SRC Environmental Analytical Laboratories

MINING & INDUSTRY SERVICE GUIDE

Effective February 21, 2017

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General Information

SRC Environmental Analytical Laboratories
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E-mail:	analytical@src.sk.ca
Web address:	www.src.sk.ca/analytical
Hours of Operation:	Monday – Friday | 7:30 a.m. - 6:00 p.m. Ensure time critical samples arrive at the lab before 5:30 pm.

Corporate Overview

For over 50 years, the Saskatchewan Research Council's (SRC) Environmental Analytical Laboratories has provided high-quality testing services throughout Saskatchewan and around the world. Our world-class facility maintains an extensive range of testing services, most of which are accredited in accordance with international standards (ISO/IEC 17025) by the Canadian Association for Laboratory Accreditation (CALA). A complete list of accredited tests offered by the laboratory is available from the laboratory or on the CALA website at www.cala.ca.

SRC Environmental Analytical Laboratories is located at Innovation Place in Saskatoon, Saskatchewan, in a modern facility with state-of-the-art instruments, equipment and data management systems. In accordance with our accreditation requirements, the laboratory follows a comprehensive quality assurance and quality control (QA/QC) program. All sample information and data are stored in a digital Laboratory Information Management System (LIMS), which is used for sample tracking, reporting and invoicing. In many cases, automated data transfer from instrumentation directly into the LIMS facilitates processing and reduces the chance of error. Data can be readily retrieved and reported in a variety of formats and can often be directly uploaded into client databases.

The skilled and knowledgeable team at SRC Environmental Analytical Laboratories provides excellent customer service and is available to assist clients with any queries. The laboratory has a long history of working with and finding solutions for clients.

We welcome your inquiries! Please contact us regarding your analysis requirements.

Billing and Reporting Information

Standard Turnaround

The rates in this price list are for reporting results within a standard turnaround time. For routine samples, the average turnaround time is 5 working days.

Rush Service

A rush service is provided for a 100% surcharge. Samples will be processed as quickly as possible during regular work hours. Turnaround time will depend on the type of analysis required and number of samples submitted, but can generally be reduced to between 1 and 3 days.

Rush Service - Overtime Authorized

Overtime is authorized to further expedite the sample turnaround time. The 100% surcharge for Rush Service will apply. In addition, any overtime required to expedite the analysis will be charged out at a rate of $125/hour.

Contact the lab directly in **advance** to discuss turnaround time requirements and authorize overtime.

Fees

Published prices may be subject to change without prior notification. **GST/HST** will be added to the invoice, if applicable.

Late Payment

Late payment charges will be assessed after 30 days, at a rate of 1.5% compounded monthly (19.6% annually).

Minimum Billing

A minimum charge of $50 may be applied to all analytical work orders.

Volume Discounts

Contact the laboratory to discuss the number of samples to be submitted and analysis requirements.

Results

Preliminary and final results can be accessed at anytime from our secure Online Results Portal. Contact the laboratory for additional information and to obtain a secure login and password.

Final results are reported in PDF format, as well as a variety of other formats (e.g., Excel, text, etc.) suitable for your particular needs. Arrangements can also be made to have results uploaded directly into your database. Contact the laboratory regarding your specific needs.

Quality Assurance

SRC Environmental Analytical Laboratories maintains an extensive Quality Assurance Program designed to ensure the reliability of analytical data. Key components of the Quality Assurance Program are:

- Accreditation and Proficiency Testing by the Canadian Association for Laboratory Accreditation (CALA)
- Participation in interlaboratory performance assessment programs
- Comprehensive Quality Control program
- Computerized sample and data management

Accreditation and Proficiency Testing

SRC Environmental Analytical Laboratories is accredited by CALA for specific environmental tests. These tests are listed in the Scope of Accreditation found on the CALA website. Our lab has one of the largest scopes of accreditation for an environmental lab in Western Canada. The accreditation program consists of on-site assessments and proficiency testing. Accreditation ensures that the laboratory management system, facilities, procedures and methods conform to ISO/IEC 17025, the internationally recognized standard for testing and calibration laboratories.

Interlaboratory Performance Assessment

The laboratory participates in several proficiency testing programs that are used to assess the performance of participating laboratories and to identify any issues with testing procedures. The laboratory participates in proficiency testing programs offered by:

- CALA
- Environment Canada National Water Research Institute (NWRI)
- Environmental Resource Associates (ERA)
- International Atomic Energy Agency (IAEA)
- Health Canada

Quality Control

A variety of techniques, such as the analysis of reference materials, control samples, duplicates and spike recovery measurements are used to ensure the validity of the analytical results. If a problem is identified, the samples are re-analyzed, or other corrective action is undertaken, to demonstrate that the analytical results are acceptable. If this is not possible, then the client is notified. Quality control data obtained during the analysis of samples can also be reported to the client.

Quality Assurance

Quality Assurance staff at SRC Environmental Analytical Laboratories manage all aspects of the quality system. This includes reviews of quality control data, method validation and quality audits.

Water

Packages for Water Analysis

Major Ions Package
Applicable to potable water, groundwater and surface water.

Includes: Calcium, Magnesium, Sodium, Potassium, Chloride, Sulfate, Fluoride, pH, Specific Conductivity, Nitrate, Alkalinity, Bicarbonate, Carbonate, Hydroxide, Total Hardness, Sum of Ions

General Chemical Package
Applicable to potable water, groundwater and surface water.

Includes: Calcium, Magnesium, Sodium, Potassium, Chloride, Sulfate, Fluoride, pH, Specific Conductivity, Nitrate, Alkalinity, Bicarbonate, Carbonate, Hydroxide, Total Hardness, Sum of Ions, Total Dissolved Solids (TDS)

Trace Metals Package
Includes: Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc

Rare Earth Elements Package
Pricing does not include initial preparation, such as drying and grinding.

Includes: Sample digestion, Cerium, Dysprosium, Erbium, Europium, Gadolinium, Hafnium, Hofnium, Lanthanum, Lutetium, Neodymium, Niobium, Praseodymium, Samarium, Scandium, Tantalum, Terbium, Thulium, Ytterbium, Yttrium

Water Potability Package (WP)
Applicable to potable water, groundwater and surface water.

Includes: Total Coliforms, Nitrates

Trihalomethanes (THM)
Includes: Chloroform, Dichlorobromomethane, Dibromochloromethane, Bromoform, THM total

Purgeable or Extractable Hydrocarbons

- Purgeable hydrocarbons includes:
  BTEX (Benzene, Toluene, Ethylbenzene, Xylenes), F1 (C6-C10)

- Extractable hydrocarbons includes:
  F2-F4 (C11-C50)

Total Petroleum Hydrocarbons

- Both purgeable and extractable hydrocarbons:
  BTEX (Benzene, Toluene, Ethylbenzene, Xylenes), F1-F4

Water

Sample Preparation

When necessary, sample preparation steps are performed to obtain suitable samples for analysis or when required for specific tests. For example, for dissolved parameters, filtration is required to remove suspended solids from the sample. Digestion is required for trace metals analysis to include any metals present in suspended material within the sample.

Filtration

Pressure Filtration

Digestion

Trace Metals

Trace Metals Package
Includes: Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc

Rare Earth Elements Package
Includes: Cerium, Dysprosium, Erbium, Europium, Gadolinium, Hafnium, Hofnium, Lanthanum, Lutetium, Neodymium, Niobium, Praseodymium, Samarium, Scandium, Tantalum, Terbium, Thulium, Ytterbium, Yttrium

Individual Elements
Available elements: Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Bismuth, Bromine, Cadmium, Calcium, Cerium, Chromium, Cobalt, Copper, Dysprosium, Europium, Erbium, Gadolinium, Hafnium, Holmium, Iron, Iodine, Lanthanum, Lead, Lithium, Lutetium, Magnesium, Manganese, Molybdenum, Nickel, Neodymium, Niobium, Phosphorous, Potassium, Praseodymium, Rubidium, Samarium, Selenium, Scandium, Silver, Sodium, Strontium, Tantalum, Tellurium, Terbium, Thallium, Thorium, Thulium, Tin, Titanium, Tungsten, Uranium, Vanadium, Ytterbium, Yttrium, Zinc, Zirconium

Mercury

Radiochemistry

Radium-226

Radium-228

Thorium-230

Thorium Isotopes (Th-228, Th-230 and Th-232)

Lead-210

Polonium-210

Radon-222

Gross Alpha and Beta

Routine Chemistry

Alkalinity
Includes: Total Alkalinity, Carbonate, Bicarbonate, Hydroxide

Calcium

Chloride

Fluoride

Magnesium

pH

Potassium

Sodium

Specific Conductivity

Sulfate

Calcium, Magnesium and Total Hardness

Water

Nutrients

Total Organic Carbon (TOC)

Dissolved Organic Carbon (DOC)
(Lab filtration)

Ammonia as Nitrogen (NH_3-N)

Nitrate (NO_3)

Nitrite (NO_2)

Nitrite + Nitrate as Nitrogen (NO_2 + NO_3-N)

Total Kjeldahl Nitrogen (TKN)

Total Phosphorous (TP)
(Digestion, $15)

ortho-Phosphate (o-PO_4)

Inorganic Phosphorous (IP)

Total Phosphorous, Inorganic Phosphorous and Organic Phosphorous

Dissolved Phosphorous
(Lab filtration, $13)

Miscellaneous

Solids, total dissolved (TDS)

Solids, total suspended (TSS)

Low-Level TSS

Turbidity

Acidity

Amines

Chlorophyll (A, B, C)
(Lab filtration, $13)

Total Cyanide

Weak Acid Dissociable Cyanide

Eh (Oxidation-reduction potential)

Microbiology

Total Coliforms and E. coli

Fecal Coliforms (membrane filtration)

Heterotrophic plate count

Fecal Streptococcus

Routine Wastewater

Biochemical Oxygen Demand (5-day BOD)

Carbanceous Biochemical Oxygen Demand
(c-BOD)

Chemical Oxygen Demand (COD)

Hexavalent Chromium (Cr VI)

Oil and Grease
(n-Hexane Extractable Material; HEM)

Mineral Oil and Grease
(Silica-Gel Treatment n-Hexane Extractable Material; SGT-HEM)

Phenolics

Sulfide

Soil, Wasterock and Solid Tailings

Sample Preparation

To obtain representative results, samples are normally dried and ground before analysis. Percent moisture can be determined and results are typically reported on a dry weight basis. If unstable or volatile parameters, such as mercury, are required, a representative portion of the wet sample is taken and analyzed. The moisture results are used to calculate these results back to a dry basis. Initial preparation charges for soil are as follows:

Drying

Grinding

Grinding (Radioactive)

Drying, Grinding and % Moisture

Drying, Grinding and % Moisture (Radioactive)

Microwave Digestion

Water Leach and Filtration

Distilled Water Leach Procedure

Compositing, per portion ($18 minimum)

Packages

Trace Metals Package
Pricing does not include initial preparation, such as drying and grinding.

Includes: Sample digestion, Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Calcium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Phosphorous, Potassium, Selenium, Sodium, Silver, Strontium, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc

Note that boron determined with the trace metals package is not suitable for evaluating compliance with environmental quality guidelines. For evaluation of compliance with environmental quality guidelines, boron must be determined from a suitable leach.

Rare Earth Elements Package
Pricing does not include initial preparation, such as drying and grinding.

Includes: Sample digestion, Cerium, Dysprosium, Erbium, Europium, Gadolinium, Hafnium, Hofnium, Lanthanum, Lutetium, Neodymium, Niobium, Praseodymium, Samarium, Scandium, Tantalum, Terbium, Thulium, Ytterbium, Yttrium

Individual Elements
Pricing does not include any sample preparation.

Available elements: Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Bismuth, Cadmium, Calcium, Cerium, Chromium, Cobalt, Copper, Dysprosium, Europium, Erbium, Gadolinium, Hafnium, Holmium, Iron, Lanthanum, Lead, Lithium, Lutetium, Magnesium, Manganese, Molybdenum, Nickel, Neodymium, Niobium, Phosphorous, Potassium, Praseodymium, Rubidium, Samarium, Selenium, Scandium, Silver, Sodium, Strontium, Tantalum, Tellurium, Terbium, Thallium, Thorium, Thulium, Tin, Titanium, Uranium, Vanadium, Ytterbium, Yttrium, Zinc, Zirconium

Mercury (includes sample digestion)

Boron (includes leach)

Soil, Wasterock and Solid Tailings

Soil Characteristics

Salinity Package
The salinity package is used to assess suitability of a soil for various agricultural purposes. It is often used for remediation purposes. A minimum of 500 g of soil is required.

Pricing includes the paste leach preparation and the following determinations: pH, Conductivity (EC, Electrical Conductivity or Specific Conductivity), Sodium Absorption Ratio (SAR), % Saturation, Calcium, Magnesium, Sodium, Potassium, Sulfate, Chloride and Theoretical Gypsum Rate (TGR)

Package price does not include initial preparation, such as drying and grinding.

For more complete information about the condition of the soil, additional parameters can be added to the package.

Ammonia as Nitrogen

Nitrite + Nitrate as Nitrogen

Phosphorus (available)

Alkalinity (carbonate and bicarbonate)

Boron

Cation Exchange Capacity (CEC)
CEC is a measure of a soil's fertility and nutrient retention capacity. Clay mineral and organic matter components of soil have negatively charged sites on their surfaces, which adsorb and hold positively charged ions (cations). In general, soils that retain more cations are more fertile than those with lower CEC.

CEC with Sodium Acetate

CEC with Ammonium Acetate

Miscellaneous

Ash

Total Carbon*

Organic Carbon*

Inorganic Carbon*

Carbonates by back titration

Chloride, water soluble (includes water leach $25)

Hexavalent Chromium (Cr VI)

Cyanide

Bulk Density

Fluoride

Gamma Spectroscopy
Scan for naturally occurring isotopes or specific gamma emitting radionuclides of interest.

Loss on Ignition (550°C)

Ammonia as Nitrogen (includes water leach $25)

Nitrite + Nitrate as Nitrogen
(includes water leach $25)

Total Kjeldahl Nitrogen

pH (suitable slurry or rinse pH)

Phenolics

Total Phosphorous (TP)
(includes digestion)

Inorganic Phosphorous (IP)

Total Phosphorous, Inorganic Phosphorous and Organic Phosphorous

Silica

Specific Conductivity

Sulfate, acid soluble (includes digestion)

Sulfide (calculated, with sulfate and total sulfur)

Sulfur, total*

*Subcontracted to another lab within SRC.

Purgeable or Extractable Hydrocarbons
- Purgeable hydrocarbons includes:
  BTEX (Benzene, Toluene, Ethylbenzene, Xylenes), F1 (C6-C10)
- Extractable hydrocarbons includes:
  F2-F4 (C11-C50)

Petroleum Hydrocarbons
- Both purgeable and extractable hydrocarbons:
  BTEX (Benzene, Toluene, Ethylbenzene, Xylenes), F1-F4

Soil, Wasterock and Solid Tailings

Radionuclides

Radionuclide Package
Includes: Sample digestion, Lead-210, Polonium-210, Radium-226 and Thorium-230

Lead-210
(includes digestion)

Polonium-210
(includes digestion)

Lead-210 and Polonium-210 together
(includes shared digestion)

Radium-226
(includes digestion)

Thorium-230
(includes digestion)

Thorium isotopes
(includes sample digestion, Th-228, Th-230 and Th-232)

Special Mine Assessment Techniques

Leachability Testing
Over the past 25 years, SRC Environmental Analytical Laboratories has performed a wide variety of leaching tests on ore, tailings and waste rock. These include dynamic column leaching, static leaching and standard EPA leach tests. All tests can be performed with natural or synthetic leach solutions under aerobic or anaerobic conditions. Please contact the laboratory to discuss your requirements.

Equilibrium between Uranium and its Progenies
This procedure is used for determining the degree of equilibrium between radium-226 and uranium-238 in rocks, sediments and ores. If gamma spectroscopy is used in the field to measure the amount of uranium in ore samples, it is important that the degree of equilibrium between uranium-238 and radium-226 is known. If dis-equilibrium exists, the apparent uranium-238 content will be incorrectly determined because the primary gamma emitters are progenies of radium-226.

Radon Emanation Rate
This measurement is performed to determine the amount of radon-222 that will be released from the surface of solid materials. It can be used to calculate the rate at which radon will diffuse from rock and ore into the surrounding air.

Radon Fractional Release Measurement
This procedure is used to determine the fraction of radon which escapes from rock, soil, sediment or ore samples. The rate of release of radon is calculated as a percentage of the total potential release.

radium-226 by Emanation
This procedure is used if interferences prevent the use of the Alpha Spectroscopy method to determine radium-226.

Acid Rock Drainage

Sample Preparation

To obtain representative results, samples are normally dried and ground before analysis. Percent moisture can be determined and results are typically reported on a dry weight basis. If unstable or volatile parameters, such as mercury, are required, a representative portion of the wet sample is taken and analyzed. The moisture results are used to calculate these results back to a dry basis. Initial preparation charges for soil are as follows:

Drying

Grinding

Crushing

Drying, Grinding and % Moisture

Shake Flask Extraction

Synthetic Precipitation Leaching Procedure (SPLP)

Toxicity Characteristic Leaching Procedure (TCLP)

Packages

Acid Base Accounting Package
Acid base accounting is used to assess the acid production potential or acid consumption potential of waste rock and ore. This can be done in accordance with Standard or Modified Sobek protocol. Please discuss your requirements with the laboratory.

Includes: Net Acid Generating Potential (NAG), Acid Neutralizing Potential (AN), Acid Producing Potential (AP), Paste pH, Sulfate Sulfur, Sulfide Sulfur, Total Sulfur

Extra charges apply for drying and grinding.

Trace Metals Package
Pricing includes sample digestion, but does not include initial preparation, such as drying and grinding.

Includes: Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Calcium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Phosphorous, Potassium, Selenium, Sodium, Silver, Strontium, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc

Whole Rock Analysis
Pricing includes lithium metaborate fusion and ICP elemental determination. Most elements are calculated and reported as the oxide. Initial preparation, such as drying and grinding, is extra. Whole Rock Analysis is subcontracted to SRC Geoanalytical Laboratories.

Includes: Aluminum, Barium, Calcium, Chromium, Iron, Magnesium, Manganese, Phosphorous, Potassium, Scandium, Silicon, Sodium, Strontium, Titanium, Yttrium, Zirconium

Individual Parameters

Total Carbon*

Organic Carbon*

Inorganic Carbon*

Carbonates by back titration

Surface Rinse pH on <2 mm fraction

Particle Size Analysis (laser diffraction)

Particle Size Analysis (sieves)

*Subcontracted to another lab within SRC.

Potash, Sodium Sulfate and Other Salts

Sample Preparation

Samples need to be dry and homogenous before analysis to obtain representative results and therefore, may require drying and grinding before analysis. Samples that are already dry and homogenous upon receipt, can be reported on the 'as received' basis. When a moisture determination is requested, the results are reported on 'a dry' basis. Most common tests require a water leach and filtration.

% Moisture with oven drying

Drying, Grinding and % Moisture

Microwave digestion

Water leach and filtration

Packages

Standard Metals Package
Includes: Sample digestion, Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc

Major Constituents Package
Includes water leach and filtrations and digestion, as well as analysis for Water Insolubles, major ion impurities in the salt, and determination of the purity of the salt, which is calculated by difference. Major ion impurities depend on the type of salt and may include: Calcium, Magnesium, Sodium, Potassium, Chloride and Sulfate.

Depending on the type of salt, an extra water leach may be required for chloride. Additional tests, such as carbonate and nitrates, are extra.

Low-level Metals Package
Includes: Water leach, filtration and MIBK extraction for the determination of low-level water soluble Chromium, Cadium, Cobalt, Copper, Iron, Lead, Molybdenum, Nickel, Vanadium, Zinc

Also included is water leach, filtration, and digestion of the insolubles retained on the filter for the determination of low-level water insoluble Chromium, Cadium, Cobalt, Copper, Iron, Lead, Molybdenum, Nickel, Vanadium, Zinc; and
Digestion and analysis for the total Aluminum, Arsenic, Boron, Barium, Beryllium, Selenium, Antimony, Manganese, Silver, Strontium, Thallium, Tin, Titanium, Uranium

Miscellaneous

Water Insolubles (includes water leach and filtration)

Acid Insolubles

pH

Density

Total Cyanide (includes water leach and filtration)

Bromide

Amine (includes water leach and filtration)

Fluoride (matrix matching)

Particle Size Analysis
(laser diffraction, solvent module)

Organic Extractables Scan

Yellow Prussiate of Soda (YPS)

Mercury

Soluble Silicon (includes water leach and filtration)

Iodine (includes water leach and filtration)

Air Quality/Industrial Hygiene

Sample Preparation of Air Filters

Sample preparation depends on the type of sample submitted and the analyses required. The digestion procedures for respirable filters and for high-volume filters are significantly different. Respirable filters require an acid digestion. Analysis of high-volume filters will involve subsampling and digestion of large portions of filter material. High-volume filters often require compositing of the filter material.

High-volume Filter Acid Digestion

High-volume Filter Compositing
(Up to 4 filters; additional filters $2 each)

Respirable Dust Cassettes Acid Digestion

Trace Metals

Trace Metals Package
Sample digestion is extra.

Includes: Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc

Individual Elements
Pricing does not include any sample preparation.

Available elements: Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Bismuth, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Manganese, Molybdenum, Nickel, Phosphorous, Potassium, Rubidium, Selenium, Scandium, Silver, Sodium, Strontium, Thallium, Thorium, Tin, Titanium, Uranium, Vanadium, Zinc, Zirconium

Radionuclides

Sample preparation charges will apply if required.

Lead-210

Polonium-210

Radium-226

Thorium-230

Thorium Isotopes
Includes: Th-228, Th-230 and Th-232

Respirable Dust Cassettes

Contact the laboratory several days in advance of sampling to arrange for preparation and delivery of respirable dust cassettes.

Total Deposited Particulate (TDP)
on respirable dust cassettes
Includes pre-weighed filter supplied in cassette, as well as final weighing

Alpha-Quartz (crystalline silica)

Alkaline Dusts (includes leach)

Total Cyanide (includes leach)

Oil Mist

Radionuclides: Gross alpha and beta

Air Quality/Industrial Hygiene

Adsorption Tubes

Inorganic Acids (HCl, HF, HNO_3, H_3PO_4, H_2SO_4)

Ammonia as Nitrogen

Formeldehyde

Carbotrap tubes

- **TO-17** (Total Risk Package)
- **Open Characterization/VOC screen**
- **Total Risk + Open Characterization**
- **Fixed and Variable Gases**
  (CO, CO_2, O_2, N_2, H_2,CH_4)

Wipes and Swabs

Metals Package
Includes: Sample digestion, Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Calcium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Phosphorous, Potassium, Selenium, Sodium, Silver, Strontium, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc

PCBs

Dustfall Jars

Total Deposited Particulate

Total and Volatile Deposited Particulate

Organic Volatiles and Gaseous Emissions

Canisters (1.4 L and 6 L)

Canister preparation, rental and batch certification

Flow Controller rental

TO-15 (Total Risk Package)

Open Characterization/VOC screen

Total Risk + Open Characterization

H_2S and other sulfur compounds

Waste Disposal

Landfill Waste Material

Many of the tests required to characterize waste material for acceptance at a landfill site are listed below. **Requirements vary** depending on the type and origin of the waste for disposal. Clients should discuss their disposal needs and arrange for a suitable testing protocol with the landfill where they intend to dispose of their waste. If you require any tests that are not listed below, contact the laboratory.

Sample Preparation

To obtain representative results, solid samples are normally dried and ground before analysis. Percent moisture can be determined and results are typically reported on a dry weight basis. If unstable or volatile parameters, such as mercury, are required, a representative portion of the wet sample is taken and analyzed. The moisture results are used to calculate these results back to a dry basis. Initial preparation charges for solid samples are as follows:

Drying and Grinding

Drying, Grinding and % Moisture

Packages for Waste Disposal

Metals Package
Includes: Sample digestion, Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Calcium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Phosphorous, Potassium, Selenium, Sodium, Silver, Strontium, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc

Purgeable or Extractable Hydrocarbons

- Purgeable hydrocarbons includes: BTEX (Benzene, Toluene, Ethylbenzene, Xylenes), F1 (C6-C10)
- Extractable hydrocarbons includes: F2-F4 (C11-C50)

Total Petroleum Hydrocarbons
Includes: BTEX (Benzene, Toluene, Ethylbenzene, Xylenes), F1-F4

Class II Landfill Packages
A variety of landfill packages are available that include many of the parameters normally required by landfills for disposal of waste material. **Requirements vary** depending on the type and origin of the waste for disposal. Clients are advised to discuss their needs with the landfill prior to testing.

Class II Landfill Complete Package
Includes: Dry, Grind, Moisture, Flashpoint, pH, Paint Filter Liquids Test, Phenolics, Metals Package, Hexavalent Chromium (Cr VI), Cyanide, Fluoride, TCLP Leach, Leachable Metals, Zero Headspace TCLP Leach, Leachable BTEX (Benzene, Toluene, Ethylbenzene, Xylenes), Total Petroleum Hydrocarbons, Polycyclic Aromatic Hydrocarbons, Volatile Organic Compounds, Glycols, Extractable Organic Halides, PCBs

Class II Landfill Basic Package
Includes: Dry, Grind, Moisture, Flashpoint, pH, Paint Filter Liquids Test, Phenolics, Metals Package, Hexavalent Chromium (Cr VI), Cyanide, Fluoride

Class II Landfill Leachable Parameters Package
Includes: TCLP Leach, Leachable Metals, Zero-headspace TCLP Leach, Leachable BTEX (Benzene, Toluene, Ethylbenzene, Xylenes)

Leachable Mercury (if required)

Class II Landfill Basic Organics Package
Includes: Total Petroleum Hydrocarbons, Polycyclic Aromatic Hydrocarbons, Volatile Organic Compounds, Glycols

Class II Landfill Chlorinated Organics Package
Includes: Extractable Organic Halides, PCBs

Polycyclic Aromatic Hydrocarbons (PAHs)
Includes: Acenaphthylene, Acenaphthene, Acridine, Anthracene, Benzo(a)anthracene, Benzo(a)-pyrene, Benzo(b+j)fluoranthene, Benzo(e)pyrene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3,c,d)pyrene, Naphthalene, Perylene, Phenanthrene, Pyrene, 1-Methylnaphthalene, 2 Methylnaphthylene, Quinoline

Volatile Organic Compounds (VOCs)
Includes: Vinyl Chloride, 1,1-dichloroethylene, Dichloromethane, MTBE, 1,1-dichloroethane, Chloroform, 1,1,1-trichloroethane, Carbon Tetrachloride, 1,2-dichloroethane, Benzene, Trichloroethylene, Bromodichloromethane, Toluene, 1,1,2 trichloroethane, Tetrachloroethylene, Dibromochloromethane Chlorobenzene, 1,1,1,2 tetrachloroethane, Ethylbenzene, m+p-xylene, o-xylene, Styrene, Bromoform, 1,1,2,2 tetrachloroethane, 1,2,4 trimethylbenzene, 1,4 dichlorobenzene, 1,2-dichlorobenzene

Extractable Organic Halides (EOX)

- Reported as chlorine

Waste Disposal

Packages for Waste Disposal (Continued)

Toxicity Characteristic Leaching Procedure
(TCLP Leach)
The TCLP leach is a US EPA method used to assess contaminants that have the potential to leach out of waste material over time. The leachate is typically analyzed for trace metals, as well as hydrocarbons. Several other parameters can also be determined on the leachate.

TCLP Leachable Metals
Includes: TCLP Leach and analysis for Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc

TCLP Leachable Metals and Mercury
Includes: TCLP Leach and analysis for Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc

TCLP Leachable Hydrocarbons
Includes: TCLP Leach and hydrocarbon fractions F2-F4

TCLP Landfill Leachable Parameters Package
Includes: TCLP Leachable metals and leachable benzene, toluene, ethylbenzene and xylenes; uses zero-headspace TCLP leach

TCLP Leachable Benzene
Includes: TCLP Leachable benzene; uses zero-headspace TCLP leach

Tests On Solid Wastes

Flashpoint

pH

Paint Filter Liquids Test

Phenolics

PCBs

Glycols
Includes: 1,2-Propanediol, Diethylene glycol, Ethylene glycol, Triethylene glycol

Hexavalent Chromium

Total Cyanide

Mercury, total

Fluoride

Sulfur, total

Sulfur, Sulfate and Sulfide

Naturally Occurring Radioactive Material (NORM)

The Canadian Guidelines for the Management of NORM outline criteria for the disposal of naturally occurring radioactive material that arises in processes unrelated to the nuclear industry. The laboratory can provide testing to help assess if these waste materials meet the release limits outlined in the guidelines.

NORM on Solids Package
Includes: determination by gamma spectroscopy for K-40, Pb-210, Ra-226, Ra-228, Th-228, Th-230; determination by ICP-MS for U-238 and Th-232; assessment if the material meets the release limits specified in the guidelines

Gamma Spectroscopy for NORM
Includes: determination by gamma spectroscopy for several NORM parameters, including K-40, Pb-210, Ra-226, Ra-228, Th-228, Th-230, Th-234

NORM on Liquids Package
For disposal of aqueous or liquid waste containing NORM, the gamma spectroscopy technique is not sufficiently sensitive to assess if a waste meets the disposal criteria for all the radionuclides outlined in the guidelines.

The NORM on liquids package includes determination of K-40, Pb-210, Ra-226, Ra-228, Th-228, Th-230, Th-232 and U-238 by sufficiently sensitive techniques to assess if the material meets the release limits specified in the guidelines.

Oily Wastes

Metals Package
Includes: Sample digestion, Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc

PCBs (oil/solvent)

Total Organic Halides (TOX) in oil/solvent

Water Content
Determined with either the Karl Fischer (non-aqueous liquids) or Dean Stark (high-water content) techniques

Paint

Lead in paint

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