: Waste Characterization and Methane Potential

Waste Characterization	Methane Generation Potential L_0 (m ³ methane/tonne)
Relatively Inert	20
Moderately Decomposable	120
Decomposable	160

2.2.4 Methane Generation Rate

The methane generation rate, k , represents the first-order biodegradation rate at which methane is generated following waste placement. This constant is influenced by moisture content, the availability of nutrients, pH, and temperature. The methane generation rate (k) value was selected using the table in Section 5.3 of the LFG Guidelines. Using an annual precipitation of 323.2 mm, methane generation rates were input into the MOECC LFG Calculation Tool as per Table 3.

The water addition factor accounts for outside moisture infiltration into a landfill cell from stormwater, leachate recirculation, or a “bioreactor” style landfill management model. The Landfill maintains a small active face with the remainder of the landfill area having received intermediate or final cover. A water addition factor of 1.0 was selected using Table 5.4 of the LFG Guidelines for a Site that has:

- Partially implemented stormwater management best practices;
- Sloped low permeability cover; and
- Absence of leachate recirculation and/or storm water injection.

All values generated from the Methane Generation Rate Selection Matrix (Table 5.2) in the LFG Guidelines were adjusted by the Water Addition Factor (Table 5.3) from the LFG Guidelines. The modified methane generation rate generated using these tables is presented in Table 3.

Table 3: Methane Generation Rate – Moisture Content Matrix

Waste Characterization	Methane Generation Rate (k) Value	Water Addition Factor	Modified Generation Rate (k)
Relatively Inert	0.01	1.0	0.01
Moderately Decomposable	0.02	1.0	0.02
Decomposable	0.05	1.0	0.05



3.0

LFG Generation Model Results

3.1

LFG Tool Parameters

The parameters set for the landfill gas calculator tool are provided in Table 4. These parameters include the standard densities for carbon dioxide and methane gas as typically found in landfill gas. The Landfill is operated under the dry anaerobic tomb sanitary landfill model. A landfill gas relative composition of 50% CO₂ and 50% CH₄ has been assumed. It is expected that passive methane release from the covered landfill cell would be composed of approximately 50% methane based on the pre-set values provided in the MOECC LFG tool.

Table 4: T2-Calculator Landfill Gas Tool Calculation Parameters

	Relatively Inert (RI)	Moderately Decomposable (MD)	Decomposable (D)
Gas Production potential, Lo =	20	120	160
lag time before start of gas production, lag	1 year		
Historical Data Used (years)	43		
1st Year of Historical Data Used	1981		
4 Years after Reporting Year	2028		
Methane (by volume)	50%		
Carbon dioxide (by volume)	50%		
Methane (density) - 1atm, 25C	0.6557 kg/m ³ (25C,SP)		
Carbon dioxide (density)	1.7988 kg/m ³ (25C,SP)		

3.2

Model Results

The calculated results for the Landfill's future methane generation have been included in Table 5 and Table 6 Results were calculated using the MOECC provided tool.

Table 5: T1 Summary Results – 2024 to 2028 Future Methane Generation

	Year of Estimate	Mass of Methane Produced (tonnes)
Estimated Quantity of Methane Produced in Year Preceding the Assessment	2023	244
Estimated Quantity of Methane Produced in Year of the Assessment	2024	243
Estimated Quantity of Methane Produced One Year after the Assessment	2025	244
Estimated Quantity of Methane Produced Two Years after the Assessment	2026	244
Estimated Quantity of Methane Produced Three Years after the Assessment	2027	245
Estimated Quantity of Methane Produced Four Years after the Assessment	2028	246

Gas Production potential, Lo =
lag time before start of gas production, lag =
Historical Data Used (years)
1st Year of Historical Data Used
4 Years after Reporting Year
methane (by volume)
carbon dioxide (by volume)
methane (density) - 1atm, 25C
carbon dioxide (density)

Relatively Inert 20
Moderately Decomposable 120
Decomposable 160
1 years
43
1981
2028
50%
50%
0.6557 kg/m³
1.7988 kg/m³

m³ CH4/tonne

Year	Year Number	Annual Tonnage (tonnes)	Cumulative Waste-in-place (tonnes)	Waste Tonnage			Methane Generation Rate, k			Annual Methane Production (tonnes/yr)	Annual Landfill Gas Production (m ³ /hr)
				Relatively Inert (tonnes)	Moderately Decomposable (tonnes)	Decomposable (tonnes)	Relatively Inert (year ⁻¹)	Moderately Decomposable (year ⁻¹)	Decomposable (year ⁻¹)		
1981	1	2,672	2,671	534	1,069	1,069	0.01	0.02	0.05	0	0.0
1982	2	2,770	5,441	554	1,108	1,108	0.01	0.02	0.05	7	2.6
1983	3	2,852	8,293	570	1,141	1,141	0.01	0.02	0.05	15	5.1
1984	4	2,938	11,231	588	1,175	1,175	0.01	0.02	0.05	22	7.6
1985	5	3,025	14,256	605	1,210	1,210	0.01	0.02	0.05	29	10.1
1986	6	3,115	17,371	623	1,246	1,246	0.01	0.02	0.05	36	12.6
1987	7	3,235	20,606	647	1,294	1,294	0.01	0.02	0.05	43	15.1
1988	8	3,355	23,961	671	1,342	1,342	0.01	0.02	0.05	50	17.6
1989	9	3,483	27,444	697	1,393	1,393	0.01	0.02	0.05	58	20.0
1990	10	3,615	31,059	723	1,446	1,446	0.01	0.02	0.05	65	22.6
1991	11	3,752	34,811	750	1,501	1,501	0.01	0.02	0.05	72	25.1
1992	12	3,895	38,706	779	1,558	1,558	0.01	0.02	0.05	79	27.7
1993	13	4,042	42,748	808	1,617	1,617	0.01	0.02	0.05	87	30.3
1994	14	4,195	46,943	839	1,678	1,678	0.01	0.02	0.05	94	32.9
1995	15	4,353	51,296	871	1,741	1,741	0.01	0.02	0.05	102	35.6
1996	16	4,614	55,910	1,292	1,246	2,076	0.01	0.02	0.05	110	38.3
1997	17	4,311	60,221	920	1,218	2,173	0.01	0.02	0.05	119	41.3
1998	18	3,679	63,900	662	1,138	1,879	0.01	0.02	0.05	127	44.3
1999	19	3,306	67,206	570	1,141	1,595	0.01	0.02	0.05	134	46.5
2000	20	3,430	70,636	783	1,270	1,377	0.01	0.02	0.05	138	48.2
2001	21	3,980	74,616	926	1,454	1,600	0.01	0.02	0.05	142	49.4
2002	22	5,785	80,401	1,382	2,120	2,283	0.01	0.02	0.05	147	51.1
2003	23	4,800	85,201	1,162	1,741	1,897	0.01	0.02	0.05	156	54.4
2004	24	5,587	90,788	1,360	1,988	2,239	0.01	0.02	0.05	163	56.7
2005	25	5,286	96,074	1,174	1,966	2,146	0.01	0.02	0.05	171	59.6
2006	26	6,562	102,636	1,536	2,213	2,813	0.01	0.02	0.05	179	62.2
2007	27	6,049	108,685	1,519	2,265	2,265	0.01	0.02	0.05	190	66.1
2008	28	6,853	115,538	1,431	3,103	2,319	0.01	0.02	0.05	198	68.8
2009	29	6,616	122,154	1,512	2,848	2,256	0.01	0.02	0.05	207	72.0
2010	30	6,871	129,025	2,312	2,559	2,000	0.01	0.02	0.05	215	74.9
2011	31	6,103	135,128	1,137	2,692	2,274	0.01	0.02	0.05	221	77.0
2012	32	5,200	140,328	923	2,163	2,114	0.01	0.02	0.05	229	79.6
2013	33	4,292	144,620	910	1,737	1,645	0.01	0.02	0.05	234	81.5
2014	34	4,305	148,925	996	1,725	1,584	0.01	0.02	0.05	236	82.2
2015	35	4,094	153,019	833	1,807	1,454	0.01	0.02	0.05	238	82.8
2016	36	4,054	157,073	834	1,703	1,517	0.01	0.02	0.05	239	83.2
2017	37	4,056	161,129	807	1,733	1,516	0.01	0.02	0.05	240	83.7
2018	38	4,898	166,027	1,001	2,043	1,854	0.01	0.02	0.05	242	84.1
2019	39	4,232	170,259	1,415	1,571	1,246	0.01	0.02	0.05	245	85.4
2020	40	4,167	174,426	1,412	1,536	1,219	0.01	0.02	0.05	245	85.2
2021	41	4,597	179,023	1,548	1,699	1,350	0.01	0.02	0.05	244	85.0
2022	42	4,045	183,068	1,358	1,498	1,189	0.01	0.02	0.05	245	85.2
2023	43	4,118	187,186	1,413	1,507	1,198	0.01	0.02	0.05	244	84.9
2024	44	4,480	191,666	1,467	1,680	1,333	0.01	0.02	0.05	243	84.7
2025	45	4,538	196,204	1,486	1,702	1,350	0.01	0.02	0.05	244	84.9
2026	46	4,593	200,797	1,504	1,722	1,366	0.01	0.02	0.05	244	85.1
2027	47	4,657	205,454	1,525	1,746	1,385	0.01	0.02	0.05	245	85.3
2028	48	4,699	210,152	1,539	1,762	1,398	0.01	0.02	0.05	246	85.6

4.0 Next Steps

Section 7 of the LFG Regulation requires a landfill generating 1,000 tonnes or more of methane generated in the calendar year immediately preceding the calendar year of the assessment to prepare a landfill gas management facilities design plan. The Landfill's methane production tonnage for 2024 is estimated at 243 tonnes CH₄, below the LFG Regulation threshold. The Town will provide subsequent landfill gas assessment reports every 5-years as outlined in the LFG Regulations or earlier if requested by the MOECC. The next scheduled LFG generation assessment is due by March 31 of 2029.

It is recommended that a multi-season waste composition study be completed at the Landfill to determine actual disposal composition and methane generation rates.

References

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- BC. Environmental Management Act. Landfill Gas Management Regulation, B.C Reg. 391 (2008).
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- Town of Osoyoos Bylaw No. 1370, “Waste Management Services and Regulation Bylaw” (2020).
- TRUE Consulting. 2019 Landfill Gas Generation Assessment Report for the Town of Osoyoos Landfill (2019).
- TRUE Consulting. Town of Osoyoos, 2022 Landfill Annual Report (ME-15273) (2023).
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- GHD Consulting. CSRD 2017 Landfill Gas Generation Assessment Report for the Golden Landfill (2017)
- GHD Consulting. RDOS 2010 Landfill Gas Production Estimate for the Operations and Closure Plan Oliver Landfill Site (2010).
- Tetrattech Consulting, City of Kelowna 2022 Glenmore Landfill Annual Report (2022).

Appendix A

Historical Waste Quantities

Osoyoos Landfill Historic Waste Quantities and Categorization from 1981 to 2028 (Tonnes)

Year ¹	Relatively Inert (RI)	Moderately Decomposable (MD)	Decomposable (D)	Total Quantity	Cumulative Waste in Place
1981	534	1,069	1,069	2,672	2,671
1982	554	1,108	1,108	2,770	5,441
1983	570	1,141	1,141	2,852	8,293
1984	588	1,175	1,175	2,938	11,231
1985	605	1,210	1,210	3,025	14,256
1986	623	1,246	1,246	3,115	17,371
1987	647	1,294	1,294	3,235	20,606
1988	671	1,342	1,342	3,355	23,961
1989	697	1,393	1,393	3,483	27,444
1990	723	1,446	1,446	3,615	31,059
1991	750	1,501	1,501	3,752	34,811
1992	779	1,558	1,558	3,895	38,706
1993	808	1,617	1,617	4,042	42,748
1994	839	1,678	1,678	4,195	46,943
1995	871	1,741	1,741	4,353	51,296
1996	1,292	1,246	2,076	4,614	55,910
1997	920	1,218	2,173	4,311	60,221
1998	662	1,138	1,879	3,679	63,900
1999	570	1,141	1,595	3,306	67,206
2000	783	1,270	1,377	3,430	70,636
2001	926	1,454	1,600	3,980	74,616
2002	1,382	2,120	2,283	5,785	80,401
2003	1,162	1,741	1,897	4,800	85,201
2004	1,360	1,988	2,239	5,587	90,788
2005	1,174	1,966	2,146	5,286	96,074
2006	1,536	2,213	2,813	6,562	102,636
2007	1,519	2,265	2,265	6,049	108,685
2008	1,431	3,103	2,319	6,853	115,538
2009	1,512	2,848	2,256	6,616	122,154
2010	2,312	2,559	2,000	6,871	129,025
2011	1,137	2,692	2,274	6,103	135,128
2012	923	2,163	2,114	5,200	140,328
2013	910	1,737	1,645	4,292	144,620

Year ¹	Relatively Inert (RI)	Moderately Decomposable (MD)	Decomposable (D)	Total Quantity	Cumulative Waste in Place
2014	996	1,725	1,584	4,305	148,925
2015	833	1,807	1,454	4,094	153,019
2016	834	1,703	1,517	4,054	157,073
2017	807	1,733	1,516	4,056	161,129
2018	1,001	2,043	1,854	4,898	166,027
2019	1,415	1,571	1,246	4,232	170,259
2020	1,412	1,536	1,219	4,167	174,426
2021	1,548	1,699	1,350	4,597	179,023
2022	1,358	1,498	1,189	4,045	183,068
2023	1,413	1,507	1,198	4,118	187,186
2024	1,467	1,680	1,333	4,480	191,666
2025	1,487	1,702	1,350	4,539	196,205
2026	1,504	1,722	1,366	4,593	200,798
2027	1,525	1,746	1,386	4,657	205,455
2028	1,539	1,762	1,398	4,699	210,154

¹ Waste quantities and categorization for years 1981 to 2018 are from the 2019 Landfill Gas Generation Assessment Report for the Town of Osoyoos Landfill prepared by TRUE Consulting. For years 2019 to 2028, the waste categorization was determined as per Section 2.2.2 of this Report.

Appendix B

Waste Characterization

Waste Categorization for Municipal Waste Category

Landfill	Relatively Inert (RI)	Moderately Decomposable (MD)	Decomposable (D)
CSRD Golden Landfill (2013) ¹	41.4%	24.5%	34.1%
RDOS Oliver Landfill (2010) ²	21.1%	45.5%	33.4%
Glenmore (Kelowna) Landfill (2021) ³	35.8%	42.5%	21.8%
Average Value	32.8%	37.5%	29.8%

¹The CSRD waste composition study results was sourced from the CSRD 2017 Landfill Gas Generation Assessment Report for the Golden Landfill (GHD – 2017)

²The RDOS LFG characterization breakdown values were averaged based on the high and low estimates provided in the RDOS 2010 Landfill Gas Production Estimate for the Operations and Closure Plan Oliver Landfill Site

³The Kelowna waste characterization data was sourced from the 2021 Waste Composition study performed by Tetrattech for the City of Kelowna. (2022 Glenmore Landfill Annual Report).

Waste Categorization for 2019 Landfilled Waste (tonnes)

2019					
Description	% in Category	RI	MD	D	Total
Municipal Waste	32.75% RI 37.50% MD 29.75% D	658	753	597	2,008
Commercial Waste		714	818	649	2,181
Construction Waste B (drywall or asphalt shingles)	100% RI	29	-	-	29
Construction Waste Mixed		14	-	-	14
Biosolids	100% D	-	-	-	0
Total		1,415	1,571	1,246	4,232

Waste Categorization for 2020 Landfilled Waste (tonnes)

2020					
Description	% in Category	RI	MD	D	Total
Municipal Waste	32.75% RI 37.50% MD 29.75% D	700	801	635	2,136
Commercial Waste		642	735	583	1,961
Construction Waste B (drywall or asphalt shingles)	100% RI	48	0	0	48
Construction Waste Mixed		22	0	0	22

2020					
Biosolids	100% D	0	0	0	0
Total		1,412	1,536	1,219	4,167

Waste Categorization for 2021 Landfilled Waste (tonnes)

2021					
Description	% in Category	RI	MD	D	Total
Municipal Waste	32.75% RI 37.50% MD 29.75% D	794	909	721	2,424
Commercial Waste		690	790	627	2,107
Construction Waste B (drywall or asphalt shingles)	100% RI	58	0	0	58
Construction Waste Mixed		6	0	0	6
Biosolids	100% D	0	0	2	2
Total		1,548	1,699	1,350	4,597

Waste Categorization for 2022 Landfilled Waste (tonnes)

2022					
Description	% in Category	RI	MD	D	Total
Municipal Waste	32.75% RI 37.50% MD 29.75% D	772	884	701	2,357
Commercial Waste		536	614	487	1,638
Construction Waste B (drywall or asphalt shingles)	100% RI	50	0	0	50
Construction Waste Mixed		0	0	0	0
Invasive Weeds	100% D	0	0	0	0
Biosolids	100% D	0	0	0	0
Total		1,358	1,498	1,189	4,045

Waste Categorization for 2023 Landfilled Waste (tonnes)

2023					
Description	% in Category	RI	MD	D	Total
Municipal Waste	32.75% RI 37.50% MD 29.75% D	704	806	639	2,149
Commercial Waste		612	701	556	1,870
Construction Waste B (drywall or asphalt shingles)	100% RI	97	0	0	97
Construction Waste Mixed		0	0	0	0
Invasive Weeds	100% D	0	0	2	2
Biosolids	100% D	0	0	0	0
Total		1,413	1,507	1,198	4,118