CAPE CHRISTIAN LONG TERM MONITORING EVENT
2021 LONG TERM MONITORING REPORT

Submitted to:

Crown-Indigenous Relations and Northern Affairs Canada
Relations Couronne-Autochtones et Affaires du Nord Canada

Crown-Indigenous Relations and Northern Affairs Canada

Contaminants and Remediation Division

P.O. Box 2200

Iqaluit, NU X0A 0H0

Prepared by:

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Yellowknife, NT X1A 1P3

Project Number: 210553

15 February 2022

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EXECUTIVE SUMMARY

IMPORTANT: This executive summary provides an overview of the main findings of the study to which it pertains. This executive summary does not provide a comprehensive report, and its review should not be considered a substitute for reading the report in its entirety.

The Cape Christian site (70° 31'N, 68° 17' W) is a former Long Range Navigation (LORAN) communications station that is located approximately 16 km northeast of the Hamlet of Clyde River. The site was operated by the United States Coast Guard between 1954 and 1974. In 1975, the site was abandoned without decommissioning. Remediation of the site began in 2008. This included demolishing the infrastructure, removing hazardous materials from the site, excavation of non-hazardous metals and petroleum hydrocarbon (PHC) contaminated soils and clean-up of other site debris. A non-hazardous waste landfill (NHWL) was constructed between 2009 and 2010 to house the non-hazardous remediation waste.

The objective of this project is to complete tasks for the long-term monitoring of the Cape Christian site as described in the *Cape Christian Long Term Monitoring Plan*, Indigenous and Northern Affairs Canada (INAC), 2017 (referred to as "the LTM Plan"). This work is Year 11 of the LTM Plan.

The field program, including visual inspection and sampling, was carried out on August 11th and 12th, 2021. A visual and environmental monitoring inspection of the site was completed and documented in the Visual Monitoring and Natural Environment Monitoring checklists, found in Appendix A. Photographic records were also collected and documented, as found in Appendix B and C.

The observations made during the 2021 long term monitoring event support that the Cape Christian non-hazardous waste landfill is performing as expected. Visual monitoring shows that the NHWL is in acceptable condition based on severity ratings presented in the Abandoned Military Site Remediation Protocol (AMSRP) Volume II (INAC, 2009). The surface of the landfill did, however, show minor indications of localized erosion (sand on boulders on the north berm) which should continue to be monitored for signs of deterioration.

An interview with the wildlife monitor revealed that polar bears and foxes frequently visit the area though no wildlife was observed during the site visit.

All four groundwater wells were sampled including a field duplicate and submitted to the analytical laboratory for petroleum hydrocarbons (PHCs), benzene, toluene, ethylbenzene and xylenes (BTEX), polychlorinated biphenyls (PCBs), total and dissolved metals, major ions, hardness, total dissolved and suspended solids, pH and conductivity analyses. The analytical results were compared to the Federal Interim Groundwater Quality Guidelines (FIGQGs). Several exceedances of the FIGQGs were reported including total and dissolved copper, selenium and zinc; and total aluminum, fluoride and chloride. It is important to note that the Tier 1 criteria applied for metals and general chemistry parameters in the FIGQGs are based on a water use exposure pathway that assumes measured groundwater impacts are within 10 m of a surface water body supporting aquatic life. This is not the case at the Cape Christian site and therefore these exceedances are not considered an area of concern. Monitoring of these exceedances should continue to determine if an increasing trend is occurring which could be as a result of leachate from waste within the NHWL entering the groundwater table.

A surface water sample was collected from ponded water north of the NHWL, potentially interacting with seepage water. The sample was submitted to the analytical laboratory for PHCs, BTEX, PCBs, total metals, major ions, hardness, total dissolved and suspended solids, pH and conductivity analyses. The analytical results were compared to the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG-PAL). There are, however, no freshwater aquatic habitats nearby and the ocean is approximately 700 m away. This guideline is therefore considered a conservative evaluation of the surface water quality at the site. The concentration of toluene was 3.92 µg/L, nearly double the CWQG for toluene (2 µg/L). Subsequent sampling in this area will need to be done to establish a trend. As no other BTEX components or PHCs were present in significant concentrations, the source of the toluene exceedance remains unknown.

A surface soil sample and field duplicate were collected from red stained soil west of the NHWL and submitted to the analytical laboratory for PHC, BTEX, PCB and metals (arsenic, cadmium, cobalt, chromium, lead, nickel and zinc) analyses. The area of red stained soil was not identified in 2017 or 2018. The analytical results were compared to the Canadian Council of Ministers of the Environment (CCME) Residential/Parkland standards. All the parameters analysed were below the CCME Residential/Parkland standards. Based on field observations and analytical results, it is anticipated that the red stained soil may be caused by algae and is not associated with seepage from the landfill.

Based on the results of the 2021 long term monitoring event, BluMetric recommends continuing the Phase II monitoring at the AMSRP recommended schedule. With no significant observable deterioration of the landfill at the Cape Christian site in 2021, the site is in acceptable condition. Year 15 is the next monitoring event, as per the LTM Plan, in 2025.

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1 INTRODUCTION

BluMetric Environmental Inc. (BluMetric™) was retained by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) – Nunavut Regional Office to conduct long term monitoring (LTM) activities at the Cape Christian site in Nunavut (herein referred to as "the site"). This project was completed under CIRNAC Standing Offer Number 4600001830 and order number 4500427910. This report describes the monitoring activities completed for CIRNAC at the site.

1.1 OBJECTIVE

The objective of this project is to complete tasks for the long term monitoring of the Cape Christian site as described in the *Cape Christian Long Term Monitoring Plan*, Indigenous and Northern Affairs Canada (INAC), 2017 (referred to as "the LTM Plan"). This work marks Year 11 of monitoring at Cape Christian (Year 10 of the LTM Plan was postponed by a year).

1.2 SCOPE OF WORK

The scope of work for the 2021 long term monitoring activities includes the following:

- Produce and implement a Logistic Plan that complies with all federal, provincial/territorial and municipal health requirements, restrictions and guidance related to COVID-19.
- Produce and implement a Health and Safety Plan including risks and mitigations specific to COVID-19.
- Produce and implement a field sampling plan including Quality Assurance and Quality Control (QAQC) plan.
- Implement a field program including:
    - Provision of wildlife monitor (with firearm) from nearby community;
    - Monitor general site conditions (i.e., roads, buildings, etc.);
    - Monitor the natural environment (i.e., wildlife);
    - Perform a visual and geotechnical inspection of the Non-Hazardous Waste Landfill (NHWL) in accordance with the LTM Plan and the Abandoned Military Site Remediation Protocol (AMSRP) (INAC, 2009);
    - Conduct a groundwater sampling program at the four monitoring wells surrounding the NHWL at Cape Christian;
    - Collect soil samples, if required, at locations where new seepage or staining has been identified;
    - Collect blind duplicate samples for at least 20% of samples; and

    - Submit groundwater and soil samples to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory for analysis.
- Submit a draft and final version of the Cape Christian 2021 Long Term Monitoring Report to CIRNAC.

2 BACKGROUND INFORMATION

The Cape Christian site (70° 31'N, 68° 17' W) is a former Long Range Navigation (LORAN) communications station that is located approximately 16 km northeast of the Hamlet of Clyde River, Nunavut. Figure 1 shows the general site location.

According to the 2017 Cape Christian LTM Plan by INAC, the United States Coast Guard operated a LORAN communications station at the site between 1954 and 1974. During this time period, the following structures were present at the Cape Christian station:

- Five buildings
    - Main station
    - Garage
    - Hazmat building
    - Terminal building
    - Survival Hut
- Six fuel aboveground storage tanks (ASTs) each with a capacity of 102,600 L
- Several oil barrels were supplied to the site over the course of its operation. These barrels were reportedly buried at the site (SLR, 2018).

In 1975, the site was abandoned without decommissioning. Remediation of the site began in 2008. This included demolishing the infrastructure, removing hazardous materials from the site, excavation of non-hazardous metals and petroleum hydrocarbon (PHC) contaminated soils and clean-up of other site debris.

A non-hazardous waste landfill (NHWL) was constructed between 2009 and 2010 to house the non-hazardous remediation waste. All non-hazardous wastes were placed into the landfill in 0.5m lifts covered by 0.15 m of granular fill. The waste layers were compacted and a final cap of a minimum of 1.0 m of granular fill was installed. The NHWL contains the following:

- Tier I Contaminated soil (i.e. soil with lead concentration up to 500 parts per million (ppm) and polychlorinated-biphenyl (PCB) concentrations up to 5 ppm;
- Petroleum hydrocarbon (PHC) fractions F3 and F4 contaminated soil;

- Non-Hazardous demolition debris such as timbers, plywood, and sheet metal;
- Non-hazardous site debris such as scrap metal and wood;
- Non-hazardous debris/soil excavated from landfills;
- Creosote timbers; and
- Double-bagged asbestos.

2.1 Previous Reports and Monitoring Programs

BluMetric Environmental reviewed the following reports prior to the field program:

- Cape Christian Long-Term Monitoring Plan, INAC, February 2017;
- Cape Christian Long-Term Monitoring Report, Arcadis, January 2018); and
- Cape Christian Long-Term Monitoring Report, SLR, December 2018.

The Cape Christian Long Term Monitoring Plan outlines the proposed frequency of monitoring as follows (INAC, 2017):

- Phase I: Years 1, 3 and 5
- Phase II: Years 7, 10, 15 and 25
- Phase III: Beyond 25 years (if required)

Phase I is conducted to confirm that physical stability criteria are achieved. Phase II is to verify that equilibrium conditions are established during Phase I, and Phase III (if required) is to monitor for long term issues, including integrity of facilities, permafrost stability, and issues caused by significant storm events.

This Year 11 monitoring at the Cape Christian site was required due to an act of vandalism and resulting loss of samples during Year 7 (2017) resulting in another LTM event to collect groundwater only in 2018. Year 10 monitoring was then postponed by one year to align with an additional monitoring event being scheduled for FOX-C Ekalugad Fjord.

3 REGULATORY GUIDELINES

BluMetric reviewed the Cape Christian LTM Plan as well as the Abandoned Military Site Remediation Protocol (AMSRP) to identify the applicable guidelines to be used in the LTM program. The following sections describe the regulatory guidelines selected for each type of sample collected at the site.

3.1 GROUNDWATER

3.1.1 Federal Interim Groundwater Quality Guidelines (FIGQG)

The analytical results were compared to the Federal Interim Groundwater Quality Guidelines (FIGQG). Generally, federal contaminated sites are evaluated using the Canadian Environmental Quality Guidelines (CEQG) developed by the Canadian Council of Ministers of the Environment (CCME). There are comprehensive guidelines for various media including surface water and soil, however no CEQG exists for groundwater. In recognizing the need for a nationally-consistent approach for assessing and managing groundwater, Environment Canada developed the Federal Interim Groundwater Quality Guidelines. These guidelines are intended as an interim measure until CEQGs for groundwater are available.

The FIGQGs follow a tiered framework as follows:

- Tier 1: direct application of generic numerical guidelines, specifically, application of the lowest guideline for any pathway;
- Tier 2: allows for the development of site-specific remediation objectives through the consideration of site-specific conditions, by modifying (within limits) the numerical guidelines based on site-specific conditions and focusing on exposure pathways and receptors that are applicable to the site; and
- Tier 3: use of site-specific risk assessment to develop Site-Specific Remediation Objectives.

From the FIGQGs, the Generic Guidelines for Residential/Parkland Land Uses, Tier 1 Lowest Guideline for coarse-grained soil (Table 2, Tier 1) were to be referenced for this report as they were deemed most representative of current site use and soil conditions. The FIGQGs typically do not apply to total metals, however, they have been applied to both total and dissolved metals to evaluate potential for transport of contaminants with colloidal materials in groundwater. As per FIGQG for certain metals (aluminum, copper, lead, and nickel) without criteria, *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (CCME 1999) were to be used. Though typically only applied to total metals, due to the absence of applicable guidelines for dissolved metals, these were to be applied to both.

3.2 SOIL

3.2.1 Canadian Environmental Quality Guidelines – CCME

One soil sample was collected during the site visit. The analytical results were compared to the following CCME guidelines for soil analytical results:

- Canadian Soil Quality Guidelines (CSQG) *for the Protection of Environmental and Human Health* (CCME, 1999, with updates) for residential/parkland use, including fact sheets for benzene, toluene, ethylbenzene and xylene (BTEX), non-potable water, coarse-grained soil.
- Canada-Wide Standard (CWS) for Petroleum Hydrocarbons in Soil (CCME, 2008) – Tier 1 Residential/Parkland, non-potable water, coarse-grained soil.

The rationale for choosing these criteria are that the groundwater at Cape Christian will not be used for drinking (non-potable) and coarse-grained material is found on site. If seepage or staining occurs and soil samples are taken in future monitoring activities, the above guidelines should be used for comparison.

3.3 SURFACE WATER

3.3.1 Canadian Environmental Quality Guidelines – CCME

One surface water sample was collected during the site visit. The analytical results were compared to the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG-PAL) (CCME, 1999). The CWQG-PAL were developed to provide basic scientific information about the effects of water quality variables and natural and anthropogenic substances on aquatic life. The guideline that was applied for surface water analytical results is the freshwater, long term exposure guidelines. However, there are no freshwater aquatic habitats nearby and the ocean is approximately 700 m away. As such, this guideline is considered a conservative evaluation of the surface water quality at the site.

4 METHODOLOGY

The field program including visual inspection and sampling was carried out on August 11th and 12th, 2021 by BluMetric Personnel. They were accompanied by CIRNAC representative Selma Al-Soweydawi, and by a wildlife monitor, Lasalie Joanasie, a resident of Clyde River, NU who also provided knowledge of the site. The site was accessed by a pickup truck on August 11 and All Terrain Vehicles (ATVs) on August 12. Logistics were carried out as per the Logistics Plan provided under a separate cover. It should be noted that the road access to site was destroyed in certain areas and the site could only be accessed by driving along the shoreline. The summaries of daily activities and notes can be found in **Appendix A**.

4.1 HEALTH AND SAFETY PLAN

In preparation for the field program, a Health and Safety Plan (HASP) was produced and submitted to CIRNAC under a separate cover. The HASP identifies risks and suspected hazards associated with work on the site. It specifically addresses any known or suspected hazards and provides mitigative measures including protocols for COVID-19. Included in the HASP are emergency contacts and procedures for medical, mechanical, or weather emergencies.

Prior to the start of work, a review of the HASP was completed with all personnel involved in the field program.

4.2 LANDFILL VISUAL MONITORING

The physical integrity of the NHWL was inspected at the Cape Christian site during the 2021 LTM event. The visual inspection looked for evidence of:

- erosion, ponding, frost action, settlement, and lateral movement;
- animal burrows, vegetation, vegetation stresses; and
- staining or seepage.

This was documented by the visual monitoring checklist and through site photographs.

4.3 NATURAL ENVIRONMENT MONITORING

Natural environment data was collected during the 2021 long term monitoring event. The specific observations that were noted included:

- wildlife sightings (species, number, gender, juveniles);
- evidence of recent presence of wildlife (droppings, tracks, feathers/fur, carcass remains, etc.);
- wildlife activity (summering/nesting/denning, migratory/passing through); and
- qualitative assessment of relative numbers versus previous years (more, same, less).

Mr. Lasalie Joanasie, the wildlife monitor and a resident of Clyde River that supported the 2021 LTM visit also provided feedback about wildlife presence and frequency as well as site conditions throughout the years.

4.4 GROUNDWATER SAMPLE COLLECTION

The site has four groundwater monitoring wells located around the NHWL (MW1 to MW4). Monitoring well locations are listed in **Table 1** below.

Table 1*:* **Cape Christian Monitoring Well Locations**

Monitoring Well	Latitude	Longitude
MW1	70 31 32.19	-68 18 19.87
MW2	70 31 34.97	-68 18 11.64
MW3	70 31 32.53	-68 18 7.952
MW4	70 31 29.87	-68 18 12.88

The following section presents the methodology that was used for the groundwater sampling and a similar methodology should be used for future monitoring events. The water level and depth were recorded, and an approximate well volume calculated. A peristaltic pump and dedicated, disposable polyethylene tubing were used to purge and sample the wells using a low-flow sampling methodology. The monitoring well was purged of three well volumes prior to sampling. Water quality parameters including dissolved oxygen (DO), oxidation-reduction potential (ORP), temperature, pH, conductivity, turbidity and total dissolved solids (TDS) were measured and recorded prior to sampling.

Prior to shipping, samples were packed in laboratory-provided coolers and ice packs were replaced daily as necessary.

The groundwater samples collected were sent to AGAT Laboratories, a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory and analysed for:

- F1 and F2 Petroleum Hydrocarbons (PHCs);
- BTEX
- Total and dissolved metals;
- Major Ions (calcium, sodium, magnesium, potassium, strontium, sulphate, chloride, bicarbonate and hydroxide);
- General chemistry (hardness, total dissolved solids, total suspended solids, pH and conductivity); and
- Polychlorinated biphenyls (PCBs).

Parameters were selected as per the Cape Christian LTM Plan (2017).

The QA/QC plan for this program included the following:

- **field duplicates** (20% of program) as per AMSRP to provide a measure of precision/repeatability of the sampling procedure, analytic technique and heterogeneity of the sample.
- **analytical method blanks** give a measure of any contamination that may be introduced during sample handling and processing and can indicate whether results are falsely inflated.
- **analytical control spike** is used to identify analytical interference associated with the sample matrix. Control spikes are evaluated by calculating a percent recovery as follows:

$$Recovery\ (\%) = \left(\frac{measured\ concentration}{certified\ concentration}\right) * 100$$

- **analytical duplicates** provide a measure of the precision and repeatability of the analytical method.
- **travel blanks** to test for background contaminants, contamination from transport and handling or presence of container or preservative contamination.
- **field blanks**, to provide a measure of the sampling procedure and whether cross-contamination or contamination from exposure to air has occurred.

For field and analytical duplicates, the precision is measured by the relative percentage difference (RPD) for duplicate samples. RPD is calculated for contaminant concentrations greater than 5 times the reportable detection limit (RDL), concentration results less than 5 times the RDL become increasingly imprecise. RPD is calculated as follows:

$$RPD\ (\%) = \left(\frac{Dup_1 - Dup_2}{average\ of\ Dup_1 + Dup_2}\right) * 100$$

The guidance, Manual for Environmental Site Characterization in Support of Human Health Risk Assessment, Volume I (CCME, 2016), recommends that RPDs for parameters of field duplicate groundwater samples not exceed 40% and RPDs for laboratory groundwater duplicates not exceed 20%. RPDs for soil sample field duplicates should not exceed 60% and RPDs for laboratory soil duplicates should not exceed 30%.

Prior to sampling, static water levels were recorded from each well on August 11, 2021. Measurements were made relative to the top of casing recorded in metres below top of casing (mTOC). Water levels are presented in **Table 2** below:

Table 2: Cape Christian Monitoring Well Locations Water Levels

Monitoring Well	Water Level (mTOC)
MW1	0.905
MW2	0.730
MW3	1.302
MW4	0.630

4.5 SOIL SAMPLING

Red staining was observed on the soil to the west and north of the NHWL. One representative sample of the staining was collected to the west of the NHWL, as shown on **Figure 2**. The following is the methodology that was used for the soil sampling and a similar methodology should be used for future monitoring events.

Soil samples were collected with a small trowel which was decontaminated with a laboratory-grade biodegrable cleaner (Alconox®) and rinsed between sampling locations. Soil samples were collected to a maximum depth of 0.15 m and packed into laboratory supplied jars with minimal to no headspace. Samples were kept cool and packed on ice for shipment to AGAT laboratories, a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory and analysed for:

- PCBs;
- F1-F4 PHCs;
- BTEX; and
- Metals (arsenic, cadmium, cobalt, chromium, lead, nickel and zinc)

Parameters were selected based on the Cape Christian LTM Plan (2017).

4.6 Surface Water Sampling

Metallic sheen was observed on ponded water to the north of the NHWL. Evidence of seepage water flowing from the NHWL to ponded water to the north was also observed. Therefore, a representative surface water sample was collected from ponded water in this area, as shown in **Figure 2**. The following is the methodology that was used for the surface water sampling and a similar methodology should be used for future monitoring events.

Surface water samples were collected manually by dipping a clean collection bottle, without preservative, into the water without disturbing the sediments or vegetation. The water was then decanted into pre-labeled laboratory supplied sample bottles. Indicator parameters including dissolved oxygen (DO), oxidation-reduction potential (ORP), temperature, pH, conductivity, turbidity and total dissolved solids (TDS) were measured and recorded prior to sampling. Prior to shipping, the sample was packed in a laboratory provided cooler and ice packs were replaced daily as necessary. The sample was shipped by Canadian North to AGAT, a CALA accredited laboratory, and analysed for:

- F1 and F2 Petroleum Hydrocarbons (PHCs);
- BTEX;
- Total metals;
- Major Ions (calcium, sodium, magnesium, potassium, strontium, sulphate, chloride, bicarbonate and hydroxide);
- General chemistry (hardness, total dissolved solids, total suspended solids, pH and conductivity); and
- Polychlorinated biphenyls (PCBs).

Parameters were selected based on the Cape Christian LTM Plan (2017).

5 RESULTS

5.1 PHOTOGRAPHIC RECORDS

The photographic record of the Cape Christian site NHWL was taken as per the scope of work. Representative photos of the site with detailed captions are attached in **Appendix B**. The photographs referenced in the text of the document are found in **Appendix B**. Supplemental photographs, taken while on site, have also been provided in **Appendix C**. Photo numbering in both photo sets corresponds to viewpoint numbering on **Figure 2**.

5.2 LANDFILL VISUAL MONITORING

The visual monitoring checklist was completed to document the inspection of the NHWL. See **Appendix A** for the visual monitoring checklist and notes collected on site. Features observed during the visual monitoring are presented on **Figure 2**. **Table 3** summarizes the notable features at the Cape Christian site.

Table 3: Cape Christian NHWL Feature Summary

Feature Letter	Feature Type	Location	Extent	Description/Change Comments	Photos
A	Settlement	S of NW Corner	<1%	Ponded water observed in 2021, similar size and extent as 2018.	9
B	Settlement	S of NW corner	N/A	Feature not observed since 2017; location unknown.	N/A
C	Settlement	S of NW corner	<1%	Ponded water observed in 2021, similar size and extent as 2018.	10
D	Settlement	S of NW corner	<1%	Feature not observed since 2017; location unknown.	N/A
E	Settlement	SW corner	N/A	Ponded water observed in 2021, likely a result of vehicular traffic, similar size and extent as 2018.	12
F	Settlement	SW corner	<1%	Formerly identified as a sinkhole, not observed in 2018. Some ponded water observed in 2021, approximately 30 cm deep.	12
G	Settlement	E of SW corner	<1%	Ponded water observed in 2021 but not in 2017 or 2018	35
H	Settlement	NE corner	<1%	Ponded water reported previously. No ponding in 2021.	34
I	Settlement	NE of NE corner	<1%	Ponded water observed in 2021 but not in 2017 or 2018.	38

Feature Letter	Feature Type	Location	Extent	Description/Change Comments	Photos
J	Settlement	W of NE corner	<1%	Ponded water with metallic sheen observed in 2021 but not in 2017 or 2018.	6
K	Settlement	W of NE corner	<1%	Ponded water and some red staining on soil observed in 2021 but not in 2017 or 2018.	36
L	Staining	W of NE corner	<1%	Ponded water with metallic sheen, some red staining on soil, observed in 2021, similar extent to 2017, not observed in 2018.	6
M	Staining	W of NE corner	<1%	Ponded water with metallic sheen and some red soil staining observed in 2021, similar extent to 2018. Ponded water was sampled (SW-1)	7
N	Staining	W of NE corner	<1%	Ponded water with metallic sheen and some red soil staining observed in 2021, similar extent to 2018, trace scrap metal observed.	8
O	Settlement	E of SE corner	<1%	Ponded water and some red soil staining observed in 2021, similar extent to 2018.	15
P	Staining	W toe	<1%	Soil staining observed in 2021, not observed in 2017 or 2018. Red stained soil was sampled (SS-1).	11, 17
Q	Staining	W toe	N/A	Soil staining, not observed since 2017	N/A
R	Settlement	E of SE corner	N/A	Previously observed saturated soils in 2017 and 2018, no longer saturated in 2021.	N/A
S	Settlement	E of SE corner	N/A	Previously observed saturated soils in 2017 and 2018, no longer saturated in 2021.	14
T	Debris	NE of NE corner	<1%	Area of scattered waste observed in 2021, similar in size to 2018.	5, 5a
U	Erosion	N berm	<1%	New area of erosion along north berm. Sand was observed on the boulders at the base of the northern berm in 2021.	37

[1]Photograph numbers in this table correspond to viewpoints on Figure 2 and numbering in both the representative (Appendix B) and supplemental (Appendix C) photo sets.

Visual monitoring shows that the NHWL is in acceptable condition based on severity ratings presented in the AMSRP Volume II (INAC, 2009). The surface of the landfill did, however, show minor indications of localised erosion (sand on boulders on the north berm) which should continue to be monitored for signs of deterioration.

No evidence of frost action such as boils and/or cracking was observed on or surrounding the NHWL.

No evidence of animal burrowing was observed on or surrounding the NHWL during the site visit.

An inspection of the groundwater wells was done during the groundwater sampling. The wells were found to be in good condition and were functional. Signs of frost heaving were observed in MW1, MW2 and MW4.

5.3 Natural Environment Monitoring

Site observations and an interview with a local resident were conducted to document the status of the natural environment.

Mr. Lasalie Joanasie, the wildlife monitor and a resident of Clyde River indicated that polar bears and foxes frequently visit the area, though no wildlife was observed during the site visit.

There was no evidence of revegetation observed on the landfill.

5.4 Groundwater Analytical Results

A total of five groundwater samples were collected. Samples from all four monitoring wells and a duplicate sample from MW4 were collected and submitted to AGAT Laboratories in Ottawa for analysis. The Certificate of Analysis can be found in **Appendix E**.

Analytical results for PHCs in groundwater in 2021 were all below reportable detection limits. This is consistent with analytical results from the previous monitoring activities. **Table E-1** presents the analytical results for PHCs and the reportable detection limits.

The analytical results show that PCB concentrations were below the reportable detection limit for all samples. **Table E-2** summarizes the analytical results for PCBs and the reportable detection limits.

Tables E-3 and **E-4** summarize the analytical results for total and dissolved metals. The concentration of total aluminum at all four wells was greater than the FIGQG. The concentration of total and dissolved copper at MW2 and MW3 as well as total selenium and zinc at MW2 also exceeded the FIGQG. It should be noted that the detection limit for total selenium was reported by the lab at 0.002 µg/L, which is above the FIGQG guideline of 0.001 µg/L. All of the dissolved selenium groundwater sample results were reported at less than the RDL for selenium with the exception of MW2. Dissolved copper, selenium, and zinc at MW2 as well as dissolved copper at MW3 exceeded the FIGQG. These results were either similar or trending down with respect to previous years. This is based on a comparison of available data from previous years as presented in the 2018 LTM report (SLR, 2018).

Analytical results from general chemistry including major ions are summarized in **Table E-5**. The concentration of chloride at MW2 and fluoride at MW1 were slightly greater than the FIGQG.

5.5 Surface Water Analytical Results

One surface water sample was collected to the north of the NHWL. The sample was submitted to AGAT Laboratories in Ottawa for analysis. The Certificate of Analysis can be found in **Appendix E.** The location of the sample was selected as representative sample to investigate the ponded water with metallic sheen observed north and northwest of the NHWL.

Analytical results for PHCs are presented in **Table E-6**. All PHC analyses were below the detection limit, with the exception of Toluene, which reported a concentration of 3.92 µg/L, nearly double the CWQG (2 µg/L).

The analytical results show that PCB concentrations were below the reportable detection limit. **Table E-7** summarizes the analytical results for PCBs and the reportable detection limits.

Table E-8 summarizes the analytical results for total metals. All metals concentrations were below the CWQG, with the exception of cadmium, where the reported detection limit was greater than the CWQG.

Analytical results from general chemistry including major ions are summarized in **Table E-9**. All concentrations were below the CWQG.

This was the first surface water sample analysed from this portion of the site. Subsequent sampling in this area will need to be done to establish any trends in ponded water quality.

5.6 Soil Analytical Results

One surface soil sample was collected to the west of the NHWL in Feature P. The sample was submitted to AGAT Laboratories in Ottawa for analysis. The Certificate of Analysis can be found in **Appendix E**. The Sample location was selected to represent and investigate the red staining observed to the west and north of the NHWL.

Analytical results for PHCs are presented in **Table E-10**. All PHC analyses were below the reportable detection limit.

The analytical results show that PCB concentrations were below the reportable detection limit. **Table E-11** summarizes the analytical results for PCBs and the reportable detection limits.

Table E-12 summarizes the analytical results for metals. All metals concentrations were below the CCME Residential/Parkland standards.

Based on the field observations and analytical results, it is anticipated that the red staining on saturated surface soil is a result of an algae bloom and not associated with oxidation of metals leaching from the landfill.

5.7 QA/QC Discussion

5.7.1 Duplicate Samples – Relative Percent Difference

The following field duplicates were collected on August 11, 2021:

- DUP – duplicate of MW4
- SS-DUP – duplicate of SS-1

The RPDs were calculated for contaminant concentrations greater than 5 times the reportable detection limit (RDL). None of the calculated RPDs exceeded the 40% RPD criterion for field duplicates. **Table E-13** shows the complete list of RPDs that were calculated. No issues with data quality were identified and the data set is considered reliable.

5.7.2 Field Blank and Trip Blank

A trip blank was prepared by AGAT Laboratories and a field blank was collected at MW4 using laboratory supplied deionized water on August 11, 2021. Field blank and trip blank results are presented in ground water Tables 1 to 5 (following the text). All field and trip blank results were below the reported detection limit.

5.7.3 Analytical QA/QC

Additional QA/QC procedures were performed by AGAT Laboratories, including method duplicates, blanks, spikes, and recoveries as part of their internal QA/QC protocol. AGAT Laboratories' QA/QC results were reviewed and are included along with the Certificates of Analysis in **Appendix E**.

The complete analytical quality control report can be found as part of the Certificates of Analyses in **Appendix E**.

6 DISCUSSION & CONCLUSIONS

The observations made during the 2021 long term monitoring event support that the Cape Christian non-hazardous waste landfill is performing as expected. Visual monitoring shows that the NHWL is in acceptable condition based on severity ratings presented in the AMSRP Volume II (INAC, 2009). The surface of the landfill did, however, show minor indications of localised erosion (sand on boulders on the north berm) which should continue to be monitored for signs of deterioration.

An interview with the wildlife monitor revealed that polar bears and foxes frequently visit the area though no wildlife was observed during the site visit. No observations indicating any changes in the natural environment for the Site were made during the site visit.

All four groundwater wells, including a field duplicate, were submitted to the analytical laboratory for PHC, BTEX, PCB, total and dissolved metals, major ions, hardness, total dissolved and suspended solids, pH and conductivity analyses. The analytical results were compared to the FIGQGs. Several exceedances of the FIGQGs were reported including total and dissolved copper, selenium and zinc, total aluminum, fluoride and chloride. It is important to note that the Tier 1 criteria applied for metals and general chemistry parameters in the FIGQGs are based on a water use exposure pathway that assumes measured groundwater impacts are withing 10 m of a surface water body supporting aquatic life, which is not the case at the Cape Christian site.

Furthermore, the ocean is more than 700 m from the site and marine guidelines do not apply. Therefore, these exceedances are not considered an area of concern. Monitoring of these exceedances should continue to determine if an increasing trend is occurring which could be a result of leachate from waste within the NHWL entering the groundwater table.

A surface water sample was collected from ponded water north of the NHWL, potentially interacting with seepage water. The sample was submitted to the analytical laboratory for PHC, BTEX, PCB, total metals, major ions, hardness, total dissolved and suspended solids, pH and conductivity analyses. The analytical results were compared to the CWQG-PAL. The concentration of toluene was 3.92 µg/L, nearly double the CWQG (2 µg/L). Subsequent sampling in this area will need to be done to establish a trend.

A surface soil sample and field duplicate were collected from red stained soil west of the NHWL (Feature P), not identified in 2017 or 2018. These were submitted to the analytical laboratory for PHC, BTEX, PCB and metals (arsenic, cadmium, cobalt, chromium, lead, nickel and zinc) analyses. The analytical results were compared to the CCME Residential/Parkland standards. All the parameters analysed were below the CCME Residential/Parkland standards.

Based on the results of the 2021 long term monitoring event, BluMetric recommends continuing the Phase II monitoring at the AMSRP recommended schedule. With no significant observable deterioration of the landfills at the Cape Christian site in 2021, the site is in acceptable condition. The next monitoring event is recommended to occur in Year 15 (2025). Due to deterioration of the road accessing the site from Clyde River it is recommended that all-terrain vehicles be used to access the site, or that the road be repaired.

6.1 CLOSURE

The conclusions presented in this report are based upon the analysis of historical information made available to BluMetric Environmental Inc. Any additional information received after the date of delivery of this report will be analysed and submitted in a timely manner in the form of an addendum or a memorandum.

BluMetric Environmental Inc, makes no warranty as to the accuracy or completeness of the information provided by others, or of conclusions and recommendations predicated on the accuracy of that information.

This report has been prepared for CIRNAC. Any use a third party makes of this report, any reliance on the report, or decisions based upon the report, are the responsibility of those third parties unless authorization is received from BluMetric Environmental Inc. in writing.

Respectfully Submitted,
BluMetric Environmental Inc.

Daniel Nastas, B. Sc. G.I.T.
Environmental Scientist

Paul Bandler, M.Sc.
Senior Environmental Scientist

Andrea Jenney, P.Eng (NU/NT)
Senior Engineer

7 REFERENCES

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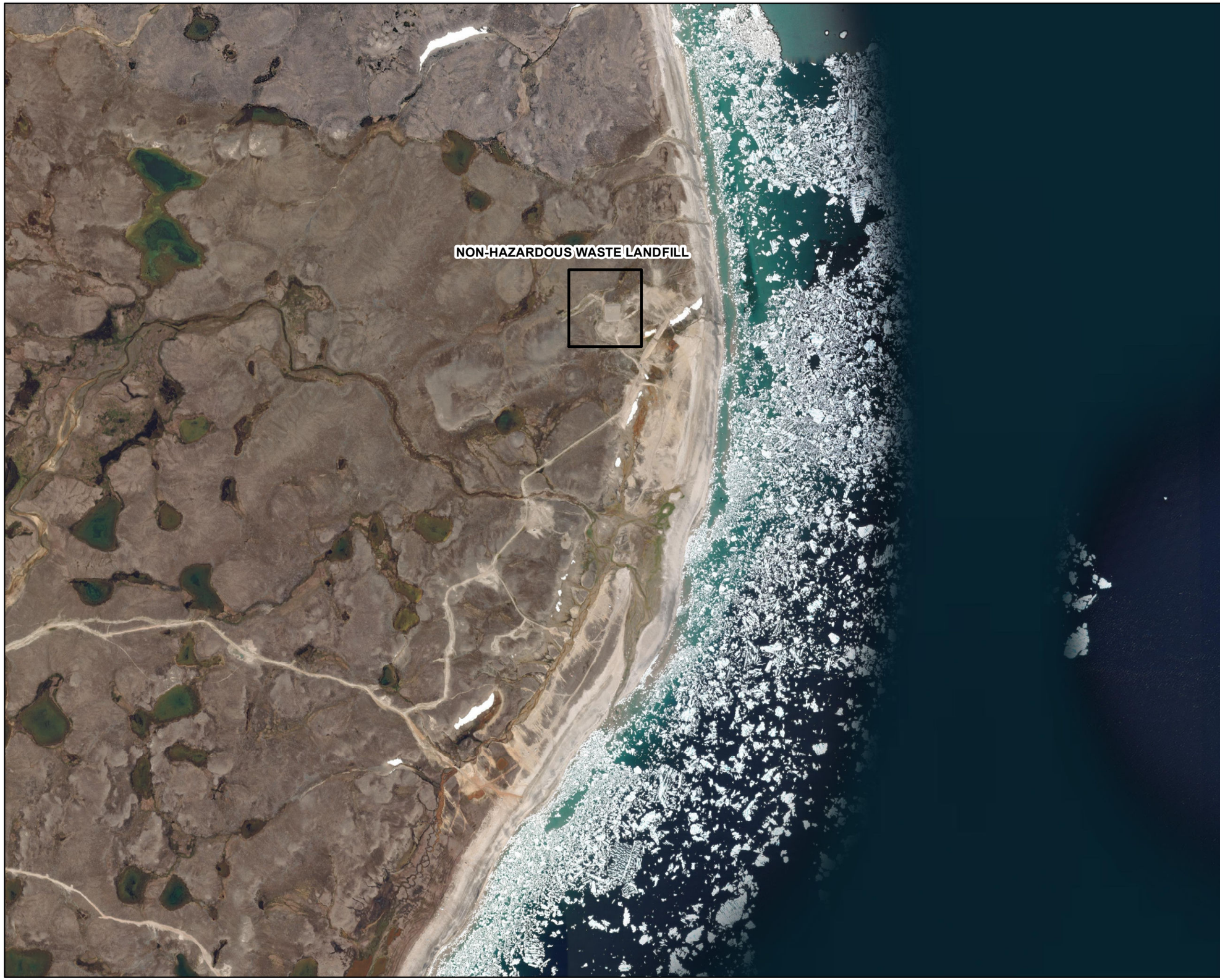
FIGURES



LEGEND

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

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CLIENT

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)

PROJECT

Long-Term Monitoring 2021
Cape Christian, Nunavut

TITLE

Site Location

BluMetric™ Environmental

4916 49th Street,
PO Box 11086
Yellowknife, NT, X1A 1P3
TEL: (867) 873-3500
FAX: (867) 873-3499
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
210553	**November 17, 2021**

DRAWN	CHECKED	FIG NO.	REV
YL	**PB**	**01**	**0**

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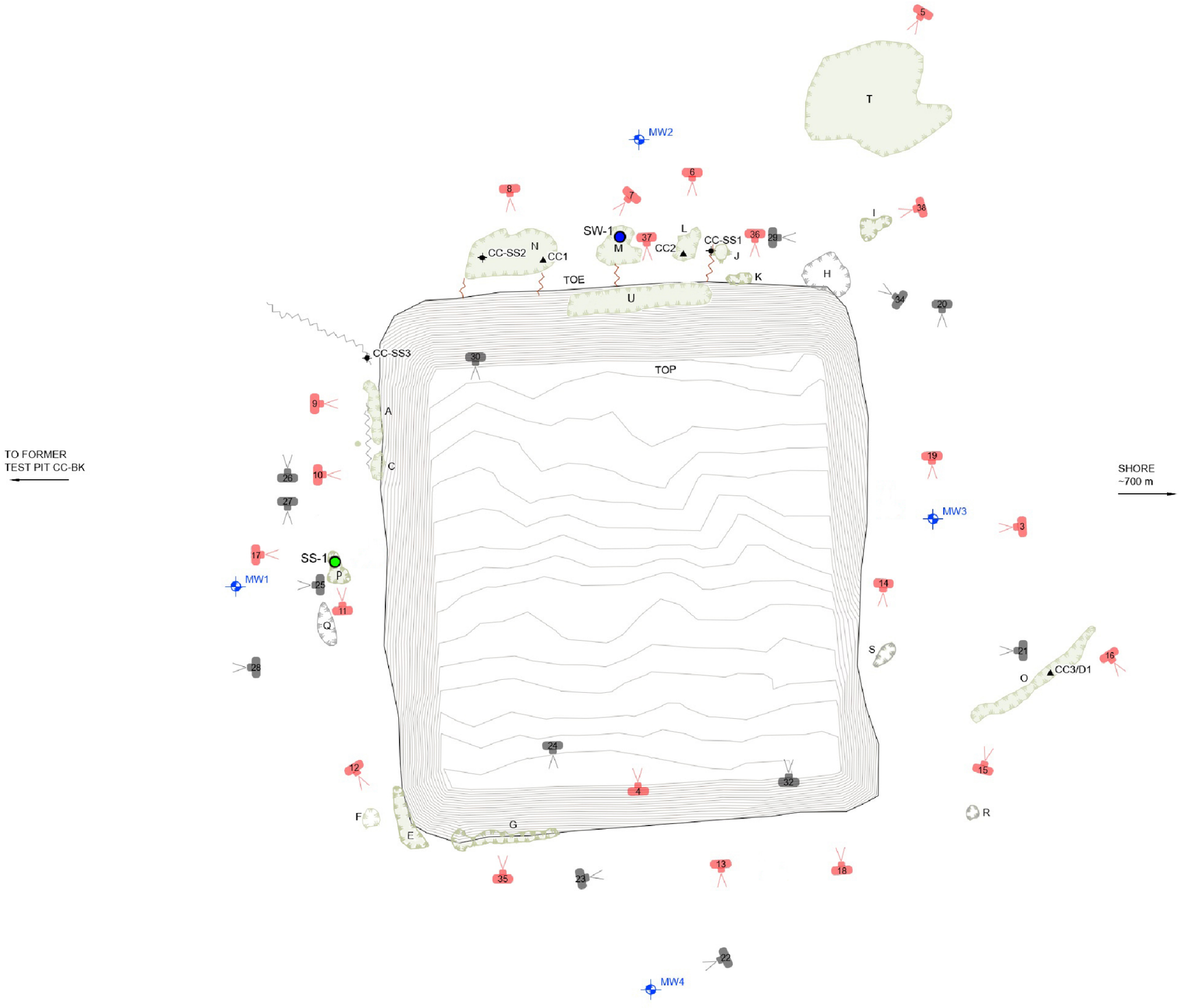

LEGEND

- Settlement or depression
- Feature not observed in 2021
- Seepage
- Former seepage point not observed in 2021
- Monitoring Well (Arcadis, 2016)
- 2011 Soil Sample
- 2013 Soil Sample
- Pothole
- Viewpoint photograph included in Appendix B
- Additional viewpoint photograph included in Appendix C
- 2021 BLM Soil Sample
- 2021 BLM Surface Water Sample

NOTES:
SITE PLAN FROM SLR 2018 REPORT

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED ARE BASED ON 11"x17" FORMAT DRAWINGS.

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N W E S

CLIENT

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)

PROJECT

Long-Term Monitoring 2021
Cape Christian, Nunavut

TITLE

Non-Hazardous Waste Landfill Site Plan

BluMetric™ Environmental
4916 49th Street,
PO Box 11086
Yellowknife, NT, X1A 1P3
TEL: (867) 873-3500
FAX: (867) 873-3499
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PROJECT #	DATE
210553	**February 01, 2022**

DRAWN	CHECKED	FIG NO.	REV
YL	**PB**	**02**	**0**

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APPENDIX A

Monitoring Checklists and Daily Field Report

Daily Activities

Date:	2021/08/11
Project Name:	CIRNAC LTM
BluMetric Project #	210553
Client:	CIRNAC
BluMetric Personnel on site:	Daniel Nastas and Alexandra Polera
Subcontractor personnel on site:	Lasalie Joanasie (wildlife monitor)
Start time:	10:00
End time:	22:00
Weather conditions:	Overcast - windy
Project Activities completed today:	Collected water level measurements at all four wells, collected 5 water samples (MW-4, MW-1, DUP, Field Blank, SW-1), collected 2 surface soil samples (SS-1 and SS-Dup) and completed the site inspection.
Health and Safety:	One near miss involving a Truck being stuck both on the way to and at the site.
Visitors and Third Party Enquiries:	N/A
Wildlife Sightings	Ravens, small brown bird with white striped wings
Project activities planned for tomorrow:	Mob to site and complete groundwater sampling at the remaining two wells.

Labour Hour Tracking

Name	Position	From	To	Hours	Notes
Lasalie Joanasie	Wildlife Monitor	10:00	22:00	12	

Equipment Tracking

Name	Model	From	To	Hours	Notes
YSI		10:00	22:00	12	
Water level meter		10:00	22:00	12	
Peristaltic pump		10:00	22:00	12	

Sample Summary

Samples Collected	APEC(s)	Total # Samples	Analysis								
			Metals	PHCs	VOCs	PAHs	PFAS	PCBs	Lead Paint	Ions	Gen Chem
Soil		2	2	2				2			
Sediment											
Surface Water		1	1	1				1		1	1
Groundwater		4	8	4				4		4	4
Vegetation											
Grain Size											
Building Material											
Other											

Photographs

Photo 1 – SW-1, Seepage to the north of the NHWL/ South

Photo 2 – Staining west of the NHWL/ facing north

Photo 3 – Truck was stuck on the way to Site

Photo 4 – Truck stuck at Site

Other Notes/Comments	The road access to Site was blocked (broken up by a river in 2020 according to the wildlife monitor), so the only way to the site was via the beach. Although truck rental was meant to be a 4x4, the 4 wheel drive transmission was broken (only one tire spins). This along with the saturated terrain resulted in the truck getting stuck on two occasions (on the way to site and at the site), and loss of time trying to free it.
Prepared by (print):	Daniel Nastas

Daily Activities

Date:	2021/08/12
Project Name:	CIRNAC LTM
BluMetric Project #	210553
Client:	CIRNAC
BluMetric Personnel on site:	Daniel Nastas and Alexandra Polera
Subcontractor personnel on site:	Lasalie Joanasie (wildlife monitor)
Start time:	14:30
End time:	20:00
Weather conditions:	Foggy, ~2^{o} C
Project Activities completed today:	Collected 2 groundwater samples (MW-2 and MW-3).
Health and Safety:	No H&S incidents
Visitors and Third Party Enquiries:	N/A
Wildlife Sightings	N/A
Project activities planned for tomorrow:	Weather day – organise samples and equipment and ship them back south. Plan the rest of the field program based on the update from Polar Continental.

Labour Hour Tracking

Name	Position	From	To	Hours	Notes
Lasalie Joanasie	Wildlife Monitor	14:30	20:00	5.5	

Equipment Tracking

Name	Model	From	To	Hours	Notes
YSI		14:30	20:00	5.5	
Water level meter		14:30	20:00	5.5	
Peristaltic pump		14:30	20:00	5.5	

Sample Summary

Samples Collected	APEC(s)	Total # Samples	Analysis								
			Metals	PHCs	VOCs	PAHs	PFAS	PCBs	Lead Paint	Ions	Gen Chem
Soil											
Sediment											
Surface Water											
Groundwater		2	4	2				2		2	2
Vegetation											
Grain Size											
Building Material											
Other											

Photographs

Photo 1 – Sampling MW-3, facing south

Photo 2 – MW-3, facing east

Photo 3 – NHWL cap, facing north

Photo 4 – Ponding near the NW portion of the NHWL, facing northeast

Other Notes/Comments	The drive to and around site was done with three ATVs today to avoid getting the truck stuck. ATVs were a lot better suited for this project and it is recommended that it be the preferred mode of transport for future LTM events, at Cape Christian especially if the road access to site is still closed.
Prepared by (print):	Daniel Nastas

NATURAL ENVIRONMENT CHECKLIST

Date:		August 11 and 12 2021	
Site:		Cape Christian	
Note	**Response**	**Extent**	**Description**
	Y/N	Provide information as applicable (i.e. length/width/depth/type)	Features of note, photographic reference with scale, point of view and direction.
Wildlife Sightings	N	- None observed	
Evidence of Wildlife	N	- None observed	
Wildlife Activity	Y	- Hunting - Polar bears and foxes pass through	From interview
Relative Number	Y	- Mr. Lasalie reported that to his knowledge, the polar bear and fox population in the area is similar to previous years	From Interview
Evidence of Revegetation	N	- Limited to no revegetation observed on the landfill	Photo 4, 30, 32

Wildlife Monitor Notes

- Potential Wildlife:
    - Polar bears and foxes
- Region used for hunting.

VISUAL MONITORING CHECKLIST

Date:		August 11 and 12, 2021	
Landfill Location:		Cape Christian	
Note	**Response**	**Extent**	**Description**
	Y/N	Provide information as applicable (i.e. length/width/depth/type)	Features of note, photographic reference with scale, point of view and direction.
Evidence of Settlement	Y	Observed to the north, east and west of the site (see fig 2)	Photos 6, 7, 8, 9, 10, 12, 35, 36 and 38
Evidence of Erosion	Y	Sand on top of the boulders observed on north berm	Photo 37
Evidence of Frost Action	N	None observed	
Animal Burrows	N	None observed	
Vegetation Present	Y	Sparse grass and small plants found surrounding the landfill. Limited to no vegetation observed on the landfill	Photos 4, 5, 6, 13, 30, 32, 38
Vegetation Stresses	N	None observed	
Staining Present	Y	Some red staining observed to the west and north of the NHWL.	Photos 6 and 11
Seepage Points	Y	Possible seepage points to the north of the landfill. Some metallic sheening observed on ponded water north of the landfill.	Photos 6, 7, 8 ,36 and 37
Exposed Debris	Y	Some metal debris found north of the NHWL.	Photo 5a
Condition of Instruments	Y	Generally in good condition, some frost heaving observed at MW1, MW2 and MW4	Photos 22 and 25
Other Features	N		

APPENDIX B

Site Photographs

Photo 1: Cape Christian Plaque, located at the entrance to the site, east of the landfill.

Photo 2: Driving along the shoreline due to the roadway access being closed/destroyed, resulting in truck getting stuck.

Photo 3: East of MW3, facing west.

Photo 4: Top of the NHWL, facing north.

Photo 5: Feature T and northeast corner of the NHWL, facing southwest.

Photo 5a: Feature T, facing northeast.

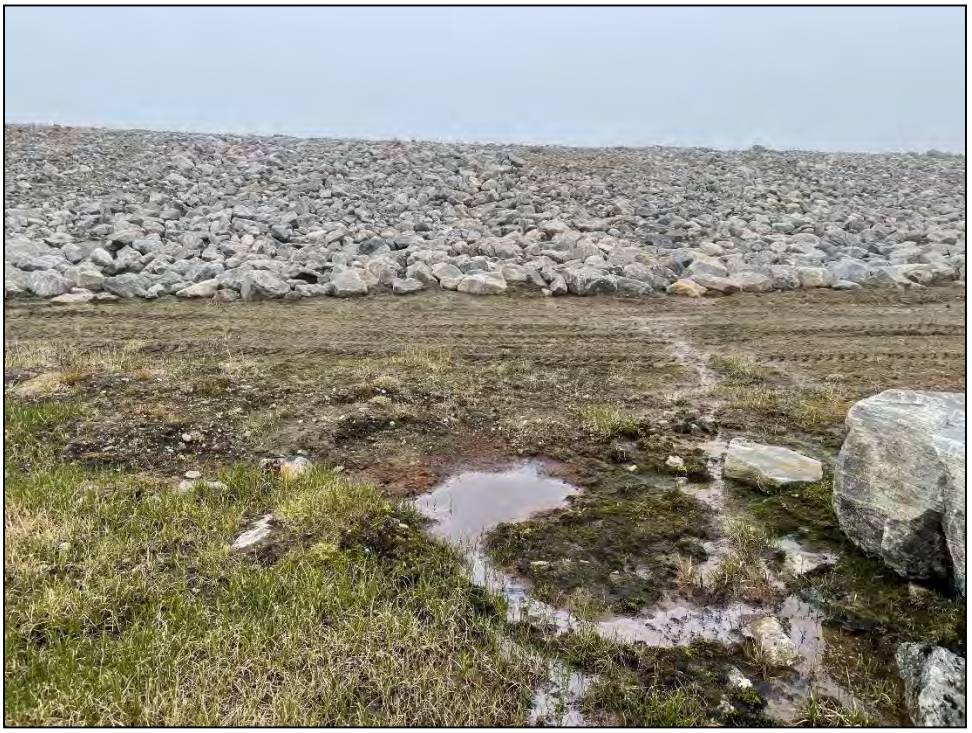

Photo 6: Ponded water north of the NHWL (Feature L), facing south.

Photo 7: Ponded water north of the NHWL (Feature M), facing southwest.

Photo 8: Ponded water north of the NHWL (Feature N), facing south.

Photo 9: Ponded water west of the NHWL (Feature A), facing east.

Photo 10: Ponded water west of the NHWL (Feature C), facing east.

Photo 11: Staining west of the NHWL (Feature P), facing north.

Photo 12: Ponded water southwest of the NHWL (Feature E and F), facing southeast.

Photo 13: Area south of the NHWL, facing south.

Photo 14: East of the NHWL, facing south.

Photo 15a: East of the NHWL, facing northeast.

Photo 15b: Feature O, facing southeast.

Photo 16: Path entering the site from the east, facing southeast.

Photo 17: staining (Feature P) and western berm of the NHWL, facing east.

Photo 18: Southeast corner of the NHWL, facing north.

Photo 19: MW3.

Photo 35: Ponded water to the southwest of the NHWL (Feature G), facing northwest.

Photo 36: Ponded water to the northeast of the NHWL (Feature K), facing south.

Photo 37: Sign of erosion on the northern berm (Feature U), facing south.

Photo 38: Ponded water to the northeast of the NHWL (Feature I), facing southwest.

APPENDIX C

Additional Site Photographs

Photo 20

Photo 21

Photo 22

Photo 23

Photo 24

Photo 25

Photo 26

Photo 27

Photo 28

Photo 29

Photo 30

Photo 32

Photo 34

APPENDIX D

Groundwater Sampling Logs

Water Sampling Log

Project Number: 210553 **Date:** 2021-Aug-11 **Samplers Names:** Alexandra Polera and Daniel Nastas

Location: Cape Christian **Start** 18:24 **End** 19:04 **Sample Type: GW**

Well ID	Depth to Bottom	Water Level Depth	Well Volume	Comments	DO	ORP	Temp	pH	Cond	Turbidity	TDS
eg. MW-19-01	mbtp	mbtp	Litres=H(m)x2.03	Colour, sheen, odour, etc	mg/L	mV	C		ms/cm	NTU	g/L
MW1	1.423	1.1	0.66	No odour, clear	14.99	177	11.37	7.32	0.44	589.0	0.33
MW1	1.423	1.095	0.67	No odour, clear	14.00	152	9.15	9.23	0.52	817.0	0.33
MW1	1.423	1.105	0.65	No odour, clear	12.43	159	9.82	8.93	0.49	816.0	0.32
MW1	1.423	1.115	0.63	No odour, clear	11.48	170	9.91	8.59	0.49	817.0	0.32
MW1	1.423	1.13	0.59	No odour, clear	10.95	175	9.83	9.84	0.49	816.0	0.32
MW1	1.423	1.1	0.66	No odour, clear	7.06	178	8.27	8.41	0.49	492.0	0.32
MW1	1.423	1.12	0.62	No odour, clear	5.29	182	9.22	8.22	0.48	802.0	0.312
MW1	1.423	1.12	0.62	No odour, clear	4.85	183	9.28	8.22	0.481	831.0	0.313
MW1	1.423	1.13	0.59	No odour, clear	4.63	184	9.27	8.25	0.479	850.0	0.311

Notes:

Water Sampling Log

Project Number: 210553 **Date:** 2021-Aug-12 **Samplers Names:** Alexandra Polera and Daniel Nastas

Location: Cape Christian **Start** 16:18 **End** 16:27 **Sample Type: GW**

Well ID	Depth to Bottom	Water Level Depth	Well Volume	Comments	DO	ORP	Temp	pH	Cond	Turbidity	TDS
eg. MW-19-01	mbtp	mbtp	Litres=H(m)x2.03	Colour, sheen, odour, etc	mg/L	mV	C		ms/cm	NTU	g/L
MW2	1.380	1.07	0.63	No odour, clear	5.99	95	5.08	6.98	0.66	47.3	0.420
				minimal recharge; proceeded with sampling for risk of running well dry.							

Notes: slow recharge, therefore sampled at 4:27 pm, Initial water level was 1.38 m

Water Sampling Log

Project Number: 210553 **Date:** 2021-Aug-12 **Samplers Names:** Alexandra Polera and Daniel Nastas

Location: Cape Christian **Start** 17:32 **End** 17:55 **Sample Type: GW**

Well ID	Depth to Bottom	Water Level Depth	Well Volume	Comments	DO	ORP	Temp	pH	Cond	Turbidity	TDS
eg. MW-19-01	mbtp	mbtp	Litres=H(m)x2.03	Colour, sheen, odour, etc	mg/L	mV	C		ms/cm	NTU	g/L
MW3	1.423	1.37	0.11	No odour, clear	17.73	138	1.91	7.52	0.10	11.7	0.067
MW3	1.423	1.37	0.11	No odour, clear	13.83	156	2.03	7.31	0.11	12.5	0.068
MW3	1.423	1.38	0.09	No odour, clear	13.78	162	2.08	7.30	0.11	9.3	0.070
MW3	1.423	1.38	0.09	No odour, clear	13.52	166	2.06	7.32	0.10	9.2	0.068
MW3	1.423	1.38	0.09	No odour, clear	13.38	172	2.05	7.33	0.10	9.7	0.065

Notes:

Water Sampling Log

Project Number: 210553 **Date:** 2021-Aug-11 **Samplers Names:** Alexandra Polera and Daniel Nastas

Location: Cape Christian **Start** 14:42 **End** 15:02 **Sample Type: GW**

Well ID	Depth to Bottom	Water Level Depth	Well Volume	Comments	DO	ORP	Temp	pH	Cond	Turbidity	TDS
eg. MW-19-01	mbtp	mbtp	Litres=H(m)x2.03	Colour, sheen, odour, etc	mg/L	mV	C		ms/cm	NTU	g/L
MW4	1.485	0.71	1.57	No odour, clear	13.04	142	8.67	6.48	0.25	47.7	0.17
MW4	1.485	0.71	1.57	No odour, clear	12.69	194	5.83	6.58	0.26	46.4	0.17
MW4	1.485	0.71	1.57	No odour, clear	12.57	202	5.87	6.61	0.25	38.8	0.16
MW4	1.485	0.71	1.57	No odour, clear	11.65	216	6.55	6.51	0.25	29.3	0.16
MW4	1.485	0.71	1.57	No odour, clear	10.96	227	6.61	6.48	0.25	34.5	0.17

Notes: Collected FB1 and DUP at this location

Water Sampling Log

Project Number: 210553 **Date:** 2021-Aug-11 **Samplers Names:** Alexandra Polera and Daniel Nastas

Location: Cape Christian **Start** 20:25 **End** 19:04 **Sample Type: GW**

Well ID	Depth to Bottom	Collection Depth	Well Volume	ORP	Temp	pH	Cond
eg. MW-19-01	mbtp	mbtp	Colour, sheen, odours, etc.	mV	C		ms/cm
SW-1	N/A	Surface	Brown froth and metallic sheen on water	172	9.28	8.21	0.09

Notes: Signs of runoff or seepage from NHWL going across path and pooling at this location (~1x1 m)

Project Numl 210553 **Date:** **2021-Aug-11** **Samplers Names: Daniel Nastas**

Location: Cape Christian

Sample #	Depth (cm)	Soil Type / Consistency	Colour	Moisture	Staining / Sheen / Odour / Comments	Vapour Screening
eg. PB-A1-1	eg. 15-30	eg. Sandy Clay / Hard	eg. light brown	eg. Very Moist	eg. Strong chemical odour	ppb
SS-1	0-15 cm	SAND, fine-medium	Red to brown	Saturated	Red staining	N/A
notes	SS-DUP collected at this location					

APPENDIX E

Chemistry Tables and Laboratory Certificates

CIRNAC - Cape Christian LTM 2021 - 210553 Table E-1: Analytical Chemistry Results for PHCs (F1 - F2) and BTEXs in Groundwater (GW)				GW	GW	GW	GW	GW	GW	GW
				MW1	MW2	MW3	MW4	DUP	FB1	Trip Blank
Parameter	Units	RDL	Criteria 1	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian
				BluMetric	BluMetric	BluMetric	BluMetric	BluMetric	BluMetric	BluMetric
			FCSAP-T1-Coarse-RP	08/11/2021	08/12/2021	08/12/2021	08/11/2021	08/11/2021	08/11/2021	08/11/2021
F1 (C6-C10)	µg/L	25	810	<25	<25	<25	<25	<25	<25	<25
F1-BTEX	µg/L	25	810	<25	<25	<25	<25	<25	<25	<25
F2 (C10-C16)	µg/L	100	1300	<100	<100	<100	<100	<100	<100	<100
Benzene	µg/L	0.2	140	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	0.1	11000	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Toluene	µg/L	0.2	83	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
ortho-Xylene	µg/L	0.1	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
meta- & para-Xylene	µg/L	0.2	-	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Xylenes	µg/L	0.2	3900	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20

Notes:

Underline	indicates detection limit exceeds criteria
Grey	indicates detected concentration exceeds criteria 1
Criteria 1	FCSAP Guidance Document on Federal Interim Groundwater Quality Guildelines for Federal Contaminated Sites (FIGQG), 2016
RDL	Refers to laboratory detection limit which may vary between sample locations and event

CIRNAC - Cape Christian LTM 2021 - 210553 Table E-2: Analytical Chemistry Results for PCBs in Groundwater (GW)				GW	GW	GW	GW	GW	GW	GW
				MW1	MW2	MW3	MW4	DUP	FB1	Trip Blank
Parameter	Units	RDL	Criteria 1	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian
				BluMetric	BluMetric	BluMetric	BluMetric	BluMetric	BluMetric	BluMetric
			FCSAP-T1-Coarse-RP	08/11/2021	08/12/2021	08/12/2021	08/11/2021	08/11/2021	08/11/2021	08/11/2021
PCBs										
Total PCBs	µg/L	0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Notes:

Underline	indicates detection limit exceeds criteria
Grey	indicates detected concentration exceeds criteria 1
Criteria 1	FCSAP Guidance Document on Federal Interim Groundwater Quality Guildelines for Federal Contaminated Sites (FIGQG), 2016
RDL	Refers to laboratory detection limit which may vary between sample locations and event

CIRNAC - Cape Christian LTM 2021 - 210553 Table E-3: Analytical Chemistry Results for Metals and Inorganics (Total) in Groundwater (GW)				GW	GW	GW	GW	GW	GW	GW
				MW1	MW2	MW3	MW4	DUP	FB1	Trip Blank
Parameter	Units	RDL	Criteria 1	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian
			FCSAP-T1-Coarse-RP	BluMetric	BluMetric	BluMetric	BluMetric	BluMetric	BluMetric	BluMetric
				08/11/2021	08/12/2021	08/12/2021	08/11/2021	08/11/2021	08/11/2021	08/11/2021
Total Metals										
Aluminum (Al)-Total	mg/L	0.010	0.1	0.966	0.414	0.353	1.74	1.89	<0.010	<0.010
Arsenic (As)-Total	mg/L	0.003	0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium (Ba)-Total	mg/L	0.002	0.5	0.028	0.038	0.006	0.016	0.016	<0.002	<0.002
Beryllium (Be)-Total	mg/L	0.0005	0.0053	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron (B)-Total	mg/L	0.010	1.5	0.033	0.011	<0.010	0.044	0.045	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	0.0001	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (Cr)-Total	mg/L	0.003	0.0089	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt (Co)-Total	mg/L	0.0005	-	<0.0005	0.014	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper (Cu)-Total	mg/L	0.001	0.004	0.003	0.005	0.007	0.002	0.002	<0.001	<0.001
Lead (Pb)-Total	mg/L	0.001	0.007	0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001
Molybdenum (Mo)-Total	mg/L	0.002	0.073	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel (Ni)-Total	mg/L	0.003	0.15	<0.003	0.018	<0.003	<0.003	<0.003	<0.003	<0.003
Selenium (Se)-Total	mg/L	0.002	0.001	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (Ag)-Total	mg/L	0.0001	0.00025	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Thallium (Tl)-Total	mg/L	0.0003	0.0008	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Uranium (U)-Total	mg/L	0.0005	0.015	0.0041	<0.0005	<0.0005	0.0009	0.0009	<0.0005	<0.0005
Vanadium (V)-Total	mg/L	0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc (Zn)-Total	mg/L	0.005	0.01	0.006	0.031	<0.005	0.007	0.006	<0.005	<0.005

Notes:

Underline	indicates detection limit exceeds criteria
Grey	indicates detected concentration exceeds criteria 1
Criteria 1	FCSAP Guidance Document on Federal Interim Groundwater Quality Guildelines for Federal Contaminated Sites (FIGQG), 2016
RDL	Refers to laboratory detection limit which may vary between sample locations and event

CIRNAC - Cape Christian LTM 2021 - 210553 Table E-4: Analytical Chemistry Results for Metals and Inorganics (Dissolved) in Groundwater (GW)				GW	GW	GW	GW	GW	GW	GW
				MW1	MW2	MW3	MW4	DUP	FB1	Trip Blank
Parameter	Units	RDL	Criteria 1	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian
			FCSAP-T1-Coarse-RP	BluMetric	BluMetric	BluMetric	BluMetric	BluMetric	BluMetric	BluMetric
				08/11/2021	08/12/2021	08/12/2021	08/11/2021	08/11/2021	08/11/2021	08/11/2021
Dissolved Metals										
Antimony (Sb)-Dissolved	µg/L	1	2000	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic (As)-Dissolved	µg/L	1	5	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Barium (Ba)-Dissolved	µg/L	2	500	18.2	29.2	4.5	10.5	10.8	<2.0	<2.0
Beryllium (Be)-Dissolved	µg/L	0.5	5.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Boron (B)-Dissolved	µg/L	10	1500	31	15.1	12.7	54.7	46.1	<10.0	<10.0
Cadmium (Cd)-Dissolved	µg/L	0.2	0.09	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Chromium (Cr)-Dissolved	µg/L	2	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Cobalt (Co)-Dissolved	µg/L	0.5	-	<0.50	11.4	<0.50	<0.50	<0.50	<0.50	<0.50
Copper (Cu)-Dissolved	µg/L	1	4	3.7	4.7	7.4	2.2	2.1	<1.0	<1.0
Lead (Pb)-Dissolved	µg/L	0.5	7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Molybdenum (Mo)-Dissolved	µg/L	0.5	73	2.07	0.53	<0.50	0.74	0.78	<0.50	<0.50
Nickel (Ni)-Dissolved	µg/L	3	150	<3.0	13.4	<3.0	<3.0	<3.0	<3.0	<3.0
Selenium (Se)-Dissolved	µg/L	1	1	<1.0	1.8	<1.0	<1.0	<1.0	<1.0	<1.0
Silver (Ag)-Dissolved	µg/L	0.2	0.25	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Thallium (Tl)-Dissolved	µg/L	0.3	0.8	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Uranium (U)-Dissolved	µg/L	0.5	15	3.24	<0.50	<0.50	0.52	<0.50	<0.50	<0.50
Vanadium (V)-Dissolved	µg/L	0.4	-	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Zinc (Zn)-Dissolved	µg/L	5	10	<5.0	23.4	<5.0	<5.0	<5.0	<5.0	<5.0

Notes:

Underline	indicates detection limit exceeds criteria
Grey	indicates detected concentration exceeds criteria 1

Criteria 1 FCSAP Guidance Document on Federal Interim Groundwater Quality Guildelines for Federal Contaminated Sites (FIGQG), 2016

RDL Refers to laboratory detection limit which may vary between sample locations and event

CIRNAC - Cape Christian LTM 2021 - 210553 Table E-5: Analytical Chemistry Results for General Chemistry in Groundwater (GW)				GW	GW	GW	GW	GW	GW	GW
				MW1	MW2	MW3	MW4	DUP	FB1	Trip Blank
Parameter	Units	RDL	Criteria 1	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian	Cape Christian
			FCSAP-T1-Coarse-RP	BluMetric	BluMetric	BluMetric	BluMetric	BluMetric	BluMetric	BluMetric
				08/11/2021	08/12/2021	08/12/2021	08/11/2021	08/11/2021	08/11/2021	08/11/2021
General Chemistry										
Conductivity	uS/cm	2	-	618	992	99	290	284	<2	<2
Hardness (as CaCO3)	mg/L	0.5	-	169	258	23.7	58.5	57.1	<0.5	<0.5
pH	pH	n/a	6.5-9	8.23	7.44	7.41	7.63	7.52	6.58	6
Total Suspended Solids	mg/L	10	-	<10	<10	<10	10	<10	<10	<10
Total Dissolved Solids	mg/L	10	-	312	530	66	198	232	<10	<10
Chloride (Cl)	mg/L	0.1	120	34.6	183	11.3	40.8	41.6	<0.10	<0.10
Fluoride (F)	mg/L	0.05	0.12	0.19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate (as N)	mg/L	0.05	13	<0.05	1.24	0.52	1.52	1.54	<0.05	<0.05
Nitrite (as N)	mg/L	0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulfate (SO4)	mg/L	0.01	100	25.3	27.6	5.65	24.8	24.9	<0.10	<0.10

Notes:

Underline	indicates detection limit exceeds criteria
Grey	indicates detected concentration exceeds criteria 1

Criteria 1 FCSAP Guidance Document on Federal Interim Groundwater Quality Guildelines for Federal Contaminated Sites (FIGQG), 2016

RDL Refers to laboratory detection limit which may vary between sample locations and event

CIRNAC - Cape Christian LTM 2021 - 210553 Table E-6: Analytical Chemistry Results for PHCs and BTEX in Surface Water (SW)				SW
				SW-1
Parameter	Units	RDL	Criteria 1	Cape Christian
				BluMetric
			CWQG Freshwater	08/11/2021
PHCs and BTEXs				
F1 (C6-C10)	ug/L	25	-	<25
F1-BTEX	ug/L	25	-	<25
F2 (C10-C16)	ug/L	100	-	<100
Benzene	ug/L	0.2	370	<0.20
Ethylbenzene	ug/L	0.1	90	<0.10
Toluene	ug/L	0.2	2	3.92
ortho-Xylene	ug/L	0.1	NV	<0.10
meta- & para-Xylene	ug/L	0.2	NV	<0.20
Total Xylenes	ug/L	0.2	74	<0.20

Notes:

Underline	indicates detection limit exceeds criteria
Grey	indicates detected concentration exceeds criteria 1

Criteria 1 Canadian Council of Members of the Environment (CCME), Canadian Water Quality Guidelines (CWQG) for the Protection of Aquatic Life. Longterm Exposure, Freshwater. (CCME, 2007, with updates)

RDL Refers to laboratory detection limit which may vary between sample locations and event

NV No Value

CIRNAC - Cape Christian LTM 2021 - 210553 Table E-7: Analytical Chemistry Results for PCBs in Surface Water (SW)				SW
				SW-1
Parameter	Units	RDL	Criteria 1	Cape Christian
			CWQG Freshwater	BluMetric
				08/11/2021
PCBs				
Total PCBs	mg/L	0.1	-	<0.1

Notes:

Underline	indicates detection limit exceeds criteria
Grey	indicates detected concentration exceeds criteria 1

Criteria 1 Canadian Council of Members of the Environment (CCME), Canadian Water Quality Guidelines (CWQG) for the Protection of Aquatic Life. Longterm Exposure, Freshwater. (CCME, 2007, with updates)

RDL Refers to laboratory detection limit which may vary between sample locations and event

CIRNAC - Cape Christian LTM 2021 - 210553 Table E-8: Analytical Chemistry Results for Metals and Inorganics (Total) in Surface Water (SW)				SW
				SW-1
Parameter	Units	RDL	Criteria 1	Cape Christian
			CWQG Freshwater	BluMetric
				08/11/2021
Total Metals				
Hardness	mg/L	0.004	-	82.5
Aluminum (Al)-Total	mg/L	0.004	-	0.03
Arsenic (As)-Total	mg/L	0.003	0.005	<0.003
Barium (Ba)-Total	mg/L	0.002	-	0.028
Beryllium (Be)-Total	mg/L	0.0005	-	<0.0005
Boron (B)-Total	mg/L	0.010	-	0.022
Cadmium (Cd)-Total	mg/L	0.0001	0.00009[1]	<0.0001
Chromium (Cr)-Total	mg/L	0.003	-	<0.003
Cobalt (Co)-Total	mg/L	0.0005	-	0.0039
Copper (Cu)-Total	mg/L	0.001	-	0.006
Lead (Pb)-Total	mg/L	0.001	0.007[2]	0.001
Molybdenum (Mo)-Total	mg/L	0.002	-	<0.002
Nickel (Ni)-Total	mg/L	0.003	0.15[3]	0.004
Selenium (Se)-Total	mg/L	0.002	-	<0.002
Silver (Ag)-Total	mg/L	0.0001	-	<0.0001
Thallium (Tl)-Total	mg/L	0.0003	-	<0.0003
Uranium (U)-Total	mg/L	0.0005	-	<0.0005
Vanadium (V)-Total	mg/L	0.002	-	<0.002
Zinc (Zn)-Total	mg/L	0.005	7	0.093

Notes:

Underline	indicates detection limit exceeds criteria
Grey	indicates detected concentration exceeds criteria 1

Criteria 1 Canadian Council of Members of the Environment (CCME), Canadian Water Quality Guidelines (CWQG) for the Protection of Aquatic Life. Longterm Exposure, Freshwater. (CCME, 2007, with updates)

RDL Refers to laboratory detection limit which may vary between sample locations and event

1 If Hardness > 280 mg/L CWQG is 0.37 ug/L, if hardness is < 17 mg/L CWQG is 0.04 ug/L, if hardness is > 17 and < 280 mg/L CWQG is calculated.

2 If Hardness > 180 mg/L CWQG is 7 ug/L, if hardness if < 60 mg/L CWQG is 1 ug/L, if hardness is > 60 and < 180 mg/L the CWQG is calculated.

3 If Hardness > 180 mg/L CWQG is 150 ug/L, if hardness if < 60 mg/L CWQG is 25 ug/L, if hardness is > 60 and < 180 mg/L the CWQG is calculated.

CIRNAC - Cape Christian LTM 2021 - 210553 Table E-9: Analytical Chemistry Results for General Chemistry in Surface Water (SW)				SW
				SW-1
Parameter	Units	RDL	Criteria 1	Cape Christian
			CWQG Freshwater	BluMetric
				08/11/2021
General Chemistry				
Conductivity	uS/cm	2	-	236
Hardness (as CaCO3)	mg/L	0.5	-	82.5
pH	pH	N/A	6.5-9	7.59
Total Suspended Solids	mg/L	3	-	<10
Total Dissolved Solids	mg/L	13	-	168
Chloride (Cl)	mg/L	0.5	120	14.2
Fluoride (F)	mg/L	0.02	0.12	<0.05
Nitrate (as N)	mg/L	0.005	3	<0.05
Nitrite (as N)	mg/L	0.001	-	<0.05
Sulfate (SO4)	mg/L	0.3	-	4.47

Notes:

Underline	indicates detection limit exceeds criteria
Grey	indicates detected concentration exceeds criteria 1

Criteria 1 Canadian Council of Members of the Environment (CCME), Canadian Water Quality Guidelines (CWQG) for the Protection of Aquatic Life. Longterm Exposure, Freshwater. (CCME, 2007, with updates)

RDL Refers to laboratory detection limit which may vary between sample locations and event

CIRNAC - Cape Christian LTM 2021 - 210553
Table E-10:
Analytical Chemistry Results for PHCs and BTEX in Soil (SS)

PARAMETER	Units	RDL	Criteria 1	Criteria 2	SS-1	SS-DUP
Sample ID			CCME [1] Residential/ Parkland	CWS for PHC in Soil (<1.5 m)[2]		
Date					2021-08-11	2021-08-11
Depth (m)					0 - 0.15 m	0 - 0.15 m
Benzene	µg/g	0.02	0.03	-	<0.02	<0.02
Toluene	µg/g	0.02	0.37	-	<0.05	<0.05
Ethylbenzene	µg/g	0.02	0.082	-	<0.05	<0.05
ortho Xylene	µg/g	0.02	ns	-	<0.05	<0.05
para and meta Xylene	µg/g	0.04	ns	-	<0.05	<0.05
Total Xylenes	µg/g	0.04	11	-	<0.05	<0.05
F1 (C6-C10)	µg/g	5	-	-	<5	<5
F1 (C6-C10) - BTEX	µg/g	5	-	30 (210)	<5	<5
F2 (C10-C16 Hydrocarbons)	µg/g	10	-	150 (150)	<10	<10
F3 (C16-C34 Hydrocarbons)	µg/g	50	-	300 (300)	<50	<50
F4 (C34-C50 Hydrocarbons)	µg/g	50	-	2800 (2800)	<50	<50
Reached Baseline at C50	µg/g	N/A	N/A	N/A	Yes	Yes

Notes:

Underline	indicates detection limit exceeds criteria
Grey	indicates detected concentration exceeds criteria 1
RED	indicates detected concentration exceeds criteria 2

RDL - Reporting Detection Limit

µg/g - micrograms per gram

[1] CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 1. Canadian Soil Quality Guidelines, Residential / Parkland Use, coarse-grained soils.

[2] CCME Canadian-Wide Standards for Petroleum Hydrocarbons in Soil - Table 1, Tier 1 levels for PHCs, Residential / Parkland Use in coarse-grained surface soils. (2008) Protection of Eco Soil Contact from Table 1 - Technical Supplement.

ns - No Standard

CIRNAC - Cape Christian LTM 2021 - 210553
Table E-11:
Analytical Chemistry Results for PCBs in Soil (SS)

PARAMETER	Units	RDL	Criteria 1	Criteria 2	SS-1	SS-DUP
Sample ID			CCME[1] Residential/ Parkland	INAC DEW Line Cleanup Criteria, Tier II[2]		
Date					2021-08-11	2021-08-11
Depth (m)					0 - 0.15 m	0 - 0.15 m
Polychlorinated Biphenyls						
Total PCB	ug/g	0.1	1.3	5	<0.1	<0.1

Notes:

Underline	indicates detection limit exceeds criteria
Grey	indicates detected concentration exceeds criteria 1
RED	indicates detected concentration exceeds criteria 2

µg/g - micrograms per gram

RDL - Reporting Detection Limit

[1] CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 1. Canadian Soil Quality Guidelines, Residential / Parkland Use, coarse-grained soils.

[2] Abandoned Military Site Remediation Protocol. Table 1. DEW Line Cleaup Criteria (DCC) for soil. DCC Tier II.

ns - No Standard

CIRNAC - Cape Christian LTM 2021 - 210553
Table E-12:
Analytical Chemistry Results for Metals in Soil (SS)

PARAMETER	Units	RDL	Critera 1	Criteria 2	SS-1	SS-DUP
Sample ID						
Date			CCME[1] Residential/	INAC DEW Line Cleanup Criteria, Tier II[2]	2021-08-11	2021-08-11
Depth (m)					0 - 0.15 m	0 - 0.15 m
Metals						
Arsenic (As)	ug/g	1	12	30	<1	<1
Cadmium (Cd)	ug/g	0.5	10	5	<0.5	<0.5
Chromium (Cr)	ug/g	5	64	250	42	47
Cobalt (Co)	ug/g	0.5	50	50	4.6	4.6
Lead (Pb)	ug/g	1	140	500	3	3
Nickel (Ni)	ug/g	1	45	100	6	6
Zinc (Zn)	ug/g	5	200	500	16	14
Physical Properties						
Moisture (%)	%	1	ns	ns	7.1	7.7

Notes:

Underline	indicates detection limit exceeds criteria
Grey	indicates detected concentration exceeds criteria 1
RED	indicates detected concentration exceeds criteria 2

µg/g - micrograms per gram

[1] CCME Canadian Soil Quality Guidelines, Residential / Parkland Use, coarse-grained soils.

[2] Abandoned Military Site Remediation Protocol. Table 1. DEW Line Cleaup Criteria (DCC) for soil. DCC Tier II.

ns - No Standard

CIRNAC - Cape Christian LTM 2021 - 210553
Table E-13:
Relative Percent Difference of Groundwater (GW) and Soil Sample (SS) Field Duplicates

Parameter		RDL	MW4	DUP	RPD (%)		RDL	SS-1	SS-DUP	RPD (%)
PHC	**unit**					**unit**				
F1 (C6-C10)	ug/L	25	<25	<25	**NA**	ug/g	5	<5	<5	**NA**
F1-BTEX	ug/L	25	<25	<25	**NA**	ug/g	5	<5	<5	**NA**
F2 (C10-C16)	ug/L	100	<100	<100	**NA**	ug/g	10	<10	<10	**NA**
F3 (C16-C34)	-	-	-	-	**NA**	ug/g	50	<50	<50	**NA**
F4 (C34-C50)	-	-	-	-	**NA**	ug/g	50	<50	<50	**NA**
Benzene	ug/L	0.2	<0.20	<0.20	**NA**	ug/g	0.02	<0.02	<0.02	**NA**
Ethylbenzene	ug/L	0.1	<0.10	<0.10	**NA**	ug/g	0.05	<0.05	<0.05	**NA**
Toluene	ug/L	0.2	<0.20	<0.20	**NA**	ug/g	0.05	<0.05	<0.05	**NA**
ortho-Xylene	ug/L	0.1	<0.10	<0.10	**NA**	ug/g	0.05	<0.05	<0.05	**NA**
meta- & para-Xylene	ug/L	0.2	<0.20	<0.20	**NA**	ug/g	0.05	<0.05	<0.05	**NA**
Total Xylenes	ug/L	0.2	<0.20	<0.20	**NA**	ug/g	0.05	<0.05	<0.05	**NA**
PCBs										
Total PCBs	mg/L	0.1	<0.1	<0.1	**NA**	ug/g	0.1	<0.1	<0.1	**NA**
TOTAL METALS										
Aluminum (Al)-Total	mg/L	0.5	1.74	1.89	**8.26%**	-	-	-	-	**NA**
Arsenic (As)-Total	mg/L	0.010	<0.003	<0.003	**NA**	ug/g	1	<1	<1	**NA**
Barium (Ba)-Total	mg/L	0.003	0.016	0.016	**0.00%**	-	-	-	-	**NA**
Beryllium (Be)-Total	mg/L	0.002	<0.0005	<0.0005	**NA**	-	-	-	-	**NA**
Boron (B)-Total	mg/L	0.0005	0.044	0.045	**2.25%**	-	-	-	-	**NA**
Cadmium (Cd)-Total	mg/L	0.010	<0.0001	<0.0001	**NA**	ug/g	0.5	<0.5	<0.5	**NA**
Chromium (Cr)-Total	mg/L	0.0001	<0.003	<0.003	**NA**	ug/g	5	42	47	**11.24%**
Cobalt (Co)-Total	mg/L	0.003	<0.0005	<0.0005	**NA**	ug/g	0.5	4.6	4.6	**0.00%**
Copper (Cu)-Total	mg/L	0.0005	0.002	0.002	**0.00%**	-	-	-	-	**NA**
Lead (Pb)-Total	mg/L	0.001	0.001	0.001	**0.00%**	ug/g	1	3	3	**0.00%**
Molybdenum (Mo)-Total	mg/L	0.001	<0.002	<0.002	**NA**	-	-	-	-	**NA**
Nickel (Ni)-Total	mg/L	0.002	<0.003	<0.003	**NA**	ug/g	1	6	6	**0.00%**
Selenium (Se)-Total	mg/L	0.003	<0.002	<0.002	**NA**	-	-	-	-	**NA**
Silver (Ag)-Total	mg/L	0.002	<0.0001	<0.0001	**NA**	-	-	-	-	**NA**
Thallium (Tl)-Total	mg/L	0.0001	<0.0003	<0.0003	**NA**	-	-	-	-	**NA**
Uranium (U)-Total	mg/L	0.0003	0.0009	0.0009	**0.00%**	-	-	-	-	**NA**
Vanadium (V)-Total	mg/L	0.0005	<0.002	<0.002	**NA**	-	-	-	-	**NA**
Zinc (Zn)-Total	mg/L	0.002	0.007	0.006	**15.38%**	ug/g	5	16	14	**13.33%**
DISSOLVED METALS										
Antimony (Sb)-Dissolved	ug/L	1	<1.0	<1.0	**NA**	-	-	-	-	**NA**
Arsenic (As)-Dissolved	ug/L	1	<1.0	<1.0	**NA**	-	-	-	-	**NA**
Barium (Ba)-Dissolved	ug/L	2	10.5	10.8	**2.82%**	-	-	-	-	**NA**
Beryllium (Be)-Dissolved	ug/L	0.5	<0.50	<0.50	**NA**	-	-	-	-	**NA**
Boron (B)-Dissolved	ug/L	10	54.7	46.1	**17.06%**	-	-	-	-	**NA**
Cadmium (Cd)-Dissolved	ug/L	0.2	<0.20	<0.20	**NA**	-	-	-	-	**NA**
Chromium (Cr)-Dissolved	ug/L	2	<2.0	<2.0	**NA**					
Cobalt (Co)-Dissolved	ug/L	0.5	<0.50	<0.50	**NA**	-	-	-	-	**NA**
Copper (Cu)-Dissolved	ug/L	1	2.2	2.1	**4.65%**	-	-	-	-	**NA**
Lead (Pb)-Dissolved	ug/L	0.5	<0.50	<0.50	**NA**	-	-	-	-	**NA**
Molybdenum (Mo)-Dissolved	ug/L	0.5	0.74	0.78	**5.26%**	-	-	-	-	**NA**
Nickel (Ni)-Dissolved	ug/L	3	<3.0	<3.0	**NA**	-	-	-	-	**NA**
Selenium (Se)-Dissolved	ug/L	1	<1.0	<1.0	**NA**	-	-	-	-	**NA**
Silver (Ag)-Dissolved	ug/L	0.2	<0.20	<0.20	**NA**	-	-	-	-	**NA**
Thallium (Tl)-Dissolved	ug/L	0.3	<0.30	<0.30	**NA**	-	-	-	-	**NA**
Uranium (U)-Dissolved	ug/L	0.5	0.52	<0.50	**NA**	-	-	-	-	**NA**
Vanadium (V)-Dissolved	ug/L	0.4	<0.40	<0.40	**NA**	-	-	-	-	**NA**
Zinc (Zn)-Dissolved	ug/L	5	<5.0	<5.0	**NA**	-	-	-	-	**NA**
General Chemistry										
Conductivity	uS/cm	2	290	284	**2.09%**	-	-	-	-	**NA**
Hardness (as CaCO3)	mg/L	0.5	58.5	57.1	**1%**	-	-	-	-	**NA**
pH	pH	0.1	7.63	7.52	**1%**	-	-	-	-	**NA**
Total Suspended Solids	mg/L	3	10	<10	**NA**	-	-	-	-	**NA**
Total Dissolved Solids	mg/L	13	198	232	**1%**	-	-	-	-	**NA**
Chloride (Cl)	mg/L	0.5	40.8	41.6	**1%**	-	-	-	-	**NA**
Fluoride (F)	mg/L	0.02	<0.05	<0.05	**NA**	-	-	-	-	**NA**
Nitrate (as N)	mg/L	0.005	1.52	1.54	**1%**	-	-	-	-	**NA**
Nitrite (as N)	mg/L	0.001	<0.05	<0.05	**NA**	-	-	-	-	**NA**
Sulfate (SO4)	mg/L	0.3	24.8	24.9	**1%**	-	-	-	-	**NA**

Notes:
RDL indicates reported detection limit
RPD indicates relative percent difference
N/A indicates RPD is not applicable as the concentrations of at least one duplicate sample was non-detected or measured at a concentration less than 5 times the RDL

Bold and Red	The CCME recommends that Relative Percent Difference (RPD) values less than 40% are considered acceptable for groundwater samples and less than 60% for soil samples.

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CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.
4 Cataraqui Street
Kingston, ON K7K1Z7
(613) 531-2725
ATTENTION TO: Paul Bandler
PROJECT: 210553
AGAT WORK ORDER: 21Z789347
SOIL ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician
TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist
WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer
DATE REPORTED: Aug 26, 2021
PAGES (INCLUDING COVER): 24
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
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- *The test results reported herewith relate only to the samples as received by the laboratory.*
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- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*

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AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

Metals in Soil

DATE RECEIVED: 2021-08-17

DATE REPORTED: 2021-08-26

				SAMPLE DESCRIPTION:	SS-1	SS-DUP
				SAMPLE TYPE:	Soil	Soil
				DATE SAMPLED:	2021-08-11 11:30	2021-08-11 11:30
Parameter	Unit	G / S	RDL		2867010	2867013
Arsenic	µg/g		1		<1	<1
Cadmium	µg/g		0.5		<0.5	<0.5
Chromium	µg/g		5		42	47
Cobalt	µg/g		0.5		4.6	4.6
Lead	µg/g		1		3	3
Nickel	µg/g		1		6	6
Zinc	µg/g		5		16	14

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Toronto (unless marked by *)

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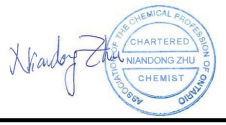

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AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2021-08-17

DATE REPORTED: 2021-08-26

				SAMPLE DESCRIPTION:	SS-1	SS-DUP
				SAMPLE TYPE:	Soil	Soil
				DATE SAMPLED:	2021-08-11 11:30	2021-08-11 11:30
Parameter	**Unit**	**G / S**	**RDL**		**2867010**	**2867013**
Benzene	µg/g		0.02		<0.02	<0.02
Toluene	µg/g		0.05		<0.05	<0.05
Ethylbenzene	µg/g		0.05		<0.05	<0.05
m & p-Xylene	µg/g		0.05		<0.05	<0.05
o-Xylene	µg/g		0.05		<0.05	<0.05
Xylenes (Total)	µg/g		0.05		<0.05	<0.05
F1 (C6 - C10)	µg/g		5		<5	<5
F1 (C6 to C10) minus BTEX	µg/g		5		<5	<5
F2 (C10 to C16)	µg/g		10		<10	<10
F3 (C16 to C34)	µg/g		50		<50	<50
F4 (C34 to C50)	µg/g		50		<50	<50
Gravimetric Heavy Hydrocarbons	µg/g		50		NA	NA
Moisture Content	%		0.1		16.9	23.4
Surrogate	**Unit**	**Acceptable Limits**				
Toluene-d8	% Recovery	60-140			90	86
Terphenyl	%	60-140			70	61

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Certificate of Analysis

AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2021-08-17

DATE REPORTED: 2021-08-26

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

2867010-2867013 Results are based on sample dry weight.
The C6-C10 fraction is calculated using Toluene response factor.
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Analysis performed at AGAT Toronto (unless marked by *)

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AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

PHCs F1 - F2 (Water)

DATE RECEIVED: 2021-08-17 **DATE REPORTED: 2021-08-26**

				SAMPLE DESCRIPTION:	MW1	MW2	MW3	MW4	FB1	Trip Blank	DUP	SW-1
				SAMPLE TYPE:	Water	Water	Water	Water	Water	Water	Water	Water
				DATE SAMPLED:	2021-08-11 11:30	2021-08-12 15:30	2021-08-12 15:30	2021-08-11 11:30	2021-08-11	2021-08-11 11:30	2021-08-11 11:30	2021-08-11 11:30
Parameter	**Unit**	**G / S**	**RDL**		**2866955**	**2866994**	**2866995**	**2866996**	**2866997**	**2866998**	**2866999**	**2867000**
Benzene	µg/L		0.20		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Toluene	µg/L		0.20		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	3.92
Ethylbenzene	µg/L		0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
m & p-Xylene	µg/L		0.20		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
o-Xylene	µg/L		0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Xylenes (Total)	µg/L		0.20		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
F1 (C6 - C10)	µg/L		25		<25	<25	<25	<25	<25	<25	<25	<25
F1 (C6 to C10) minus BTEX	µg/L		25		<25	<25	<25	<25	<25	<25	<25	<25
F2 (C10 to C16)	µg/L		100		<100	<100	<100	<100	<100	<100	<100	<100
Sediment					No	No	No	No	No	No	No	No
Surrogate	**Unit**	**Acceptable Limits**										
Toluene-d8	% Recovery	60-140			105	120	104	102	107	104	110	96.5
Terphenyl	% Recovery	60-140			94	97	101	98	89	80	77	88

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AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

PHCs F1 - F2 (Water)

DATE RECEIVED: 2021-08-17

DATE REPORTED: 2021-08-26

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

2866955-2867000

The C6-C10 fraction is calculated using Toluene response factor.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and nC34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16 - C50 and are only determined if the chromatogram of the C34 - C50 Hydrocarbons indicated that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6-C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153/04, results are considered valid without determining the PAH contribution if not requested by the client.
NA = Not Applicable

Sediment parameter is comment only based on visual inspection of the sample prior to extraction and is not an accredited test.

Analysis performed at AGAT Toronto (unless marked by *)

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AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

Total PCBs (soil)

DATE RECEIVED: 2021-08-17

DATE REPORTED: 2021-08-26

		SAMPLE DESCRIPTION:		**SS-1**	**SS-DUP**
		SAMPLE TYPE:		**Soil**	**Soil**
		DATE SAMPLED:		**2021-08-11 11:30**	**2021-08-11 11:30**
Parameter	**Unit**	**G / S**	**RDL**	**2867010**	**2867013**
Polychlorinated Biphenyls	µg/g		0.1	<0.1	<0.1
Moisture Content	%		0.1	16.9	23.4
Surrogate	**Unit**	**Acceptable Limits**			
Decachlorobiphenyl	%	60-130		80	100

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

2867010-2867013 Results are based on the dry weight of soil extracted.

Analysis performed at AGAT Toronto (unless marked by *)

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AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

Total PCBs (water)

DATE RECEIVED: 2021-08-17 **DATE REPORTED: 2021-08-26**

			SAMPLE DESCRIPTION:	MW1	MW2	MW3	MW4	FB1	Trip Blank	DUP	SW-1
			SAMPLE TYPE:	Water	Water	Water	Water	Water	Water	Water	Water
			DATE SAMPLED:	2021-08-11 11:30	2021-08-12 15:30	2021-08-12 15:30	2021-08-11 11:30	2021-08-11	2021-08-11 11:30	2021-08-11 11:30	2021-08-11 11:30
Parameter	**Unit**	**G / S**	**RDL**	**2866955**	**2866994**	**2866995**	**2866996**	**2866997**	**2866998**	**2866999**	**2867000**
PCBs	µg/L		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate	**Unit**	**Acceptable Limits**									
Decachlorobiphenyl	%	60-130		91	109	107	120	114	108	119	102

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopowich

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Certificate of Analysis

AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

(Water) Inorganic Chemistry

DATE RECEIVED: 2021-08-17

DATE REPORTED: 2021-08-26

		SAMPLE DESCRIPTION:		MW1		MW2		MW3	MW4	FB1	Trip Blank
		SAMPLE TYPE:		Water		Water		Water	Water	Water	Water
		DATE SAMPLED:		2021-08-11 11:30		2021-08-12 15:30		2021-08-12 15:30	2021-08-11 11:30	2021-08-11	2021-08-11 11:30
Parameter	Unit	G / S	RDL	2866955	RDL	2866994	RDL	2866995	2866996	2866997	2866998
pH	pH Units		NA	8.23	NA	7.44	NA	7.41	7.63	6.58	6.00
Total Dissolved Solids	mg/L		10	312	10	530	10	66	198	<10	<10
Total Suspended Solids	mg/L		10	<10	10	<10	10	<10	10	<10	<10
Electrical Conductivity	µS/cm		2	618	2	992	2	99	290	<2	<2
Fluoride	mg/L		0.05	0.19	0.05	<0.05	0.05	<0.05	<0.05	<0.05	<0.05
Ortho Phosphate as P	mg/L		0.10	<0.10	0.10	<0.10	0.10	<0.10	<0.10	<0.10	<0.10
Sulphate	mg/L		0.10	25.3	0.10	27.6	0.10	5.65	24.8	<0.10	<0.10
Chloride	mg/L		0.10	34.6	0.12	183	0.10	11.3	40.8	<0.10	<0.10
Nitrate as N	mg/L		0.05	<0.05	0.05	1.24	0.05	0.52	1.52	<0.05	<0.05
Nitrite as N	mg/L		0.05	<0.05	0.05	<0.05	0.05	<0.05	<0.05	<0.05	<0.05
True Colour	TCU		5	6	5	5	5	17	16	<5	<5

		SAMPLE DESCRIPTION:		DUP	SW-1
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2021-08-11 11:30	2021-08-11 11:30
Parameter	Unit	G / S	RDL	2866999	2867000
pH	pH Units		NA	7.52	7.59
Total Dissolved Solids	mg/L		10	232	168
Total Suspended Solids	mg/L		10	<10	<10
Electrical Conductivity	µS/cm		2	284	236
Fluoride	mg/L		0.05	<0.05	<0.05
Ortho Phosphate as P	mg/L		0.10	<0.10	<0.10
Sulphate	mg/L		0.10	24.9	4.47
Chloride	mg/L		0.10	41.6	14.2
Nitrate as N	mg/L		0.05	1.54	<0.05
Nitrite as N	mg/L		0.05	<0.05	<0.05
True Colour	TCU		5	14	54

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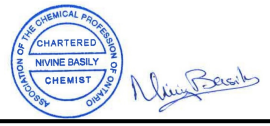

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AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

(Water) Inorganic Chemistry

DATE RECEIVED: 2021-08-17

DATE REPORTED: 2021-08-26

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

2866955-2867000 Dilution required, RDL has been increased accordingly.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

Hardness in Water (Dissolved metals) (mg/L)

DATE RECEIVED: 2021-08-17 **DATE REPORTED: 2021-08-26**

				SAMPLE DESCRIPTION:	MW1	MW2	MW3	MW4	FB1	Trip Blank	DUP
				SAMPLE TYPE:	Water	Water	Water	Water	Water	Water	Water
				DATE SAMPLED:	2021-08-11 11:30	2021-08-12 15:30	2021-08-12 15:30	2021-08-11 11:30	2021-08-11	2021-08-11 11:30	2021-08-11 11:30
Parameter	**Unit**	**G / S**	**RDL**		**2866955**	**2866994**	**2866995**	**2866996**	**2866997**	**2866998**	**2866999**
Hardness (as CaCO3) (Calculated)	mg/L		0.5		141	214	21.0	42.3	<0.5	<0.5	44.3

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

2866955-2866999 Metals analysis completed on a filtered sample.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

Hardness in Water (Total metals) (mg/L)

DATE RECEIVED: 2021-08-17

DATE REPORTED: 2021-08-26

		SAMPLE DESCRIPTION:		MW1	MW2	MW3	MW4	FB1	Trip Blank	DUP	SW-1
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		2021-08-11 11:30	2021-08-12 15:30	2021-08-12 15:30	2021-08-11 11:30	2021-08-11	2021-08-11 11:30	2021-08-11 11:30	2021-08-11 11:30
Parameter	**Unit**	**G / S**	**RDL**	**2866955**	**2866994**	**2866995**	**2866996**	**2866997**	**2866998**	**2866999**	**2867000**
Hardness (as CaCO3) (Calculated)	mg/L		0.5	169	258	23.7	58.5	<0.5	<0.5	57.1	82.5

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

O. Reg. 153(511) - Metals (Including Hydrides) (Water) - Lab Filtered

DATE RECEIVED: 2021-08-17 **DATE REPORTED: 2021-08-26**

				SAMPLE DESCRIPTION:	MW1	MW2	MW3	MW4	FB1	Trip Blank	DUP
				SAMPLE TYPE:	Water	Water	Water	Water	Water	Water	Water
				DATE SAMPLED:	2021-08-11 11:30	2021-08-12 15:30	2021-08-12 15:30	2021-08-11 11:30	2021-08-11	2021-08-11 11:30	2021-08-11 11:30
Parameter	**Unit**	**G / S**	**RDL**		**2866955**	**2866994**	**2866995**	**2866996**	**2866997**	**2866998**	**2866999**
Dissolved Antimony	µg/L		1.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dissolved Arsenic	µg/L		1.0		1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dissolved Barium	µg/L		2.0		18.2	29.2	4.5	10.5	<2.0	<2.0	10.8
Dissolved Beryllium	µg/L		0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dissolved Boron	µg/L		10.0		31.0	15.1	12.7	54.7	<10.0	<10.0	46.1
Dissolved Cadmium	µg/L		0.20		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Dissolved Chromium	µg/L		2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Dissolved Cobalt	µg/L		0.50		<0.50	11.4	<0.50	<0.50	<0.50	<0.50	<0.50
Dissolved Copper	µg/L		1.0		3.7	4.7	7.4	2.2	<1.0	<1.0	2.1
Dissolved Lead	µg/L		0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dissolved Molybdenum	µg/L		0.50		2.07	0.53	<0.50	0.74	<0.50	<0.50	0.78
Dissolved Nickel	µg/L		3.0		<3.0	13.4	<3.0	<3.0	<3.0	<3.0	<3.0
Dissolved Selenium	µg/L		1.0		<1.0	1.8	<1.0	<1.0	<1.0	<1.0	<1.0
Dissolved Silver	µg/L		0.20		<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Dissolved Thallium	µg/L		0.30		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Dissolved Uranium	µg/L		0.50		3.24	<0.50	<0.50	0.52	<0.50	<0.50	<0.50
Dissolved Vanadium	µg/L		0.40		<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Dissolved Zinc	µg/L		5.0		<5.0	23.4	<5.0	<5.0	<5.0	<5.0	<5.0
Lab Filtration Performed					2021/08/19	2021/08/19	2021/08/19	2021/08/19	2021/08/19	2021/08/19	2021/08/19

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

2866955-2866999 Metals analysis completed on a lab filtered sample.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

Total Metals in water (mg/L)

DATE RECEIVED: 2021-08-17

DATE REPORTED: 2021-08-26

		SAMPLE DESCRIPTION:		SW-1
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2021-08-11 11:30
Parameter	Unit	G / S	RDL	2867000
Aluminum-dissolved	mg/L		0.004	0.030
Total Arsenic	mg/L		0.003	<0.003
Total Barium	mg/L		0.002	0.028
Total Beryllium	mg/L		0.0005	<0.0005
Total Boron	mg/L		0.010	0.022
Total Cadmium	mg/L		0.0001	<0.0001
Total Chromium	mg/L		0.003	<0.003
Total Cobalt	mg/L		0.0005	0.0039
Total Copper	mg/L		0.001	0.006
Total Lead	mg/L		0.001	0.001
Total Molybdenum	mg/L		0.002	<0.002
Total Nickel	mg/L		0.003	0.004
Total Selenium	mg/L		0.002	<0.002
Total Silver	mg/L		0.0001	<0.0001
Total Thallium	mg/L		0.0003	<0.0003
Total Uranium	mg/L		0.0005	<0.0005
Total Vanadium	mg/L		0.002	<0.002
Total Zinc	mg/L		0.005	0.093

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certified By:

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AGAT WORK ORDER: 21Z789347

PROJECT: 210553

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

Total Metals in water (mg/L)

DATE RECEIVED: 2021-08-17

DATE REPORTED: 2021-08-26

SAMPLE DESCRIPTION:				MW1	MW2	MW3	MW4	FB1	Trip Blank	DUP
SAMPLE TYPE:				Water	Water	Water	Water	Water	Water	Water
DATE SAMPLED:				2021-08-11 11:30	2021-08-12 15:30	2021-08-12 15:30	2021-08-11 11:30	2021-08-11	2021-08-11 11:30	2021-08-11 11:30
Parameter	Unit	G / S	RDL	2866955	2866994	2866995	2866996	2866997	2866998	2866999
Total Aluminum	mg/L		0.010	0.966	0.414	0.353	1.74	<0.010	<0.010	1.89
Total Arsenic	mg/L		0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Barium	mg/L		0.002	0.028	0.038	0.006	0.016	<0.002	<0.002	0.016
Total Beryllium	mg/L		0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Boron	mg/L		0.010	0.033	0.011	<0.010	0.044	<0.010	<0.010	0.045
Total Cadmium	mg/L		0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Chromium	mg/L		0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Cobalt	mg/L		0.0005	<0.0005	0.0140	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Copper	mg/L		0.001	0.003	0.005	0.007	0.002	<0.001	<0.001	0.002
Total Lead	mg/L		0.001	0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001
Total Molybdenum	mg/L		0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Nickel	mg/L		0.003	<0.003	0.018	<0.003	<0.003	<0.003	<0.003	<0.003
Total Selenium	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Silver	mg/L		0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Thallium	mg/L		0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Total Uranium	mg/L		0.0005	0.0041	<0.0005	<0.0005	0.0009	<0.0005	<0.0005	0.0009
Total Vanadium	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Zinc	mg/L		0.005	0.006	0.031	<0.005	0.007	<0.005	<0.005	0.006

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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Quality Assurance

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 21Z789347

PROJECT: 210553

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

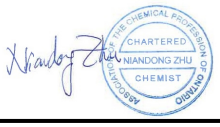
SAMPLED BY:

Soil Analysis

RPT Date: Aug 26, 2021			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Metals in Soil															
Arsenic	2867578		3	3	NA	< 1	117%	70%	130%	95%	80%	120%	104%	70%	130%
Cadmium	2867578		<0.5	<0.5	NA	< 0.5	113%	70%	130%	99%	80%	120%	102%	70%	130%
Chromium	2867578		12	12	NA	< 5	125%	70%	130%	105%	80%	120%	110%	70%	130%
Cobalt	2867578		3.6	3.6	0.0%	< 0.5	116%	70%	130%	101%	80%	120%	107%	70%	130%
Lead	2867578		16	16	0.0%	< 1	107%	70%	130%	90%	80%	120%	93%	70%	130%
Nickel	2867578		7	7	0.0%	< 1	110%	70%	130%	101%	80%	120%	106%	70%	130%
Zinc	2867578		41	41	0.0%	< 5	103%	70%	130%	99%	80%	120%	126%	70%	130%

Comments: NA Signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Certified By:



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Quality Assurance

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 21Z789347

PROJECT: 210553

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

Trace Organics Analysis

RPT Date: Aug 26, 2021			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (Soil)															
Benzene	2866087		<0.02	<0.02	NA	< 0.02	99%	60%	140%	96%	60%	140%	71%	60%	140%
Toluene	2866087		<0.05	<0.05	NA	< 0.05	88%	60%	140%	113%	60%	140%	87%	60%	140%
Ethylbenzene	2866087		<0.05	<0.05	NA	< 0.05	98%	60%	140%	82%	60%	140%	87%	60%	140%
m & p-Xylene	2866087		<0.05	<0.05	NA	< 0.05	107%	60%	140%	102%	60%	140%	108%	60%	140%
o-Xylene	2866087		<0.05	<0.05	NA	< 0.05	103%	60%	140%	96%	60%	140%	92%	60%	140%
F1 (C6 - C10)	2866087		<5	<5	NA	< 5	105%	60%	140%	104%	60%	140%	107%	60%	140%
F2 (C10 to C16)	2867804		< 10	< 10	NA	< 10	110%	60%	140%	85%	60%	140%	101%	60%	140%
F3 (C16 to C34)	2867804		< 50	< 50	NA	< 50	112%	60%	140%	86%	60%	140%	95%	60%	140%
F4 (C34 to C50)	2867804		< 50	< 50	NA	< 50	95%	60%	140%	96%	60%	140%	96%	60%	140%
Total PCBs (soil)															
Polychlorinated Biphenyls	2867528		< 0.1	< 0.1	NA	< 0.1	102%	60%	140%	91%	60%	140%	88%	60%	140%
Total PCBs (water)															
PCBs	2866999	2866999	< 0.1	< 0.1	NA	< 0.1	96%	50%	140%	102%	50%	140%	113%	50%	140%
PHCs F1 - F2 (Water)															
Benzene	2866004		<0.20	<0.20	NA	< 0.20	103%	60%	140%	100%	60%	140%	100%	60%	140%
Toluene	2866004		<0.20	<0.20	NA	< 0.20	113%	60%	140%	89%	60%	140%	98%	60%	140%
Ethylbenzene	2866004		<0.10	<0.10	NA	< 0.10	114%	60%	140%	86%	60%	140%	111%	60%	140%
m & p-Xylene	2866004		<0.20	<0.20	NA	< 0.20	98%	60%	140%	101%	60%	140%	98%	60%	140%
o-Xylene	2866004		<0.10	<0.10	NA	< 0.10	110%	60%	140%	84%	60%	140%	103%	60%	140%
F1 (C6 - C10)	2866004		<25	<25	NA	< 25	102%	60%	140%	93%	60%	140%	96%	60%	140%
F2 (C10 to C16)	2801762		< 100	< 100	NA	< 100	114%	60%	140%	87%	60%	140%	81%	60%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: N Popowich

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Quality Assurance

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 21Z789347

PROJECT: 210553

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

Water Analysis

RPT Date: Aug 26, 2021			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
(Water) Inorganic Chemistry															
pH	2865246		8.01	7.99	0.2%	NA	103%	90%	110%						
Total Dissolved Solids	2847394		72	72	0.0%	< 10	102%	80%	120%						
Total Suspended Solids	2866955	2866955	<10	<10	NA	< 10	102%	80%	120%						
Electrical Conductivity	2865246		503	501	0.4%	< 2	107%	90%	110%						
Fluoride	2859495		<0.05	<0.05	NA	< 0.05	108%	70%	130%	100%	80%	120%	111%	70%	130%
Ortho Phosphate as P	2859495		<0.10	<0.10	NA	< 0.10	107%	70%	130%	91%	80%	120%	92%	70%	130%
Sulphate	2859495		26.9	27.0	0.4%	< 0.10	100%	70%	130%	102%	80%	120%	100%	70%	130%
Chloride	2859495		163	162	0.6%	< 0.10	94%	70%	130%	104%	80%	120%	NA	70%	130%
Nitrate as N	2859495		1.82	1.78	2.2%	< 0.05	93%	70%	130%	101%	80%	120%	101%	70%	130%
Nitrite as N	2859495		<0.05	<0.05	NA	< 0.05	101%	70%	130%	100%	80%	120%	112%	70%	130%
True Colour	2870103		<5	<5	NA	< 5	100%	90%	110%						

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.

Total Metals in water (mg/L)															
Total Aluminum	2855947	0.028	0.027	NA	< 0.010	97%	70%	130%	108%	80%	120%	100%	70%	130%
Total Arsenic	2855947	0.004	0.004	NA	< 0.003	93%	70%	130%	102%	80%	120%	111%	70%	130%
Total Barium	2855947	0.195	0.192	1.9%	< 0.002	98%	70%	130%	97%	80%	120%	101%	70%	130%
Total Beryllium	2855947	<0.0005	<0.0005	NA	< 0.0005	100%	70%	130%	109%	80%	120%	117%	70%	130%
Total Boron	2855947	3.23	3.11	3.7%	< 0.010	97%	70%	130%	105%	80%	120%	106%	70%	130%
Total Cadmium	2855947	0.0001	<0.0001	NA	< 0.0001	97%	70%	130%	102%	80%	120%	93%	70%	130%
Total Chromium	2855947	<0.003	<0.003	NA	< 0.003	95%	70%	130%	100%	80%	120%	105%	70%	130%
Total Cobalt	2855947	0.0017	0.0014	NA	< 0.0005	91%	70%	130%	99%	80%	120%	102%	70%	130%
Total Copper	2855947	0.001	0.002	NA	< 0.001	92%	70%	130%	100%	80%	120%	91%	70%	130%
Total Lead	2855947	<0.001	<0.001	NA	< 0.001	99%	70%	130%	99%	80%	120%	80%	70%	130%
Total Molybdenum	2855947	0.011	0.012	9.1%	< 0.002	98%	70%	130%	101%	80%	120%	108%	70%	130%
Total Nickel	2855947	0.005	0.004	NA	< 0.003	92%	70%	130%	104%	80%	120%	94%	70%	130%
Total Selenium	2855947	0.005	0.008	NA	< 0.002	107%	70%	130%	107%	80%	120%	118%	70%	130%
Total Silver	2855947	<0.0001	<0.0001	NA	< 0.0001	93%	70%	130%	97%	80%	120%	84%	70%	130%
Total Thallium	2855947	<0.0003	<0.0003	NA	< 0.0003	95%	70%	130%	96%	80%	120%	84%	70%	130%
Total Uranium	2855947	0.0023	0.0022	NA	< 0.0005	96%	70%	130%	100%	80%	120%	113%	70%	130%
Total Vanadium	2855947	<0.002	<0.002	NA	< 0.002	95%	70%	130%	102%	80%	120%	114%	70%	130%
Total Zinc	2855947	0.034	0.013	NA	< 0.005	96%	70%	130%	102%	80%	120%	90%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

O. Reg. 153(511) - Metals (Including Hydrides) (Water) - Lab Filtered

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Quality Assurance

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.
AGAT WORK ORDER: 21Z789347
PROJECT: 210553
ATTENTION TO: Paul Bandler
SAMPLING SITE:DN8 AP
SAMPLED BY:

Water Analysis (Continued)

RPT Date: Aug 26, 2021			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Dissolved Antimony	2862775		<1.0	<1.0	NA	< 1.0	109%	70%	130%	108%	80%	120%	108%	70%	130%
Dissolved Arsenic	2862775		1.0	<1.0	NA	< 1.0	96%	70%	130%	108%	80%	120%	129%	70%	130%
Dissolved Barium	2862775		338	345	2.0%	< 2.0	100%	70%	130%	103%	80%	120%	93%	70%	130%
Dissolved Beryllium	2862775		<0.50	<0.50	NA	< 0.50	94%	70%	130%	105%	80%	120%	101%	70%	130%
Dissolved Boron	2862775		266	276	3.7%	< 10.0	97%	70%	130%	104%	80%	120%	92%	70%	130%
Dissolved Cadmium	2862775		<0.20	<0.20	NA	< 0.20	99%	70%	130%	109%	80%	120%	109%	70%	130%
Dissolved Chromium	2862775		<2.0	<2.0	NA	< 2.0	103%	70%	130%	106%	80%	120%	102%	70%	130%
Dissolved Cobalt	2862775		4.36	4.68	7.1%	< 0.50	100%	70%	130%	107%	80%	120%	102%	70%	130%
Dissolved Copper	2862775		<1.0	<1.0	NA	< 1.0	100%	70%	130%	105%	80%	120%	102%	70%	130%
Dissolved Lead	2862775		<0.50	<0.50	NA	< 0.50	101%	70%	130%	105%	80%	120%	102%	70%	130%
Dissolved Molybdenum	2862775		1.19	1.33	NA	< 0.50	102%	70%	130%	105%	80%	120%	106%	70%	130%
Dissolved Nickel	2862775		7.4	9.3	NA	< 3.0	100%	70%	130%	105%	80%	120%	101%	70%	130%
Dissolved Selenium	2862775		<1.0	<1.0	NA	< 1.0	103%	70%	130%	114%	80%	120%	115%	70%	130%
Dissolved Silver	2862775		<0.20	<0.20	NA	< 0.20	102%	70%	130%	108%	80%	120%	89%	70%	130%
Dissolved Thallium	2862775		<0.30	<0.30	NA	< 0.30	104%	70%	130%	107%	80%	120%	105%	70%	130%
Dissolved Uranium	2862775		1.00	0.99	NA	< 0.50	104%	70%	130%	108%	80%	120%	107%	70%	130%
Dissolved Vanadium	2862775		1.11	1.25	NA	< 0.40	103%	70%	130%	109%	80%	120%	105%	70%	130%
Dissolved Zinc	2862775		<5.0	<5.0	NA	< 5.0	98%	70%	130%	110%	80%	120%	103%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Total Metals in water (mg/L)

Aluminum-dissolved	2867000	2867000	0.030	0.028	6.9%	< 0.004	94%	70%	130%	107%	80%	120%	103%	70%	130%

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
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http://www.agatlabs.com

Method Summary

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 21Z789347

PROJECT: 210553

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET 93 -6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Trace Organics Analysis			
Benzene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Toluene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Ethylbenzene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
m & p-Xylene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
o-Xylene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Xylenes (Total)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
F1 (C6 - C10)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	modified from CCME Tier 1 Method	P&T GC/FID
Toluene-d8	VOL-91-5009	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS
F2 (C10 to C16)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Benzene	VOL-91-5010	modified from MOE PHC-E3421	(P&T)GC/MS
Toluene	VOL-91-5010	modified from MOE PHC-E3421	(P&T)GC/MS
Ethylbenzene	VOL-91-5010	modified from MOE PHC-E3421	(P&T)GC/MS
m & p-Xylene	VOL-91-5010	modified from MOE PHC-E3421	(P&T)GC/MS
o-Xylene	VOL-91-5010	modified from MOE PHC-E3421	(P&T)GC/MS
Xylenes (Total)	VOL-91-5010	modified from MOE PHC-E3421	(P&T)GC/MS
F1 (C6 - C10)	VOL-91-5010	modified from MOE PHC-E3421	(P&T)GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5010	modified from MOE PHC-E3421	(P&T)GC/FID
Toluene-d8	VOL-91-5010	modified from MOE PHC-E3421	(P&T)GC/MS
F2 (C10 to C16)	VOL-91-5010	modified from MOE PHC-E3421	GC/FID
Terphenyl	VOL-91-5010	modified from MOE PHC-E3421	GC/FID
Sediment			
Polychlorinated Biphenyls	ORG-91-5113	modified from EPA SW-846 3541 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5113	modified from EPA SW-846 3541 & 8082	GC/ECD
Moisture Content	ORG-91-5009	CCME Tier 1 Method	BALANCE
PCBs	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD

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Method Summary

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 21Z789347

PROJECT: 210553

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Total Dissolved Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Total Suspended Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Electrical Conductivity	INOR-93-6000	modified from SM 2510 B	PC TITRATE
Fluoride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Ortho Phosphate as P	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
True Colour	INOR-93-6074	modified from SM 2120 B	LACHAT FIA
Hardness (as CaCO3) (Calculated)	MET-93-6105	modified from EPA SW-846 6010C & 200.7 & SM 2340 B	CALCULATION
Dissolved Antimony	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Arsenic	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Barium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Beryllium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Boron	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Cadmium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Chromium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Cobalt	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Copper	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Lead	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Molybdenum	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Nickel	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Selenium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Silver	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Thallium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Uranium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Vanadium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Zinc	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Lab Filtration Performed			FILTRATION
Aluminum-dissolved	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS

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Method Summary

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 21Z789347

PROJECT: 210553

ATTENTION TO: Paul Bandler

SAMPLING SITE:DN8 AP

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Arsenic	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Barium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Beryllium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Boron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cadmium	MET -93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Chromium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cobalt	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Copper	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Lead	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Molybdenum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Nickel	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Selenium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Silver	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Thallium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Uranium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Vanadium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zinc	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Aluminum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS

Invoice - 949886 / 11412128 / 12413128

AGAT Laboratories

3 Lg

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: BluMetric Environmental
Contact: Paul Bandler
Address: 4 Cataraqui St
Kingston ON
K7K 1Z7
Phone: Fax:
Reports to be sent to:
1. Email: pbandler@blumetric.ca
2. Email: dnastas@blumetric.ca

Project Information:

Project: 210553
Site Location:
Sampled By: DN & AP
AGAT ID #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐
Company:
Contact:
Address:
Email: ap@blumetric.ca

Regulatory Requirements:

(Please check all applicable boxes)

☐ Regulation 153/04
Table _____ *Indicate One*
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☐ Coarse
☐ Fine

☐ Excess Soils R406
Table _____ *Indicate One*
☐ Regulation 558
☐ CCME

☐ Sewer Use
☐ Sanitary ☐ Storm
_____ *Region*
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
_____ *Indicate One*

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Laboratory Use Only

Work Order #: 21789347
Cooler Quantity: 1
Arrival Temperatures: 13.6 | 13.5 | 14.2
Custody Seal Intact: ☐ Yes ☐ No ☐ ~~N/A~~
Notes: Ice Pack

Turnaround Time (TAT) Required:

Regular TAT (Most Analysis) ☒ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day
OR Date Required (Rush Surcharges May Apply):
Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*
For 'Same Day' analysis, please contact your AGAT CPM

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y/N	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs; Analyze F4G if required ☐ Yes ☐ No	O. Reg 153: ~~Diss~~ Metals	O. Reg 153: Total PCBs ☐ Aroclor	O. Reg 153: ~~Vor~~ Total Metals	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach; SPLP: ☐ Metals ☐ VOCs ☐ SVOCs	O. Reg 406: Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	~~Salt~~ EC/SAR	PHC F1-F2	Major Ions	General Chemistry	PCBs	PHC F1-F4	As, Cd, Co, Cr, Pb, Ni, Zn			Potentially Hazardous or High Concentration (Y/N)
MW1	21/08/11	11:30 AM	13	GW						X		X				X	X	X	X					
MW2	21/08/12	15:30 AM / 13:30 PM																						
MW3	21/08/12	15:30 AM / 13:30 PM																						
MW4	21/08/11	11:30 AM / 18:30 PM																						
FB1		AM / PM	12																					
~~TB~~ Trip Blank	21/07/29	11:30 AM / 18:30 PM	13																					
DUP	21/08/11	AM / PM	13																					
SW-1		AM / PM	12	SW																				
SS-1		AM / PM	4	S																X	X	X		
SS-DUP		AM / PM	4	S																X	X	X		
		AM / PM																						

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Daniel Nastas	21/08/13	10:30	Matt Sous	17/8/21	11:30
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign): Simon Z	21/8/18	8:40
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1

Nº: T 122091

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM - BURNABY

Work Order # 2107892276

RECEIVING BASICS:

Received From: TESTAV Waybill #: _____

SAMPLE QUANTITIES:

Coolers: 3 Containers: _____

TIME SENSITIVE ISSUES:

Earliest Date Sampled: _____ ALREADY EXCEEDED? Yes No

NON-CONFORMANCES:

3 temperatures of samples* and average of each cooler: (record differing temperatures on the CoC next to sample ID's) *use jars when available

(1) 8 + 8 + 9 = 8 °C (2) 8 + 9 + 10 = 9 °C (3) 8 + 10 + 7 = 8 °C (4) ___ + ___ + ___ = ___ °C

Was ice or ice pack present: (Yes) No

Integrity Issues: 8°C

Account Project Manager: _____ have they been notified of the above issues: Yes No

Whom spoken to: _____ Date and Time: _____

ADDITIONAL NOTES: