QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC) PLAN FOR THE COLLECTION OF WATER SAMPLES AT THE **FOX-2 (LONGSTAFF BLUFF)** DEW LINE SITE

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Revised May 2005
Revised September 2005

Prepared by:
ENVIRONMENTAL SCIENCES GROUP
for
DEFENCE CONSTRUCTION CANADA
&
UMA ENGINEERING LTD.

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1. Introduction

During the remediation work taking place at the FOX-2 DEW Line site at Longstaff Bluff, Nunavut, water samples from any wastewater that requires discharge will be collected. The collection of wastewater samples is similar to the collection of other types of water samples.

As outlined in the proposed Monitoring Program, samples will be analyzed for the following parameters:

2. For wastewater requiring discharge:
   - pH;
   - Total petroleum hydrocarbons (TPH);
   - Oil and grease (visual inspection for sheen);
   - Inorganic elements (total arsenic, dissolved cadmium, total chromium, dissolved cobalt, dissolved copper, dissolved lead, total mercury, dissolved nickel, and, total zinc);
   - PCBs; and
   - Phenols.

2. Sample Collection

2.1. Location

Sample locations were marked with a disk stamped with the sample number and a piece of flagging tape, attached with a 150-mm nail. Each sample location was assigned a distinct sample number. These sample numbers were recorded on a map as well as in a field notebook along with a description of the associated sample location. The GPS coordinates of the sample locations will be recorded as well.

2.2. Sampling Equipment

The following table summarizes the equipment and storage requirements for each water sample type collected. New bottles were used in all cases for the collection of the water samples.

Contaminant	Container	Amount	Rinse	Storage	Special Treatment
pH	1L Plastic Bottle	Full	No	Cool	Do not filter
TPH, Hg	250 mL amber glass bottle	Full – no headspace	No	Cool	
Phenols	100 mL amber glass bottle (Qorpak vial)	Full	No	Cool	Acidify with H_2PO_4 to pH<4*
Oil and grease, PCBs	1L Teflon bottle or 1 L amber glass bottle	Full	Teflon – yes Glass - no	Cool	Do not filter

*Generally it is not possible to acidify the samples in the field due to TDGA regulations. The samples, therefore, are acidified immediately upon receipt in the laboratory, prior to extraction

2.3. Sampling Methods

Sample bottles will be filled completely at the time of sampling. Bottles are not to be filled progressively over the course of days. If there is not sufficient water to completely fill the bottle(s), then no water sample will be collected. The bottles are to be filled with no headspace remaining to guard against volatilization of dissolved phases. Generally, the samples will be collected immediately prior to departure from the site and submitted for analysis within 48 hours.

3. Sample Handling

3.1. Preservation

The water samples will be kept cool (approximately 4^0 C) prior to and during shipping. In general, water samples will be collected when transportation from the site will be available almost immediately after, as many types of the required analyses should be performed as quickly as possible after collection.

Ideally, samples collected for inorganic analyses should be acidified in the field, at the time of collection. However, regulations concerning the transportation of dangerous goods make supplying concentrated nitric acid in the field difficult. Where samples can not be acidified in the field, it will be requested that the samples are acidified immediately upon receipt in the lab, *prior* to decanting or sample extraction. When

acidifying in the lab, the container will be rinsed with 35% HNO_3 and included with the sample.

Samples are not to be filtered at any time. If samples contain excessive sediment, the samples will simply be decanted in the southern laboratory (*following* acidification, for metal analyses) prior to analysis.

3.2. Sample Identification

Each water sample will be given a blind number that was the only number provided on the labels of samples submitted for analysis. This sample number corresponds to the number assigned to that specific sample location which will be recorded on a map and in the field notebook.

3.3. Transportation

Samples are to be shipped by guaranteed airfreight in coolers from the site to their respective accredited laboratory for analysis. Chain-of-custody forms will be filled out and checked for each sample before shipment from the North, and the contents of shipments will be verified upon receipt in the laboratory.

4. Lab Analysis

4.1. Lab Accreditation

All laboratory analysis is carried out at accredited labs. The following laboratories are the ones primarily responsible for the analysis of water samples collected at FOX-2 (Longstaff Bluff):

1) Analytical Services Unit, Queen's University, Kingston ON; and
2) Analytical Sciences Group, Royal Military College of Canada, Kingston ON.

Proof of accreditation from these laboratories is located in Appendix A. The standard methods used by the laboratories for each of these analyses are listed in the laboratory's scope of accreditation.

4.2. Detection Limits

The following table provides a summary of the detection limits for the analysis to be performed on water samples collected at FOX-2 (Longstaff Bluff).

Parameter	Detection Limit
Total arsenic	0.003 mg/L
Dissolved cadmium	0.001 mg/L
Total chromium	0.005 mg/L
Dissolved cobalt	0.003 mg/L
Dissolved copper	0.003 mg/L
Dissolved lead	0.010 mg/L
Dissolved nickel	0.005 mg/L
Total zinc	0.01 mg/L
Total mercury	0.0005 mg/L
Oil and grease	1.0 mg/L
Phenols	1.0 µg/L
PCBs	3.0 µg/L
Total petroleum hydrocarbons (TPH)	1 mg/L

4.3. Methodology

The following is a summary of the methods to be used in the analysis of the water samples collected from FOX-2 (Longstaff Bluff).

4.3.1. Inorganic Elements by Inductively Coupled Plasma Atomic Emission Spectroscopy

Analyses were conducted by the Analytical Services Unit, Queen's University, Kingston, Ontario. Each sample was clearly labelled and stored at low temperatures in a secured area before and after analysis.

Each water sample (400 mL), with 3 mL of nitric acid, was placed in a beaker on a hot plate and slowly boiled to dryness. To this was added 20 mL of 2% nitric acid. The sample was then heated to boiling, cooled, and made up to 25 mL with distilled deionized

water. The resulting solutions were analyzed by ICP-AES for the selected eight elements: arsenic (As), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), lead (Pb), nickel (Ni), and zinc (Zn).

4.3.2. Mercury in Water

Analyses were conducted by the Analytical Services Group, Royal Military College, Kingston, Ontario. Each sample was clearly labeled and kept at a low temperature before and after analysis.

Samples were analyzed using cold vapour generated mercury hydride atomic absorption spectrophotometry. Water samples were preserved with nitric acid and 5% potassium dichromate solution. The samples were analyzed using a Perkin-Elmer FIMS-100 Mercury System equipped with a 253.7 ηm source mercury lamp, quartz cell, Perkin-Elmer AS-90 autosampler, and the Perkin Elmer AA WinLab Analyst software. The carrier solution was 3% HCl and the reducing agent was 1.1% $SnCl_2$ in 3% HCl. Ultrahigh purity argon was used as the carrier gas, with the flow rate set between 40 and 70 mL/min. Three 500-µL replicates for each sample were analyzed. A signal was generated in the quartz cell by measuring the amount of light (wavelength 253.7 ηm) absorbed. The mercury concentrations in the samples were determined by comparing sample absorbance responses to a calibration curve generated from standards of known concentration. Duplicates, blanks and control samples were included in each run. The sample results were reported as mg/L (ppm) for water.

4.3.3. Oil and Grease in Water

Analyses were conducted by the Analytical Services Unit, Queen's University, Kingston, Ontario. Each sample was clearly labelled and stored at low temperatures in a secured area before and after analysis.

A sample volume (800 mL) was placed in a 1-L separatory funnel. The sample was extracted three times with 25 mL of dichloromethane. The extract was filtered through a funnel containing anhydrous sodium sulphate and into a round-bottom flask. The extract was rotoevaporated to approximately 2 mL and transferred to a preweighed vial, which was allowed to stand overnight in a fume hood and reweighed when dry. All values were reported as mg/L dry weight (ppm).

4.3.4. Phenols in Water

Analyses were conducted by the Analytical Services Unit, Queen's University, Kingston, Ontario.

Water samples were analyzed for phenols by means of a colorimetric assay using the Technicon Autoanalyzer system. The term "phenolic compounds" is applied to those hydroxy derivatives of benzene, which react under the conditions of the test, with the reagents used. Phenol was used as a standard and any colour produced by reaction with the reagent was reported as phenol.

Prior to analysis, turbid samples were filtered using a 0.45um Millipore filter attached to a syringe. If phenol levels were known or suspected to exceed 25 ppb, the samples were diluted to within the appropriate range in deionized water. The lower detection limit was 1 ppb.

Aliquots of each sample were applied to an Autoanalyzer, where they were mixed with phosphoric acid prior to entering an automated distillation system. The distillate was then mixed with a tartrate-borax buffer, pH 9.4, and 4-aminoantipyrine to produce an antipyrine dye, which was finally oxidized by alkaline ferricyanide. The absorbance of the colour complex was measured in a 5-cm flow cell at 505 nm. The concentration of each sample in ug/L phenol was determined by comparing a chart recorder trace of the sample with peaks produced by a similarly treated series of standards.

4.3.5. Total Petroleum Hydrocarbon (TPH) in Water

Analyses were conducted by the Analytical Services Group, Royal Military College, Kingston, Ontario. Each sample was stored in a clearly labeled container and kept at low temperatures in a secured area before and after analysis.

For water samples, a 75-mL portion of the water sample was accurately measured and transferred to a clean 125-mL glass separatory funnel. Hexane (5 mL) was added and the mixture shaken vigorously and allowed to separate. If emulsions formed, the funnel was briefly sonicated to ensure adequate phase separation. Some of the hexane phase was then transferred to a GC vial.

All samples were analyzed by temperature-programmed gas chromatography on an HP/Agilent 6890 Plus instrument fitted with an FID detector. SPB-1 fused silica capillary column or equivalent was used (30 m, 0.25 mm i.d. x 0.25 µm film thickness). Alternatively a SGE BPX% (10m, 0.1 mm i.d. x 0.1 µm film thickness) was used. TPH was quantified by comparing the chromatogram peak area of the sample with standards of fuel oil and lubricating oil standards prepared in hexane. Compound identity was determined by comparing the sample chromatogram with those of known hydrocarbons. The results were reported as mg/L (ppm) for water.

4.3.6. PCBs in Water

An 800-mL sample was placed in a 1-L separatory funnel and spiked with DCBP, an internal standard. Dichloromethane (25 mL) was added to the separatory funnel, which was then shaken with frequent venting. The bottom layer was decanted through a funnel containing anhydrous sodium sulphate and into a round-bottom flask. This extraction step was repeated twice more, giving a collected volume of 75 mL in the round-bottom flask. The solvent in the flask was then exchanged for hexane by rotary evaporation of the original 75 mL down to 1 mL, and 5 mL of hexane were added and again evaporated to 1 mL. The addition of 5 mL of hexane was repeated twice more, to give a final volume of 1 mL after the last rotary evaporation. The 1-mL volume remaining in the flask was pipetted onto a LC-Florisil solid phase extraction tube (Supelco) and eluted with hexane. The PCB concentrations were determined by running the resulting solutions on an HP/Agilent 6890 Plus gas chromatograph with ECD detector.

Analyses requiring ultra-low detection limits were similarly treated, but were concentrated to a known volume of approximately 0.5 mL after Florisil elution. Injection volumes of 2 mL were used in the GC analysis.

4.3.7. pH Measurement

Measurements on water samples were conducted by the Analytical Services Unit, Queen's University, Kingston, Ontario.

Water samples were measured directly using a 50 mL sample. pH was measured with a Fischer Scientific Accumet Model 10 pH meter and probe

4.4. Reporting Requirements

The following types of QA/QC samples will also be collected as part of the water sampling program. Note that if more than one type of bottle is used for each water sample, QA/QC samples will be submitted in each type of bottle used for the collection of the samples.

Field duplicates*:* Approximately 10% of the samples were collected as field duplicates. That is, two samples were collected from one sample location. These samples were handled in the same way and submitted blindly to the laboratories for analysis.

Field blanks: Field blanks consisted of distilled water and were collected to ensure that there is no corruption of samples from the sampling method. The distilled water was poured from its container into the sample container at the same time and using the same techniques as used to collect the regular water samples.

Travel blanks: The purpose of travel blanks is to ensure that there is no corruption of the sample or sample container during travel. Ideally, a full set of travel blanks should accompany each shipment of water samples. However, in cases where very few samples are shipped at a time, this guideline can be extended to a more reasonable number. Travel blanks were filled at ESG prior to leaving for the field. They were shipped with the sample bottles, stored with the sample bottles on site, brought out to the sampling location in the field, returned to the lab, and shipped to the labs with the water samples. They should not be opened unless the other bottles or water samples are opened for some reason during shipping.

Appendix A: Proof of Laboratory Accreditation

CAEAL Directory of Laboratories

Login
Member:
Password:
Login

Home | List all | Search PT Directory | Search Accreditation Directory

Membership Number: 2709
Laboratory Name: Queen's Analytical Services Unit
Parent Institution: Queen's University
Address: Environmental Studies Biosciences Complex Kingston, Ontario K7L 3N6
Contact: Dr. Allison Rutter
Phone: (613) 533-2642
Fax: (613) 533-2897
Email: ruttera@biology.queensu.ca

Standard: Conforms with requirements of CAN-P-4D (ISO/IEC 17025)
Clients Served:
Revised On: February 21, 2005
Valid To: February 16, 2008

Click for PT Directory	Showing Accreditation Directory

Scope of Accreditation

Search Criteria - results highlighted in yellow
Laboratory Name contains "analytical services unit"

Oil
PCB - Oil (004)
ASU 04; based on EPA 8081
GC/ECD - EXTRACTION
Total PCB

Soil/Sediment
Metals - Soil (007)
ASU007; based on EPA 200.7
ICP/OES - DIGESTION
Arsenic
Cadmium
Chromium
Cobalt
Copper
Lead
Nickel
Zinc

Water (Inorganic)
Ammonia - Water (009)
ASU09; based on TECHNICON METHOD
AUTO COLOR
Ammonia

Water (Inorganic)
Dissolved Metals - Water (008)
ASU08; based on EPA 200.7
ICP/AES

Dissolved Arsenic
Dissolved Cadmium
Dissolved Chromium (High)
Dissolved Cobalt (High)
Dissolved Copper (High)
Dissolved Lead (High)
Dissolved Manganese (High)
Dissolved Nickel (High)
Dissolved Zinc (High)

Water (Inorganic)

Major Ions - Water (003)
ASU 03; based on DIONEX MANUAL
ION CHROMATOGRAPHY
Chloride
Nitrate
Nitrate plus Nitrite
Sulfate

Water (Inorganic)

Oil and Grease - Water (010)
ASU10; based on SM 5520 (20TH EDITION)
GRAVIMETRIC - EXTRACTION
Oil and Grease

Water (Inorganic)

Total Metals - Water (012)
ASU08; based on EPA 200.7
ICP/AES
Total Arsenic
Total Cadmium
Total Chromium
Total Cobalt
Total Copper
Total Lead
Total Manganese
Total Nickel
Total Zinc

Water (Organic)

Biphenyl - Water (005)
ASU 05; IN HOUSE METHOD
GC/FID - EXTRACTION
Biphenyl
Biphenyl Ether

Water (Organic)

Phenols - Water (001)
ASU 01; based on MOE METHOD 1983
AUTOANALYZER/COLORIMETRY
Phenols

CAEAL Directory of Laboratories

Login
Member:
Password:
Login

Home | List all | Search PT Directory | Search Accreditation Directory

Membership Number: 2965
Laboratory Name: RMC Analytical Services Group
Parent Institution: The Royal Military College of Canada
Address: Dept. of Chemistry & Chemical Engineering RMC, PO Box 17000 Stn. Forces Kingston, Ontario K7K 7B4
Contact: Dr. David Kelly
Phone: (613) 541-6000 Ext. 6921
Fax: (613) 545-8341
Email: david.kelly@rmc.ca

Standard: Conforms with requirements of CAN-P-4D (ISO/IEC 17025)
Clients Served: Specified Clients
Revised On: January 03, 2005
Valid To: January 03, 2008

Click for PT Directory	Showing Accreditation Directory

Scope of Accreditation

Search Criteria - results highlighted in yellow
Laboratory Name contains "analytical services group"

Oil

Total Chlorine - Oil (003)
ASG 003; based on J. RADIONAL CHEM., 50, 229-234 (1979) AND based on ANAL. CHIM. ACTA., 108, 137-147 (1979).

NAA
Total Chlorine

Plant Tissue

Polychorinated Biphenyls (PCB) - Plants (020)
ASG026; based on EPA 8082, EPA 680, EPA 8082, EPA 3545, EPA 3640C, FRAME, ET. AL. J. HIGH RESOL. CHROMATOGR., 19:657-668, 1996.

Arochlors
PCB Conegeners

Radio Chemistry

Radionuclide Activity - Biota (008)
ASG 031; based on SM AMERICAN WATER ASSN. METHOD 7120, SM FOR EXAM. OF WATER/WASTEWATER, 20TH ED., & USEPA METHOD 901.1.

GAMMA SPECTROSCOPY
Barium-140
Cerium-144
Cesium-134
Cesium-136
Cesium-137
Cesium-138

Cobalt-60
Iodine-131
Iodine-132
Iodine-133
Iodine-134
Iodine-135
Lanthanum-140
Molybdenum-99
Niobium-95
Rubidium-86
Rubidium-88
Ruthenium-103
Ruthenium/Rhodium-106
Strontium-91
Tellurium-129m
Tellurium-131m
Tellurium-132
Yttrium-90m
Yttrium-91m
Zirconium-95

Soil

BTEX/Petroluem Hydrocarbons (PHC) - Soil (025)
ASG 053; based on CCME REFERENCE METHOD FOR THE CANADA-WIDE STANDARD FOR PETROLEUM HYDROCARBONS IN SOIL - TIER 1 METHOD 2001

GC/MS - EXTRACTION
Benzene
Ethylbenzene
F1: C6-C10
F2: C10-C16
F3: C16-C34
F4: C34-C50
m/p-xylene
o-xylene
Toluene

Soil/Sediment

Activity of Radionuclide - Soil (007)
ASG 030; based on SM AMERICAN WATER ASSN. METHOD 7120, SM FOR EXAM. OF WATER/WASTEWATER, 20TH ED., & USEPA METHOD 901.1.

GAMMA SPECTROSCOPY
Barium-140
Cerium-144
Cesium-134
Cesium-136
Cesium-137
Cesium-138
Iodine-131
Iodine-132
Iodine-133
Iodine-134
Iodine-135
Lanthanum-140
Molybdenum-99
Niobium-95
Rubidium-86
Rubidium-88
Ruthenium-103
Ruthenium/Rhodium-106
Strontium-91
Tellurium-129m
Tellurium-131m
Tellurium-132
Yttrium-90m
Yttrium-91m
Zirconium-95

Soil/Sediment

PCBs - Soil (005)
ASG 005; based on EPA 8081

GC/ECD - SOXHLET/PSE
PCBs

Soil/Sediment

Polycyclic Aromatic Hydrocarbons (PAH) - Soil (001)
ASG 002; based on EPA 8100
GC/MS - EXTRACTION
Acenaphthene
Acenaphthylene
Anthracene
Benzo (a) anthracene
Benzo (a) pyrene
Benzo (b) fluoranthene
Benzo (g,h,i) perylene
Benzo (k) fluoranthene
Chrysene
Dibenz (a,h) anthracene
Fluoranthene
Fluorene
Indeno (1,2,3 - cd) pyrene
Naphthalene
Phenanthrene
Pyrene

Soil/Sediment

Total Petroleum Hydrocarbons (TPH) - Soil (010)
ASG010; based on EPA 3550B, EPA 8015C
GC/FID - EXTRACTION
Total Petroleum Hydrocarbons

Water (Inorganic)

Alkalinity - Water (Drinking/Surface/Sewage/Ground) (013)
ASG035; based on NAQUADAT NO. 10101, EPA 310.1, SM 20TH ED. 2320
POTENTIOMETRIC
Alkalinity (pH 4.5)

Water (Inorganic)

Biochemical Oxygen Demand (BOD) - Water (Surface/Sewage/Ground) (019)
ASG042; based on NAQUADAT NO. 08201, EPA 405.1, SM 20TH ED. 5210
D.O. METER
BOD (5 day)

Water (Inorganic)

Conductivity - Water (Drinking/Surface/Sewage/Ground) (016)
ASG038; based on SM 20TH. ED. 2510, EPA 120.1
CONDUCTIVITY METER
Conductivity (25Ã?C)

Water (Inorganic)

Mercury - Water (Ground/Surface/Drinking) (011)
ASG021; based on EPA 7470A
FLOW INJECTION MERCURY SPEC
Mercury

Water (Inorganic)

Metals - Water (024)
ASG 049; based on EPA 200.8 AND SM 20TH ED. 3125
ICP/MS
Dissolved Aluminum
Dissolved Beryllium
Dissolved Boron
Dissolved Cadmium
Dissolved Chromium
Dissolved Cobalt
Dissolved Copper
Dissolved Lead
Dissolved Manganese
Dissolved Molybdenum
Dissolved Nickel
Dissolved Silver
Dissolved Strontium
Dissolved Thallium
Dissolved Tin
Dissolved Uranium
Dissolved Vanadium Parameter suspended on 5/18/2005
Total Antimony
Total Arsenic

Water (Inorganic)

pH - Water (Drinking/Surface/Sewage/Ground) (015)
ASG037; based on SM 20TH. ED. 4500-H+, EPA 150.1

pH METER
pH

Water (Inorganic)

Total Dissloved Solids (TDS) - Water (Drinking/Surface/Sewage/Ground) (018)
ASG040; based on EPA 160.1, SM 18TH ED. 2540C
GRAVIMETRIC
Total Dissolved Solids

Water (Inorganic)

Total Suspended Solids (TSS) - Water (Drinking/Surface/Sewage/Ground) (017)
ASG039; based on EPA 160.2, SM 18TH ED. 2540D
GRAVIMETRIC
Total Suspended Solids

Water (Microbiology)

Coliforms - Water (Drinking/Surface/Sewage/Ground) (014)
ASG036; based on MOE MICROMEFDC-E3407, SM 20TH ED. 9225
MEMBRANE FILTRATION (DC)
Escherichia coli (E. coli)
Total Coliforms

Water (Microbiology)

Fecal Coliforms - Water (Drinking/Surface/Sewage/Ground) (022)
ASG044; based on MOE MICROMEFDC-E3407, SM 20TH ED. 9222 D
MEMBRANE FILTRATION (m FC)
Fecal Coliforms

Water (Microbiology)

Heterotrophic Plate Count (HPC) - Water (Drinking/Surface/Sewage/Ground) (023)
ASG041; SM 20TH ED. 9215 D
MEMBRANE FILTRATION
Heterotrophic Plate Count (HPC)

Water (Organic)

Total PCB - Water (Surface/Sewage/Ground) (009)
ASG015, ASG022; based on EPA 8082, EPA 617, FRAME, ET. AL. J. HIGH RESOL. CHROMATOGR., 19: 657-668, 1996
GC/MS - EXTRACTION
Total PCB

Water (Organic)

Total PCB - Water (021)
ASG006, ASG008; based on EPA 8082, EPA 617, FRAME, ET. AL. J. HIGH RESOL. CHROMATOGR., 19: 657-668, 1996.
GC/ECD - EXTRACTION
Total PCB

Water (Organic)

Volatile Organic Compounds (VOC) - Water (Drinking/Surface/Ground) (012)
ASG023; based on EPA 624, EPA 8260B
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-Dibromoethane
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
2,2-Dichloropropane
4-Chlorotoluene
Benzene
Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromoform

Bromomethane
Carbon Tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
cis-1,2-Dichloroethylene
cis-1,3-Dichloropropene
Dibromomethane
Dichlorodifluoromethane
Dichloromethane Parameter suspended on 8/17/2005
Ethylbenzene
Hexachlorobutadiene
Isopropylbenzene
Isopropyltoluene
m/p-xylene
n-Butylbenzene
n-Propylbenzene
Naphthalene
o-xylene
sec-Butylbenzene
Styrene
tert-Butylbenzene
Tetrachloroethylene
Toluene
trans-1,2-Dichloroethylene
trans-1,3-Dichloropropene
Trichloroethylene
Trichlorofluoromethane
Vinyl Chloride

Water (Radiochemistry)

Alpha/Beta Radiation (Swab) (004)
ASG 004; RMC-CMR LSC PROCEDURES MANUAL VER. 1.0
LIQUID SCINTILLATION COUNTING
Alpha radiation
Beta radiation

Water (Radiochemistry)

Radionuclide (Activity) - Water (006)
ASG 024; based on SM AMERICAN WATER ASSN. METHOD 7120, SM FOR EXAM. OF WATER/WASTEWATER, 20TH ED., & USEPA METHOD 901.1.
GAMMA SPECTROSCOPY
Barium-140
Cerium-144
Cesium-134
Cesium-136
Cesium-137
Cesium-138
Cobalt-60
Iodine-131
Iodine-132
Iodine-133
Iodine-134
Iodine-135
Lanthanum-140
Molybdenum-99
Niobium-95
Rubidium-86
Rubidium-88
Ruthenium-103
Ruthenium/Rhodium-106
Strontium-91
Tellurium-129m
Tellurium-131m
Tellurium-132
Yttrium-90m
Yttrium-91m
Zirconium-95

Standards Council of Canada
Conseil canadien des normes
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Ottawa, ON (Canada)
K1P 6N7
Canada
Tel.: +1 613 238 3222
Fax.: +1 613 569 7808
E-mail/Courriel : info@scc.ca
Internet: http://www.scc.ca

SCOPE OF ACCREDITATION

The Royal Military College of Canada
RMC ANALYTICAL SERVICES GROUP
Department of Chemistry and Chemical Engineering P.O. Box 17000, Station Forces
Kingston, ON
K7K 7B4

Accredited Laboratory No. 276
(Conforms with requirements of CAN−P−4D (ISO/IEC 17025), and CAN−P−1598)

CONTACT: Dr. David Kelly
TEL: (613) 541−6000 x6921
FAX: (613) 545−8341
EMAIL: david.kelly@rmc.ca

CLIENTS SERVED: All interested parties

FIELDS OF TESTING: Chemical/Physical

PROGRAM SPECIALTY AREA: Environmental

ISSUED ON: 2005−06−22

VALID TO: 2006−11−02

ENVIRONMENTAL AND OCCUPATIONAL HEALTH AND SAFETY

Environmental

Water (Microbiology)

(Coliforms − Water [014]) (OSDWA)

ASG036; based on MOE
MICROMEFDC−E3407, SM 20TH ED. 9225

MEMBRANE FILTRATION (DC)
Escherichia coli (E. coli)
Total Coliforms

(Fecal Coliforms − Water [022]) (OSDWA)

ASG044; based on MOE
MICROMEFDC−E3407, SM 20TH ED. 9222
D

MEMBRANE FILTRATION (m FC)
Fecal Coliforms

(Heterotrophic Plate Count (HPC) − Water [023]) (OSDWA)

ASG041; SM 20TH ED. 9215 D

MEMBRANE FILTRATION
Heterotrophic Plate Count (HPC)

Notes:

CAN−P−4D (ISO/IEC 17025): General Requirements for the Competence of Testing and Calibration Laboratories ISO/IEC 17025−1999)

CAN−P−1598: Guidelines for Accreditation of Environmental Testing Laboratories

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)

P. Paladino, P. Eng., Director, Conformity Assessment

Date: 2005−06−22

SCC 1003−15/358
CAEAL #2965
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