SCOPE OF ACCREDITATION

SGS
SGS CANADA - MINERALS SERVICES - LAKEFIELD
P.O. Box 4300, 185 Concession Street
Lakefield, ON
K0L 2H0

Accredited Laboratory No. 184
(Conforms with requirements of CAN-P-1579, CAN-P-4E (ISO/IEC 17025:2005))

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CLIENTS SERVED: All interested parties

FIELDS OF TESTING: Chemical/Physical

PROGRAM SPECIALTY AREA: Mineral Analysis

ISSUED ON: 2014-12-09

VALID TO: 2017-03-06

METALLIC ORES AND PRODUCTS

Concentrates, Metallic Liquors and Other Process Products:
Metallic Ores:
Metal Powders
Precious Metals
Rocks and Ores
Sediments

Mineral Analysis Testing:
Assay, Umpire assay work
Contract Settlement Assaying
Geotechnical Testing
Mineral Assaying

G_PHY09B Determination of Combined Water in Exploration Samples by Gravimetric Analysis [H2O+]
GC/GO_AAS93A Preparation and Determination of Refractory Metals (Aluminum,
Calcium, Chromium, Iron, Magnesium, Manganese, Silica, Tin, Titanium, Vanadium in Ores and Metallurgical Samples by Sodium Peroxide Fusion and Atomic Absorption Spectrometry [Al, Ca, Cr, Fe, Mg, Mn, Si, Sn, Ti, V, AAS]

GC/GT_AAS42V Preparation and Determination of Silver in Ores, Concentrates and Metallurgical Products by Acid Digest and Atomic Absorption Spectroscopy [Ag, AAS, HNO3, HCL, HClO4, HF]

GC/GT_CLA37V Determination of Total Calcium, Calcium Carbonate and Calcium Fluor spar by Complexometric Titration [Ca, CaCO3, CaF2: EDTA; modified from ASTM]

GC/GT_CON03V Preparation and Determination of Total Copper in Ores, Concentrates, Metallurgical Products and Metals by Separation and Electrogravimetry of Acid Solubles and Fusion-Atomic Absorption Spectrophotometry of Acid Insolubles [Cu: Electrogravimetry, ICP, AAS; modified from ISO 10469]

GC/GT_CON07V Preparation and Determination of Nickel by Electrogravimetry and Atomic Absorption Spectrometry [Ni, DMG; AAS, ICP; modified from ISO 12169]

GC/GT_CON08V The Preparation and Determination of Iron in Ores, Concentrates and Metallurgical Products by Fusion, Separation and Titration [Fe]

GC/GT_CON11V Preparation and Determination of Lead in Ores, Concentrates, Metallurgical Products and Metal Alloys by Precipitation and Titration of Acid Solubles and Fusion-Atomic Absorption Spectrophotometry of Acid Insolubles [Pb: EDTA, AAS; modified from ISO 13545]

GC/GT_CON12V Preparation and Determination of Zinc in Ores, Concentrates, Metallurgical Products and Metals by Separation, Precipitation and Titration of Acid Solubles: Fusion-Atomic Absorption Spectrometry of Acid Insolubles [Zn: EDTA, AAS]

GC/GT_CVA20C Preparation and Determination of Mercury in Ores, Concentrates, Metallurgical Products by Strong Acid digest and Cold Vapour-Atomic Absorption Spectrometry [Hg, CV-AAS]


GC/GT_FAI34V Preparation and Determination of Gold, Platinum and Palladium in Concentrates and Metallurgical products by Lead Fusion and Inductively Coupled Plasma - Optical Emission Spectroscopy [Au, Pt, Pd; ICP-OES]

GC/GT_ICP11V Preparation and Determination of Arsenic, Antimony, Selenium, Cadmium, Lead and Zinc in Ores, Concentrates and Metallurgical Products by Microwave Digest and Inductively Coupled Plasma - Optical Emission Spectroscopy [As, Sb, Se, Cd, Pb, Zn; ICP-OES]

GC/GT_ISE05V Preparation and Determination of Fluoride by KOH Fusion for Ores, Metallurgical Products, Battery Scraps, and Low Grade Fluorspar, ISE Probe [F: ISE]

GC_CLA35V Preparation and Determination of Fe2+ and Fe3+ in Process Control Samples by Sulphuric/HF acid Digest, Potassium Dichromate Titration [Fe2+: K2Cr2O7, Fe3+ Calculation]

GC_ICP46C Multi-Element Preparation and Determination of Thirty (30) Elements in Highly Mineralized Samples by Strong Acid Digest with Fusion and
ICP-OES (ores, concentrates and metallurgical test products) [silver, Ag; aluminum, Al; arsenic, As; barium, Ba; beryllium, Be; bismuth, Bi; cadmium, Cd; calcium, Ca; chromium, Cr; cobalt, Co; copper, Cu; iron, Fe; potassium, K; lithium, Li; magnesium, Mg; manganese, Mn; molybdenum, Mo; sodium, Na; nickel, Ni; phosphorous, P; lead, Pb; antimony, Sb; selenium, Se; tin, Sn; strontium, Sr; thallium, Tl; titanium, Ti; vanadium, V; yttrium, Y; zinc, Zn; ICP-OES]

GC_SOL84T Preparation and Determination of Cadmium, Cobalt, Copper, Iron, Nickel and Zinc in Acidic Metallurgical Process Solutions by Atomic Absorption Spectrometry [Cd, Co, Cu, Fe, Ni, Zn; AAS]

GC_XRF76B Preparation and Determination of Uranium by Borate Fusion-Internal Standard and Xray Fluorescence Spectrometry [U3O8; XRF]

GE.GO/GC/GT_CSA06V The Preparation and Determination of Sulfur and Carbon in Exploration, Ores, Concentrates and Metallurgical Samples by Combustion - Infrared Detection [S, C; IR, modified from ASTM E1915-01]

GE.GO/GC_CLA01V Preparation and Determination of Ferrous Iron (FeO) in Exploration, Ore Grade and Process Control samples by Sulphuric/HF acid Digest, Potassium Dichromate Titration [FeO: K2Cr2O7]

GE_AAS12E Determination of Silver in Exploration Samples by Nitric and Hydrochloric Acid Digest and Atomic Absorption Spectroscopy [Ag; HNO3; HCL; AAS]

GE_AAS21E Determination of Silver in Exploration Samples by a three acid Digest and Atomic Absorption Spectroscopy [Ag; AAS; HF; HCL; HNO3]

GE_CVA20A Determination of Mercury in Exploration Samples using Multi-Acid Digestion and Cold Vapour Atomic Absorption Spectrometry [Hg; CV_AAS]

GE_FAA313/515 Determination of Gold by Lead Fusion Fire Assay and Atomic Absorption Spectrometry in Exploration Samples [30g/50g; Au; AAS]

GE_FAI313/515 Determination of Gold by Lead Fusion Fire Assay and Inductively Coupled Plasma - Optical Emission Spectrometry in Exploration Samples [30g/50g; Au; ICP-OES]

GE_FAI323 Determination of Exploration Grade Gold, Platinum and Palladium by Lead Fusion Fire Assay and Inductively Coupled Plasma - Optical Emission Spectrometry [30g; Au; Pt; Pd; ICP-OES]

GE_HAS90A Determination of Hydride Elements in Exploration Samples using Sodium Peroxide Fusion and Hydride Generation Atomic Absorption Spectrometry (HAAS) [As;Bi;Sb]

GE_ICM12B Determination of Fifty-Two (52) Elements in Exploration Samples using Nitric and Hydrochloric Acid Digestion and a combination of Inductively Coupled Plasma- Optical Emission Spectroscopy (ICP-OES) and Inductively Coupled Plasma - Mass Spectroscopy (ICP-MS) [HNO3;HCL;Ag;Al;As;Ba;Be;Bi;B;Ca;Cd;Ce;Co;Cr;Cs;Cu;Fe;Ga;Ge;Hf;Hg;In;K;La;Li;Lu;Mg;Mn;Mo;Na;Nb;Ni;P;Pb;Rb;S;Sb;Se;Sc;Sn;Sr;Ta;Te;Tb;Th;TI;Ti;U;V;W;Y;Yb;Zn;Zr]

GE_ICM40B Determination of Forty Nine (49) Elements in Exploration Samples using Multi-Acid Digestion and a combination of Inductively Coupled Plasma- Optical Emission Spectroscopy (ICP-OES) and Inductively Coupled Plasma - Mass Spectroscopy (ICP-MS)
GE_ICM90A  Determination of Fifty-Five (55) Elements in Exploration Samples using Sodium Peroxide Fusion and a combination of Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES) and Inductively Coupled Mass Spectroscopy (ICP-MS)  
\([\text{Na}_2\text{O}_2;\text{HNO}_3;\text{C}_4\text{H}_6\text{O}_3;\text{Ag;Al;As;Ba;Be;Bi;Ca;Cd;Ce;Co;Cr;Cs;Cu;Fe;Ga;Hf;In;K;La;Li;Lu;Mg;Mn;Mo;Na;Nb;Ni;P;Pb;Rb;S;Sb;Sc;Se;Sn;Sr;Ta};\text{Te;Tb;Th;Ti;U;V;W;Y;Yb;Zn;Zr}]\)

GE_ICP12B Determination of Thirty Four (34) Elements in Exploration Samples using Nitric and Hydrochloric Acid Digestion and Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES)  
\([\text{HNO}_3;\text{HCl;Ag;Al;As;Ba;Be;Bi;Ca;Cd;Co;Cr;Cu;Fe;Hg;K;La;Li;Mg;Mn;Mo;Na;Ni;P;Pb;Sc;Sn;Sr;Ta};\text{Ti;U;V;W;Y;Yb;Zn;Zr}]\)

GE_ICP40 Determination of Forty (40) Elements in Exploration Samples using Multi-Acid Digestion and Inductively Coupled Plasma-Optical Emission Spectroscopy  
\([\text{HNO}_3;\text{HCl;HF;HClO}_4;\text{Ag;Al;As;Au;Ba;Be;Bi;Ca;Cd;Ce;Co;Cr;Cu;Fe;Ga;K;La;Li;Mg;Mn;Mo;Na;Nb;Nd;Ni;P;Pb;Sc;Sn;Sr;Ta};\text{Th;Ti;U;V;W;Y;Yb;Zn}]\)

GE_ICP40B Determination of Thirty Three (33) Elements in Exploration Samples using a Multi-Acid Digestion and Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES)  
\([\text{HNO}_3;\text{HCl;HF;HClO}_4;\text{Ag;Al;As;Ba;Be;Bi;Ca;Cd;Co;Cr;Cu;Fe;K;La;Li;Mg;Mn;Mo;Na;Ni;P;Pb;Sc;Sn;Sr;S};\text{Ti;V;W;Y;Zn}]\)

GE_IMS95R Determination of Seventeen (17) Rare Earth Elements in Exploration Samples using Lithium Metaborate Fusion and Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)  
\([\text{Ce; Dy; Er; Eu; Gd; Ho; La; Li; Mg; Mn; Mo; Nd; Ni; P; Pb; Sc};\text{Sn; Sr; Ta; Tb; Th; Ti; U; V; Y; Yb}]\)

GE_MMI-M Determination of Fifty Three (53) Mobile Metal Ions by Multi-Element MMI Technology in Soil Geological Samples Using Inductively Coupled Plasma Mass Spectrometry [MMI; ICP-MS; Ag, Al, As, Au, Ba, Bi, Ca, Cd, Ce, Co, Cr, Cu, Dy, Er, Eu, Fe, Ga, Gd, Hg, In, K, La, Li, Mg, Mn, Mo, Nb, Nd, Ni, P, Pb, Pd, Pr, Pt, Rb, Sb, Sc, Sm, Sn, Sr, Ta, Tb, Te, Th, Ti, U, W, Y, Yb, Zn, Zr]

GO/GC/GT_FAG323 Preparation and Determination of Silver by Lead fusion, Gravimetric and Gold by Lead Fusion and Atomic Absorption Spectrometry in Ores, Concentrates and Metallurgical Products [Au, Ag; AAS]

GO/GC/GT_XRF76V/R Preparation and Determination of Major Element Oxides, LOI and Rare Earth Oxides by Borate Fusion and Xray Fluorescence Spectrometry [SiO2, Al2O3, Fe2O3, MgO, CaO, Na2O, K2O, P2O5, MnO, TiO2, Cr2O3; V2O5; LOI; additions BaO; Ce2O3; Nd2O3, La2O3; Pr2O3, Sm2O3; Nb2O5; Th2O7; Ta2O5; Sn2O2; SrO; Zr2O; Hf2O2; Y2O3; WO3; U3O8; Co; Ni; XRF]

GO/GC/GT_CON13V Preparation and Determination of Total Copper by Short Iodide Titration and Atomic Absorption Spectrometry [Cu, Titration, AAS]
GO/GC/GT_FAM363 Preparation and Determination of Platinum, Palladium, Rhodium, Ruthenium and Iridium by Nickel Sulfide Fusion and Inductively Coupled Plasma - Mass Spectroscopy [Pt, Pd, Rh, Ru, Ir; ICP-MS]

GO/GC_AAS21C Preparation and Determination of Low Level Metals (silver, bismuth, cadmium, cobalt, copper, indium, nickel, lead, zinc) in Ores and Metallurgical Samples by Triple Acid Digestion and Atomic Absorption Spectrometry [Ag, Bi, Cd, Co,Cu, In, Ni, Pb, Zn; AAS]

GO/GC_AAS21E Preparation and Determination of Low Level Silver in Ores and Metallurgical Samples by Triple Acid Digestion and Atomic Absorption Spectrometry [Ag; AAS]

GO/GC_AAS93B Preparation and Determination of Lithium in Ores, Geological and Metallurgical Samples by Sodium Peroxide Fusion and Flame Atomic Absorption [Li; AAS]

GO/GC_CVA20B Preparation and Determination of Mercury in Ores and Metallurgical samples by CETAC Cold Vapor Atomic Absorption Spectroscopy [Hg, CETAC CVAAS]

GO/GC_IMS46C Preparation and Determination of Uranium in Highly Mineralized Samples by Strong Acid Digest with Fusion and ICP-MS (ores, concentrates and metallurgical test products) [U, ICP-MS]

GO/GC_XRF75F Preparation and Determination of Arsenic, Tin, Antimony, Tantalium, Thorium and Uranium in Ores and Metallurgical Products by Xray Fluorescence Spectrometry using Internal Standard Addition [As, Sn, Ta, Th, U; XRF]

GO/GC_XRF77B Preparation and Determination of Base Metals (Copper, Nickel, Cobalt, Iron, Lead, Zinc, Chromium, Manganese and Molybdenum) in Sulphide Ores and Metallurgical Products by Potassium Pyrosulfate Fusion and Xray Fluorescence Spectrometry [Cu, Ni, Co, Fe, Pb, Zn, Cr, Mn, Mo; XRF]

GO_FAG303/505 Determination of Ore Grade Gold by Lead Fusion Fire Assay and Gravimetric Finish [30g/50g; Au]

GO_ICP90Q Determination of Six (6) Elements in Ore Grade Samples using Sodium Peroxide Fusion and Inductively Coupled Plasma- Optical Emission Spectroscopy (ICP-OES) [Co;Cu;Pb;Mo;Ni;Zn; ICP-OES]

GT_BUL36V Gravimetric Determination of Au and Ag for Au Bullion [Au, Ag; Gravimetric modified from ASTM E1335.08]

GT_CLA17V Preparation and Determination of Platinum, Palladium and Rhodium in Automotive and Petroleum Catalysts by Sodium Peroxide Fusion, Tellurium collection and Inductively Coupled Plasma - Optical Emission Spectroscopy [Pt, Pd, Rh; Na2O2; ICP-OES]

GT_CLA18V Preparation and Determination of Platinum, Palladium and Rhodium in Automotive and Petroleum Catalysts by Sodium Peroxide Fusion, Tellurium collection and Atomic Absorption Spectrometry [Pt, Pd, Rh; Na2O2; AAS]

GT_CON22V Preparation and Determination of Arsenic and Antimony in Ores Concentrates and Metallurgical Products by Strong Acid Digest and Inductively Coupled Plasma - Optical Emission Spectroscopy [As, Sb, ICP-OES]

GT_SOL88V Gravimetric Determination of Rhodium using Sodium Borohydride in Concentrate Solutions [Rh, Gravimetric]

GT_SOL89V
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<tr>
<th>Code</th>
<th>Description</th>
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<tr>
<td>GT_SOL90V</td>
<td>Gravimetric Determination of Palladium using Dimethylglyoxime in</td>
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<td>Palladium Concentrate Solutions [Pd, Gravimetric]</td>
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<td>ME-LR-MIN-MET-DS-A01</td>
<td>Determining Specific Gravity Using a Gas Pycnometer [SG]</td>
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<td>ME-LR-MIN-MET-DS-A02</td>
<td>Determining Bulk Density [BD, Wax, Core]</td>
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<td>ME-LR-MIN-MET-MN-C01</td>
<td>High Definition Mineralogical Analysis using QEMSCAN (Quantitative</td>
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<td>Evaluation of Materials by Scanning Electron Microscopy)</td>
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<td>ME-LR-MIN-MET-MN-D01</td>
<td>Qualitative Mineral Identification By XRD</td>
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<td>ME-LR-MIN-MET-MN-D03</td>
<td>Semi-Quantitative Mineral Identification by X-Ray Diffraction Analysis</td>
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<td>[XRD, Semi-Quantitative, Mineralogy, Crystallinity]</td>
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<td>Clay Speciation by X-Ray Diffraction [XRD, Mineralogy, Clay]</td>
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<td>ME-LR-MIN-MET-MN-D05</td>
<td>Quantitative Rietveld Method of Mineral Identification by X-Ray</td>
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<td>Diffraction Analysis [XRD, Quantitative, Mineralogy, Crystallinity]</td>
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<td>ME-LR-MIN-MET-MN-G01</td>
<td>Determination of Precious Metal Deportment (Au, Ag and PGE) using</td>
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<td>Optical Microscopy and SEM/EDS</td>
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<td>ME-LR-MIN-MET-MN-H01</td>
<td>Extraction, Recovery, Selection and Identification of Diamonds</td>
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<td>ME-LR-MIN-MET-MN-H02</td>
<td>Extraction and Recovery, Selection and Identification of Diamond</td>
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<td>Indicator Minerals</td>
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<td>ME-LR-MIN-MET-MS-A01</td>
<td>Measuring Magnetics by Satmagan Saturation Magnetization Analyzer</td>
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<td>[Magnetic Iron, Fe3O4]</td>
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<td>ME-LR-MIN-MET-MS-A02</td>
<td>Measuring Low Intensity Magnetic Separation (LIMS) by Davis Tube</td>
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<td>[DT, LIMS]</td>
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**Notes:**

The physical sample preparation involving accredited test methods as listed on the scope of accreditation may be performed at SGS Minerals Services - Lakefield laboratory or at off site sample preparation locations that are monitored regularly for quality control and quality assurance practices.


**CAN-P-1579:** Requirements for the Accreditation of Mineral Analysis Testing Laboratories