

QUALITY ASSURANCE AND QUALITY CONTROL PLAN

ENVIRONMENTAL WASTE PROCESSING FACILITY

Qikiqtaaluk Environmental Inc.
PO Box 2110
2027 Iqaluit Lane
Iqaluit, Nunavut X0A 0H0

September 24, 2020

O/Ref.: QE19-100-8



Quality Assurance and Quality Control Plan

Environmental Waste Processing Facility

Qikiqtaaluk Environmental Inc.
PO Box 2110
2027 Iqaluit Lane
Iqaluit, Nunavut X0A 0H0

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Director

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Qikiqtaaluk Environmental

1. Introduction

1.1 General

Qikiqtaaluk Environmental Inc. (QE)'s Environmental Waste Processing Facility (EWPF) was developed due to a rising need for an environmental services provider in the City of Iqaluit and Nunavut in general. The EWPF is part of a business model to provide QE's clients with a turnkey solution for the safe management of their environmental liabilities. For this Quality Assurance and Quality Control (QA/QC) Plan, the EWPF's activities are divided into 3 general categories, which are outlined in the *QA and QC Guidelines*¹.

1.2 Location

The EWPF measures 19,160 m² and is located in Iqaluit. The Site plan is presented in Appendix A. The approximate coordinates of the centre of the property are:

Latitude: 63°44'38.22" N

Longitude: 68°32'58.59" W

The legal description of the EWPF is:

Lot 1673 Plan 666 REM Parcels Q & O

The civic address of the EWPF is:

2027 Iqaluit Lane

PO Box 2110

Iqaluit, Nunavut X0A 0H0

¹ "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

2. FIELD SAMPLING

2.1 Sample Collection

Sampling is to be conducted pursuant to NWB Licence No. 1BR-THI2027¹, and is summarized in Table 1, drawn directly from the licence renewal.

The locations of all sampling stations are presented in Appendix A. The project licencing history is presented in Appendix B.

TABLE 1 Summarized Sampling Plan

Monitoring Station ID	Description	Frequency	Parameters
THI-1a	Monitoring Station at new location of the WTF, treated effluent prior to be reused for equipment cleaning discharged to the environment	As per Part J, Item 3	Volume (as per Part J, Item 2) Quality (as per Part J, Item 5)
THI-2 and THI-3	Monitoring Stations at the EWPF, surface contact water and seepage up gradient and down gradient, collected from the perimeter of the Facility (drainage ditches)	As per approved Environmental Protection Plan	Quality (as per Part J, Item 6)
THI-4a	Monitoring well installed up-gradient of the STF	Once during spring freshet, and once during late summer	Quality (as per Part J, Item 6)
THI-4b	Monitoring well installed up-gradient of the site where the WTF treated effluent is discharged	Once during spring freshet, and once during late summer	Quality (as per Part J, Item 6)
THI-5a	Monitoring well installed down-gradient of the STF	Once during spring freshet, and once during late summer	Quality (as per Part J, Item 6)
THI-5b	Monitoring well installed downgradient of the site where the WTF treated effluent is discharged	Once during spring freshet, and once during late summer	Quality (as per Part J, Item 6)
THI-6a	Monitoring well installed down-gradient of the STF	Once during spring freshet, and once during late summer	Quality (as per Part J, Item 6)
THI-6b	Monitoring well installed downgradient of the site where the WTF treated effluent is discharged	Once during spring freshet, and once during late summer	Quality (as per Part J, Item 6)
THI-7	Reference or Control Area for soil monitoring (determined by the Licensee directed by Inspector)	Once a year at the same time that THI-8 monitoring is carried out	Quality (as per Part J, Item 17)
THI-8	Soil monitoring at the location where the WTF Effluent is discharged	Once a year after treated effluent from the WTF is discharged	Quality (as per Part J, Item 17)

¹ Nunavut Water Board Amended Renewal Water Licence, Licence No. 1BR-THI2027, effective January 1, 2020 through December 31, 2027

Stations are identified onsite with markers and the sampling is conducted by the same personnel and techniques to reduce operational errors.

2.2 Sampling Equipment and Methodology

The equipment used for sampling is always the same and is a standard for QE. The instrumentation devices such as the PID should be checked and/or calibrated every year by the supplier or a competent technician, or according to the supplier's recommendations. Spare equipment should be available whether in stock or leased to compare readings and to verify the precision of measurements. The readings obtained are recorded in the calibration log with the date and the initials or signature of the technician or in the certificate by the supplier. An instrument is normally verified against a value that corresponds to a normal operating condition.

New collection bottles must be used for each sample analysis. The bottles, as well as the containment they will be transported in, must be stored in a clean area.

QE uses laboratory-supplied non-metallic sampling equipment and bottles/jars. The sampling bottles are constructed of HDPE plastic or glass, depending on the type of analysis required, i.e. glass bottles are used for oil and grease analysis.

A replicate sample is required at each sampling campaign, and a field duplicate is recommended as needed to ensure precision at the laboratory. The field technician will log the sample that corresponds to the replicate but will not transmit this information to the laboratory to ensure better quality control. All chain of custodies, laboratory communication, result tables, and certificates of analyses are saved in QE's server under the affiliated project.

A third party will be contacted to follow a sampling campaign in the year 2021.

2.3 Sample Handling

Preservation

QE uses laboratory-supplied jars and bottles that already contain the necessary types and concentrations of preservatives for each type of analysis. The bottles that contain preservatives should always be sealed. If the seal is broken when the person sampling opens a bottle, it will be discarded and will not be used. Expiration dates on each sample are also given by the laboratory.

Identification

Sample identification and chain of custodies must be clearly visible. The samples must be identified using the monitoring station names presented in Table 1, along with the date that the sampling took place. For example, THI-7_190831 was a sample taken at station THI-7 on August 31, 2019.

The sampling bottle or jar is identified with a water-resistant, non-smear marker and includes details such as the company name, sample ID as well as date and time collected. This info is then also indicated on the chain of custody begin sent to the laboratory. One copy of the chain of custody is kept in QE's records, and another copy accompanies the samples to the laboratory.

Qikiqtaaluk Environmental

Transportation

Once the samples are collected and identified, their integrity is ensured by packaging and sealing them in an upright position in a cooler and protected by a bubble-wrap type packaging to avoid breakage. Ice packs are placed in the cooler to ensure the samples requiring refrigeration for preservation remain at an adequate temperature. They are then shipped the same day they are collected by commercial air freight from Iqaluit to a laboratory in Ottawa to ensure the fastest possible transit times.

3. LABORATORY ANALYSIS

QE's samples are analysed at outside laboratories. Water and soil analysis are usually conducted at Caduceon Environmental Laboratories located in Ottawa, Ontario, which holds a valid CALA¹ (Canadian Association for Laboratory Accreditation Inc.) accreditation. A copy of Caduceon's CALA certificate stating the parameters for which they are accredited is included in Appendix C.

Laboratories used by QE, as well as other suppliers and subcontractors, must be on QE's list of approved suppliers which is updated yearly and for which suppliers must show their necessary permits, accreditations and insurance are valid.

Detection limits should be identified for each parameter and included in the presentation of the results. If any sample results are outside the appropriate QA/QC ranges, attempts should be made to correct the problem immediately and re-analyzed. Reference standards are kept up to date yearly.

¹ CALA was formerly known as the *Canadian Association for Environmental Analytical Laboratories* (since this was the requirement of INAC's guideline in 1992). The name was changed in June 2008.

4. REPORTING REQUIREMENTS

For reporting of the results, the following information must be included in the annual reports:

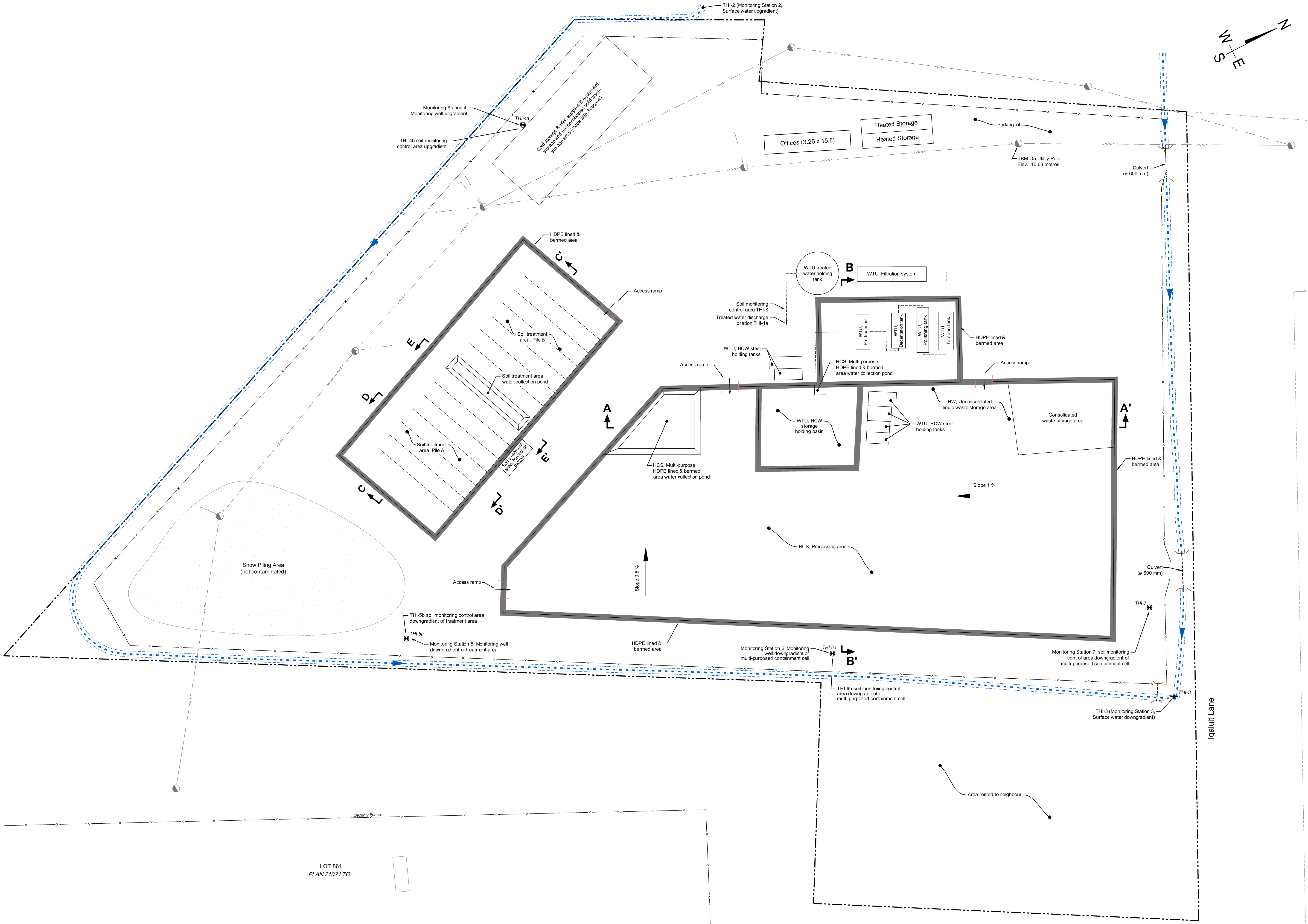
- Dates that the sampling took place;
- Identification and/or coordinates of the sampling location or monitoring well
- Certificates of analysis from the accredited laboratory;
- Approval communications for the discharge of the effluent;
- The volume of water discharged.

The annual report must be submitted to the Nunavut Water Board by March of the following year.



APPENDIX A

Figure



Legend

- Monitoring well (QE, 2018) (approximate location)
- Water quality monitoring point (approximate location)
- Fence (metal mesh, 1.8 m of height, 3 rows of barbedwires)
- Ditch
- Overhead electrical line
- Utility pole and guy wire
- Boundary of lease (approximate location)
- HDPE lined and bermed area
- Cross-section location

Source:

- Kudlik Construction Ltd.;
- As built drawing n° QIKI ENVIRONNEMENT.dwg, November 2019;
- QE land survey date: October 2017;
- Sub-Arctic Surveys Ltd., File no. 15-206-QE-JL14-TOPO, July 15, 2015;
- Iqaluit - Survey Sketch 001-2015.dwg, 2015.

0 3 6 9 12 15m

CONFIDENTIAL

Sequence: C AS-BUILT DRAWING

Prepared by: J.-F. Larose, Eng No OIQ: 111779 Date: 2019-12-03

Approved by: J. Godin Date: 2019-12-03

Sequence: B FOR PERMIT

Prepared by: J.-S. B. Dicaire, jr Eng J.-F. Larose, P. Eng No OIQ: 111779 Date: 2019-09-24

Approved by: O. Simard Date: 2019-09-24

Sequence: A FOR PERMIT

Prepared by: J.-S. B. Dicaire, jr Eng J.-F. Larose, P. Eng No OIQ: 111779 Date: 2019-06-27

Approved by: O. Simard Date: 2019-06-27

Figure 1
Environmental Waste Processing Facility
As-built Drawing

NIRB AND NWB LICENCE APPLICATIONS

Submitted to:

Property located at:
Lease parcels O and Q,
Airport lands in Iqaluit, NU

Drawn by: D. Grant Prepared by: R. Labranche, Eng Approved by: J. Godin

Date: 2020-09-22 Revision: 1 Project no.: QE19-100-8 Contract no.: --

Qikistauk
environmental



APPENDIX B

Project Licencing History

Table 1
Project Licencing History

Licence Number	Date Issued	Comments
1BR-THI1419	20-Aug-14	Authorization to commercially treat hydrocarbon impacted water
1BR-THI1722	4-May-17	Authorization to commercially treat contaminated soil, contaminated water, and manage hazardous waste
1BR-THI1722 Amendment No. 1	15-Sep-17	Modification of discharge limits for the WTF'S treated effluent
1BR-THI2027	6-Jan-20	Modification of the deposit of waste



APPENDIX C

Caduceon CALA Certification



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: September 12, 2019

Valid To: August 1, 2021

Scope of Accreditation

Air (Inorganic)

Metals - Air [Filter] (012)

D-ICP-02; modified from NIOSH 7303 and SM 3120 B

ICP - DIGESTION

Cadmium

Copper

Lead

Zinc

Air (Inorganic)

Total Suspended Particulates - Air [Filter, Particulate] (018)

A-TSP-01; modified from ON MOECC E3288A

GRAVIMETRIC

Total Suspended Particulates

Dustfall

Dustfall - Dustfall (020)

A-DF-01; modified from ON MOECC E3043A

FILTRATION - GRAVIMETRIC

Insoluble Dustfall

Total Dustfall

Fluoride Candles

Fluoride - Fluoride Candles (019)

A-FISE-01; modified from ON MOECC 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).

Solids (Inorganic)

Anions - Solids [Biosolid, Soil] (069)

A-IC-01; modified from SM 4110 C

ION CHROMATOGRAPHY - EXTRACTION

Chloride

Nitrate

Nitrite

Sulphate (Sulfate)

Solids (Inorganic)

Boron (Hot Water Soluble) - Solids [Soil] (098)

D-ICP-02; ON MOECC E3470

ICP/AES - EXTRACTION

Boron

Solids (Inorganic)

Conductivity - Solids [Sediment, Soil] (099)

A-COND-03; modified from ON MOECC E3530 and SM 2510 B

CONDUCTIVITY METER - EXTRACTION

Conductivity

Solids (Inorganic)

Extractable Anions - Solids (090)

A-IC-01; modified from EPA 1311 (PREPARATION) and SM 4110 C (ANALYSIS)

ION CHROMATOGRAPHY - TCLP

Nitrate

Nitrite

Solids (Inorganic)

Extractable Metals - Solids (091)

D-ICP-01; modified from EPA 1311 (PREPARATION) and SM 3120 B (ANALYSIS)

ICP/AES - TCLP

Arsenic

Barium

Beryllium

Boron

Cadmium

Chromium

Lead

Nickel

Silver

Zinc

Solids (Inorganic)

Extractable Metals - Solids (092)

D-ICPMS-01; modified from EPA 1311 (PREPARATION) and EPA 200.8 (ANALYSIS)

ICP/MS - TCLP

Antimony

Arsenic

Selenium

Uranium

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Solids (Inorganic)

Extractable Metals - Solids (093)

D-HG-02; modified from EPA 1311 (PREPARATION) and SM 3112 B (ANALYSIS)

COLD VAPOUR AA - TCLP

Mercury

Solids (Inorganic)

Flashpoint - Solids [Ash, Soil] (096)

C-FPCC-01; modified from ASTM D93

CLOSED CUP FLASH POINT TESTER

Flashpoint

Solids (Inorganic)

Hexavalent Chromium - Solids [Soil] (094)

D-CRVI-02; modified from EPA 3060A and EPA 7196A

COLORIMETRIC - MANUAL

Hexavalent Chromium

Solids (Inorganic)

Mercury - Solids [Biosolid, Soil] (017)

D-HG-01; modified from EPA 7471A

COLD VAPOUR AA - DIGESTION

Mercury

Solids (Inorganic)

Metals - Solids [Biosolid, Soil] (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

Sodium

Strontium

Tin

Titanium

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Tungsten
Vanadium
Zinc

Solids (Inorganic)

pH - Solids [Sediment, Sludge, Soil] (100)
A-pH-03; modified from ON MOECC E3530 and SM 4500-H+
pH METER - EXTRACTION
pH

Solids (Inorganic)

Total Metals - Solids [Biosolid, Soil] (070)
D-ICPMS-01; modified from EPA 6020
ICP/MS - DIGESTION
Antimony
Arsenic
Selenium
Silver
Thallium
Uranium

Water (Inorganic)

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

Water (Inorganic)

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

Water (Inorganic)

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

Water (Inorganic)

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

Water (Inorganic)

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

† "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).

Water (Inorganic) Conductivity - Water (003) A-COND-01; modified from SM 2510 B CONDUCTIVITY METER Conductivity (25°C)	OSDWA †
Water (Inorganic) Conductivity - Water (087) A-COND-02; modified from SM 2510 B AUTO CONDUCTIVITY METER Conductivity (25°C)	OSDWA †
Water (Inorganic) 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	OSDWA †

† "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

Water (Inorganic)

Dissolved Metals - Water (049)

D-ICPMS-01; modified from EPA 200.8

ICP/MS

Antimony

Arsenic

Barium

Beryllium

Cadmium

Chromium

Cobalt

Copper

Lead

Molybdenum

Selenium

Silver

Thallium

Uranium

Vanadium

OSDWA †

Water (Inorganic)

Hexavalent Chromium - Water (095)

D-CRVI-01; modified from ON MOECC E3056

COLORIMETRIC - MANUAL

Hexavalent Chromium

Water (Inorganic)

Mercury - Water [Wastewater] (025)

D-HG-02; modified from SM 3112 B

COLD VAPOUR AA - DIGESTION

Mercury

OSDWA †

Water (Inorganic)

pH - Water (086)

A-pH-02; modified from SM 4500-H+ B

AUTO - pH METER

pH

OSDWA †

Water (Inorganic)

pH - Water [Liquid Biosolid, Wastewater] (005)

A-pH-01; modified from SM 4500-H+

pH METER

pH

OSDWA †

Water (Inorganic)

Total Metals - Water [Liquid Biosolid, Wastewater] (067)

D-ICP-01; modified from SM 3120 B

ICP/AES - DIGESTION

Aluminum

Antimony

Arsenic

Barium

Beryllium

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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 [Liquid Biosolid, Wastewater] (071)

D-ICPMS-01; modified from EPA 6020

ICP/MS - DIGESTION

Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Copper
Lead
Molybdenum
Selenium
Silver
Vanadium

† "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

Water (Inorganic) Turbidity - Water (026) A-TURB-01; modified from SM 2130 B NEPHELOMETRY Turbidity	OSDWA †
Water (Microbiology) Coliforms - Water (050) B-ECTC-01; modified from ON MOECC E3407 MEMBRANE FILTRATION (DC) Background Bacteria Escherichia coli Total Coliforms	OSDWA †
Water (Microbiology) Escherichia coli (E. coli) - Water (010) B-MFEC-01; modified from ON MOECC E3371 MEMBRANE FILTRATION (EC) Escherichia coli	OSDWA †
Water (Microbiology) Fecal (Thermotolerant) Coliforms - Water (065) B-MFFC-01; modified from ON MOECC E3371 MEMBRANE FILTRATION (mFC) Fecal (Thermotolerant) Coliforms	OSDWA †
Water (Microbiology) Heterotrophic Plate Count (HPC) - Water (021) B-HPC-01; modified from SM 9215 C SPREAD PLATE Heterotrophic Plate Count (HPC)	OSDWA †
Water (Microbiology) Total Coliforms - Water (066) B-MFTC-01; modified from ON MOECC E3371 MEMBRANE FILTRATION (mENDO) Background Counts Total Coliforms	OSDWA †

† “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



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