CADUCEON™
ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

December 18th, 2017

Bhabesh Roy
Government of Nunavut
PO BOX 379
Pond Inlet, NU
X0A 0S0

Dear Bhabesh Roy,

Caduceon Environmental Laboratories looks forward to aiding the Hamlet of Pangnirtung in their environmental analysis. Caduceon staff have reviewed the PDF document entitled *"Quality Assurance/Quality Control Plan Hamlet of Pangnirtung, Nunavut"* that was provided to our Ottawa Laboratory.

Our staff has read and understands the requirements found within this document and see no issues with providing you quality service and analysis. In addition, it has been noted that it is necessary all testing be completed by a CALA accredited Laboratory. Caduceon Environmental Laboratories are accredited for all of the parameters listed within the document with the exception of drinking water parameters 1) Alkyl Benzene Sulfonate (ABS) and 2) Carbon Chloroform Extract (CCE). We currently subcontract out Anionic Surfactants as MBAS (i.e. Methylene Blue Active Substances) to Niagara Analytical Laboratories in lieu of these 2 tests.

The most recent CALA Scopes of Accreditation for our Ottawa and Kingston Labs have been provided to you for your records. I have also included a partially completed Drinking Water submission form as per your request. In addition I have provided you with our most recent revision of CP-005 (Sample Bottle Requirements).

Should you require any further information please feel to contact me at the coordinates listed in my signature below.

Thank you for providing us with the opportunity to work with the Hamlet of Pangnirtung.

Regards,

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Caduceon Environmental Laboratories
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Fax: (613) 526-1244
E-mail: gclarkin@caduceonlabs.com

cc: Gord Murphy, Lab Supervisor
Rebecca Marshall, Customer Service Representative
Damien Gilbert, CEO

Quality Assurance / Quality Control Plan Hamlet of Pangnirtung, Pangnirtung, Nunavut

Project Name:
Water Licence Compliance – Hamlet of Pangnirtung

Type of Document:
Final, Rev. 1

Project Number:
FRE-00232735-A0

Prepared By: Robert Renaud, M.Sc., P.Geo.

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Date Submitted:
May 24, 2018

Hamlet of Pangnirtung

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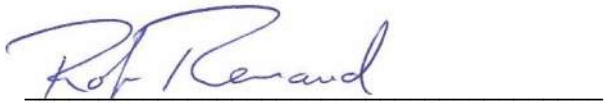

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Date Submitted:
May 24, 2018

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1 Introduction

The purpose of this document is to provide guidance to ensure that the monitoring program samples collected from the Hamlet's water, wastewater and solid waste disposal facilities are done so with a high degree of quality, in order to ensure that they accurately reflect the physical and chemical nature of the matrix being tested.

1.1 Background

The Hamlet of Pangnirtung (Hamlet) is located on Baffin Island at N66°08.82' and W65°42.07' on the south shore of the Pangnirtung Fiord. The population of Pangnirtung in 2017 is estimated to be 1,592 according to the Nunavut Bureau of Statistics. The estimated population of the community in 2035 would be approximately 2000. The Hamlet is primarily residential in nature with a few businesses (lodges, grocery stores, etc.), schools, and a fish processing plant (Pangnirtung Fisheries). Both fresh water and the wastewater are transported by trucks to and from the various buildings (i.e., there is no piped system within the community).

The Nunavut Water Board (NWB) issued a Class A Water Licence (No. 3AM-PAN1828) to the Hamlet on May 4, 2018. This QA/QC document is to fulfill the requirements for the application of a Class A Water Licence. The Water Licence governs water use and waste disposal within the Hamlet. A copy of the Class A Water Licence is provided in Appendix A.

1.2 Quality Assurance and Quality Control Monitoring

The Hamlet's Water Licence includes a monitoring program. The monitoring program specifies the locations of six (6) sampling locations, along with the analytical parameters to be tested. The following quality assurance (QA) and quality control (QC) program is to be implemented to ensure that the analytical results received are accurate and dependable. A QA/QC program is a system of documented checks that validate the reliability of the data collected regarding any given site. Quality Assurance is a system that ensures that quality control procedures are correctly performed and documented. Quality Control refers to the established procedures observed both in the field and in the laboratory, designed to ensure that the resulting end data meet intended quality objectives. The proposed program will verify compliance with regulations.

1.3 Definitions

The following definitions that are relevant to this plan include:

Quality Assurance is a system that ensures that quality control procedures are correctly performed and documented.

Quality Control refers to the established procedures observed both in the field and in the laboratory, designed to ensure that the resulting end data meet intended quality objectives.

Field Blank is a sample of analyte-free (i.e., clean) water poured into the container in the field, preserved and shipped to the laboratory with field samples and is analyzed along with field samples to check contamination from field conditions during sampling.

Blind Duplicate is a duplicate sample that is not labelled as such. The purpose of the blind duplicate sample is to ensure analytical precision.

CALA refers to the Canadian Association for Laboratory Accreditation, formally known as the Canadian Association for Environmental Analytical Laboratories (CAEAL).

Chain of Custody Documentation refers to the documentation that accompanies samples sent to an analytical laboratory. It is a legal document which ensures that the sample taken at a specific site is the same sample received in the laboratory. It also provides information on the sample condition and integrity as received by the laboratory.

2 Sampling for Regulatory Compliance

2.1 Sampling Locations

The Hamlet's Water Licence specifies six (6) monitoring locations. Table 2.1 provides a description of the sampling points, along with their coordinates.

Table 2.1 – Monitoring Locations

Monitoring Program Station Number and Coordinates	Description	Status
PAN-1 N66° 08.80', W65° 41.03'	Raw water supply intake at the Duval River	Active (Volume)
PAN-2 N66° 09.31', W65° 40.48'	Raw sewage from the pump-out truck	Active (Volume)
PAN-3 N66° 09.31', W65° 40.52'	Effluent from Wastewater Treatment Plant	Active (Quality)
PAN-4 N66° 09.48', W65° 39.98'	Run-off from Sludge Disposal Area	Active (Quality)
PAN-5 N66° 09.45', W65° 40.16'	Run-off from the Solid Waste Disposal Facility	Active (Quality)
PAN-6 N66° 09.49', W65° 39.67'	Run-off from Metals and Hazardous Waste Storage Area	Active (Quality)

2.2 Sampling Frequency

The following outlines the Sampling Testing and Compliance requirements, as outlined in the Hamlet's Water Licence. Any other additional sampling during the year will be at the request of the regulatory agencies. Once collected, the samples will be shipped to the laboratory and analyzed using the same test/method/procedure.

The Hamlet is required to measure and record, in cubic metres, the daily, monthly and annual quantities of water pumped at Monitoring Program Stations PAN-1 and at the Truck-fill Station. The Hamlet is also required to measure and record, in cubic metres, the daily, monthly and annual quantities of raw sewage offloaded from trucks at Monitoring Program Station PAN-2.

Table 2.2 – Water Licence Required Sampling Frequency

Monitoring Program Station Number	Description	Frequency
PAN-1	Raw water supply intake at the Duval River	No sampling – only daily, monthly, annual volume measurements
PAN-2	Raw sewage from the pump-out truck	No sampling – only daily, monthly, annual volume measurements
PAN-3	Effluent from Waste Water Treatment Facility	Monthly during operation and discharge of effluent.
PAN-4	Run-off from Sludge Disposal Area	Beginning, middle and near the end of discharge/run-off observed.
PAN-5	Run-off from the Solid Waste Disposal Facility	Beginning, middle and near the end of discharge/run-off observed.
PAN-6	Run-off from Metals Storage Area	Beginning, middle and near the end of discharge/run-off observed.

2.3 Sampling Parameters

2.3.1 Water Samples

The requirements for drinking water sample collection frequency, and analytical testing is provided below.

Microbiological Properties:

The current population of the community is less than 2000 but more than 500. Therefore, biweekly bacteria sampling is required. Samples will be collected from five locations: raw water, treated water and three different taps. Each sample bottle is to be filled up to 200 mL mark. The samples are forwarded to the GN-DOH lab in Iqaluit for testing and reporting.

Chemical Analysis:

As required by the Public Health Act, the Hamlet samples the raw water and treated water twice annually and the samples are forwarded to Caduceon Environmental Laboratories, a CALA accredited lab in Ottawa.

Samples collected from Monitoring Station PAN-1 and the Truck-Fill Station shall be analyzed for the following parameters:

- Alkyl benzene sulfonate (ABS)
- Arsenic (As)
- Barium (Ba)
- Cadmium (Cd)
- Carbon Chloroform Extract (CCE)
- Chloride (Cl)
- Chromium (hexavalent) (Cr^{6+})
- Copper (Cu)
- Cyanide (CN)
- Fluoride (F)
- Iron (Fe)
- Lead (Pb)
- Manganese (Mn)
- Nitrate (NO_3)
- Phenols
- Selenium (Se)
- Silver (Ag)
- Sulfate (SO_4)
- Total dissolved solids
- Zinc (Zn)

2.3.2 Wastewater and Leachate Samples Sampling Parameters for the Current Licence # 3AM-PAN1828

Samples collected from Monitoring Stations PAN-3, PAN-4, PAN-5, and PAN-6 shall be analyzed for the following parameters:

- Biochemical Oxygen Demand – BOD_5
- pH
- Total Suspended Solids
- Nitrate-Nitrite
- Chloride
- Sodium
- Magnesium
- Total Hardness
- Total Phenols
- Total Arsenic
- Total Cadmium
- Total Copper
- Total Iron
- Total Mercury
- Total Zinc
- LC50 Bioassay (R Trout) for PAN-3
- Faecal Coliforms
- Conductivity
- Oil and Grease (visual)
- Ammonia Nitrogen
- Sulphate
- Potassium
- Calcium
- Total Alkalinity
- Total Manganese
- Total Aluminum
- Total Cobalt
- Total Chromium
- Total Lead
- Total Nickel
- Total Organic Carbon – TOC

2.4 Compliance Point (Part E.3) for Wastewater Effluent for Current Water Licence # 3AM-PAN1828

The water licence has set the final discharge from the WWTP (Monitoring Station PAN-3) as the compliance point as it is the last point of measurement and control. The effluent released from the WWTP must meet the criteria list in Table 2.4.

Table 2.4 – Effluent Quality Criteria

Parameter	Maximum Concentration of any Grab Sample
pH	Between 6 and 9
BOD_5	120 mg/L
Total Suspended Solids	180 mg/L
Faecal Coliforms	1 x 10^3 CFU/100 mL
Oil and Grease	No Visible Sheen

2.5 Sampling Procedures (Wastewater & Leachate)

All sampling, sample preservation and analyses are to be conducted in accordance with methods described in the current edition of *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association, American Water Works Association, and Water Environment Federation, most current edition). Also, additional guidance can be obtained from the contract laboratory (accredited by the Canadian Association for Laboratory Accreditation).

To obtain meaningful results from the analyses, the following six factors are of particular importance:

- Sample collection as per schedule and location.
- Correct usage of container/sample bottle for parameter being tested.
- Correct labelling of sample bottles and filling out record/field sheet.
- Correct procedure for sampling.
- Proper and timely shipment of samples to the laboratory.
- Timely delivery of samples to the laboratory from the air cargo facility.

2.6 Sampling Collection (Wastewater & Leachate)

Refer to the *Wastewater Treatment Facility Process Operation Manual*, dated November 2014 for specific details related to Health and Safety considerations, facility components and processes, as well as monitoring and testing procedures.

2.6.1 Sampling Equipment

Dedicated latex or nitrile gloves (i.e., one pair per sample) are to be used during sample collection and sample handling. Monitoring program samples collected for analysis of selected chemical parameters are to be placed directly into new pre-cleaned, laboratory-supplied sample bottles (see Appendix B). All monitoring samples are to be placed in clean coolers for transportation to the subcontract laboratory. The samples are transported/submitted under Chain of Custody documentation. Included on a Chain of Custody form is the client information, the sample information, the analyses requested, the relevant regulations, the turnaround time for the analytical results, comments, and temperature of the samples at the time they arrived in the laboratory. An example of a completed Chain of Custody form is included in Appendix C.

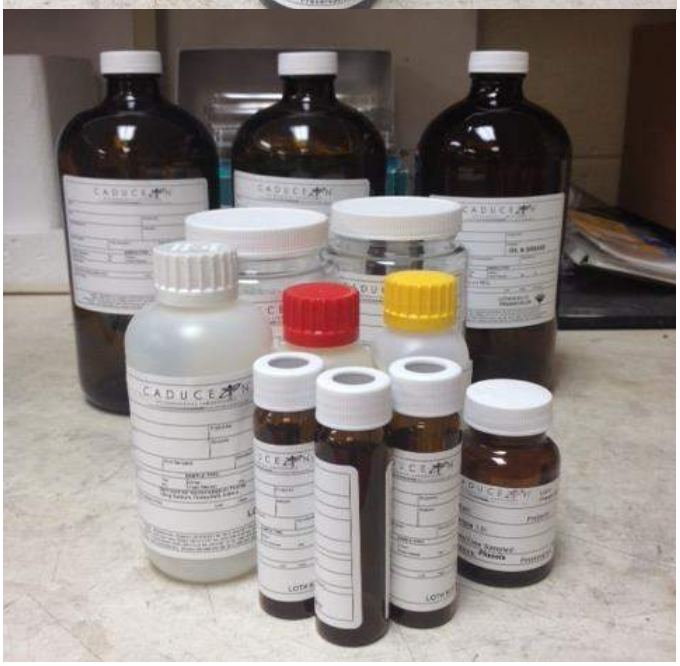
2.6.2 Sampling Containers

Samples for water, wastewater and leachate have their own set of containers. The following photographs indicate the containers in each kit. Specific sample bottle requirements are presented in Appendix B.

WATER

WASTEWATER

LEACHATE



2.6.3 Sampling Methods

All monitoring program samples will be collected by suitably-trained municipal staff. The following techniques are to be used (when possible) whenever grab samples are collected:

- If the sample is being collected from a surface water body, a tank or sump, the sample is to be collected from a location where there is good mixing and the sample will be representative. The sample is not to be skimmed from the surface, taken very close to the bottom, or near any sidewalls. The sample is to be taken from a middle zone, if possible, where there is good mixing and the

geometry of the surface water channel or tank/sump and any equipment within will not affect the quality of the sample.

- If the sample is taken from a sample tap from a tank or pipe, care is to be taken to flush the sample line. The operator is to open the sample valve to flush the contents of the sample line into a container. This material is disposed of or returned to the process if possible. Immediately after flushing the line, the operator then collects the appropriate volume of sample directly into new pre-cleaned, laboratory-supplied sample bottles. The volume to be flushed prior to sampling will depend on the size of the line and distance between the sample valve and the main line/tank. Ideally, the entire volume of this sample line is to be flushed to ensure the collected sample is fresh and representative.
- If the treated water is collected from the end of water truck hose, allow flushing for a minimum 30 seconds before sampling. During sampling, reduce the flow through the nozzle.
- The monitoring program samples need to be shipped to the analytical laboratory for analysis immediately or as soon as practical after collecting the sample.
- Samples should always be collected into new, pre-cleaned, laboratory-supplied sample bottles.

2.7 Sample Handling

All monitoring program samples are to be collected into new, pre-cleaned laboratory-supplied containers with the proper preservative, where applicable. A complete list of parameter handling and preservatives can be found in Appendix B.

All sample containers are to be tightly sealed and properly labelled with the sample ID, date and time of sample collection, location of sample collection and parameters to be analyzed. The outside of the bottles are to be cleaned with soap and water after sampling and dried off prior to placing the samples in the cooler. The samples are to be stored on ice in a cooler until delivery to the laboratory. A Chain of Custody form is to be filled out completely and is used to track the samples and placed in the cooler with the samples, in a Ziplock bag. Keep the last page of the Chain of Custody and give it to the Hamlet Foreman for their records.

The following checks are generally performed by the laboratory upon receipt:

- Verification of the integrity and condition of all sample coolers.
- Verification of the integrity and condition of all sample containers.
- Checks for leakage, cracked or broken closures or containers, evidence of grossly contaminated container exteriors or shipping cooler interiors, and obvious odours, etc.
- Verification of receipt of complete documentation for each container.
- Verification that sample identification numbers on sample transmittal forms corresponds to sample identification numbers on the sample containers.
- Verifications that holding times were met and samples were kept cool during transit.

2.8 Quality Assurance and Quality Control Program

Cross contamination is a common source of error in sampling procedures. QC samples help identify when and how contamination might occur. There are various types of QC samples. EXP recommends the following number of quality control samples based on the number of samples collected:

- One field blank per cooler.
- 10% blind duplicates.

If the total number of samples collected is less than five, include at a minimum, one blind duplicate.

It is essential to request extra bottle sets from the contract laboratory when placing the bottle order in order to allow the collection of field blanks and blind duplicate samples.

3 Laboratory Analysis

3.1 Laboratory Accreditation

As indicated in the Guidelines, the Hamlet should use an analytical laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA); formally known as the Canadian Association for Environmental Analytical Laboratories (CAEAL) for the Water Licence monitoring program. Appendix D includes a copy of the laboratory's CALA accreditation certificate and a list of the parameters for which they are certified.

Note that the GN-DOH does bacteria testing in their own lab in Iqaluit following their own guidelines.

3.2 Method Detection Limits

The method detection limits (MDLs) are provided on the contract laboratory's Certificates of Analysis.

3.3 Methodology

As indicated above, the contract laboratory is accredited by CALA for specific tests and complies with the requirements of ISO/IEC Standard 17025.

4 Reporting Requirements

As a condition of NWB Licence 3AM-PAN1828 (Appendix A), the Hamlet is required to submit an Annual Report to the NWB, no later than March 31st of the year following the calendar year reported. Among other requirements, the annual report is required to include tabular summaries of all analytical data generated under the Monitoring Program (compared to the Maximum Concentration of any Grab Sample – provided in Part E.3 of the NWB Licence 3AM-PAN1828 – where applicable).

5 References

Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan, Department of Indian and Northern Affairs Canada, Water Resources Division and the Northwest Territories Water Board, July 1996.

Standard Methods for the Examination of Water and Wastewater, American Public Health Association, American Water Works Association, and Water Environment Federation, Latest Edition.

Appendix A:
Hamlet of Pangnirtung's Water Licence

NUNAVUT WATER BOARD

TYPE "A" WATER LICENCE NO. 3AM-PAN1828

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Licence No. 3AM-PAN1828

Pursuant to the Nunavut Waters and Nunavut Surface Rights Tribunal Act and the Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada, the Nunavut Water Board, hereinafter referred to as the Board, hereby grants to the

HAMLET OF PANGNIRTUNG

(Licensee)

P.O. BOX 253 Municipality of Pangnirtung, NU X0A 0R0

(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use Water or deposit Waste for a period subject to restrictions and conditions contained within this Licence:

Licence Number / Type:	**3AM-PAN1828 / TYPE "A"**
Water Management Area:	**NORTHERN CUMBERLAND SOUND WATERSHED (51)**
Location:	**WITHIN HAMLET OF PANGNIRTUNG'S MUNICIPAL BOUNDARIES, QIKIQTANI REGION, NUNAVUT**
Classification:	**MUNICIPAL UNDERTAKING**
Purpose:	**USE OF WATERS AND DEPOSIT OF WASTE**
Quantity of Water not to be Exceeded:	**120,000 CUBIC METRES ANNUALLY**
Date Licence Issuance:	**MAY 4, 2018**
Expiry of Licence:	**MAY 3, 2028**

This Licence issued **(Motion Number: 2018-05-P18-05)** and recorded at Gjoa Haven, Nunavut, includes and is subject to the annexed conditions.

Lootie Tomasie
Chairman
Nunavut Water Board

APPROVED BY: Minister of Crown-Indigenous Relations and Northern Affairs Canada

APPROVAL DATE:

PART A: SCOPE, DEFINITIONS, AND ENFORCEMENT

1. SCOPE

1. This Type "A" Water Licence No. 3AM- PAN1828 ("Replacement and Amended Licence" or "Licence") authorizes the Hamlet of Pangnirtung ("Licensee" or the "Hamlet") to use Water and deposit Waste in support of a Municipal undertaking, as classified under Schedule 1 of the Regulations, within the Hamlet's municipal boundaries at the following approximate geographic coordinates:

Undertaking	Latitude	Longitude
Municipal	66° 09' 00" N	65° 40' 34" W

The scope of activities, works, and undertakings authorized in accordance with the terms and conditions of this Replacement and Amended Licence is as follows:

a. Use, management, and protection of the Duval River drainage basin;
b. Withdrawal of Water from Duval River to a storage reservoir to support community needs;
c. Continued operation of the following municipal facilities:
    a. Water Treatment and Supply Facility to treat and store water for municipal use;
    b. Wastewater Treatment Plant to treat and dispose of wastewater and sewage; and
    c. Solid Waste Management Facility to dispose of solid and hazardous wastes generated within the municipality.

2. This Licence is issued subject to conditions contained herein with respect to the use of Waters and the depositing of Waste of any type in any Waters or in any place under any conditions where such Waste or any other Waste that results from the deposits of such Waste may enter any Waters. Whenever new Regulations are made or existing Regulations are amended by the Governor in Council under the Act, or other statutes imposing more stringent conditions relating to the quantity, type or manner under which any such Waste may be so deposited, this Licence shall be deemed to be subject to such requirements; and

3. Compliance with the terms and conditions of this Licence does not absolve the Licensee from the responsibility for compliance with all applicable legislation, guidelines, and directives.

2. DEFINITIONS

1. The Licensee shall refer to Schedule A for definitions of terms used in this Licence.

3. ENFORCEMENT

1. Failure to comply with this Licence shall be a violation of the Act, subjecting the Licensee to the enforcement measures and the penalties provided for in the Act.

2. All inspection and enforcement services regarding this Licence will be provided by Inspectors appointed under the Act.

3. For the purpose of enforcing the terms and conditions of this Licence with respect to the use of Water and deposit or Discharge of Waste in Waters, Inspectors appointed under the Act, hold all powers, privileges, and protections that are conferred upon them by the Act or by other applicable laws.

PART B: GENERAL CONDITIONS

1. The Licensee shall file, with the Board for review, no later than the 31st of March of the year following the calendar year being reported, an Annual Report formulated in accordance with the requirements under Schedule B of this Licence.

2. The Licensee shall maintain a copy of this Licence at the Municipal Office, Water Treatment and Supply Facility, and the Waste Treatment Facilities at all times.

3. The Licensee shall file an application for renewal or amendment of this Licence at least one (1) year prior to the Licence expiry or requested amendment.

4. The Licensee shall, to the satisfaction of an Inspector, install, operate, and maintain meters, devices or other appropriate methods for measuring the volumes of Water used and Waste Discharged or deposited.

5. The Licensee shall post the necessary signs to identify the stations of the Monitoring Program included under Schedule H of this Licence. All signage shall be in the Official Languages of Nunavut.

6. The Licensee shall, for all Plans submitted under this Licence, include a proposed timetable for implementation. Plans submitted cannot be undertaken without subsequent written approval and/or directions from the Board. The Board may alter or modify a Plan if necessary to achieve legislative objectives and will notify the Licensee in writing of acceptance, rejection, or alteration of the Plan.

7. The Licensee shall, for all Plans submitted under this Licence, implement the Plan as accepted by the Board or approved by the Board in writing.

8. The Licensee shall, within thirty (30) days of notification or within the timeframe specified by the Board, submit for review and/or the Board's approval revisions to any plan that is unacceptable to the Board.

9. Every Plan to be carried out pursuant to the terms and conditions of this Licence shall

become a part of the Licence, and any additional terms and conditions imposed upon approval of a Plan by the Board shall also become part of the Licence. All relevant terms and conditions of the Licence should be contemplated in the development of a Plan where appropriate.

10. The Licensee shall review the Plans referred to in this Licence as required by changes in operation and/or technology and modify the Plans accordingly. Revisions to any Plan shall be submitted in the form of an addendum to be included within the Annual Report required under Part B, Item 1, complete with the lists of revisions detailing where significant content changes are made.

11. The Licensee shall immediately report to the NWT/NU 24-Hour Spill Report Line (867-920-8130) any spills of Waste associated with the Undertakings under this Licence, including the Water Treatment Facility and Waste Treatment Facilities, which are reported to or observed by the Licensee.

12. Any communication with respect to this Licence shall be made in writing to the attention of:

Manager of Licensing
Nunavut Water Board
P. O. Box 119
Gjoa Haven, NU X0B 1J0
Telephone: (867) 360-6338
Fax: (867) 360-6369
Email: licensing@nwb-oen.ca

13. Any notice made to an Inspector shall be made in writing to the attention of:

Water Resources Officer
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4295
Fax: (867) 979-6445

14. Unless otherwise directed by the Board in writing, the Licensee shall submit, to the Board one (1) electronic copy of all reports, studies, and Plans generated for the works, activities, and undertakings under this Licence. All Reports, studies or Plans submitted to the Board by the Licensee shall include an executive summary in English, Inuktitut, and French.

15. The Licensee shall ensure that any document(s) or correspondence submitted by the Licensee to the Board is received by the Board and maintain on file a copy of the acknowledgment of receipt issued by the Manager of Licensing or his/her designate.

16. This Licence is assignable as provided for in section 44 of the Act.

17. The expiry or cancellation of this Licence does not relieve the Licensee from any obligation imposed by the Licence, or any other regulatory requirement.

18. The Schedules attached to this Licence provide details regarding the requirements associated with specific items in the main body of the Licence and are included in the Schedule to provide greater clarity and as an aid to interpretation for the Licensee. If the Board subsequently determines that an item in any of the Schedules requires revision in order to better reflect the intent and objectives of the Licence, the Board may at its discretion, and upon consulting and providing written notice to the Licensee and interested parties, revise the Schedule accordingly. Unless the Board directs otherwise, such revision may not necessarily be considered as an "Amendment" to the Licence.

19. Unless otherwise stated, references in the Licence to any specific legislation, policy, guideline or other regulatory requirement is deemed to refer to the regulatory requirement as may be amended or as may be expressly replaced by successor legislation, policy, guidelines or other regulatory requirements after the Licence is approved by the Minister.

PART C: CONDITIONS APPLYING TO SECURITY

1. The Licensee is not required to post reclamation security for the activities, works, and undertakings authorized under this Licence.

PART D: CONDITIONS APPLYING TO THE USE OF WATERS AND WATER MANAGEMENT PLANS

1. The Licensee shall withdraw Water for the Municipal Undertaking from the Duval River at Monitoring Station No. PAN-1, using the Water Treatment and Supply Facility, or as otherwise approved by the Board in writing.

2. The annual quantity of Water used for all purposes from the Duval River shall not exceed one hundred and twenty thousand (120,000) cubic metres per annum, or as otherwise approved by the Board in writing.

3. The Licensee shall, within six (6) months of approval of this Licence, install the appropriate flow-metering equipment required to accurately record the quantity of Water withdrawn from the Duval River .

4. The Licensee shall, within six (6) months of approval of this Licence, equip all freshwater intake structures with screens of appropriate mesh size that meet the requirements of Fisheries and Oceans (DFO) Canada's Freshwater Intake End-of-Pipe Fish Screen Guidelines (1995 or the most current) so as to prevent the entrainment of fish and control Water withdrawal rates such that fish do not become impinged within the screens.

5. The Licensee shall complete and provide to the Board the results of a Hydrological Study of the Duval River within four (4) years of the approval of this Licence by the Minister. The Hydrological Study shall address relevant intervener's comments and recommendations made during the 2017-2018 licensing process, including, at a minimum, details related to the discharge volume and velocity, erosion, sedimentation, water quality, and variability of discharge into the Duval River.

6. The Licensee shall withdraw Water from the Duval River at a rate that shall not exceed ten per cent (10%) of the instantaneous flow in the river, and shall cease all water withdrawal when the instantaneous flow in the river is below thirty per cent (30%) of the mean annual discharge.

7. The Licensee shall limit the withdrawal of Water from the Duval River to the months of July and August, unless otherwise recommended by the Hydrological Study provided under Part D, Item 5 and approved by the Board in writing.

8. The Licensee shall not remove any material from below the ordinary High Water Mark of any Water body unless otherwise approved by the Board in writing.

9. The Licensee shall not cause erosion to the banks of any body of Water and shall provide the necessary controls to prevent such erosion.

10. The Licensee shall implement necessary measures to control sediment and erosion prior to and during operations to prevent entry of sediments into Water.

11. The Licensee shall maintain the Water Treatment and Supply Facility in accordance with applicable guidelines, procedures, and regulations and to the satisfaction of an Inspector.

12. The Licensee shall implement the Water Reservoir Operations and Maintenance Manual dated December 20, 2017 and as approved by the Board.

13. The Licensee shall submit for Board review an updated Water Reservoir Operations and Maintenance Manual with the 2018 Annual Report. The updates shall address intervener's comments and recommendations made during the 2017-2018 licensing process and public hearing.

PART E: CONDITIONS APPLYING TO THE DEPOSIT OF WASTE AND WASTE MANAGEMENT

1. The Licensee shall direct all Sewage to the Wastewater Treatment Plant, or as otherwise approved by the Board in writing.

2. The Licensee shall establish the relevant monitoring stations for the facilities authorized under this Licence in accordance with Schedule H.

3. All Effluent discharged from the Wastewater Treatment Plant at Monitoring Program Station PAN-3 shall not exceed the following Effluent quality limits:

Parameter	Maximum Average Concentration	Maximum concentration of Any Grab Sample
BOD_5	120 mg/L	120 mg/L
pH	Between 6 and 9	
Fecal Colifroms	1 x 10^3 CFU/100 mL	1 x 10^3 CFU/100 mL
Total Suspended Solids (TSS)	180 mg/L	180 mg/L
Oil and grease	No visible sheen	

4. The Discharge of Effluent from Wastewater Treatment Plant at Monitoring Program Station PAN-3, shall be demonstrated to be Acutely non-Lethal under the following test and as stipulated in Schedule H of the Licence:
   - Acute Lethality of Effluents to Rainbow Trout (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13 Second Edition December 2000 (with May 2007 amendments).

5. The Licensee shall dispose of and contain all fish processing wastes at the Solid Waste Management Facility, in a pit excavated below the active layer-permafrost interface. Fish wastes deposited at the Solid Waste Management Facility shall be treated with lime, and covered with soil prior to the onset of the annual spring freshet and then weekly thereafter during June, July, August and September.

6. The Licensee shall practice open burning only as a means of last resort when all other reasonable disposal measures have been implemented.

7. The Licensee shall implement measures to prevent hazardous materials and/or leachate from the Solid Waste Management Facility and Metal and Hazardous Waste Storage Area from entering water, and shall control surface runoff from the Solid Waste Management Facility and Metal Storage Area.

8. The Licensee shall erect a fence surrounding the Metal and Hazardous Waste Storage Area within six months of the approval of this Licence by the Minister.

9. The Licensee shall submit to the Board, for approval, a standalone Drainage / Seepage Monitoring and Management Plan with the 2018 Annual Report to address intervener's comments and recommendations made during the 2017-2018 licensing process and public hearing, including, at a minium, a list of parameters of concern, targeted concentrations limits and monitoring details.

10. The Licensee shall implement the following Plans as approved by the Board:

    a. Wastewater Treatment Plant Bypass Contingency Plan dated August 10, 2017;
    b. Operation and Maintenance Plan for Solid Waste Facilities dated December, 2017; and

c. Wastewater Treatment Plant Process Operation Manual dated February, 2015.

11. The Licensee shall submit to the Board, for review, an updated Wastewater Treatment Plant Bypass Contingency Plan with the 2018 Annual Report to address intervener's comments and recommendations made during the licensing process.

12. The Licensee shall dispose of, and contain, all municipal solid waste generated by the Hamlet at the Landfill or as otherwise approved by the Board in writing.

13. The Licensee shall maintain the Licensed Facilities to the satisfaction of an Inspector.

14. The Licensee shall remove from the site associated with the undertaking, all Hazardous Wastes, waste oil and non-combustible waste generated through the course of the operation, for disposal at a licensed waste disposal facility.

15. The Licensee shall maintain records of all Waste removed from site and records of confirmation of proper disposal of removed Waste. These records shall be made available to an Inspector or the Board upon request.

PART F: CONDITIONS APPLYING TO MODIFICATIONS AND CONSTRUCTION

1. The Licensee may, without written consent from the Board, carry out Modifications to the potable Water Treatment and Supply Facility and Waste Treatment Facilities provided that such Modifications are consistent with the terms of this Licence and the following requirements are met:

   a. the Licensee has notified the Board in writing of such proposed Modifications at least sixty (60) days prior to beginning the Modifications;
   b. such Modifications are consistent with the NPC Land Use Planning Conformity Determination and the NIRB Screening Decision;
   c. such Modifications do not place the Licensee in contravention of the Licence or the *Act*;
   d. the Board has not, during the sixty (60) days following notification of the proposed Modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and
   e. The Board has not rejected the proposed Modifications.

2. Modifications for which all of the conditions referred to in Part F, Item 1 have not been met can be carried out only with written approval from the Board.

3. The Licensee shall provide as-built plans and drawings of the Modifications referred to in this Licence within ninety (90) days of completion of the Modifications. These plans and drawings shall be stamped by an Engineer.

PART G: CONDITIONS APPLYING TO SPILL CONTINGENCY PLANNING

1. The Licensee shall implement the Spill Contingency Plan dated August 10, 2017 as approved by the Board.

2. The Licensee shall submit to the Board for review an updated Spill Contingency Plan with the 2018 Annual Report. The updates shall address interveners comments and recommendations made during the licensing process and public hearing, including a topographical map with all infrastructures/facilities included within the scope of this Licence.
3. The Licensee shall, subject to section 16 of the Regulations, report any unauthorized deposits of Waste or foreseeable unauthorized deposits of waste and/or Discharges of Effluent, and:

    a. Employ, as required, the approved Spill Contingency Plan;
    b. Report the incident immediately via the NWT/NU 24-Hour Spill Reporting Line (867) 920-8130 and to the Inspector at (867) 975-4295; and
    c. For each spill occurrence, submit a detailed report to the Inspector and to NWB, no later than thirty (30) days after initially reporting the event. The report shall include the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain, clean up and restore the spill site.

4. The Licensee shall, in addition to Part H, Item 3, regardless of the quantity of release of a harmful substance, report to the NWT/NU Spill Line if the release is near or into a Water body.

PART H: CONDITIONS APPLYING TO MONITORING

1. The Licensee shall monitor the relevant Water Treatment and Supply Facility and Waste Treatment Facilities authorized under this Licence in accordance with requirements included under Schedule H.

2. The Licensee shall conduct during open water in 2018, a sampling campaign at Monitoring Program Stations PAN-4, PAN-5 and PAN-6 to monitor run-off and leachate quality data within the Drainage / Seepage Monitoring and Management Plan referred to in Part E, Item 9. The campaign shall consist of sampling three times (at the beginning, middle and near the end of discharge/run-off) during the spring freshet and once per every subsequent month until freezing. Additional sampling is required after every rainfall event. Samples shall be analyzed for the parameters listed in Schedule H.

3. The Licensee shall sample monthly at Monitoring Program Stations PAN-4, PAN-5 and

PAN-6. Samples shall be analyzed for the parameters listed in Schedule H in accordance with Tables 1 and 2.

4. All analyses required under Schedule H shall be conducted using methods as described in the most recent edition of "*Standard Methods for the Examination of Water and Wastewater*", or by such other methods as approved by the Board in writing.

5. All laboratory analyses shall be performed at a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.

6. The Licensee shall implement the Quality Assurance / Quality Control Plan dated December 19, 2017 as accepted by the Board.

7. The Licensee shall submit to the Board for review, with the 2018 Annual Report, an updated Quality Assurance/Quality Control Plan to address relevant intervener's comments and recommendations made during the 2017-2018 licensing process and public hearing.

8. The Plan shall be acceptable to an accredited laboratory and include a covering letter from the accredited laboratory confirming acceptance of the Plan for analyses to be performed under the Licence.

9. The Licensee shall include all of the data and information required by the Monitoring Program under Schedule H within the Annual Report required under Part B, Item 1 of the Licence or as otherwise requested by an Inspector and/or the Board.

10. Additional Monitoring may be requested by the Board and/or the Inspector.

11. The Monitoring Program and compliance dates specified in the Licence may be modified at the discretion of the Board in writing and do not necessarily constitute an Amendment to the Licence as defined in the *Act.*

PART I: CONDITIONS APPLYING TO CLOSURE AND RECLAMATION

1. The Licensee shall submit to the Board for approval in writing, at least six (6) months prior to commencing the decommissioning of a facility, a Final Closure and Reclamation Plan prepared by an Engineer in accordance with industry's best practices and relevant guidelines.

2. The Licensee shall, for the Plan required under Part I, Item 1, include a presentation of data and a discussion of environmental conditions existing before the use of the site by the Licensee, as well as remediation objectives.

3. The Licensee shall notify the Board in writing, at least six months prior to the implementation of final closure, of its intentions to proceed with final closure of any Water use or Waste disposal facilities included within the scope of this Licence, excluding the

Facility under Part I, Item 1.

SCHEDULES

Schedule A: Scope, Definitions, and Enforcement
Schedule B: General Conditions
Schedule C: No Schedule for Security
Schedule D: No Schedule for Use of Water and Water Management Plans
Schedule E: No Schedule for Deposit of Waste and Waste Management
Schedule F: No Schedule for Modifications and Construction
Schedule G: No Schedule for Spill Contingency Planning
Schedule H: Monitoring
Schedule I: No Schedule for Closure and Reclamation

Schedule A: Definitions

In this Licence 3AM-PAN1828:

"**Act**" means the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*;

"**Addendum**" means the supplemental text that is added to a full plan, manual, or report, usually included at the end of the document and is not intended to require a full resubmission of the revised report. It may also be considered as an appendix or supplement;

"**Amendment**" means a change to any terms and conditions of this Licence through application to the NWB, requiring a change, addition, or deletion of specific terms and conditions of the Licence not considered as a modification;

"**Annually**" means, in the context of monitoring frequency, one sampling event occurring every 365 days with a minimum of 200 days between sampling events;

"**Application**" means, for the purposes of this License, the totality of the NWB Public Register opened as a result of the filing of the application to replace and amend expired Water Licence 3BM-PAN1417);

"**Board**" means the Nunavut Water Board established under Article 13 of the *Nunavut Agreement* and under section 14 of the Act;

"**Discharge**" means the release of any Water or Waste to the receiving environment;

"**Effective Date**" means the date on which the Minister of Crown-Indigenous Relations and Northern Affairs Canada approves the Licence;

"**Effluent**" means treated or untreated liquid Waste material that is Discharged into the environment from the site water management facilities such as a settling pond or a treatment plant;

"**Engineer**" means a professional engineer registered to practice in Nunavut in accordance with the *Consolidation of Engineers and Geoscientists Act S. Nu 2008, c.2* and the *Engineering and Geoscience Professions Act S.N.W.T. 2006, c.16 Amended by S.N.W.T. 2009, c.12*;

"**Engineered Structure**" means any facility, designed and approved by a Professional Engineer who is registered with the Association of Professional Engineers, Geologists and Geophysicists of Nunavut;

"**Grab Sample**" means an undiluted quantity of material collected at a particular time and place that may be representative of the total substance being sampled at the time and place it was collected;

"**Greywater**" means the component of Effluent produced from domestic use (i.e. washing, bathing, food preparation and laundering), excluding Sewage;

"**Hazardous Waste**" means materials or contaminants categorized as dangerous goods under the *Transportation of Dangerous Good Act* (1992), no longer used for their original purpose and intended for recycling, treatment, disposal or storage at appropriate facilities;

"**High Water Mark**" means the usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land (ref. *Department of Fisheries and Oceans Canada, Operational Statement: Mineral Exploration Activities*);

"**Inspector**" means an Inspector designated by the Minister under section 85 (1) of the Act;

"**Landfill**" means the Solid Waste Management Facility that is designed to manage solid waste generated by the Hamlet of Pangnirtung.

"**Licence**" means this Type "A" Water Licence No. 3AM-PAN1828, issued by the Nunavut Water Board to the Hamlet of Pangnirtung in accordance with the Act;

"**Licensee**" means the entity to whom Licence No. 3AM-PAN1828 is issued or assigned;

"**Metal and Hazardous Waste Storage Area**" means the area within the Solid Waste Management Facility where metal and hazardous waste is stored as described in the Water Licence Application dated May 10, 2017;

"**Minister**" means the Minister of Crown-Indigenous Relations and Northern Affairs Canada (CIRNA);

"**Modification**" means an alteration to a physical work that may introduce a new structure or eliminates an existing structure and does not alter the purpose or function of the work;

"**Monitoring Program**" means the program to collect data on surface water and groundwater quality to assess impacts to the environment of an appurtenant undertaking;

"**Monthly**" means, in the context of monitoring frequency, one sampling event occurring within calendar month with a minimum of twenty-one (21) days between sampling events;

"**Nunavut Agreement**" means the "*Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada*," including its preamble and schedules, and any Amendments to that agreement made pursuant to it;

"**Quality Assurance / Quality Control (QA/QC)**" Quality Assurance means the system of activities designed to better ensure that quality control is done effectively; Quality Control means the use of established procedures to achieve standards of measurement for the three principle components of quality: precision, accuracy and reliability;

"**Regulations**" means the *Nunavut Waters Regulations* (SOR/2013-669);

"**Sewage**" means all toilet wastes and greywater;

"Solid Waste Management Facility" means the Landfill and all other facilities identified in the Application that are designed and constructed to manage solid waste generated by the Hamlet of Pangnirtung;

"Surface Drainage" means all surface waters resulting from the flow over, through or out of an operations area and is collected by means of Engineered structures;

"**Undertaking or Undertakings**" means an undertaking or undertakings in respect of which Water is to be used or Waste is to be deposited, as classified in Schedule 1 of the *Regulations*;

"**Use**" means use as defined in section 4 of the Act;

"**Waste**" means Waste as defined in section 4 of the Act;

"**Waste Treatment Facilities**" refers to all facilities constructed and operated by the Hamlet of Pangnirtung to manage solid and liquid Waste associated with this licence.

"**Wastewater**" means the water generated by site activities or originates on-site that requires treatment or any other water management activity;

"**Wastewater Treatment Facilities**" means the Sewage Lagoon, Wastewater Treatment Plant, and associated facilities authorized under this Licence;

"**Wastewater Treatment Plant**" means the engineered system that is designed for the containment and preliminary treatment of Sewage generated by the Hamlet of Pangnirtung as described in the Application;

"**Water or Waters**" means water as defined in section 4 of the Act;

"**Water Treatment and Supply Facility**" means the engineered facilities and appurtenances designed and constructed for the withdrawal,storage,treatment and distribution of fresh water for domestic purposes, described in the Application.

Schedule B: Annual Reporting Requirements

The Annual Report referred to in Part B, Item 1, shall include the following:

a. The monthly and annual quantities in cubic metres of fresh Water withdrawn from the Duval River at Monitoring Station No. PAN-1;
b. The monthly and annual quantities in cubic metres of any Discharges to and from the Wastewater Treatment Facilities at Monitoring Stations PAN-2 and PAN-3;
c. Quality of the runoff from the sludge disposal area, Solid Waste Management Facility, and Metal and Hazardous Waste Storage Area at Monitoring Stations PAN-4, PAN-5, and PAN-6, respectively;
d. The monthly and annual quantities in cubic metres of sludge removed from the Wastewater Treatment Plant;
e. The monthly and annual quantities of Wastes disposed of at the landfill;
f. A summary report which includes all data and information generated under the Monitoring Program, including the QA/QC program, in electronic and printed formats acceptable to the Board;
g. A summary of modifications and/or major maintenance work carried out on the potable Water Treatment and Supply and Waste Treatment Facilities, including all associated structures;
h. A progress report and revisions (if applicable) to any studies requested by the Board that relate to Waste management, Water use or reclamation and a brief description of any future studies planned by the Licensee including, a non-technical executive summary for the general public, translated into Inuktitut;
i. Any revisions required, in the form of addenda, to Plans, Manuals and Reports approved under the Licence;
j. A list and description, including volumes, of all unauthorized Discharges, spills and summaries of follow-up action taken;
k. A summary of any closure and reclamation work undertaken and an outline of any work anticipated for the next year, including any changes to implementation and scheduling;
l. A summary of actions taken to address concerns or deficiencies listed in the inspection reports and/or compliance reports filed by an Inspector;
m. A brief update on the implementation plan of all facilities within the scope of this Licence including changes projected implementation;
n. A summary of any studies, reports and plans requested by the Board that relate to Waste disposal, Water use or reclamation and a brief description of any future studies planned; and
o. Any other details on the use of Water or Waste disposal requested by the Board by November 1st of the year being reported.

Schedule H: Conditions Applying to Monitoring

Table 1 – Water Quality Parameters

Test Group	Analytical Parameter	Unit of Measurement
Effluent (E)	pH (field and lab)	NA
	Conductivity (field and lab)	uS/cm
	Temperature (field)	^{o}C
	Total Suspended Solids (TSS)	mg/L
	Biochemical Oxygen Demand	mg/L
	Fecal Coliform	CFU/100 mL
	Nitrate-Nitrite	mg/L
	Ammonia Nitrogen	mg/L
	Sulphate	mg/L
	Chloride	mg/L
	Total Hardness	mg/L
	Total Alkalinity	mg/L
	Total Phenols	mg/L
	Total Organic Carbon - TOC	mg/L
Acute Lethality (AL)	Based on Environment Canada's Acute Lethality of Effluents to Rainbow Trout (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13 Second Edition December 2000 (with May 2007 amendments)	"Pass" / "Fail"
ICP Metals Scan (Total) (Me)	Al, As, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Na, Ni, Pb, Zn	mg/L
Flow (F)	Volume	m^3

Table 2 - Water Quality Monitoring Criteria

Station ID	Description	Status	Parameter	Testing / Measurement Frequency	Reporting Frequency
PAN-1	Duval River – Raw Water	Active	F	Daily	Annualy
PAN-2	Raw Sewage from pump-out truck	Active	F	Daily	Annually
PAN-3	Effluent from Wastewater Treatment Plant	Active	F, E, AL, Me	Monthly	Annually
PAN-4	Run-off from sludge disposal area	Active	F, E, Me	When discharge is observed	Annually
PAN-5	Run-off from solid waste disposal facility	Active	F, E, Me	When discharge is observed	Annually
PAN-6	Run-off from metal and hazardous waste storage area	Active	F, E, Me	When discharge is observed	Annually

Appendix B:
Summary of Sample Bottle Requirements

Appendix B1 – General Bottle Requirements

Appendix A: Individual Parameters for Water Analysis (see Appendix D for O.Reg. 153/04 requirements)

Parameter	Sample Containers		Minimum	Preservative	Storage	Holding Times		
	Size mL)	Type	Volume (mL)		Conditions	Caduceon	EPA/SM(Reg.)	MOE
GENERAL CHEMISTRY, PHYSICAL PROPERTIES								
Alkalinity	500	P	50	None	1	7d	14d/14d	7d
Ammonia (NH_3)	125	P or G	50	pH <2 H_2SO_4/None	1	28d/3d	28d/28d	10d
BOD_5/$CBOD_5$	500	P	300	None	1	4d	48h/48h	4d
Bromide	500	P	50	None	1	28d	-	-
Chloride	500	P	50	None	1	28 d	28d/28d	30d
COD	125, 250	P or G	50	pH<2 H_2SO_4	1	28 d	28d/28d	30d
Colour	500	P	100	None	1	48h/7d	48h/48h	7d
Conductivity	500	P	100	None	1	4d	28d/28d	4d
Cyanide (free)	125	P	50	pH >12 NaOH	1, in dark	7d	- /14 d	7d(MISA)
Cyanide (total)	125	P	50	pH >12 NaOH	1	6 m	14d/14d	6 m
Fluoride	500	P	50	None	1	28d	28d/28d	30d
Hardness	250	P	100	pH<2 HNO_3	2	28d	6m/6m	28d
Lead (O.Reg 243, O.Reg 170)	1000	P	1000	pH<2 HNO_3	2	60d	6m/6m	60d
Mercury	125	G,AG, P	100	pH<2 HCl , or $K_2Cr_2O_7$ + HNO_3	2	7d	28d/-	14d, 7d(MISA)
Metals- except Mercury	125	P	100	pH<2 HNO_3	2	60d	6m/6m	60d
Nitrate (N)	500	P	50	None	1	7d	48h/48h	7d
Nitrite (N)	500	P	50	None	1	7d	48h/48h	7d
Nitrate-Nitrite (N)	500	P	50	None	1	7d	48h/48h	7d
Nitrogen (Total Kjeldahl)	125, 250	P or G	100	pH<2 H_2SO_4	1	28d	28d/-	-
Organic Carbon, Dissolved (DOC)	125	G or P	40	Field filter + pH <2 H_2SO_4 / None	1	28d/7d	-	-
Organic Carbon, Total (TOC)	125	G or P	40	pH<2 H_2SO_4	1	28d	28d/28d	-
Oil & Grease, Total, A/V/Mineral	1000	G	1000	HCl/None	1	28d/7d	28d/28d	7d(MISA)
pH	500	P	100	None	1	4d	Imm./Imm.	4d/asap(MISA)
Phenolics (4-aap) *	60, 120	AG	50	pH<2 H_2SO_4	1	28d	28d/28d	30d(MISA)
Phosphate, dissolved (P)	125	P	50	Filter, analyze ASAP/pH<2 H_2SO_4	1	48h/28d	48h/-	-
Phosphorus, total	125	P or G	100	pH<2 H_2SO_4	1	28d	28d/-	30d(MISA)
Solids (TS,TSS,TDS,VS,VSS)	500	P	500	None	1	7d	7d/2-7d	7d(MISA)
Silica	125	P	100	pH<2 HNO_3	2	28d	28d/-	-
Sulphide (S^{2-} , H_2S)	125	P or G	100	2N zinc acetate + pH>9 NaOH	1	7d	7d/7d	7d(MISA)
Sulfate	500	P	50	None	1	28d	28d/28d	30d(MISA)
Turbidity	500	P	100	analyze ASAP	1	48h/7d	48h/48h	48h(MISA)

MICROBIOLOGICAL								
Coliforms, Total, Fecal, Escherichia	300, 250	SP	100 (per test)	None, $Na_2S_2O_3$(chlorinated)	1	48h	-/30h	48h/24h(MISA)
Background	300, 250	SP	100	None, $Na_2S_2O_3$(chlorinated)	1	48h	-/30h	48h
Heterotrophic Plate Count	300, 250	SP	50	None, $Na_2S_2O_3$(chlorinated)	1	48h	-/24h	48h
Fecal Streptococcus	300, 250	SP	100	None, $Na_2S_2O_3$(chlorinated)	1	48h	-/24h	48h
Pseudomonas	300, 250	SP	100	None, $Na_2S_2O_3$(chlorinated)	1	48h	-/24h	48h
Iron Reducing Bacteria	300, 250	SP	100	None	1	48h	-	-
Chlorophyll-a	1000	AG	1000	None, Wrap in Aluminum Foil	1, in dark	30d	- /30d	-
ORGANICS								
Diquat/Paraquat	1000	P	250	None, $Na_2S_2O_3$(chlorinated)	1	14dpre/20dpost	7dpre/21dpost	20d
Glyphosate	1000	P	50	None, $Na_2S_2O_3$(chlorinated)	1	14d	14d	20d
Glycols	40	GV	40	None	1	7d	-	-
OC Pesticides	1000	AG	1000	None, $Na_2S_2O_3$(chlorinated)	1	10dpre/40dpost	14dpre/30dpost	42d
PAH's	1000	AG	1000 (x2)	None	1	14dpre/40dpost	14dpre/30dpost	35d
PCB's	1000	AG	1000	None, $Na_2S_2O_3$(chlorinated)	1	10dpre/40dpost	14dpre/30dpost	42d
PHC (F1)	40	AGV	40 (x2)	$NaHSO_4$, HCl, None	1	14d	-	7d
PHC (F2-F4)	1000	AG	1000	$NaHSO_4$, None	1	14d	-	14dpre/7dpost
Phenols by GC/MS	1000	AG	1000	None	1	7dpre/ 30dpost	14dpre/30dpost	20d/30d(MISA)
SVOC (Acid, Base/Neutral Ext.)	1000	AG	1000 (x2)	None	1	14dpre/40dpost	14dpre/30dpost	30d
VOC's	40	AGV	40 (x2)	$NaHSO_4$, $Na_2S_2O_3$(chlorinated), HCl, None	1	7 to 14d	14d/14d	14d, 7to14(MISA)
SUBCONTRACTED PARAMETERS								
Dioxins/Furans	1000	AG	1000	None	1	30d	30d	
Formaldehyde	1000	AG	1000	None	1	7d		
NDMA	1000	AG	1000 (x2)	None	1	10d		10 d
NTA	1000	AG	100	None	1	30d		30 d
Radionuclides (Gross Alpha, Beta and Tritium)	1000	P	1000	None / HNO_3	1	10d / 6m		
Radionuclide (ODWS Table 3)	1000	P	1000 (x3)	None / HNO_3	1	10d / 6m		

Sample Container Codes:

P = Plastic, either HDPE or PETE

G = Glass, GV = Glass Vial

AG = Amber Glass, AGV = Amber Glass Vial,

SP = Sterile Plastic

* Teflon-lined phenate free cap

Storage Conditions Codes:

1 = 4 ± 3°C

2 = Room Temperature (if preserved)

d = days

m = months

Imm = Immediate

Appendix B: Soil Sample Analysis/General (see Appendix D for O.Reg. 153/04 requirements)

Parameter	Sample Containers		Minimum Volume (mL)	Preservative	Storage Conditions	Holding Times		
	Size (mL)	Type				Caduceon	EPA	MOE
PHC (F2-F4)	180	AGJ	180	None	1	7 d	-	14 d
BTEX/PHC (F1)	100	AGJ	50	None	1	7 d	-	7 d
VOC's	100	AGJ	50	None	1	7 d	14 d	7 to 14 d
Metals (including mercury)	180	AGJ	180	None	2	28 d	28 d	Indefinite
Inorganic General	180	AGJ	180	None	2	see individual	see individual	see individual
Oil & Grease	180	AGJ	180	None	1	28 d	-	-
Nutrients (TOC,TP,TKN)	180	AGJ	180	None	2	28 d	-	-
Anions	180	AGJ	180	None	2	28 d	-	-
Semivolatiles	180	AGJ	180	None	1	see individual	see individual	see individual
Pesticides	180	AGJ	180	None	1	see individual	see individual	see individual

Sample Container Codes:
AGJ = Amber Glass Jar

Storage Conditions Codes:
1 = 4 ± 3°C
2 = Room Temperature

Indefinite = indefinite when dried
individual = individual parameter test method
d = days m = months

Appendix C: Bottles required for Regulatory Ontario Drinking Water Submissions

Parameter	Bottle	Sampling	Storage
THM's	Two - 40 mL VOC amber glass vials, $Na_2S_2O_3$ added	Fill slowly and completely - no air bubbles present	4 ± 3ºC
Fluoride, Nitrate and Nitrite	125 mL HDPE, 250 mL HDPE or 500mL PETE, no preservative (4°C)	Grab	4 ± 3ºC

Schedule 23, Sodium, Lead (Distribution): Inorganic Parameters

Parameter	Bottle	Sampling	Storage
Metals	125 mL HDPE, HNO_3 added	No rinsing. Be careful of acid preservative	Room temperature
Mercury	125 mL HDPE, $K_2Cr_2O_7$ + HNO_3 or pH<2 HCl	No rinsing. Be careful of acid preservative	4 ± 3ºC

Schedule 15.1 (O.Reg. 170) & O.Reg. 243 (Schools, Private Schools & Day Nurseries)

Parameter	Bottle	Sampling	Storage
Lead	1000 mL HDPE, HNO_3 added	No rinsing. Be careful of acid preservative	Room temperature

Schedule 24: Organic Parameters

Parameter	Bottle	Sampling	Storage
VOC's	Two - 40 mL VOC amber glass vials, $Na_2S_2O_3$ added	Fill slowly and completely - no air bubbles present	4 ± 3ºC
Pesticides	**2**- 1 L Amber Glass, no preservative – **Pest MS,** **1** - 1 L HDPE, $Na_2S_2O_3$ added - **Diquat, Paraquat & Glyphosate** **2** - 1 L Amber Glass, no preservative – **OC Pesticides**	Grab	4 ± 3ºC

Appendix D: Parameters for Water Analysis required for O.Reg 153/04 (amended July 01, 2011)

Parameter	Sample Containers		Minimum	Preservative	Storage	Holding Times		
	Size (mL)	Type	Volume (mL)		Conditions	Caduceon	MOE	Comments
GENERAL CHEMISTRY, PHYSICAL PROPERTIES								
Chloride	500	P	50	None	1	28 d	28d	
Conductivity	500	P	100	None	1	4d	28d	
Cyanide (wad)	125	P	50	Field filter + pH >12 NaOH	1	14d	14d	must be field preserved
Hexavalent Chromium (CrVI)	125	P	50	Field filter + buffer/NaOH to pH 9 - 10	1	28d	28d	must be preserved to pH 9.3 – 9.7 within 24hrs of sampling
Mercury	125	G,AG	100	Field filter + pH<2 HCl	2	28d	28d	must be field preserved
Methyl Mercury	125	G,AG	100	pH<2 HCl, $K_2Cr_2O_7$ + HNO_3	1	28d	28d	Do not Filter must be field preserved
Metals- except Mercury	125	P	100	Field filter + pH<2 HNO_3	2	60d	60d	must be field preserved
pH	500	P	100	None	1	4d	28d	
ORGANICS								
OC Pesticides	1000	AG	1000	None	1	14d	14d	
PAH's	1000	AG	1000	None	1	14d	14d	
PCB's	1000	AG	1000	None	1	14d	14d	
PHC (F1)	40	AGV	40 (x2)	pH<2 $NaHSO_4$, HCl / None	1	14d / 7d	14d / 7d	
PHC (F2-F4)	1000	AG	1000	pH<2 $NaHSO_4$, HCl / None	1	40d / 7d	40d / 7d	
Chlorophenols by GC/MS	1000	AG	1000	None	1	14d	14d	
SVOC (Acid, Base/Neutral Ext.)	1000	AG	1000	None	1	14d	14d	
VOCs/THMs/BTEX	40	GV,AGV	40 (x2)	pH<2 $NaHSO_4$, HCl / None	1	14d / 7d	14d / 7d	
Dioxins/Furans	1000	AG	1000	None	1	indefinite	indefinite	

Sample Container Codes:
P = Plastic, either HDPE or PETE
G = Glass, GV = Glass Vial
AG = Amber Glass, AGV = Amber Glass Vial,
SP = Sterile Plastic
* Teflon-lined phenate free cap

Storage Conditions Codes:
1 = 4 ± 3°C
2 = Room Temperature (if preserved)

d = days
m = months
Imm = Immediate

Appendix E: Parameters for Soil Analysis required for O.Reg 153/04 (amended July 01, 2011)

Parameter	Sample Containers		Minimum	Preservative	Storage	Holding Times		
	Size (mL)	Type	Volume (mL)		Conditions	Caduceon	MOE	Comments
GENERAL CHEMISTRY, PHYSICAL PROPERTIES								
Chloride	180	AGJ	180	None	1	30d	30d	indefinite when dried
Conductivity	180	AGJ	180	None	1	30d	30d	indefinite when dried
Cyanide (wad)	180	AGJ *	180	Protect from Light	1	14d	14d	
Fraction Organic Carbon (FOC)	180	AGJ *	180	None	1	28d	28d	indefinite when dried
Hexavalent Chromium	180	AGJ	180	None	1	30d	30d	
Mercury	180	AGJ	180	None	1	28d	28 d	
Methyl Mercury	180	AGJ	180	None	1	28d	28 d	
Metals- except Mercury	180	AGJ	180	None	1	180d	180 d	indefinite when dried
pH	180	AGJ	180	None	1	30d	30d	indefinite when dried
ORGANICS								
OC Pesticides	180	AGJ *	180	None	1	60d	60d	
PAH's	180	AGJ *	180	None	1	60d	60d	
PCB's	180	AGJ *	180	None	1	indefinite	indefinite	
PHC (F1) **	40	GV	40 (x2)	Methanol (preweighed) [a]	1	14d	14d	
PHC (F2-F4)	180	AGJ *	180	None	1	14d	14d	
Chlorophenols by GC/MS	180	AGJ *	180	None	1	60d	60d	
SVOC (Acid, Base/Neutral Ext.)	180	AGJ *	180	None	1	60d	60d	
VOCs/THMs/BTEX **	40	GV	40 (x2)	Methanol (preweighed) [a]	1	14d	14d	
Dioxins/Furans	180	AGJ *	180	None	1	indefinite	indefinite	

Sample Container Codes:
AGJ = Amber Glass Jar
G = Glass, GV = Glass Vial
AG = Amber Glass, AGV = Amber Glass Vial,
SP = Sterile Plastic
* Teflon-lined phenate free cap
** Include one (1) Terracore sampler for each sample

Storage Conditions Codes:
1 = 4 ± 3°C
2 = Room Temperature

[a] $NaHSO_4$ for bromomethane

d = days
m = months
Imm = Immediate

Appendix B2 – Water

Raw & Treated Water Samples Bottles Include:

1. 1 L clear, no preservative
2. 500 mL clear plastic, no preservative
3. Green cap for CN, 12 N NAON preservative
4. Purple cap for Cr-VI, NAON preservative
5. Red cap for Metals bottle, HNO_3 Nitric Acid preservative
6. 125 mL amber for Phenolics, H_2SO_4 Sulphuric Acid preservative
7. Round 250 mL plastic for Bacteria, $Na_2S_2O_3$ Sodium thiosulfate preservative to offset effects of chlorination
8. 40 mL Vial for DOC, should be field filtered, H_2SO_4 preservative

Appendix B3 – Wastewater

Wastewater Samples Bottles Include:

1. 1 L amber HCL preservative
2. Red cap for Metals bottle, HNO_3 Nitric Acid preservative
3. 125 mL amber for Phenolics, H_2SO_4 Sulphuric Acid preservative
4. Round 250 mL plastic for Bacteria, $Na_2S_2O_3$ Sodium thiosulfate preservative to offset effects of chlorination
5. 2 x 500 mL clear plastic no preservative
6. 1 Yellow cap for TKN/TP, H_2SO_4 Sulphuric Acid preservative

Appendix B4 - Leachate

Leachate Samples Bottles Include:

1. 3 x 1 L amber:
   1 for O&G, HCL preservative,
   1 for PHC F_2-F_4, no preservative, and
   1 for SVOC-4, no preservative
2. Red cap for Metals bottle, HNO_3 Nitric Acid preservative
3. 125 mL amber for Phenolics, H_2SO_4 Sulphuric Acid preservative
4. Round 250 mL plastic for Bacteria, $Na_2S_2O_3$ Sodium thiosulfate preservative to offset effects of chlorination
5. 2 x 500 mL clear plastic, no preservative
6. 1 Yellow cap for TKN/TP, H_2SO_4 Sulphuric Acid preservative
7. 3 x 40 ml Vial for PHC F_1 and BTEX

Appendix C:
Completed Example of Chain of Custody Documentation

DRINKING WATER SUBMISSION FORM

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

Indicate Laboratory or Depot Samples are Submitted to
☐ Kingston ■ Ottawa ☐ Richmond Hill ☐ Windsor ☐ Barrie ☐ London

DRINKING WATER FACILITY CLASSIFICATION

☐ Municipal	☐ Non-Municipal	☐ Reg. 170/03
☐ Large	☐ Small	☐ Reg. 318/08 & 319/08
☐ Residential	☐ Non-Residential	☐ Reg. 243/07
☐ Seasonal	☐ Year-Round	☐ Private Well Water
■ Other: _____		

REPORT NUMBER (Lab Use)

Organization: Hamlet of Pangnirtung	**Waterworks Address:** Hamlet of Pangnirtung, PO Box 253, Pangnirtung, NU, X0A 0R0	**Invoicing Address (if different):**
Contact:		
Tel: 867-473-8953 **Fax:** 867-473-8832		
After Hours Tel: **Public Health Unit:**	**Waterworks No.:**	**Project Name/No.:**
Email: pang_sao@qiniq.com	**Quote No.:** P16_Nunavut	**P.O. No.:**

ANALYSES REQUESTED

Microbiological					Chemical						Other		
Fl, Cl, NO3, SO4	As, Ba, Cd, Cu, Fe, Pb	Mn, Se, Ag and Zn	Cr(VI)	TDS (Calc from Cond)	DOC	Surfactants							

TURNAROUND TIME REQUESTED

Summary of Surcharges ***
☐ Platinum 200% - same day**
☐ Gold 100% - 24 Hour
☐ Silver 50% - 48 Hours
☐ Bronze 25% - 72 Hours
■ Standard 5-7 days
☐ Specific Date: _____

* Sample Matrix Legend: TW = Treated Water, DW = Distribution Water, GW = Raw Groundwater, SW = Raw Surface Water, UGW = Untreated Groundwater (Drinking Water/Distribution)
GUDI = Groundwater under the influence of surface water, PR = Plumbing Residential, PNR = Plumbing Non-Residential ** Fastest possible TAT achievable (same day if applicable) *** See Caduceon General Turnaround Time Terms

Lab No.	Sample Source and/or Sample Identification	S.P.L.	Sample Matrix *	Date Collected (yy-mm-dd)	Time Collected	Adverse Resample	Indicate Test For Each Sample By Using A Check Mark In The Box Provided													Chlorine Free	Chlorine Total	# Bottles/ Sample
	PAN-1						x	x	x	x	x	x	x									
	Truck-Fill Station						x	x	x	x	x	x	x									

Has Lab Service Notification (LSN) Form been completed & submitted to the MOE/PHU? ☐ Yes ☐ No ☐ Not Applicable
Laboratory Analysis will not commence until all Notification information is received and the Submission form is appropriately completed

SAMPLE SUBMISSION INFORMATION

	Sampled by:	Submitted by:
Print:		
Sign:		
	Date (yy-mm-dd)/Time:	Date (yy-mm-dd)/Time:

SHIPPING INFORMATION

Courier (Client account)	■	Invoice ☐
Courier (Caduceon account)	☐	
Drop Off	☐	# of Pieces
Caduceon (Pick-up)	☐	

REPORTING / INVOICING

Report by Fax	☐
Report by Email	■
Invoice by Email	■
Invoice by Mail	☐

SAMPLE RECEIVING INFORMATION (LABORATORY USE ONLY)

Received By (print): Signature:
Date Received (yy-mm-dd): Time Received:
Laboratory Prepared Bottles: ☐ Yes ☐ No
Sample Temperature °C: Labeled by:

Comments:

Page _____ of _____
DW

GENERAL TERMS, CONDITIONS AND SAMPLING INFORMATION GUIDE

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

Sample Acceptance

Caduceon Enterprises is a commercial testing laboratory specializing in environmental analyses of samples including, but not limited to the following:
Drinking Water, Groundwater, Surface Water, Wastewater and/or Industrial Process Water/Effluents, Liquid and Solid Sludge, Soil and Sediment, Oil (limited types).

Caduceon does not accept samples including but not limited to the following matrices unless otherwise prearranged with an authorized Caduceon representative:
Human or Animal Tissue, Unprocessed Human or Animal Waste, Food or Beverage (other than Drinking Water), Unknown solids and liquids, Vegetation, Hazardous Waste, Highly contaminated samples (which cause process and instrument complications).

Samples submitted to Caduceon without proper designation are subject to supplementary charges, but not limited to the following:
Sample Disposal Fees, Process and Handling Fees, Instrument Maintenance and Refurbishment Fees (parts and labour).

Chain of Custody Forms must be completed with all required information. Analyses of samples will not commence until all required information is received. Receipt of samples will only occur at this time.
Samples must be submitted in Caduceon sampling containers and/or acceptable alternatives with appropriate preservatives (if required).
Samples must be received at the laboratory within required sample holding times. If samples require RUSH analyses based on sample holding times, surcharges may apply. See Turnaround Time Terms and Conditions.

Turnaround Time

Platinum Service – 200% Surcharge (minimum)** Fastest possible Turnaround Time available and/or achievable, same day service or does not meet one of the other listed categories. Subject to additional fees for weekend and/or after hours service.
Gold Service – 100% Surcharge Samples received prior to 2 p.m. will be reported by 5 p.m. on the next business day from the day of receipt. Samples received after 2 p.m. will be reported by 12 p.m. on the second business day from the day of receipt.
Silver Service - 50% Surcharge Samples received prior to 2 p.m. will be reported by 5 p.m. on the second business day from the day of receipt. Samples received after 2 p.m. will be reported by 12 p.m. on the third business day from the day of receipt.
Bronze Service - 25% Surcharge Samples received prior to 2 p.m. will be reported by 5 p.m. on the third business day from the day of receipt. Samples received after 2 p.m. will be reported by 12 p.m. on the fourth business day from the day of receipt.
Standard Service – No Surcharge 5- 7 business days from the time of receipt. Note: Samples received after 2 p.m. are considered received the next business day.
Note: If the specific level of Turnaround Time requested is not met the next level of service achieved will be surcharged accordingly. This is at the sole discretion of the laboratory.

Payment

By submission of samples and signing of the chain of custody you agree to Caduceon's Payment Terns and Conditions. (See Caduceon website for details www.caduceonlabs.com)

Ontario Drinking Water Sampling Requirements

Parameter	Sample Containers		Minimum Volume (mL)	Preservative	Storage Conditions	Holding Times
	Size (mL)	Type				
Treated & Distribution Samples						
Item 1: Total Colifoms (& Background Colonies), *Esherichia coli* (E.coli), Heterotrophic Plate Count	200	SP	100 per test	$Na_2S_2O_3$	1	48h
Raw Samples						
Item 2: Total Colifoms (& Background Colonies), *Esherichia coli* (E.coli)	200	SP	100 per test	$Na_2S_2O_3$	1	48h
Treated						
Item 3: Nitrate and Nitrite as N (quarterly)	500	P	50	None	1	7d
Item 5: Schedule 23: Inorganic Parameters (As, Ba, B, Cd, Cr, Hg, Sb, Se, U)	125	P, Red Cap	100	HNO_3	1	60d
	125	G	100	$K_2Cr_2O_7 + HNO_3$	1	14d
Item 6: Schedule 24: Semivolatile & Volatile Organics (Pesticides, Herbicides, PCB's, Benzo(a)pyrene) & MCPA	1000	AG	1000(x5)	None, 1 x $Na_2S_2O_3$	1	14dpre/14dpost/40dpost
	1000	P	1000	$Na_2S_2O_3$	1	20dpre/36dpost
	40	AGV	40	$Na_2S_2O_3$ (No Headspace)		14d
Item 7: Fluoride (can be sampled with Item 3)	500	P	100	None	1	30d
Item 8: Sodium (can be sampled with Item 5)	125	P, Red Cap	100	HNO_3	1	60d
Distribution						
Item 4: Trihalomethanes or,	40	AGV	40(x2)	$Na_2S_2O_3$ (No Headspace)	1	14d
HAA's (quarterly if chlorination system used)	40	AGV	40(x2)	NH_4Cl	1	28d
Item 9a: Lead	125	P, Red Cap	100	HNO_3	1	60d
Item 9b: Alkalinity	120	P	50	None	1	14d
Item 10: Lead (plumbing)	1000	P	1000(x2)	HNO_3	1	60d

Sample Container Codes:
P = Plastic, either HDPE or PETE
G = Glass
AG = Amber Glass, AGV = Amber Glass Vial,
SP = Sterile Plastic

Storage Conditions Codes:
1 = 4 ± 3°C

Holding Time Codes:
h = hours
d = days
dpre = days pre extraction
dpost = days post extraction

Holding times are summarized for convenience purposes and are to be used only as a guide. Please consult the official regulations to ensure the appropriate holding times are followed.

Laboratory & Depot Locations/Shipping Addresses

Kingston Lab - 285 Dalton Ave., Kingston, ON K7K 6Z1, Tel: (613) 544-2001 Fax: (613) 544-2770 Email: contactkingston@caduceonlabs.com
Ottawa Lab - 2378 Holly Lane, Ottawa, ON K1V 7P1, Tel: (613) 526-0123 Fax: (613) 526-1244 Email: contactottawa@caduceonlabs.com
Richmond Hill Lab - #14-110 West Beaver Creek Rd., ON L4B 1J9, Tel: (289) 475-5442 Fax: (866) 562-1963 Email: contactrichmondhill@caduceonlabs.com
Windsor Lab - #5-3201 Marentette Ave., Windsor, ON N8X 4G3, Tel: (519) 966-9541 Fax: (519) 966-9567 Email: contactwindsor@caduceonlabs.com
Barrie Lab - 112 Commerce Park Drive, Unit L, Barrie, ON L4N 8W8, Tel: (705) 252-5743 Fax: (705) 252-5746 Email: contactbarrie@caduceonlabs.com
London Depot - #1-600 Newbold St., London, ON N6E 2T7, Tel: (519) 601-1833 Fax: (519) 601-1833 Email: contactlondon@caduceonlabs.com

CADUCEON™ ENVIRONMENTAL LABORATORIES

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- ☐ O.Reg 153/04 (1___ 2___ 3___ 4___ 5___ 6___)
- ☐ MISA Guidelines
- ☐ Provincial Water Quality Objectives
- ☐ Sewer Use By-Law: _____
- ☐ ODWS (Non Regulatory)
- ☐ O.Reg 558 Leachate Analysis
- Disposal Site: _____
- ☑ Other: CCME

Turnaround Time Requested

Rush 24 Hr	☐ 100% Surcharge
Rush 48 Hr	☐ 50% Surcharge
Rush 72 Hr	☐ 25% Surcharge
5-7 Day	☑ Standard
Specific Date:	

Organization: Hamlet of Pangnirtung
Contact: Billy Qaqasiq
Tel: 867-473-8951
Fax: 867-473-8832
Email: pang_stp@qiniq.com

Address and Invoicing Address (if different)
P.O. Box 253
Pangnirtung, NU
X0A 0R0

Quote No.:
P.O. No.:
Project Name:
Additional Info: Waybill No. _____

ANALYSES REQUESTED (Print Test in Boxes)

BOD; Faecal Coliforms; pH, Conductivity; TSS; Nitrate-Nitrite; Ammonia-N; Total Metals, Hg; Anions-Cl, SO_4; Na, K, Ca, Mg; Phenols; Alkalinity; Hardness; TOC

REPORT NUMBER:

Lab No.	Sample Identification	Sample Matrix *	Date Collected (yy-mm-dd)	Time Collected	Indicate Test For Each Sample By Using A Check Mark In The Box Provided	Field pH	Field Temp.	# Bottles/ Sample	Field Filtered(Y/N)
	PAN-3	WW	14-12-23	9:00	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	-	-	6	N

Sample Submission Information
Sampled By (print): Billy Qaqasiq
Submitted By (print): Billy Qaqasiq
Signature: ←
Date(yy-mm-dd): 14-12-23 Time: 10:00

Shipping Information
- ☑ Courier (Client account)
- ☐ Courier (Caduceon account)
- ☐ Drop Off
- ☐ Caduceon (Pick-up)

Reporting and Invoicing
- Invoice for Shipping ☐
- # of Pieces: 1
- ☐ Fax Results
- ☑ Email Results
- ☑ Invoice by Email
- ☐ Invoice by Mail

LABORATORY USE ONLY
Received By (print): Signature:
Date(yy-mm-dd) Received: Time Received:
Comments: Laboratory Prepared Bottles: ☐ YES ☐ NO

* Sample Matrix Legend: WW=Waste Water SW=Surface Water GW=Groundwater LS=Liquid Sludge SS=Solid Sludge S=Soil Sed=Sediment PC=Paint Chips F=Filter

Laboratory Locations/Shipping Addresses

Kingston Lab - 285 Dalton Ave., Kingston, ON K7K 6Z1, Tel: (613) 544-2001 Fax: (613) 544-2770 Email: contactkingston@caduceonlabs.com
Ottawa Lab - 2378 Holly Lane, Ottawa, ON K1V 7P1, Tel: (613) 526-0123 Fax: (613) 526-1244 Email: contactottawa@caduceonlabs.com
Peterborough Lab - #206-160 Charlotte St., Peterborough, ON K9J 2T8, Tel: (705) 748-1506 Fax: (705) 748-6514 Email: contactpeterborough@caduceonlabs.com
Windsor Lab - #5-3201 Marentette Ave., Windsor, ON N8X 4G3, Tel: (519) 966-9541 Fax: (519) 966-9567 Email: contactwindsor@caduceonlabs.com
Moncton Lab - 150 Lutz St., Moncton, NB E1C 5E9, Tel: (506) 855-6472 Fax: (506) 855-8294 Email: contactmoncton@caduceonlabs.com

C 15192

Appendix D:
Subcontract Laboratory Accreditation

CALA
Canadian Association for Laboratory Accreditation Inc.

CALA Directory of Laboratories

Membership Number: 2644
Laboratory Name: Caduceon Environmental Laboratories (Ottawa)
Parent Institution: Caduceon Enterprises Inc.
Address: 2378 Holly Lane Ottawa ON K1V 7P1
Contact: Mr. Greg Clarkin
Phone: (613) 526-0123
Fax: (613) 526-1244
Email: gclarkin@caduceonlabs.com; sburrows@caduceonlabs.com

Standard: Conforms with requirements of ISO/IEC 17025
Clients Served:
Revised On: November 1, 2017
Valid To: August 16, 2019

Scope of Accreditation

Air (Inorganic)
Metals - Air Filter (012)
D-ICP-02; modified from SM 3120 B
ICP - DIGESTION
Cadmium
Copper
Lead
Zinc

Air (Inorganic)
Total Suspended Particulates - Air Filter (018)
A-TSP-01; modified from MOEE E3288A
GRAVIMETRIC
Total Suspended Particulates

Dustfall
Dustfall - Dustfall (020)
A-DF-01; modified from MOEE DF-E3043A
FILTRATION - GRAVIMETRIC
Insoluble Dustfall
Total Dustfall

Fluoride Candles
Fluoride - Candles (019)
A-FISE-01; modified from MOEE FSIE-1983D
DIGESTION - ISE
Fluoride

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at http://www.cala.ca/cala_directories.html

Soil/Solid Biosolids
Inorganic Ammonia - Soil, Solid Biosolids (105)
A-NH3-01; modified from MOEE RNDNP - E3364/SDNP-E3366
AUTO COLOR
Total Ammonia

Soil/Solid Biosolids
Inorganic Nitrogen - Soil, Solid Biosolids (106)
A-TKN-01; modified from MOE NPSED E3116
AUTO COLOR - DIGESTION
Total Kjeldahl Nitrogen (TKN)

Soil/Solid Biosolids
Inorganic Phosphorus - Soil, Solid Biosolids (107)
A-TP-01; modified from MOE NPSED E3116
AUTO COLOR - DIGESTION
Total Phosphorus

Solids (Inorganic)
Anions - Soils, Biosolids (069)
A-IC-01; modified from SM 4110 C
ION CHROMATOGRAPHY - EXTRACTION
Chloride
Nitrate
Nitrite
Sulphate

Solids (Inorganic)
Boron (Hot Water Soluble) - Soil (098)
D-ICP-02; MOE-LSB E3470
ICP/AES - EXTRACTION
Boron

Solids (Inorganic)
Conductivity - Soil, Sediments (099)
A-COND-03; modified from SM 2510 B and MOECC-LSB E 3530
CONDUCTIVITY METER - EXTRACTION
Conductivity

Solids (Inorganic)
Extractable Anions - Leachate [100% SOLID SAMPLES ONLY] (090)
A-IC-01; EPA 1311 (LEACH) and modified from SM 4110 C (ANALYSIS)
ION CHROMATOGRAPHY - TCLP
Nitrate
Nitrite

Solids (Inorganic)
Extractable Metals - Leachate [100% SOLID SAMPLES ONLY] (091)
D-ICP-01; EPA 1311 (LEACH) and modified from EPA SM 3120 B (ANALYSIS)
ICP/AES - TCLP
Arsenic
Barium
Beryllium
Boron
Cadmium
Chromium
Lead
Nickel
Silver

† "OSDWA" indicates the appendix is used for the analysis of Ontario drinking water samples, which is subject to the rules and related regulations under the Ontario "Safe Drinking Water Act" (2002).

The list of tests and measurement capabilities for which a laboratory is accredited can change at any time due to circumstances such as scope extensions, voluntary withdrawal of tests by the laboratory and suspension. Scopes are published by the CALA via the Internet at http://www.cala.ca/cala_directories.html

Zinc

Solids (Inorganic)
Extractable Metals - Leachate [100% SOLID SAMPLES ONLY] (092)
D-ICPMS-01; EPA 1311 (LEACH) and modified from EPA 200.8 (ANALYSIS)
ICP/MS - TCLP
Antimony
Arsenic
Selenium
Uranium

Solids (Inorganic)
Extractable Metals - Leachate [100% SOLID SAMPLES ONLY] (093)
D-HG-02; EPA 1311 (LEACH) and modified from SM 3112B (ANALYSIS)
COLD VAPOUR AA - TCLP
Mercury

Solids (Inorganic)
Flashpoint - Soil, Solid Waste (096)
C-FPCC-01; modified from ASTM D93
CLOSED CUP FLASH POINT TESTER
Flashpoint

Solids (Inorganic)
Hexavalent Chromium - Soil (094)
D-CRVI-02; modified from EPA 3060A and EPA 7196A
COLORIMETRIC - MANUAL
Chromium VI

Solids (Inorganic)
Mercury - Soil, Solid Biosolids (017)
D-HG-01; modified from EPA 7471A
COLD VAPOUR AA - DIGESTION
Mercury

Solids (Inorganic)
Metals - Soil, Solid Biosolids (015)
D-ICP-02; modified from EPA 6010
ICP/OES - DIGESTION
Aluminum
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Molybdenum
Nickel
Potassium
Silver

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Sodium
Strontium
Tin
Titanium
Tungsten
Vanadium
Zinc

Solids (Inorganic)
pH - Soil, Sediment, Solid Sludge (100)
A-pH-03; modified from SM 4500 H and MOECC-LSB E 3530
pH METER - EXTRACTION
pH

Solids (Inorganic)
Total Metals - Soils, Biosolids (070)
D-ICPMS-01; modified from EPA 6020
ICP/MS - DIGESTION
Antimony
Arsenic
Selenium
Silver
Thallium
Uranium

Solids (Organic)
Extractable Volatile Organic Compounds (VOC) - Leachate [100% SOLID SAMPLES ONLY] (089)
C-VOC-01; EPA SW-846 1311 (LEACH) and modified from EPA SW-846 5030 and EPA SW-846 8260 (ANALYSIS)
GC/MS - PURGE AND TRAP - TCLP
1,1-Dichloroethylene
1,2-Dichlorobenzene
1,2-Dichloroethane
1,4-Dichlorobenzene
Benzene
Carbon tetrachloride
Chlorobenzene
Chloroform
Dichloromethane
Methyl ethyl ketone
Tetrachloroethylene
Trichloroethylene
Vinyl chloride

Solids (Organic)
Volatile Organic Compounds (VOC) - Soil (063)
C-VOC-02; modified from EPA 8260
GC/MS - PURGE AND TRAP
1,1-Dichloroethane
1,1-dichloroethylene
1,1-Dichloropropene
1,1,1-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dibromo-3-chloropropane
1,2-dichlorobenzene

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1,2-dichloroethane
1,2-Dichloropropane
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3-Dichlorobenzene
1,3-Dichloropropane
1,3,5-Trimethylbenzene
1,4-dichlorobenzene
2-Chlorotoluene
2-Hexanone (MBK)
2,2-Dichloropropane
4-Chlorotoluene
Acetone (2-Propanone)
Benzene
Bromobenzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dibromomethane
Dichlorodifluoromethane
Dichloromethane
Ethylbenzene
Ethylene Dibromide
Hexachlorobutadiene
Hexane
Isopropylbenzene
Isopropyltoluene
m/p-xylene
Methyl Ethyl Ketone
Methyl isobutyl Ketone
Methyl t-butyl ether
n - Butylbenzene
Naphthalene
o-xylene
Propylbenzene
sec - Butylbenzene
Styrene
tert-Butylbenzene
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethylene

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Trichlorofluoromethane
Vinyl chloride

Solids (Organic)
Volatile Petroleum Hydrocarbons (VPH) - Soil (073)
C-GRO-01; CCME CWS REF. METHOD and MOE E3398
GC/FID - PURGE AND TRAP
F1: C6-C10

Water (Inorganic) OSDWA †
Alkalinity - Water (088)
A-ALK-03; modified from SM 2320 B
AUTO TITRIMETRIC
Alkalinity (pH 4.5)

Water (Inorganic) OSDWA †
Ammonia - Water, Wastewater, Liquid Biosolids (055)
A-NH3-01; modified from MOEE RNDNP-E3364, SDNP-E3366
AUTO COLOR
Ammonia
Ammonia-Nitrogen

Water (Inorganic) OSDWA †
Anions - Water, Wastewater, Liquid Biosolids (002)
A-IC-01; modified from SM 4110 C
ION CHROMATOGRAPHY
Bromide
Chloride
Fluoride
Nitrate
Nitrite
Sulfate

Water (Inorganic) OSDWA †
Biochemical Oxygen Demand (BOD) - Water (008)
C-BOD-01; modified from SM 5210 B
D.O. METER
BOD (5 day)
CBOD (5 day)

Water (Inorganic) OSDWA †
Carbon - Water (054)
C-OC-01; modified from SM 5310C and EPA 415.2
IR-UV-PERSULFATE
Organic Carbon

Water (Inorganic) OSDWA †
Chemical Oxygen Demand (COD) - Water (083)
C-COD-01; modified from SM 5220 D
COLORIMETRIC
COD

Water (Inorganic) OSDWA †
Colour - Water (027)
A-COL-01; modified from SM 2120 C
SPECTROPHOTOMETRIC
True Colour

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Water (Inorganic) OSDWA †
Conductivity - Water (003)
A-COND-01; modified from SM 2510 B
CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic) OSDWA †
Conductivity - Water (087)
A-COND-02; modified from SM 2510 B
AUTO CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic) OSDWA †
Dissolved and Extractable Metals - Water (004)
D-ICP-01; modified from SM 3120 B
ICP
Aluminum
Barium
Beryllium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum
Nickel
Potassium
Silicon
Silver
Sodium
Strontium
Tin
Titanium
Tungsten
Vanadium
Yttrium
Zinc
Zirconium

Water (Inorganic) OSDWA †
Dissolved Metals - Water (049)
D-ICPMS-01; modified from EPA 200.8
ICP/MS
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium

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Cobalt
Copper
Lead
Molybdenum
Selenium
Silver
Thallium
Uranium
Vanadium

Water (Inorganic)
Hexavalent Chromium - Water (095)
D-CRVI-01; modified from MOE - HEXCR-E3056
COLORIMETRIC - MANUAL
Hexavalent Chromium

Water (Inorganic) OSDWA †
Mercury - Water, Wastewater (025)
D-HG-02; modified from SM 3112 B
COLD VAPOUR AA - DIGESTION
Mercury

Water (Inorganic) OSDWA †
Nitrogen - Water, Wastewater, Liquid Biosolids (033)
A-TKN-01; modified from MOEE RTNP-E3367
AUTO COLOR - DIGESTION
Total Kjeldahl Nitrogen

Water (Inorganic) OSDWA †
pH - Water (086)
A-pH-02; modified from SM 4500H+ B
AUTO - pH METER
pH

Water (Inorganic) OSDWA †
pH - Water, Wastewater, Liquid Biosolids (005)
A-pH-01; modified from SM 4500 H
pH METER
pH

Water (Inorganic) OSDWA †
Phenols - Water (056)
C-PHEN-01; modified from MOE ROPHEN-E3179
AUTO, 4-AAP
Total Phenolics

Water (Inorganic) OSDWA †
Phosphate - Water (058)
A-PO4-01; modified from MOEE RNDNP-E3364, SDNP-E3366
AUTO COLOR
Phosphate

Water (Inorganic)
Total Metals - Water, Wastewater, Liquid Biosolids (067)
D-ICP-01; modified from SM 3120 B
ICP/AES - DIGESTION
Aluminum
Antimony
Arsenic
Barium

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Beryllium
Bismuth
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Molybdenum
Nickel
Potassium
Silver
Sodium
Strontium
Tin
Titanium
Tungsten
Vanadium
Yttrium
Zinc
Zirconium

Water (Inorganic)
Total Metals - Water, Wastewater, Liquid Biosolids (071)
D-ICPMS-01; modified from EPA 6020
ICP/MS - DIGESTION
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Copper
Lead
Molybdenum
Selenium
Silver
Vanadium

Water (Inorganic) OSDWA †
Total Phosphorus - Water, Wastewater, Liquid Biosolids (057)
A-TP-01; modified from MOEE RTNP-E3367
AUTO COLOR - DIGESTION
Total Phosphorus

Water (Inorganic) OSDWA †
Total Suspended Solids (TSS) - Water (009)
A-TSS-01; modified from SM 2540 D
GRAVIMETRIC
Total Suspended Solids

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Water (Inorganic) OSDWA †
Turbidity - Water (026)
A-TURB-01; modified from SM 2130 B
NEPHELOMETRY
Turbidity

Water (Microbiology) OSDWA †
Coliforms - Water (050)
B-ECTC-01; modified from MICROMFDC-E3407
MEMBRANE FILTRATION (DC)
Background Bacteria
Escherichia coli (E. coli)
Total Coliforms

Water (Microbiology) OSDWA †
Escherichia coli (E. coli) - Water (010)
B-MFEC-01; modified from MFMICRO-E3371
MEMBRANE FILTRATION (EC)
Escherichia coli (E. coli)

Water (Microbiology) OSDWA †
Fecal (Thermotolerant) Coliforms - Water (065)
B-MFFC-01; modified from MFMICRO-E3371
MEMBRANE FILTRATION (mFC)
Fecal (Thermotolerant) Coliforms

Water (Microbiology) OSDWA †
Heterotrophic Plate Count (HPC) - Water (021)
B-HPC-01; modified from SM 9215 C
SPREAD PLATE
Heterotrophic Plate Count (HPC)

Water (Microbiology) OSDWA †
Total Coliforms - Water (066)
B-MFTC-01; modified from MFMICRO-E3371
MEMBRANE FILTRATION (mENDO)
Background Counts
Total Coliforms

Water (Organic) OSDWA †
Glycols - Water (085)
C-GLYCOL-01; modified from EPA 8015B
DIRECT INJECTION GC-FID
Diethylene glycol
Ethylene glycol
Propylene glycol

Water (Organic) OSDWA †
Petroleum Hydrocarbons (PHC) - Water (072)
C-GROw-02; modified from MOE E3421
GC/FID - PURGE AND TRAP
F1: C6-C10

Water (Organic) OSDWA †
Volatile Organic Compounds (VOC) - Water (041)
C-VOC-02; modified from EPA 8260 and 5030
GC/MS - PURGE AND TRAP
1,1-Dichloroethane
1,1-dichloroethylene
1,1-Dichloropropene

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1,1,1-Trichloroethane
1,1,1,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dibromo-3-chloropropane
1,2-dichlorobenzene
1,2-dichloroethane
1,2-Dichloropropane
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3-Dichlorobenzene
1,3-Dichloropropane
1,3,5-Trimethylbenzene
1,4-dichlorobenzene
2-Chlorotoluene
2-Hexanone (MBK)
2,2-Dichloropropane
4-Chlorotoluene
4-Isopropyltoluene
Acetone (2-Propanone)
Benzene
Bromobenzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroform
Chloromethane
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dibromomethane
Dichlorodifluoromethane
Dichloromethane
Ethylbenzene
Ethylene Dibromide
Hexachlorobutadiene
Hexane
Isopropylbenzene
m/p-xylene
Methyl Ethyl Ketone
Methyl isobutyl Ketone
Methyl t-butyl ether
n-Butylbenzene
n-Propylbenzene
Naphthalene
o-xylene
sec-Butylbenzene
Styrene
tert-Butylbenzene

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Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethylene
Trichlorofluoromethane
Vinyl Chloride

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CALA
Canadian Association for Laboratory Accreditation Inc.

CALA Directory of Laboratories

Membership Number: 2728
Laboratory Name: Caduceon Environmental Laboratories (Kingston)
Parent Institution: Caduceon Enterprises Inc.
Address: 285 Dalton Ave. Kingston ON K7K 6Z1
Contact: Ms. Michelle Dubien
Phone: (613) 544-2001
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Email: mdubien@caduceonlabs.com

Standard: Conforms with requirements of ISO/IEC 17025
Clients Served:
Revised On: September 27, 2017
Valid To: June 22, 2019

Scope of Accreditation

Oil (Organic)
Polychlorinated Biphenyls (PCB) - Oil (081)
PCB-002; modified from EPA 8082A
GC/ECD - EXTRACTION
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Total PCB

Soil (Organic)
Polychlorinated Biphenyls (PCB) - Soil (080)
PCB-003; modified from EPA 8082A
GC/ECD - EXTRACTION
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Total PCB

Solids
Total Ammonia - Soil, Solids, Biosolids (083)
NH3-001; modified from MOEE 3116
AUTO COLOR
Total Ammonia

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Solids (Inorganic)
Conductivity - Solids (077)
COND-003; modified from MOE E3138
CONDUCTIVITY METER
Conductivity

Solids (Inorganic)
Cyanide - Soil (074)
CN-001; modified from EPA 9012B
COLORIMETRIC - WATER EXTRACTION
Cyanide (Total)
Free Cyanide

Solids (Inorganic)
Extractable Cyanide - Solid Waste [100% SOLID MATRICES ONLY] (061)
CN-001; EPA 1311 (LEACH) and modified from SM4500 CN-E (ANALYSIS)
COLORIMETRIC - TCLP
Cyanide (WAD)

Solids (Inorganic)
Extractable Fluoride - Solid Waste [100% SOLID MATRICES ONLY] (062)
F-001; EPA 1311 (LEACH) and modified from SM 4500-F, D (ANALYSIS)
SPADNS-TCLP
Fluoride

Solids (Inorganic)
Oil and Grease - Soil (049)
O & G-001; modified from SM 5520 B, F
GRAVIMETRIC
Animal/Vegetable Oil and Grease
Mineral Oil and Grease
Total Oil and Grease

Solids (Inorganic)
pH - Soil (056)
pH-001/pH-003; modified from MOECC PHSOIL-E3137
pH METER
pH

Solids (Inorganic)
Total Kjeldahl Nitrogen (TKN) - Soil, Solids, Biosolids (078)
TPTKN-001; modified from MOE E3116
AUTO COLOR - DIGESTION
Total Kjeldahl Nitrogen (TKN)

Solids (Inorganic)
Total Phosphorus - Soils, Solid Biosolids (079)
TPTKN-001; modified from MOE E3116
AUTO COLOR - DIGESTION
Total Phosphorus

Solids (Organic)
Base Neutral Acid Extractables (BNA) - Soil (048)
NAB-S-001; modified from EPA 525.2 and EPA 8270D
GC/MS - EXTRACTION
1+2-Methylnaphthalene (Calculation)
1-Methylnaphthalene
1,1-Biphenyl
1,2,4-Trichlorobenzene
2-Chlorophenol

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2-Methylnaphthalene
2,4+2,6-Dinitrotoluene (Calculation)
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,4,5-Trichlorophenol
2,6-Dinitrotoluene
3,3'-Dichlorobenzidine
Acenaphthene
Acenaphthylene
Alachlor
Aldicarb
Anthracene
Atrazine
Atrazine, desethyl
Azinphos-methyl
Bendiocarb
Benzo (a) anthracene
Benzo (a) pyrene
Benzo (b) fluoranthene
Benzo (g,h,i) perylene
Benzo (k) fluoranthene
Bis(2-chloroethyl) ether
Bis(2-chloroisopropyl) ether
Bis(2-ethylhexyl) phthalate
Bromoxynil
Carbaryl
Carbofuran
Chlorpyrifos ethyl
Chrysene
Cyanazine
Di-n-butyl phthalate
Diazinon
Dibenzo (a,h) anthracene
Dicamba
Dichlorophenol, 2,4-
Dichlorophenoxy acetic acid, 2,4-
Diclofop-methyl
Diethyl phthalate
Dimethoate
Dimethyl phthalate
Dinoseb
Diuron
Fluoranthene
Fluorene
Hexachloroethane
Indeno (1,2,3 - cd) pyrene
Malathion
Metolachlor
Metribuzin
Naphthalene
p-Chloroaniline
Parathion-ethyl

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Pentachlorophenol
Phenanthrene
Phenol
Phorate
Picloram
Prometryne
Pyrene
Simazine
Temephos
Terbufos
Tetrachlorophenol, 2,4,5,6-
Total PAHs (Calculation)
Triallate
Trichlorophenol, 2,4,6-
Trichlorophenoxy acetic acid, 2,4,5-
Trifluralin

Solids (Organic)
Base Neutral Acid Extractables (BNA) - Solid Waste [100% SOLID MATRICES ONLY] (060)
NAB-W-001; EPA 1311 (LEACH) and modified from EPA 8270D (ANALYSIS)
GC/MS - TCLP
2,3,4,6-Tetrachlorophenol
2,4-Dichlorophenol
2,4-Dinitrotoluene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
3/4-Methylphenol
Benzo(a)pyrene
Cresols (total)
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
Nitrobenzene
Pentachlorophenol
Pyridine

Solids (Organic)
Chlorinated Pesticides - Soil (076)
PESTCL-002; modified from EPA 8081B and EPA 8082A
GC/ECD - EXTRACTION
Aldrin
Aldrin + Dieldrin
alpha-BHC
alpha-Chlordane
beta-BHC
DDT + metabolites
Dieldrin
Endosulfan I
Endosulfan I/II
Endosulfan II
Endosulfan Sulfate
Endrin
gamma-BHC (Lindane)
gamma-Chlordane
Heptachlor

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Heptachlor epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
Methoxychlor
Mirex
o,p'-DDD
o,p'-DDE
o,p'-DDT
Oxychlordane
p,p'-DDD
p,p'-DDE
pp'-DDT
Total DDD
Total DDE
Total DDT

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (046)
PHC-S-001; CCME and MOEE TPH E3398
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

Solids (Organic)
Petroleum Hydrocarbons (PHC) - Soil (058)
PHC-S-001; CCME CWS REFERENCE METHOD
GRAVIMETRIC
F4: Gravimetric

Solids (Organic)
Total Petroleum Hydrocarbons (TPH) - Soil (018)
TPH EXT - 002; modified from MOEE TPH-E3398
SONICATION GC/FID - EXTRACTION
Diesel Range Organics C10-C24
Heavy Oils: C24-C50
TPH C10-C50

Water (Inorganic) OSDWA †
Alkalinity - Water (008)
ALK 001; modified from SM 2320 B
TITRIMETRIC
Alkalinity (pH 4.5)
Bicarbonate
Carbonate

Water (Inorganic) OSDWA †
Alkalinity - Water (065)
ALK-002; modified from SM 2320 B
AUTO TITRIMETRIC
Alkalinity (pH 4.5)
Bicarbonate
Carbonate

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Water (Inorganic) OSDWA †
Ammonia + Ammonium - Water, Wastewater, Liquid Biosolids (025)
NH3-001; modified from SM 4500-NH3-H
AUTO COLOR
Ammonia
Unionized Ammonia

Water (Inorganic) OSDWA †
Biochemical Oxygen Demand (BOD) - Water (054)
BOD-001; modified from SM 5210 B
D.O. METER
BOD (5 day)
CBOD (5 day)

Water (Inorganic) OSDWA †
Colour - Water (013)
COL 001; modified from SM 2120 C
COLORIMETRIC
True Colour

Water (Inorganic) OSDWA †
Conductivity - Water (010)
COND 001; modified from SM 2510 B
CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic) OSDWA †
Conductivity - Water (067)
COND-002; modified from SM 2510 B
AUTO CONDUCTIVITY METER
Conductivity (25°C)

Water (Inorganic) OSDWA †
Cyanide - Water (006)
CN 001; modified from SM 4500 CN-E
AUTO COLOR - DISTILLATION
Cyanide (SAD)
Free Cyanide

Water (Inorganic) OSDWA †
Oil and Grease - Water (047)
O & G-001; modified from SM 5520 B, F
GRAVIMETRIC
Animal/Vegetable Oil and Grease
Mineral Oil and Grease
Total Oil and Grease

Water (Inorganic) OSDWA †
pH - Water (009)
PH 001; modified from SM 4500 H+B
pH - METER
pH

Water (Inorganic) OSDWA †
pH - Water (066)
pH-002; modified from SM 4500H+ B
AUTO - pH METER
pH

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Water (Inorganic) OSDWA †
Phosphate - Water (033)
DRP-001; modified from SM 4500-P, E
COLOR
Phosphate

Water (Inorganic) OSDWA †
Solids - Water, Liquid Sludge (026)
TSS-001/TS-001; modified from SM 2540 B, D, E
GRAVIMETRIC
Total Solids
Total Suspended Solids
Total Volatile Solids
Volatile Suspended Solids

Water (Inorganic) OSDWA †
Sulphide - Water (036)
H2S-001; modified from SM 4500-S2-D
COLORIMETRIC
Sulfide

Water (Inorganic) OSDWA †
Tannin and Lignin - Water (085)
TAN-001; SM 5550
AUTO COLOR
Tannin and Lignin

Water (Inorganic) OSDWA †
Total Kjeldahl Nitrogen (TKN) - Water, Wastewater, Liquid Biosolids (016)
TPTKN 001; modified from MOEE STKNP-E3199A.1
AUTO COLOR - DIGESTION
Organic Nitrogen
Total Kjeldahl Nitrogen

Water (Inorganic) OSDWA †
Total Phosphorus - Water, Wastewater, Liquid Biosolids (042)
TPTKN 001; modified from MOE STKNP-E3199A.I
AUTO COLOR - DIGESTION
Total Phosphorus

Water (Inorganic) OSDWA †
Turbidity - Water (014)
TURB 001; modified from SM 2130 B
TURBIDIMETRIC
Turbidity

Water (Microbiology) OSDWA †
Coliforms - Water (035)
ECTC-001; modified from MOE DC MEDIUM MICROMFDC-E3407
MEMBRANE FILTRATION (DC)
Background
Escherichia coli (E. coli)
Total Coliforms

Water (Microbiology) OSDWA †
Escherichia coli (E. coli) - Water (002)
EC 001; modified from SM 9222 D
MEMBRANE FILTRATION (mTEC-XGLUC)
Escherichia coli (E. coli)

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Water (Microbiology) OSDWA †
Fecal (Thermotolerant) Coliforms - Water (044)
FC-001; modified from SM 9222 D
MEMBRANE FILTRATION (mTEC) WITH INDICATOR
Fecal (Thermotolerant) Coliforms

Water (Microbiology) OSDWA †
Fecal Streptococci - Water (003)
FS 001; modified from SM 9230 C
MEMBRANE FILTRATION
Fecal streptococci

Water (Microbiology) OSDWA †
Heterotrophic Plate Count (HPC) - Water (001)
HPC 001; modified from SM 9215 D
MEMBRANE FILTRATION
Heterotrophic Plate Count (HPC)

Water (Microbiology) OSDWA †
Total Coliforms - Water (043)
TC 001; modified from SM 9222 B
MEMBRANE FILTRATION (mENDO)
Background Counts
Total Coliforms

Water (Organic)
2-methyl-4-chlorophenoxyacetic acid (MCPA) - Water (084)
HERB-001; modified from EPA 515.1
GC/MS
MCPA

Water (Organic) OSDWA †
Base Neutral Acid Extractables (BNA) - Water (030)
NAB-W-001; modified from EPA 8270D
GC/MS
1+2-Methylnaphthalene (Calculation)
1-Methylnaphthalene
1,1-Biphenyl
1,2-Dichlorobenzene
1,2,4-Trichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2-Chloronaphthalene
2-Chlorophenol
2-Methylnaphthalene
2-Methylphenol
2-Nitrophenol
2,3,4,6-tetrachlorophenol
2,4+2,6-Dinitrotoluene (Calculation)
2,4-dichlorophenol
2,4-dichlorophenoxyacetic acid
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,4,5-Trichlorophenol
2,4,5-trichlorophenoxyacetic acid
2,4,6-trichlorophenol
2,6-Dinitrotoluene

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3,3-Dichlorobenzidine
4-Bromophenyl phenyl ether
4-Chloro-3-methyl phenol
4-Chloroaniline
4-Chlorophenyl phenyl ether
4-Methylphenol
4-Nitrophenol
4,6-Dinitro-2-methylphenol
Acenaphthene
Acenaphthylene
Alachlor
Aldicarb
Anthracene
Atrazine
Azinphos-methyl
Azobenzene
Bendiocarb
Benzo (a) anthracene
Benzo (a) pyrene
Benzo (b) fluoranthene
Benzo (g,h,i) perylene
Benzo (k) fluoranthene
Bis(2-chloroethoxy)methane
Bis(2-chloroethyl) ether
Bis(2-chloroisopropyl) ether
Bis(2-ethylhexyl) phthalate
Bromoxynil
Butlybenzyl phthalate
Carbaryl
Carbazole
Carbofuran
Chlorpyrifos (ethyl)
Chrysene
Cyanazine
Desethyl atrazine
Di-n-butyl phthalate
Di-n-octyl phthalate
Diazinon
Dibenzo (a,h) anthracene
Dibenzofuran
Dicamba
Diclofop-methyl (as free acid)
Diethyl phthalate
Dimethoate
Dimethyl phthalate
Dinoseb
Diuron
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane

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Indeno (1,2,3 - cd) pyrene
Isophorone
Malathion
Metolachlor
Metribuzin
N-Nitrosodi-n-propylamine
N-Nitrosodiphenylamine
Naphthalene
Nitrobenzene
Parathion (ethyl)
Pentachlorophenol
Phenanthrene
Phenol
Phorate
Picloram
Prometryne
Pyrene
Simazine
Temephos
Terbufos
Total PAH
Triallate
Trifluralin

Water (Organic) OSDWA †
Diquat and Paraquat - Water (028)
HPLCDIQ-001; modified from EPA 549.2
HPLC
Diquat
Paraquat

Water (Organic) OSDWA †
Glyphosate - Water (031)
GLYPH-002; modified from EPA 547
DIRECT INJECTION HPLC
Glyphosate

Water (Organic) OSDWA †
Pesticides and Polychlorinated Biphenyls (PCB) - Water (027)
PESTCL-001/PCB-001; modified from EPA 8081 and EPA 8082A
GC/ECD - EXTRACTION
A -BHC
Aldrin
Aldrin + Dieldrin
alpha-Chlordane
beta-BHC
DDT + metabolites (Calculation)
delta-BHC
Dieldrin
Endosulfan I
Endosulfan I/II
Endosulfan II
Endosulfan Sulfate
Endrin
Endrin Aldehyde
Endrin Ketone

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gamma-Chlordane
Heptachlor
Heptachlor Epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Lindane (gamma-BHC)
Methoxychlor
Mirex
o,p' - DDT
o,p'-DDD
o,p'-DDE
Oxychlordane
p,p' - DDT
p,p'-DDD
p,p'-DDE
Total DDD (Calculation)
Total DDE (Calculation)
Total DDT (Calculation)
Total PCB

Water (Organic) OSDWA †
Petroleum Hydrocarbons (PHC) - Water (050)
PHC-W-001; modified from MOEE TPM E3397A, E 3398
GC/FID - EXTRACTION
F2: C10-C16
F3: C16-C34
F4: C34-C50

Water (Organic) OSDWA †
Petroleum Hydrocarbons (PHC) - Water (059)
PHC-W-001; MOE E3421
GRAVIMETRIC
F4: Gravimetric

Water (Organic)
Polychlorinated Biphenyls (PCB) - Water (082)
PCB-001, PESTCL-001; modified from EPA 8081 AND EPAS 8082 A
GC/ECD - EXTRACTION
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Total PCB

Water (Organic) OSDWA †
Total Petroleum Hydrocarbons (TPH) - Water (019)
TPH EXT - 002; modified from MOEE E 3421
GC/FID - LIQUID EXTRACTION
Diesel Range Organics C10-C24
Heavy Oils: C24-C50
TPH C10-C50

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