MSALABS

Schedule of Services

2026

msalabs.com

CONTENTS

A Message from Our Chief Operations Officer

Dear Clients and Industry Partners,

At MSALABS, our purpose is clear: to deliver analytical results you can trust, at the pace your decisions demand, and with a level of service that reflects a deep respect for the work you do.

Mineral exploration and mining operate in increasingly complex technical, regulatory, and social environments. Our role as a geochemistry laboratory is not simply to provide assays, but to act as a reliable extension of your technical team - supporting exploration success, operational efficiency, and responsible resource development.

Equally important is our commitment to partnership. We believe strong outcomes are achieved through collaboration - listening carefully to client needs, adapting services where required, and working within local contexts while maintaining global standards. Whether supporting commercial laboratories, near mine facilities, or onsite solutions, our philosophy is to remain agile, accountable, and solutions focused.

We are committed to excellence through disciplined quality systems, continual investment in technology, and the expertise of our people. From early stage exploration to operating mines, our laboratories are designed and operated to deliver consistent, high quality data across diverse geographies and project conditions. Safety, environmental stewardship, and data integrity underpin every aspect of our operations.

This Services Guide reflects our current capabilities and the standards we hold ourselves to. As your projects evolve, so will we - continuing to invest in people, systems, and innovation to ensure MSALABS remains a trusted partner to the mining industry worldwide.

Thank you for the confidence you place in MSALABS. We look forward to continuing to support your success.

Sincerely,

Mark Beach

Chief Operations Officer
MSALABS

MSALABS is an innovative global assay services company offering a full range of geochemical laboratory services tailored to our client's needs.

Industry-leading turnaround times (TAT)

All metals, including Au, Ag, Cu, Li and Rare Earths

ISO 17025 accreditation for more than 70 methods

30+ laboratories globally (including franchise partners)

Largest PhotonAssay™ capability globally

Continued investment in equipment and technology to deliver the fastest Turnaround Times

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ABOUT MSALABS

We provide a complete range of geochemical analysis and testing solutions to our global client base.

At MSALABS we understand that mining and exploration are dynamic and the pace and performance of these projects can be heavily reliant on assay results to guide management decisions on the next phase of work, in turn enabled by timely accurate data.

To assist our clients make decisions rapidly, we focus on delivering fast turnaround times (TAT) without compromising quality. We deliver this through leading the adoption of the industry's most innovative technologies, investing in the highest quality, fastest and most efficient equipment, and designing laboratories that facilitate optimal performance.

We are dedicated to minerals testing for the exploration and mining industries, we are not dividing our time and resources with other analytical fields and we remain responsive and flexible to your needs - that means if something changes for you, we can respond and adjust our schedule to accommodate new requests in most cases.

Experienced Team & Expert Advice

Our team of industry experts take the time to understand your program to provide the best advice, across the entire sampling and analysis process.

If you are unsure on what analysis you need, we will work closely with you to understand what stage your project is at and what your specific goals are. This enables us to recommend a tailored suite of analytical methodologies to provide the data you need.

Our team's expertise also includes tailored laboratory design for optimal performance, construction and commissioning and ongoing assay laboratory management.

INNOVATION THAT IMPROVES SAFETY AND SUSTAINABILITY

Digital Safety

MSALABS HSE App

MSALABS uses the HSE App to enable timely, consistent, and verifiable health, safety, and environmental reporting across operations. The app is accessible via mobile phones and dedicated site tablets, allowing teams to capture information directly in the field.

The platform allows users to:

- Report hazards, unsafe acts or conditions, near-miss events, and incidents
- Complete inspections and standardized inspection checklists
- Record visible field leadership interactions (VFLs) and planned task observations

The app also supports pre-task risk assessment through the S.A.F.E. process, helping teams identify and control risks before work begins.

All submissions are automatically stored in HSE SharePoint records, ensuring reliable recordkeeping, improved visibility of leading indicators, and effective action tracking and follow-up.

PhotonAssay™

Faster Results, Lower Impact, Safer Work

MSALABS is a leading adopter of innovative laboratory technologies that strengthen both safety and sustainability outcomes. PhotonAssay™ delivers rapid, accurate gold analysis and is a safer, more environmentally responsible alternative to traditional fire assay.

Key benefits include faster turnaround times, reduced use of hazardous reagents, and lower waste generation.

Customer value: quicker access to results, improved operational decision-making, and reduced exposure to hazardous assay processes.

Eco Detection

Smarter Environmental Monitoring

MSALABS has made strategic investments in Eco Detection, a patented platform for remote water monitoring. Eco Detection integrates complex water chemistry and environmental data into a secure, cloud-based visualization platform, delivering insights in near real time.

Customer value: enhanced environmental insight, improved data quality, and faster, more confident environmental and compliance decisions.

HEALTH, SAFETY & ENVIRONMENT

Our Commitment

At MSALABS, health, safety, and environmental performance are foundational to how we operate - because the confidence our customers place in our results must be matched by confidence in how those results are produced.

We are committed to operating sustainably, protecting our people, and ensuring that our activities do not expose surrounding communities or the environment to harm.

This commitment applies across all locations, services, and stages of our operations.

Prevention, Not Reaction

MSALABS is committed to providing the right equipment, resources, and training to eliminate hazards and prevent injuries before they occur.

To maintain consistent standards across diverse operating environments, we use structured reporting and governance mechanisms, including:

- Incident and near-miss tracking
- Corrective action identification and follow-up
- Cross-site sharing of learnings to support continual improvement.

These systems ensure issues are addressed promptly and lessons are applied consistently across the organization.

A Safety-First Culture - Built into Daily Work

Our approach goes beyond compliance. We foster a proactive safety culture where safety is an everyday responsibility shared by leaders, employees, and contractors.

This culture is supported by:

- Clear expectations and accountability
- Ongoing training and competency development
- Visible leadership and active engagement in the field.

MANAGEMENT SYSTEMS & ENVIRONMENTAL STEWARDSHIP

Robust, Auditable Management Systems

MSALABS operates under a robust, integrated management system that supports both service reliability and strong HSE performance.

Our Health, Safety & Environmental management system is aligned with internationally recognized standards and certified to:

- ISO 45001:2018 - Occupational Health & Safety Management System
- ISO 14001:2015 - Environmental Management System
- SA8000:2014 - Social Accountability (Social Responsibility & Compliance Initiative).

Integration of Quality and HSE

This integrated approach ensures that safe work and high-quality results are not competing priorities.

They are delivered together through:

- Consistent operational processes
- Formal auditing and verification
- Management review and continual improvement.

Environmental Stewardship Embedded in Operations

Our environmental approach focuses on identifying environmental aspects, understanding potential impacts, and implementing effective controls through site-specific Environmental Management Plans.

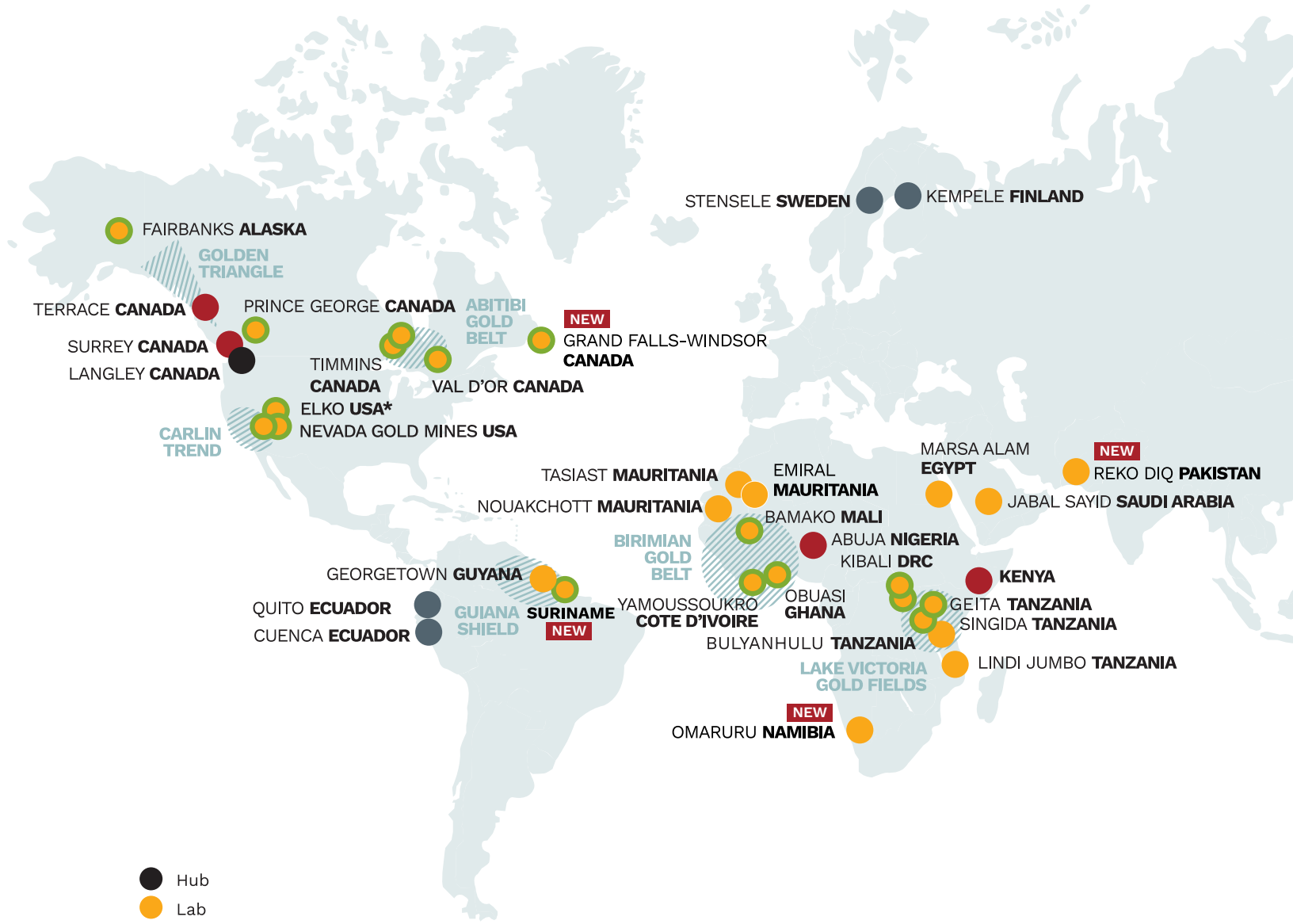
These plans are supported by:

- Ongoing environmental monitoring
- Structured reporting programs
- Documented records to support transparency and traceability.

Assurance and Continuous Improvement

Environmental performance is reinforced through structured assurance and improvement mechanisms, including:

- Internal and external audits
- Corrective action tracking and verification
- Regular review cycles
- Consistent tools, governance, and reporting ensure environmental risks are managed responsibly and performance continues to improve over time.



Note: Current at March 2026

Global Network

We have a rapidly growing network of laboratories in key mining regions around the world. They are strategically located to ensure our customers can access the latest assay technologies with shorter lead times and simplified logistics, and therefore lower costs.

Community and Social Impact

We are committed to ensuring we act as a responsible corporate citizen and actively engage with the local communities where we operate. We strive to foster a positive and sustainable approach, fostering workforce development contributing to various community projects and creating shared value. We also work closely with local indigenous cultures, First Nations and Inuit communities in our America's operations through impact-benefit agreements. As such, we are accredited with the Social Responsibility and Compliance Initiative Management System, consistent with the requirements of SA8000:2014 and ISO 26000:2010 Guidelines.

We are committed to building strong local partnerships and fostering workforce development, working closely within local cultures and supporting Indigenous, First Nations, and Inuit communities through impact-benefit agreements. This ensures operational excellence while delivering sustainable, community-aligned project outcomes.

MSALIMS Data on Demand

Our proprietary Laboratory Information Management System (MSALIMS) is a custom built, cloud based system with flexibility and data integrity designed into the solution.

MSALIMS allows for fast profiling and registration of samples, recording of catch weights and assay data and rapid QA/QC analysis and reporting. It provides our clients with 24/7 visibility of sample progress and analysis completion and reporting time frames are updated regularly, providing current information on when to expect results.

Data reports are available in most formats. They can be sent by email or can be retrieved via MSALIMS. Please enquire regarding the availability of your required format.

Quality Control

Our company maintains the highest quality standards and our quality management systems meets the guidelines of ISO17025 accreditation and ISO9001, ISO14001 and ISO45001 certification. Certificates are available for download from our website.

Our laboratories in Langley (TL- 736), Geita (TL-1320), Prince George (TL-1263), Timmins (TL-1214), Val d'Or (TL-1156) and Yamoussoukro (TL-1179) are accredited assay and geochemical laboratories under the ISO/IEC 17025 standard. All other laboratories operate to these guidelines. Internal and external audits and Management Reviews are conducted annually to ensure the effectiveness of the Quality Management System.

We use methods and procedures which are appropriate and documented for all tests within scope. These procedures include the handling, transport (where applicable), storage and preparation of samples to be tested and where appropriate, an estimation of the measurement uncertainty as well as statistical techniques for the analysis of test data.

Continuous improvements in methodologies and equipment operations are distributed to all laboratories as part of our system of globally aligned methods.

We also participate in scheduled proficiency testing schemes including Geostats, PTP-MAL, Rocklabs, OREAS and AMIS, that are executed by competent providers. The performance in the proficiency testing schemes allows for the evaluation of laboratory performance by an independent external party as well as comparison of relative performance using interlaboratory comparison.

Our analytical batches will include internal QCs (blanks, certified reference materials (CRM) and laboratory duplicates (replicates)) inserted into each batch of samples and are used to monitor laboratory hygiene, method accuracy and precision. Deviation from the acceptance criteria may necessitate the generation of repeat assays.

ONSITE, HYBRID & OFFSITE LABORATORY SOLUTIONS

Commercial models to suit your budget and requirements

Our global projects team, specializing in laboratory design, construction, and management, offers flexible onsite, hybrid, and offsite laboratory models tailored to a wide range of operational needs and budget requirements.

We are a trusted global partner with an exceptional track record in laboratory deployment, having successfully delivered more than 28 laboratories worldwide, safely, on budget, and on schedule. With extensive experience across diverse regions and operational environments, our team brings the confidence and consistency clients need to execute complex laboratory projects at a global scale.

Our automation ready designs, innovative solutions, and operational depth keep clients at the forefront of modern minerals analysis, enhancing precision, throughput, and turnaround times.

Offering flexible financing models, an integrated service approach, and the ability to collaborate seamlessly with Engineering, Procurement, and Construction Management (EPCM) engineering firms we make it easy for clients to advance their projects without compromising quality or timelines.

Regardless of project size, complexity, or location, MSALABS delivers excellence in laboratory design, construction, deployment, and long term operations management.

Onsite

- Design, construction & commissioning
- Operations management
- Takeover of existing labs and staff
- Rebuilds and redesigns
- Revisions and optimization
- Fit-for-purpose analytical turnaround
- Site-specific staffing models, dedicated design and workflow.

Hybrid

- Coordinated onsite – offsite workflows
- Integration of data
- Flexible capacity management
- Operational continuity planning and reduced risk
- Share costs with peers in a hybrid dedicated, commercial assay arrangement
- Fills the gap for analysis not economical onsite while providing excellent turnaround times.

Offsite

- Access to full analytical capability within our commercial labs
- Scalable capacity planning
- Lowers operational overhead
- Strong QA/QC frameworks
- Comprehensive sample logistics and management support
- Ask us about dedicated capacity arrangements and our service-level guarantee.

SAMPLE PREPARATION

SAMPLE PREPARATION

Sample preparation includes all steps from sample receipt until delivery to the assay department.

The purpose of sample preparation is to ensure that the laboratory processes a pulp representative of the whole sample. Sample preparation needs vary according to the project and the sample matrix. If you would like a specific sample preparation method, please let us know and we can tailor a package to your needs.

SPECIFIC GRAVITY & BULK DENSITY

DESCRIPTION	DETECTION RANGE	CODE
Specific gravity by weight on core		SPG-410
Specific gravity by weight on pulp		SPG-411
Specific gravity by weight on waxed core		SPG-415
Bulk density on waxed core g/cm³		BDE-110
Moisture determination	0.01 - 100%	PMO-200
Acid insoluble content	0.01 - 100%	SPE-INS

ROCKS & DRILL CORE

Preparation of rock samples and drill core require meticulous care to produce a homogeneous sub-sample for analysis.

DESCRIPTION	CODE
Dry, crush to 2mm, split 250g and pulverize to 85% passing 75µm	PRP-910
Dry, crush to 2mm, split 500g and pulverize to 85% passing 75µm	PRP-915
Dry, crush to 2mm, split 1000g and pulverize to 85% passing 75µm	PRP-920
Dry, crush to 70% -2mm, split 500g for PhotonAssay™	CRU-CPA
Surcharge for samples overlimit kg, per kg	

SOIL & SEDIMENT

Soil and sediment samples are dried and then screened to the desired mesh size. The undersized (-) fraction is analyzed and the oversized (+) fraction is discarded unless otherwise specified.

DESCRIPTION	CODE
Dry, screen 500g to 80 mesh, discard plus fraction	PRP-757
Dry, screen 1,000g to 80 mesh, discard plus fraction	PRP-758
Extra drying for excessively wet samples, per 500g	DRI-100
Screen at other sieve size	PSC-999
Surcharge for soils >1kg, per kg (80 mesh)	PSC-101
Surcharge for soils >1kg, per kg (230 mesh)	PSC-102
Save all soil reject	PSC-110

INDIVIDUAL PREPARATION

DESCRIPTION	CODE
DRYING	
Drying at 60°C	DRI-060
Drying at 90°C	DRI-090
Extra drying time for excessively wet samples, per kg	DRI-100
Air drying of samples	DRI-200
Drying to customer specification	DRI-300
CRUSHING	
Crush to 70% passing 2mm	CRU-220
Dry, crush to 70% passing 2mm	CRU-221
Crush to 90% passing 2mm	CRU-240
Dry, crush to 90% passing 2mm	CRU-241
Crush to 70% passing 6mm (¼)	CRU-260
Dry, crush to 70% passing 6mm (¼)	CRU-261
Surcharge for samples >1kg, per kg	CRU-200
Crush to customer specification	CRU-999
SPLITTING	
Split pulp for various uses (Riffle Split), per kg	SPL-400
Split 250g crushed material (Riffle Split)	SPL-410
Split 250g crushed material (Rotary Split)	SPL-415
Split 1000g crushed material (Riffle Split)	SPL-420
Split 1000g crushed material (Rotary Split)	SPL-425
Split 500g crushed material (Riffle Split)	SPL-430
Split 500g crushed material (Rotary Split)	SPL-435
PULVERIZING	
Pulverize 250g to 85% passing 75µm	PPU-510
Pulverize 500g to 85% passing 75µm	PPU-520
Pulverize 1000g to 85% passing 75µm	PPU-530
Pulverize 500g to 85% passing 106µm	PPU-620
Pulverize 1000g to 85% passing 106µm	PPU-630
MISCELLANEOUS	
Barren wash between samples – crusher	PWA-200
Barren wash between samples – pulverizer	PWA-500
Homogenizing and pulverizing composite, per 250g	PPU-560
Homogenizing pulp by mat rolling	PRO-100
Homogenizing pulp by light pulverizing	PRO-200

SAMPLING SUPPLIES

DESCRIPTION	PACK QTY
Shipping Sacks (Rice Bags)	10
Plastic Bags, 6 mil 8” x 13”	100
Plastic Bags, 6 mil 12” x 18”	100
Tin-Tie Bags	1,000
Cable Ties, 7”	100
Assay Tags Booklet	50

ADMINISTRATION

DESCRIPTION	CODE
Batch charge for submissions of less than 20 samples	ADM-100
Import charge for international samples	ADM-200
Batch charge per submission	ADM-300
Log sample received as pulp	PLG-100
Sample pick up service available at any MSALABS	PIC-100

Please contact us for more information.

SAMPLE STORAGE & DISPOSAL

All pulps and rejects will be stored **free of charge for 90 days** from the Test Report release date. After this period, samples will be stored, disposed of, or returned as instructed.

DESCRIPTION	CODE
Handling and retrieval of pulp or reject from storage, per hour	STO-100
Storage of reject after 90-day free period, per sample/month	STO-200
Storage of pulp after 90-day free period, per sample/month	STO-300
Reject disposition, per sample (≤ 3 kg)	DIS-100
Reject disposition per sample (>3 kg per kg)	DIS-101
Pulp disposition, per sample	DIS-200
Material disposal	MDIS-300
Heat treatment and disposal of international soils	DIS-400
Special handling, per hour	HAN-200
Return shipment of rejects / pulps	DIS-500
Environmental Handling Fee	ENV-100

SAMPLE CUSTODY

Chain of Custody (CoC) is the formal, documented process that tracks the possession, handling, transfer, and storage of samples or data from the moment they are collected until their final analysis and reporting. It ensures that samples are authentic, traceable and tamper-free.

Proper handling and custody of physical samples involves tracking samples from collection or delivery throughout the preparation, laboratory analysis, storage and returns.

To ensure traceability and data integrity, all handling steps are documented through custody records including traceability throughout the sample preparation and analytical processes with our Laboratory Information Management System, MSALIMS, establishing a verifiable chain of custody identifying the date, time, and individual responsible for each intervention. These records support quality assurance making them an essential component of MSALABS' Quality Assurance Plan (QAP) and Standard Operating Procedures (SOP).

PHOTONASSAY™

PHOTONASSAY™ ANALYSIS

Faster Results. Safer Processes. Sustainable Performance.

PhotonAssay™ is an advanced X-ray assay technology that delivers fast, accurate analysis of gold in minutes rather than hours or days. It is a safer and more sustainable alternative to traditional fire assay, supporting improved operational decision-making while reducing environmental impact.

Technology Overview

PhotonAssay™ uses high-energy X-rays to excite elements at the nucleus level, enabling enhanced detection of gold, silver, copper*, and associated elements. Samples are crushed, with approximately 500 g split into sealed jars and analyzed directly within the PhotonAssay™ unit.

Larger sample sizes improve representativity and confidence, while automation ensures consistent, repeatable outcomes.

> Results can be generated in as little as **2–3 minutes**, with seven-day turnaround times available to most clients.

Measurable benefits over traditional fire assay analysis

	Time Per Sample[2]	Sample Size	CO_2 Per Sample	Hazardous Waste Per Sample	Energy Use Per Sample	Automation
Fire Assay	**3-4** Hours	**10-50** Grams	**0.91** Kg	**0.31** Kg	**1.3** kWh	✗
PhotonAssay™	**2-3** Mins	**250-650** Grams	**0.455** Kg	**0** Kg	**0.65** kWh	✓
Benefits	**80-90x** Times Faster	**13-25x** Larger Sample	**50%** Less Emissions	**ZERO** Hazardous Waste	**50%** Less Energy	**Automated Process**

1. *Comparison of PhotonAssay™ and Fire Assay per Frost & Sullivan industry report.*
2. *Fire Assay shown based on the minimum processing time. 24-hours is generally considered rapid turn around in practice.*
3. *Assumes same electricity source is used.*

PHOTONASSAY™

MSALABS offers rapid and reliable PhotonAssay™ services designed to support efficient turnaround and high-quality analytical results. Sample sizes are analyzed, delivering improved repeatability and more representative results - particularly valuable for deposits with coarse or “nuggety” gold.

PhotonAssay™ combines advanced X-ray technology with automated workflows to enhance safety, reduce environmental impact, and support confident decision-making.

GOLD, SILVER & COPPER

DESCRIPTION		DETECTION RANGE (ppm)			PORTION	CODE
GOLD						
Au by Gamma-ray – 2 Cycle		0.010	-	350	500g	**CPA-Au2**
		350	-	3,500	500g	**CPA-Au2H**
		3,500	-	10,000	500g	**CPA-Au2HH**
Au by Gamma-ray – 4 Cycle		0.008	-	350	500g	**CPA-Au4**
GOLD & SILVER						
Au & Ag by Gamma-ray – **Ag Optimized**	Au	0.030	-	350	500g	**CPA-AgAu1**
	Ag	1.50	-	5,000		
Au & Ag by Gamma-ray – **Au Optimized**	Au	0.010	-	350	500g	**CPA-AuAg1**
	Ag	3.70	-	5,000		
COPPER						
Cu by Gamma-ray		50	-	40,000	500g	**CPA-Cu1**
Cu by Gamma-ray – High Grade		20,000	-	300,000	500g	**CPA-Cu1H**

Note 1: Cu by PhotonAssay™ is material specific requiring test work to determine interfering elements and correction factors.

CRM SUBMISSION & REUSE

Certified Reference Materials (CRMs) submitted for PhotonAssay™ require a minimum mass of **400–500 g** to ensure representative and reliable results. As PhotonAssay™ is **non-destructive**, CRM material remains intact after analysis and can be **reused** for ongoing quality control and future testing, supporting consistency and cost efficiency.

MSALABS CAPABILITY

MSALABS is a recognized global leader in the deployment of PhotonAssay™ technology and laboratory automation, **with more than 15 PhotonAssay™ laboratories delivered worldwide**.

Our expertise enables:

- Rapid, reliable technology implementation
- Optimized sample preparation and workflow design
- Automated jar cleaning and handling systems
- Consistently fast, dependable assay turnaround times

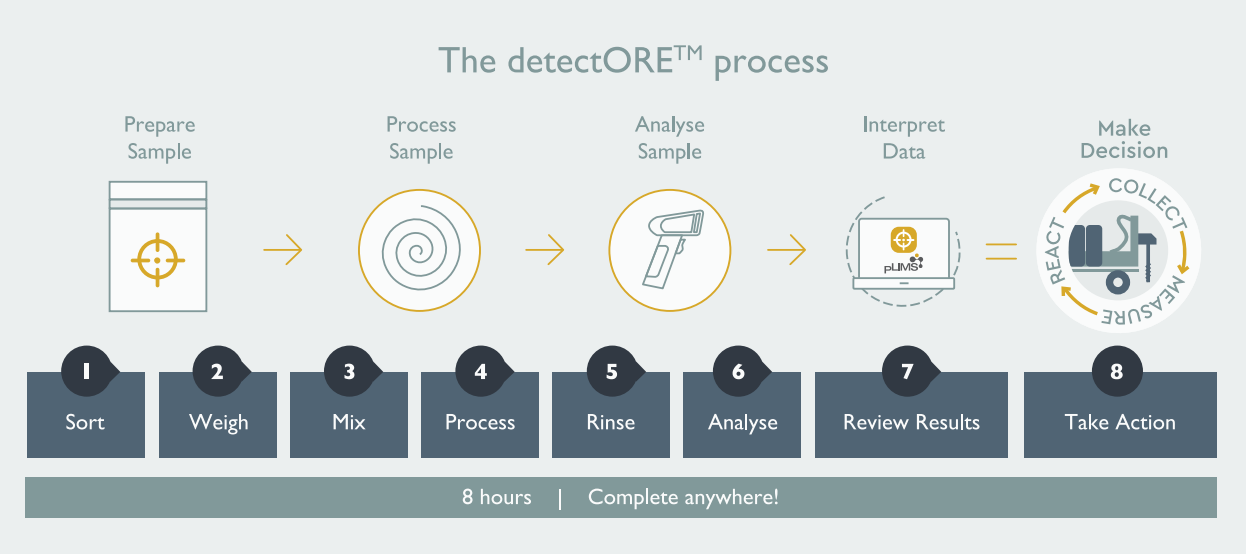
Customer value: faster access to results, reduced operational risk, and confidence in a high-quality, sustainable assay solution.

PORTABLE PPB

PORTABLE PPB

PortablePPB's detectORE™ system provides a new approach to early-stage gold exploration by combining a chemical process, a consumable, and a software application. It enables geologists to generate near real-time, PPB-level gold measurements in the field using handheld pXRF instruments, supporting faster and more adaptive exploration decisions.

When paired with the ROKBOT™ automated pXRF platform, detectORE™ increases data density early in the exploration cycle and allows multiple stages of geochemical investigation to be completed in a single field campaign—especially valuable in remote areas.



PRECIOUS METALS ANALYSIS

PRECIOUS METALS

In conventional fire assay, sample pulp is mixed with a combination of chemical reagents. The mixture is heated at high temperature resulting in the formation of a lead button and slag.

The lead button which contains precious metals is cupelled at high temperature. The lead is absorbed by the cupel and leaves behind a bead that contains the precious metals. The bead is acid digested and analyzed by instrumental or gravimetric methods. At the discretion of the laboratory, precious metal recovery optimization may require a reduction in sample weight.

GOLD

DESCRIPTION	DETECTION RANGE (ppm)			PORTION	CODE
PHOTONASSAY™					
Au by Gamma-ray – 2 Cycle[1]	0.010	-	350	500g	CPA-Au2
	350	-	3,500	500g	CPA-Au2H
	3,500	-	10,000	500g	CPA-Au2HH
Au by Gamma-ray – 4 Cycle	0.008	-	350	500g	CPA-Au4
FIRE ASSAY					
Au by Fusion – AAS	0.005	-	10	30g	FAS-111
				50g	FAS-121
Au by Fusion – ICP-ES	0.002	-	10	30g	FAS-114
				50g	FAS-124
Au by Fusion – AAS	0.01	-	100	30g	FAS-211
				50g	FAS-221
Au by Fusion – ICP-ES	0.01	-	100	30g	FAS-214
				50g	FAS-224
Au by Fusion - Gravimetric	0.9	-	10,000	30g	FAS-415
				50g	FAS-425
METALLIC SCREEN FIRE ASSAY[2]					
500g - Plus (+) fraction & duplicate minus (-) fraction	0.9	-	10,000	30g	MSC-530
				50g	MSC-550
1000g - Plus (+) fraction & duplicate minus (-) fraction	0.9	-	10,000	30g	MSC-130
				50g	MSC-150

[1]PhotonAssay™ Extended Range: The analytical range can be extended to 35,000 ppm (3.5% Au) by reducing the X-ray beam intensity, allowing for the analysis of high-grade concentrates.

[2]A 500g or 1kg sample will be screened to 106µm. Fire assay is used to analyze the entire plus (+) fraction and a duplicate of the minus (-) fraction either by gravimetric or instrumental finish.

SILVER

In addition to several multi-element packages that include Silver (Ag) as part of the suite we offer our clients the methods below:

DESCRIPTION	DETECTION RAMGE (ppm)			PORTION	CODE
AQUA REGIA					
Ag by digestion – ICP-ES	0.2	-	100	0.5g	ICA-5Ag
	1	-	1,500	0.4g	ICA-6Ag
FIRE ASSAY					
Au by Fusion – ICP-ES	50	-	10,000	30g	FAS-418
				50g	FAS-428

GOLD & SILVER

DESCRIPTION		DETECTION RANGE (ppm)			PORTION	CODE
PHOTONASSAY™						
Au & Ag by Gamma-ray – **Ag Optimized**	Au	0.030	-	350	500g	**CPA-AgAu1**
	Ag	1.50	-	5,000		
Au & Ag by Gamma-ray – **Au Optimized**	Au	0.010	-	350	500g	**CPA-AuAg1**
	Ag	3.70	-	5,000		
FIRE ASSAY						
Au by Fusion – AAS / Ag by Aqua Regia – ICP-ES	Au	0.005	-	10	30g	**AuAg-12**
	Ag	0.20	-	100	50g	**AuAg-22**
Au & Ag by Fusion - Gravimetric	Au	0.09	-	10,000	30g	**FAS-413**
	Ag	50	-	10,000	50g	**FAS-423**
BULLION						
Au		0.01	-	1,000		**FAS-501**
Ag		0.01	-	1,000		**FAS-502**

GOLD, PLATINUM & PALLADIUM

DESCRIPTION		DETECTION RANGE (ppm)			PORTION	CODE
FIRE ASSAY						
Au, Pt & Pd by fusion – ICP-ES	Au, Pd	0.002	-	10	30g	**FAS-113**
	& Pt	0.005	-	10	50g	**FAS-123**
Ag by Fusion – ICP-ES	Au, Pt & Pd	0.01	-	100	30g	**FAS-213**
					50g	**FAS-223**

OSMIUM, RHODIUM, RUTHENIUM & IRIDIUM

DESCRIPTION	DETECTION (ppm)	PORTION	CODE
FIRE ASSAY			
NiS by fusion - INAA	Matrix dependent	On request	**FAS-611**

CONCENTRATES

DESCRIPTION	DETECTION RANGE (ppm)			CODE
Gold by fusion – Gravimetric	5	-	800,000	**CON-9Au**
Silver by fusion – Gravimetric	5	-	800,000	**CON-9Ag**
Platinum by fusion – ICP-ES	5	-	800,000	**CON-9Pt**
Palladium by fusion – ICP-ES	5	-	800,000	**CON-9Pd**

EXPLORATION

EXPLORATION

GeochemSIGN

Designed for early-stage Greenfields exploration enhancing detection of ultra-trace geochemical anomalies in soils, sediments and lean rocks. The dilute aqua regia digest is balanced—strong enough to liberate mobile and pathfinder elements, yet mild enough to avoid over-dissolving the mineral matrix—resulting in improved signal-to-noise ratios and clearer anomaly definition.

Gold is reported with the full multi-element suite from a single digest, with gold detection down to 0.5 ppb—making subtle, low-level anomalies statistically meaningful. The focus is on identifying anomalous responses rather than absolute grades, with confirmatory fire assay or PhotonAssayTM used for follow-up.

Suitable for porphyry, epithermal, VMS, and skarn systems. (ISO/IEC 17025 accredited.)

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)											PORTION	CODE
ULTRATRACE LEVEL				ICP-MS & ICP-ES							51 ELEMENTS	
Ag	0.01	-	100	**Ge**	0.05	-	500	**S**	0.01	- 10%		
Al	0.01	-	25%	**Hf**	0.02	-	500	**Sb**	0.05	- 10,000		
As	0.1	-	10,000	**Hg**	0.005	-	10,000	**Sc**	0.1	- 10,000		
Au[1]	0.5ppb	-	25	**In**	0.005	-	500	**Se**	0.2	- 1,000		
B	10	-	10,000	**K**	0.01	-	10%	**Sn**	0.2	- 500		
Ba	10	-	10,000	**La**	0.02	-	10,000	**Sr**	0.2	- 10,000		
Be	0.05	-	1,000	**Li**	0.1	-	10,000	**Ta**	0.01	- 500	0.5g	**IMS-110**
Bi	0.01	-	10,000	**Mg**	0.01	-	25%	**Te**	0.01	- 500	20g	**IMS-111**
Ca	0.01	-	25%	**Mn**	5	-	50,000	**Th**	0.2	- 10,000	40g	**IMS-112**
Cd	0.01	-	1,000	**Mo**	0.05	-	10,000	**Ti**	0.01	- 10%		
Ce	0.02	-	500	**Na**	0.01	-	10%	**Tl**	0.02	- 10,000		
Co	0.1	-	10,000	**Nb**	0.05	-	500	**U**	0.05	- 10,000		
Cr	1	-	10,000	**Ni**	0.2	-	10,000	**V**	1	- 10,000		
Cs	0.05	-	500	**P**	10	-	10,000	**W**	0.05	- 10,000		
Cu	0.2	-	10,000	**Pb**	0.2	-	10,000	**Y**	0.05	- 500		
Fe	0.01	-	50%	**Rb**	0.1	-	10,000	**Zn**	1	- 10,000		
Ga	0.05	-	10,000	**Re**	0.001	-	50	**Zr**	0.5	- 500		
											0.5g	**IMD-5xx**
Individual Element (xx – insert element symbol)											20g	**IMD-2xx**
											40g	**IMD-4xx**

[1]Gold is semi-quantitative due to the small sample size (0.5g), sample matrix and acid strength.

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)											PORTION	CODE
TRACE LEVEL				ICP-MS & ICP-ES							39 ELEMENTS	
Ag	0.05	-	100	**Ga**	0.1	-	10,000	**Sb**	0.05	- 10,000		
Al	0.01	-	25%	**Hg**	0.005	-	10,000	**Sc**	0.1	- 10,000		
As	0.1	-	10,000	**K**	0.01	-	10%	**Se**	0.2	- 1,000		
Au	0.5ppb	-	25	**La**	0.5	-	10,000	**Sr**	0.5	- 10,000		
B	10	-	10,000	**Mg**	0.01	-	25%	**Te**	0.05	- 500	0.5g	**IMS-116**
Ba	10	-	10,000	**Mn**	5	-	50,000	**Th**	0.2	- 10,000	20g	**IMS-117**

AQUA REGIA

MSALABS offers various types of Aqua Regia digestions: a true strength mixture of hydrochloric and nitric acids and dilute mixtures (equal portion) of hydrochloric, nitric, and deionized water. Aqua Regia acts as an oxidizing agent to dissolve most oxide, sulfide and carbonate minerals, making it an excellent trace level exploration tool.

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)											PORTION	CODE
ULTRATRACE LEVEL				ICP-MS & ICP-ES								51 ELEMENTS
Ag	0.01	-	100	**Ge**	0.05	-	500	**S**	0.01	-	10%	
Al	0.01	-	25%	**Hf**	0.02	-	500	**Sb**	0.05	-	10,000	
As	0.1	-	10,000	**Hg**	0.005	-	10,000	**Sc**	0.1	-	10,000	
Au[1]	0.5ppb	-	25	**In**	0.005	-	500	**Se**	0.2	-	1,000	
B	10	-	10,000	**K**	0.01	-	10%	**Sn**	0.2	-	500	
Ba	10	-	10,000	**La**	0.02	-	10,000	**Sr**	0.2	-	10,000	
Be	0.05	-	1,000	**Li**	0.1	-	10,000	**Ta**	0.01	-	500	0.5g **IMS-130**
Bi	0.01	-	10,000	**Mg**	0.01	-	25%	**Te**	0.01	-	500	20g **IMS-131**
Ca	0.01	-	25%	**Mn**	5	-	50,000	**Th**	0.2	-	10,000	40g **IMS-132**
Cd	0.01	-	1,000	**Mo**	0.05	-	10,000	**Ti**	0.01	-	10%	
Ce	0.02	-	500	**Na**	0.01	-	10%	**Tl**	0.02	-	10,000	
Co	0.1	-	10,000	**Nb**	0.05	-	500	**U**	0.05	-	10,000	
Cr	1	-	10,000	**Ni**	0.2	-	10,000	**V**	1	-	10,000	
Cs	0.05	-	500	**P**	10	-	10,000	**W**	0.05	-	10,000	
Cu	0.2	-	10,000	**Pb**	0.2	-	10,000	**Y**	0.05	-	500	
Fe	0.01	-	50%	**Rb**	0.1	-	10,000	**Zn**	1	-	10,000	
Ga	0.05	-	10,000	**Re**	0.001	-	50	**Zr**	0.5	-	500	
											0.5g	**IMA-5xx**
Individual Element (xx – insert element symbol)											20g	**IMA-2xx**
											40g	**IMA-4xx**

[1]Gold is semi-quantitative due to the small sample size (0.5g), sample matrix and acid strength.

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)											PORTION	CODE
TRACE LEVEL				ICP-MS & ICP-ES							39 ELEMENTS	
Ag	0.05	-	100	Ga	0.1	-	10,000	Sb	0.05	-	10,000	
Al	0.01	-	25%	Hg	0.005	-	10,000	Sc	0.1	-	10,000	
As	0.1	-	10,000	K	0.01	-	10%	Se	0.2	-	1,000	
Au	0.5ppb	-	25	La	0.5	-	10,000	Sr	0.5	-	10,000	
B	10	-	10,000	Mg	0.01	-	25%	Te	0.05	-	500	0.5g IMS-127
Ba	10	-	10,000	Mn	5	-	50,000	Th	0.2	-	10,000	20g IMS-128
Bi	0.01	-	10,000	Mo	0.05	-	10,000	Ti	0.01	-	10%	40g IMS-129
Ca	0.01	-	25%	Na	0.01	-	10%	Tl	0.02	-	10,000	
Cd	0.05	-	1,000	Ni	0.2	-	10,000	U	0.05	-	10,000	
Co	0.1	-	10,000	P	10	-	10,000	V	1	-	10,000	
Cr	1	-	10,000	Pb	0.2	-	10,000	W	0.05	-	10,000	
Cu	0.2	-	10,000	Re	0.005	-	50	Y	0.5	-	500	
Fe	0.01	-	50%	S	0.01	-	10%	Zn	2	-	10,000	

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)											CODE
STANDARD LEVEL				ICP-ES							35 ELEMENTS
Ag	0.2	-	100	Fe	0.01	-	50%	S	0.01	-	10%	
Al	0.01	-	25%	Ga	10	-	10,000	Sb	2	-	10,000	
As	2	-	10,000	Hg	1	-	10,000	Sc	2	-	10,000	
B	10	-	10,000	K	0.01	-	10%	Sr	1	-	10,000	
Ba	10	-	10,000	La	10	-	10,000	Th	8	-	2,000	
Be	0.5	-	1,000	Mg	0.01	-	25%	Ti	0.01	-	10%	ICP-130
Bi	2	-	10,000	Mn	5	-	50,000	Tl	10	-	10,000	
Ca	0.01	-	25%	Mo	1	-	10,000	V	1	-	10,000	
Cd	0.5	-	2,000	Na	0.01	-	10%	W	10	-	10,000	
Co	1	-	10,000	Ni	1	-	10,000	Zn	1	-	10,000	
Cr	1	-	10,000	P	10	-	10,000	Zr	5	-	2,000	
Cu	1	-	10,000	Pb	2	-	10,000					
ICP-130 + Hg by ICP-MS				Hg	0.005	-	10,000					ICP-135
Individual Element (xx – insert element symbol)												ICA-5xx

4-ACID

4-Acid or ‘near total’ digestion uses a combination of hydrochloric, nitric, perchloric and hydrofluoric acids. Only the most highly resistant minerals will not be dissolved. Mercury is volatilized in this type of digestion; however, it can be added by using aqua regia digestion at an additional cost.

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)												CODE
ULTRATRACE LEVEL				ICP-MS & ICP-ES								48 ELEMENTS
Ag	0.01	-	100	Hf	0.1	-	500	Sb	0.5	-	10,000	
Al	0.01	-	50%	In	0.005	-	500	Sc	0.1	-	10,000	
As	0.2	-	10,000	K	0.01	-	10%	Se	1	-	1,000	
Ba	10	-	10,000	La	0.5	-	10,000	Sn	0.2	-	500	
Be	0.05	-	1,000	Li	0.2	-	10,000	Sr	0.2	-	10,000	
Bi	0.01	-	10,000	Mg	0.01	-	50%	Ta	0.05	-	100	
Ca	0.01	-	50%	Mn	5	-	100,000	Te	0.05	-	500	
Cd	0.02	-	1,000	Mo	0.05	-	10,000	Th	0.2	-	10,000	IMS-230
Ce	0.02	-	500	Na	0.01	-	10%	Ti	0.01	-	10%	
Co	0.1	-	10,000	Nb	0.1	-	500	Tl	0.02	-	10,000	
Cr	1	-	10,000	Ni	0.2	-	10,000	U	0.1	-	10,000	
Cs	0.05	-	500	P	10	-	10,000	V	1	-	10,000	
Cu	0.2	-	10,000	Pb	0.5	-	10,000	W	0.1	-	10,000	
Fe	0.01	-	50%	Rb	0.1	-	10,000	Y	0.1	-	500	
Ga	0.05	-	10,000	Re	0.002	-	50	Zn	2	-	10,000	
Ge	0.05	-	500	S	0.01	-	10%	Zr	0.5	-	500	
IMS-130 + Hg by ICP-MS				Hg	0.005	-	10,000					IMS-235
Individual Element (xx – insert element symbol)												IMF-5xx

Minimum weight requirement is 1g pulp.

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)												CODE
STANDARD LEVEL				ICP-ES								34 ELEMENTS
Ag	0.5	-	100	Ga	10	-	10,000	Sb	5	-	10.000	
Al	0.01	-	50%	K	0.01	-	10%	Sc	2	-	10.000	
As	5	-	10,000	La	10	-	10,000	Sr	1	-	10.000	
Ba	10	-	10,000	Li	10	-	10,000	Th	8	-	10.000	
Be	0.5	-	1,000	Mg	0.01	-	50%	Ti	0.01	-	10%	
Bi	2	-	10,000	Mn	5	-	100,000	Tl	10	-	10,000	ICP-230
Ca	0.01	-	50%	Mo	1	-	10,000	V	1	-	10,000	
Cd	0.5	-	1,000	Na	0.01	-	10%	W	10	-	10,000	
Co	1	-	10,000	Ni	1	-	10,000	Zn	2	-	10,000	
Cr	1	-	10,000	P	10	-	10,000	Zr	5	-	2,000	
Cu	1	-	10,000	Pb	2	-	10,000					
Fe	0.01	-	50%	S	0.01	-	10%					
ICP-230 4-Acid package + Hg by ICP-MS								Hg	0.005	-	10,000	ICP-235
Individual Element (xx – insert element symbol)												ICF-5xx

ORE GRADE

ORE GRADE

AQUA REGIA

DETECTION RANGE (% UNLESS OTHERWISE NOTED)												CODE
ICP-ES												33 ELEMENTS
Ag	1	-	1,500ppm	Fe	0.05	-	50	Pb	0.001	-	5	
Al	0.05	-	50	Ga	0.005	-	5	S	0.05	-	10	
As	0.001	-	10	Hg	0.001	-	5	Sb	0.001	-	5	
Ba	0.005	-	5	K	0.05	-	50	Sc	0.001	-	5	
Be	0.001	-	5	La	0.005	-	5	Sr	0.001	-	5	
Bi	0.001	-	5	Mg	0.05	-	50	Ti	0.05	-	50	ICP-140
Ca	0.05	-	50	Mn	0.01	-	25	Tl	0.005	-	5	
Cd	0.001	-	1	Mo	0.001	-	5	V	0.001	-	5	
Co	0.001	-	5	Na	0.05	-	50	W	0.005	-	5	
Cr	0.001	-	5	Ni	0.001	-	5	Zn	0.001	-	15	
Cu	0.001	-	10	P	0.005	-	25	Zr	0.001	-	2	
Individual Element (xx – insert element symbol)												ICA-6xx

4-ACID

DETECTION RANGE (% UNLESS OTHERWISE NOTED)												CODE
ICP-ES												30 ELEMENTS
Ag	1	-	1,000ppm	Cu	0.001	-	40	P	0.01	-	10	
Al	0.05	-	30	Fe	0.05	-	50	Pb	0.01	-	20	
As	0.005	-	10	K	0.1	-	30	S	0.05	-	10	
Ba	0.005	-	5	La	0.005	-	5	Sb	0.005	-	5	
Be	0.001	-	1	Li	0.005	-	5	Sr	0.01	-	10	ICP-240
Bi	0.005	-	5	Mg	0.05	-	50	Ti	0.05	-	30	
Ca	0.05	-	50	Mn	0.01	-	10	Tl	0.005	-	5	
Cd	0.001	-	1	Mo	0.001	-	5	V	0.001	-	10	
Co	0.001	-	5	Na	0.05	-	30	W	0.01	-	5	
Cr	0.001	-	10	Ni	0.001	-	10	Zn	0.01	-	40	
Individual Element (xx – insert element symbol)												ICF-6xx

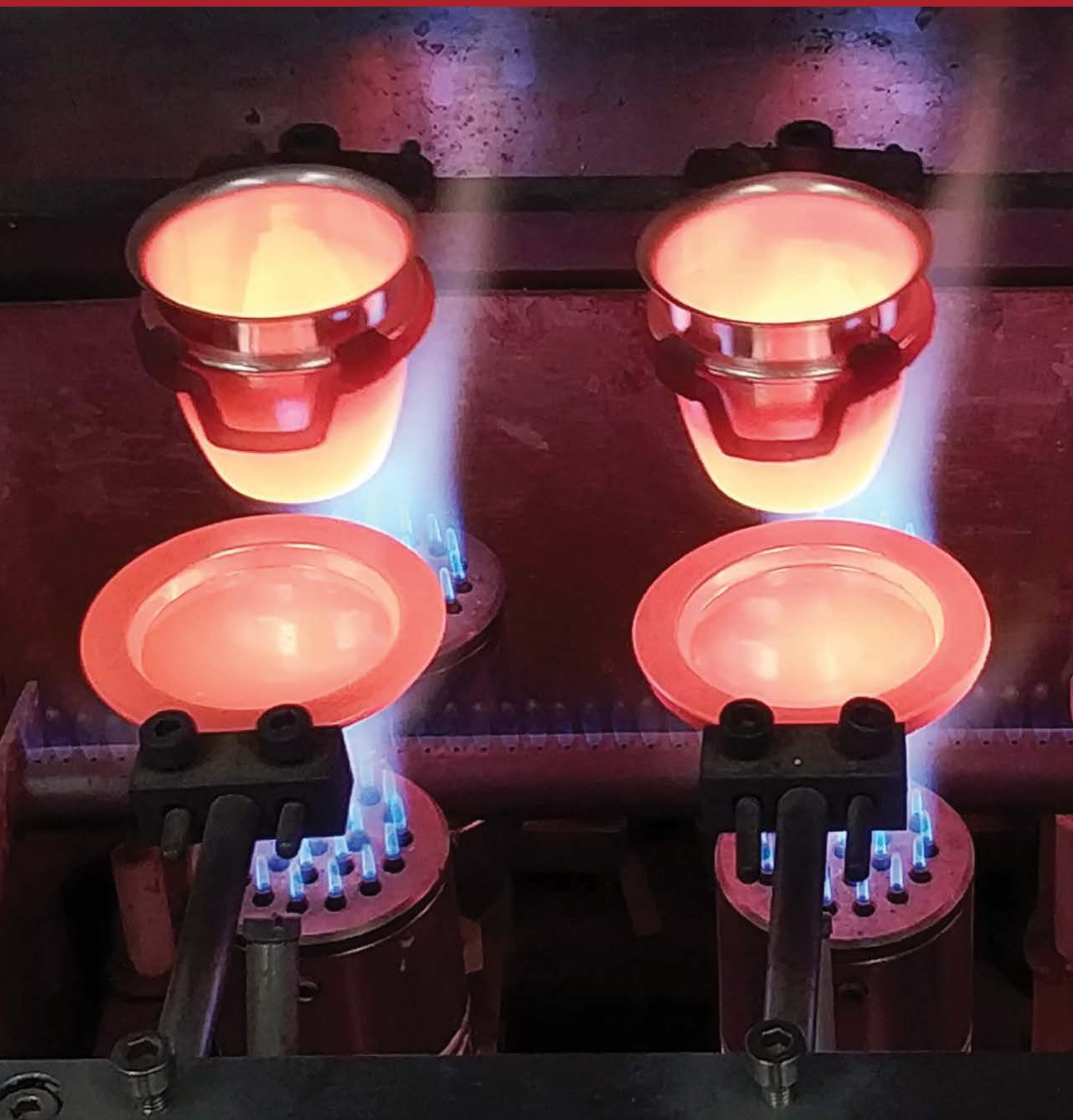
PEROXIDE FUSION

DETECTION RANGE (%)												CODE
ICP-ES												18 ELEMENTS
Al	0.01	-	50	Fe	0.05	-	70	Pb	0.01	-	30	
As	0.01	-	10	K	0.1	-	30	S	0.01	-	60	
Ca	0.05	-	50	Li	0.01	-	30	Si	0.1	-	50	PER-700
Co	0.002	-	30	Mg	0.01	-	30	Sn	0.01	-	30	
Cr	0.01	-	30	Mn	0.01	-	50	Ti	0.01	-	30	
Cu	0.005	-	30	Ni	0.005	-	30	Zn	0.01	-	30	
On Request – xx insert element symbol												
B	0.005	-	10	Mo	10	-	25,000ppm	W	10	-	25,000ppm	PER-7xx

VOLUMETRIC METHODS

DESCRIPTION	DETECTION RANGE (%)			CODE
CLASSICAL TITRATION				
Copper	0.01	-	100	**STI-8Cu**
Lead	0.01	-	100	**STI-8Pb**
Zinc	0.01	-	100	**STI-8Zn**
Iron	0.01	-	100	**STI-8Fe**
Ferrous Iron (FeO)	0.01	-	100	**STI-8FeO**
Antimony	0.01	-	100	**STI-8Sb**

LITHOGEOCHEMISTRY



LITHOGEOCHEMISTRY

Lithogeochemical testing helps identify rock types and monitor elemental changes caused by metamorphism, alteration, and mineralization. MSALABS offers specialized analytical packages to ensure comprehensive rock characterization, including Sulphur and Carbon species that are important for processing, waste management, and geometallurgy.

Please provide at least four times the nominal sample weight.

LOSS ON IGNITION (LOI)

DESCRIPTION	DETECTION RANGE (%)	CODE
Loss on Ignition @ 550°C	0.1 - 100	LOI-550
Loss on Ignition @ 1000°C	0.1 - 100	LOI-1000

WHOLE ROCK

Major elements are accurately measured by XRF, ICP-ES or by combining ICP-MS & ICP-ES after fusion. These methods are not suitable for samples containing base or precious metal mineralization.

PEROXIDE FUSION

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)										CODE
TRACE LEVEL			ICP-MS & ICP-ES			55 ELEMENTS				
Ag	10	12,500	Ho	0.01	25,000	Si	0.1	505		
Al	0.05	25%	In	0.3	25,000	Sm	0.04	25,000		
As	10	25,000	K	0.05	25%	Sn	5	25,000		
Ba	8	25,000	La	0.08	25,000	Sr	20	25,000		
Be	2	25,000	Li	2	25,000	Ta	3	25,000		
Bi	0.2	25,000	Lu	0.05	25,000	Tb	0.01	25,000		
Ca	0.1	25%	Mg	0.05	25%	Te	5	25,000		
Cd	1	25,000	Mn	10	25,000	Th	1	25,000		
Ce	0.1	25,000	Mo	2	25,000	Ti	0.005	25%		
Co	1	25,000	Nb	5	25,000	Tl	0.02	25,000		IMS-700
Cs	0.2	25,000	Nd	0.2	25,000	Tm	0.01	25,000		
Cu	20	25,000	Ni	10	25,000	U	1	25,000		
Dy	0.03	25,000	Pb	2	25,000	V	10	25,000		
Er	0.02	25,000	Pr	0.05	25,000	W	5	25,000		
Eu	0.05	25,000	Rb	10	25,000	Y	1	25,000		
Fe	0.05	25%	Re	0.01	25,000	Yb	0.02	25,000		
Ga	5	25,000	S	0.05	25%	Zn	10	25,000		
Gd	3	25,000	Sb	4	25,000					
Ge	2	25,000	Se	10	25,000					

LITHIUM BORATE FUSION

DETECTION RANGE (%)									CODE
TRACE LEVEL			ICP-ES			14 OXIDES + LOI			
Al_2O_3	0.01	100	K_2O	0.01	100	SiO_2	0.01	100	
BaO	0.01	100	MgO	0.01	100	SrO	0.01	100	
CaO	0.01	100	MnO	0.01	100	TiO_2	0.01	100	WRA-310
Cr_2O_3	0.01	100	Na_2O	0.01	100	LOI	0.01	100	
Fe_2O_3	0.01	100	P_2O_5	0.01	100				
WRA-310 + C&S			C	0.01	50	S	0.01	50	WRA-311
Individual Element (xx – insert element symbol)									WRA-3xx

DETECTION RANGE (%)												CODE
STANDARD LEVEL				XRF							14 OXIDES +LOI	
Al_2O_3	0.01	-	100	K_2O	0.01	-	15	SiO_2	0.01	-	100	
BaO	0.01	-	66	MgO	0.01	-	45	SO_3	0.01	-	30	
CaO	0.01	-	55	MnO	0.01	-	40	SrO	0.01	-	1.5	WRX-310
Cr_2O_3	0.01	-	10	Na_2O	0.01	-	10	TiO_2	0.01	-	30	
Fe_2O_3	0.01	-	100	P_2O_5	0.01	-	45	LOI	0.01	-	100	
WRA-310 + C&S				C	0.01	-	50	S	0.01	-	50	WRX-311
Individual Element (xx – insert element symbol)												WRX-3xx

LITHIUM BORATE FUSION

DETECTION RANGE (ppm)											CODE
REE'S & REFRACTORIES				ICP-MS							30 ELEMENTS
Ba	0.5	-	10,000	Ho	0.01	-	1,000	Ta	0.1	-	2,500	
Ce	0.1	-	10,000	La	0.1	-	10,000	Tb	0.01	-	1,000	
Cr	10	-	10,000	Lu	0.01	-	1,000	Th	0.05	-	1,000	
Cs	0.01	-	10,000	Nb	0.1	-	2,500	Tm	0.01	-	1,000	
Dy	0.05	-	1,000	Nd	0.1	-	10,000	U	0.05	-	1,000	IMS-300
Er	0.03	-	1,000	Pr	0.03	-	1,000	V	10	-	10,000	
Eu	0.03	-	1,000	Rb	0.2	-	10,000	W	1	-	10,000	
Ga	0.2	-	1,000	Sm	0.03	-	1,000	Y	0.5	-	10,000	
Gd	0.05	-	1,000	Sn	5	-	10,000	Yb	0.03	-	1,000	
Hf	0.2	-	10,000	Sr	0.1	-	10,000	Zr	2	-	10,000	

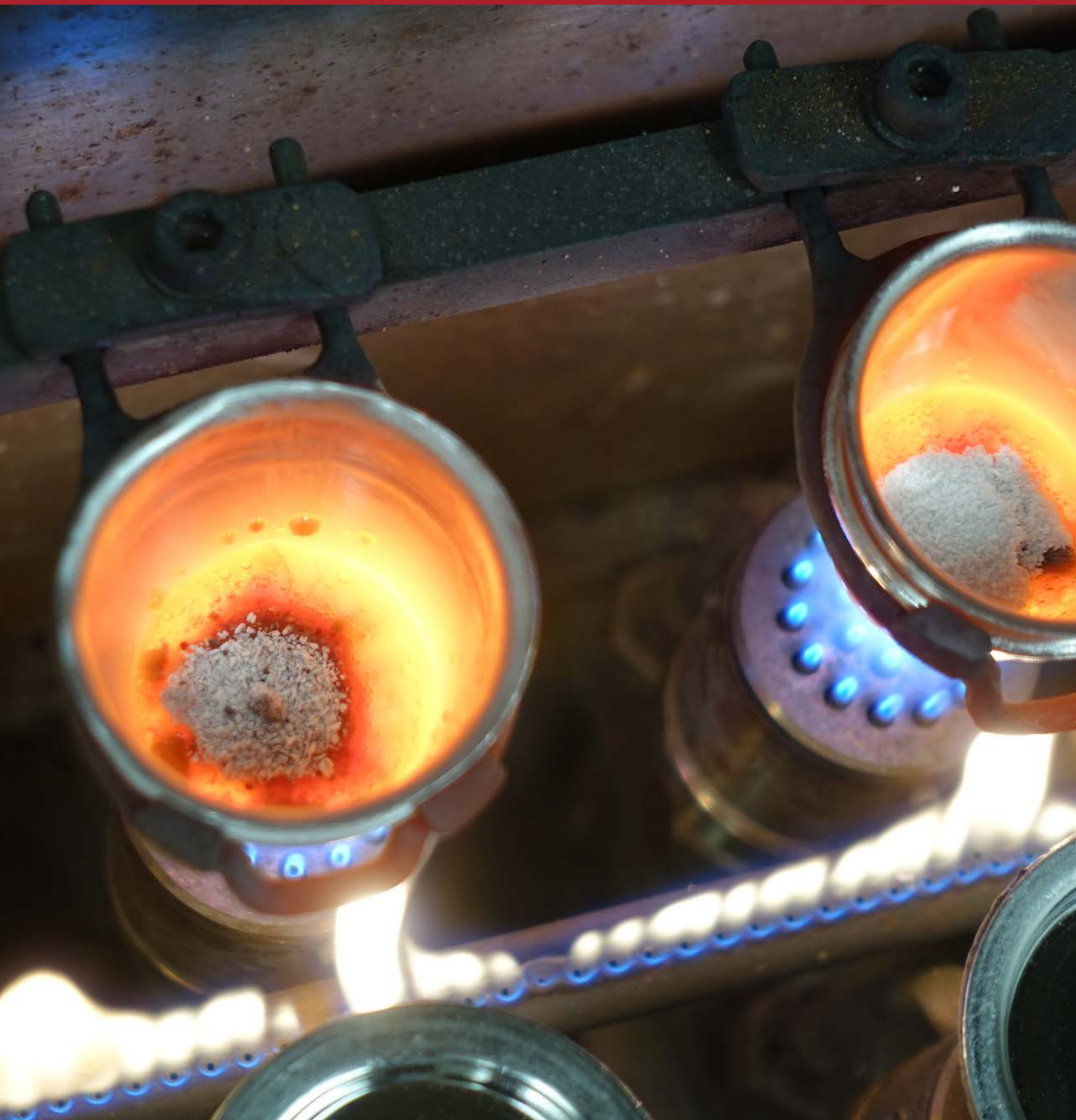
ADD ON DIGEST

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)											CODE
											14 ELEMENTS
As	0.1	-	10,000	Cu	0.2	-	10,000	Sb	0.05	-	10,000	
Ag	0.1	-	100	Hg	0.005	-	10,000	Se	0.2	-	1,000	
Au	0.5ppb	-	25	Mo	0.05	-	10,000	Ti	0.02	-	10,000	
Bi	0.01	-	10,000	Ni	0.2	-	10,000	Zn	2	-	10,000	
Cd	0.02	-	1,000	Pb	0.2	-	10,000					
Aqua Regia – ICP-ES & ICP-MS												IMS-130
4-Acid – ICP-ES & ICP-MS												IMS-230

WHOLE ROCK PACKAGES

DESCRIPTION	CODE
Whole Rock + C&S (WRA-311) + Refractories & REE (IMS-300)	WRA-330
Whole Rock + C&S (WRA-311) + Refractories & REE (IMS-300) + AR digestion add-on (IMS-130)	WRA-340
Whole Rock + C&S (WRA-311) + Refractories & REE (IMS-300) + AR digestion add-on (IMS-130) + 4-acid digestion add-on (IMS-230)	WRA-360

CRITICAL MINERALS & ORES



CRITICAL MINERALS & ORES

Critical minerals and ores are fundamental to modern industry, driving technologies from renewable energy to advanced electronics, while their supply is often constrained by geological complexity and geopolitical factors. Accurate identification and analysis of these materials are essential for efficient exploration, resource development, and processing optimization.

RARE EARTH ELEMENTS (REE'S)

DETECTION RANGE (%)											CODE
LITHIUM BORATE FUSION	XRF										15 OXIDES
CeO_2	0.01	-	50	Ho_2O_3	0.01	-	10	Sm_2O_3	0.01	-	10	
Dy_2O_3	0.01	-	10	La_2O_3	0.01	-	50	Tb_4O_7	0.01	-	10	
Er_2O_3	0.01	-	10	Lu_2O_3	0.01	-	10	Tm_2O_3	0.01	-	10	WRX-500
Eu_2O_3	0.01	-	10	Nd_2O_3	0.01	-	10	Y_2O_3	0.01	-	10	
Gd_2O_3	0.01	-	10	Pr_6O_{11}	0.01	-	10	Yb_2O_3	0.01	-	10	
Individual Element (xx – insert element symbol)												WRX-5xx

RESISTIVE METALS

DETECTION RANGE (%)											CODE
LITHIUM BORATE FUSION	XRF										11 ELEMENTS
Ba	0.01	-	40	Sb	0.01	-	45	U	0.01	-	13	
Ga	0.01	-	10	Sn	0.01	-	55	W	0.01	-	50	
Ge	0.01	-	10	Ta	0.01	-	45	Zr	0.01	-	50	
Nb	0.01	-	10	Th	0.01	-	13					
Individual Element (xx – insert element symbol)												WRX-4xx

Additional element available upon request.

COPPER ORE

Sequential Leaches for Copper Minerals.

DESCRIPTION	DETECTION RANGE (%)			PORTION	CODE
Citric acid leach, AAS/ICP-ES finish	0.001	-	10		SQL-CA1
Sulfuric acid leach, AAS/ICP-ES finish	0.001	-	10		SQL-AS1
Sulfuric acid/sodium sulfite leach, AAS finish	0.001	-	10		SQL-AS2
Sodium cyanide leach, AAS finish	0.001	-	10		SQL-CN1
Residue, 4-Acid, ICP-ES finish	0.001	-	10		SQL-RE1
Residue, by calculation	0.001	-	10		SQL-RE2
Total Cu, 4-Acid, ICP-ES finish	0.001	-	40		ICF-6Cu
Sequential leach package includes: ICF-6Cu, SQL-AS1, SQL-CN1, SQL-RE2	0.001	-	10		SQL-PK1
PHOTONASSAY™[1]	**DETECTION RANGE (ppm)**				
Cu by Gamma-ray	50	-	40,000	500g	CPA-Cu1
Cu by Gamma-ray – High Grade	20,000	-	300,000	500g	CPA-Cu1H

[1]Cu by PhotonAssay™ is material specific requiring test work to determine interfering elements and correction factors.

IRON ORE

DETECTION RANGE (%)												CODE
LITHIUM BORATE FUSION XRF												
Al_2O_3	0.01	-	100	K_2O	0.01	-	7	Sn	0.01	-	2	
As	0.01	-	2	MgO	0.01	-	40	Sr	0.01	-	2	
Ba	0.01	-	10	Mn	0.01	-	25	TiO_2	0.01	-	50	
CaO	0.01	-	40	Na_2O	0.01	-	10	V	0.01	-	5	
Cl	0.01	-	6	Ni	0.01	-	10	Zn	0.01	-	2	WRX-610
Co	0.01	-	5	P	0.01	-	10	Zr	0.01	-	1	
Cr_2O_3	0.01	-	10	Pb	0.01	-	2	LOI	0.01	-	100	
Cu	0.01	-	2	S	0.01	-	5					
Fe	0.01	-	75	SiO_2	0.01	-	100					

CARBON & SULFUR

Total Carbon and Total Sulfur are analyzed directly by induction. All Carbon and Sulfur methods are available separately or as packages.

DESCRIPTION			DETECTION RANGE (%)			CODE
Total C			0.01	-	50	SPM-110
Overlimit C (>50%)				Up to	100	SPM-115
Total inorganic C	*Ashed. residue by induction with graphite C correction*		0.02	-	50	SPM-120
Total inorganic C	*Ashed, residue by induction*		0.02	-	50	SPM-125
Total organic C	*By difference between total and ashed C content*		0.02	-	50	SPM-130
Graphite C	*Ashed, leached, residue measured by induction*		0.02	-	50	SPM-140
Complete C Package (SPM-125, SPM-130, SPM-140)				-		SPM-511
Total C & S		C	0.01	-	50	SPM-512
		S	0.01	-	50	
Total S			0.01	-	50	SPM-210
Overlimit S (>50%)				Up to	100	SPM-215
Sulfide-S: Total S-Sulfate S-Elemental S			0.01	-	100	SPM-220
Sulfate-S by HCl leach, ICP-ES finish			0.01	-	40	SPM-230
Elemental-S by Solvent extraction, gravimetric finish			0.01	-	100	SPM-240
Complete S Package SPM-210, SPM-220, SPM-230, SPM-240						SPM-522

GRASSROOTS

GRASSROOTS

The following analytical packages determine low grade elemental occurrence in waters and vegetation. These methods are an invaluable tool to provide you with geochemical information in the hunt for hidden mineralization.

BIOGEOCHEMISTRY

Vegetation and trees can absorb mineral-rich nutrients via root systems from their environments – soil, bedrock, water – and provide the explorationist with significant geochemical information. Vegetation surveys can provide effective complementary data for deeply buried deposits when establishing geochemical signatures. Macerated or ashed sample analyses are available. The default sample weight for macerated samples is 1g and for ashed samples is 0.25g.

Other sample weights are available on request.

DESCRIPTION	CODE
VEGETATION PREPARATION	
Dry and macerate to 1mm, per 100g	PRP-VG1
Dry and ash at 475°C	PRP-VG2
Save all or part of reject fraction	PSC-115

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)												CODE
ULTRATRACE LEVEL				**ICP-MS**								**51 ELEMENTS**
Ag	0.01	-	100	**Ge**	0.05	-	500	**S**	0.01	-	10%	
Al	0.01	-	25%	**Hf**	0.02	-	500	**Sb**	0.05	-	10,000	
As	0.1	-	10,000	**Hg**	0.005	-	10,000	**Sc**	0.1	-	10,000	
Au	0.5ppb	-	25	**In**	0.005	-	500	**Se**	0.2	-	1,000	
B	10	-	10,000	**K**	0.01	-	10%	**Sn**	0.2	-	500	
Ba	10	-	10,000	**La**	0.2	-	10,000	**Sr**	0.2	-	10,000	
Be	0.05	-	1,000	**Li**	0.1	-	10,000	**Ta**	0.01	-	500	
Bi	0.01	-	10,000	**Mg**	0.01	-	25%	**Te**	0.01	-	500	
Ca	0.01	-	25%	**Mn**	5	-	50,000	**Th**	0.2	-	10,000	IMS-330
Cd	0.01	-	1,000	**Mo**	0.05	-	10,000	**Ti**	0.01	-	10%	
Ce	0.02	-	500	**Na**	0.01	-	10%	**Tl**	0.02	-	10,000	
Co	0.1	-	10,000	**Nb**	0.05	-	500	**U**	0.05	-	10,000	
Cr	1	-	10,000	**Ni**	0.2	-	10,000	**V**	1	-	10,000	
Cs	0.05	-	500	**P**	10	-	10,000	**W**	0.05	-	10,000	
Cu	0.2	-	10,000	**Pb**	0.2	-	10,000	**Y**	0.05	-	500	
Fe	0.01	-	50%	**Rb**	0.1		10,000	**Zn**	1	-	10,000	
Ga	0.05	-	10,000	**Re**	0.001		50	**Zr**	0.5	-	500	

HYDROGEOCHEMISTRY

Surface and groundwater surveys can be an effective tool in mineral exploration. As water comes in contact with rocks containing ore deposits, minerals may dissolve in the water emulating the chemical composition of the rock. Ultra trace analysis by ICP-MS provides the sensitivity required between background levels and anomalous levels.

Water sampling bottles, 0.45µm filters, environmental grade nitric acid, and deionized water for field blanks can be provided at cost. Please notify the lab in advance about the supplies prior to sampling.

Minimum sample volume requirement is 25ml.

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)								CODE
ULTRATRACE LEVEL		ICP-MS						65 ELEMENTS
Ag	0.01	**Eu**	0.01	**Na**	20	**Sm**	0.01	
Al	20	**Fe**	30	**Nb**	0.01	**Sn**	0.01	
As	0.05	**Ga**	0.01	**Nd**	0.01	**Sr**	0.01	
Au	0.02	**Gd**	0.01	**Ni**	0.1	**Ta**	0.01	
B	10	**Ge**	0.05	**P**	100	**Tb**	0.01	
Ba	0.01	**Hf**	0.01	**Pd**	0.05	**Te**	0.05	
Be	0.05	**Hg**	0.1	**Pb**	0.5	**Th**	0.01	
Bi	0.01	**Ho**	0.01	**Pr**	0.01	**Tl**	0.01	
Ca	20	**In**	0.01	**Pt**	0.05	**Tm**	0.01	**DIR-IMS**
Cd	0.01	**K**	10	**Rb**	0.01	**U**	0.01	
Ce	0.01	**La**	0.01	**Re**	0.004	**V**	0.1	
Co	0.02	**Li**	1	**S**	50	**W**	0.01	
Cr	0.05	**Lu**	0.01	**Sb**	0.05	**Y**	0.01	
Cs	0.01	**Mg**	20	**Sc**	4	**Yb**	0.01	
Cu	0.05	**Mn**	0.05	**Se**	0.5	**Zn**	0.5	
Dy	0.01	**Mo**	0.05	**Si**	10	**Zr**	0.02	
Er	0.01							
Dilution of samples containing >1% solids								**DIL-IMS**

Detection Limits are based on samples containing low levels of total dissolved solids (less than 0.1%). Samples containing high levels of total dissolved solids will be diluted prior to analysis and as a result, the cost and detection limits will change.

NEUTRON ACTIVATION (INAA)

Instrumental neutron activation analysis is a non-destructive method that is used to determine the concentration of elements in a variety of matrices. As the irradiated sample decays, radioactive nuclides are produced emitting gamma-rays whose energies are characteristic to each element. Contact us for more information.

Minimum weight requirement is 25g.

DESCRIPTION	CODE
Au + 33 elements	NAA-120

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)												
Au	5	-	10,000	**Hf**	2	-	10,000	**Sn**	200	-	20,000
Ag	5	-	10,000	**Ir**	100	-	10,000	**Ta**	1	-	5,000
As	1	-	20,000	**La**	5	-	10,000	**Tb**	1	-	5,000
Ba	100	-	50,000	**Lu**	1	-	5,000	**Te**	1	-	5,000
Br	1	-	1,000	**Mo**	2	-	10,000	**Th**	0.5	-	10,000
Cd	10	-	1,000	**Na**	0.05	-	100%	**U**	0.5	-	10,000
Ce	10	-	10,000	**Ni**	20	-	20,000	**W**	2	-	10,000
Co	10	-	20,000	**Rb**	10	-	20,000	**Yb**	5	-	5,000
Cr	50	-	20,000	**Sb**	0.2	-	10,000	**Zn**	200	-	20,000
Cs	1	-	10,000	**Sc**	0.5	-	10,000	**Zr**	500	-	50,0000
Eu	2	-	5,000	**Se**	10	-	5,000				
Fe	0.5	-	100%	**Sm**	0.2	-	5,000				

METALLURGICAL SERVICES

METALLURGICAL SERVICES

BULK LEACH EXTRACTABLE GOLD (BLEG)

Cyanide is used to extract gold into solution. These procedures can be applied to geological samples in which fine gold may be present or where gold may be heterogeneously distributed. Advanced BLEG tests include multiple sampling periods as well as analysis of the leached solution and the residue to better understand the leachability of the ore.

DESCRIPTION	DETECTION RANGE (ppm)			PORTION	CODE
BLEG Quick cyanide test, leached solution by AAS	0.01	-	100		AU-CN00
BLEG Leached solution by AAS, Residue by fire assay	0.01	-	100	500g	AU-CN01
	0.01	-	100	1kg	AU-CN04

ADVANCED BLEG

DESCRIPTION	DETECTION RANGE (ppm)			PORTION	CODE
2hr, 6hr, 24hr, 48hr sampling of cyanide liquor with AAS finish Fire assay of residue before leaching and after 48 hours	0.01	-	100		AU-CN02

METALLURGICAL BLEG

DESCRIPTION	PORTION	CODE
Multiple sampling periods to determine leach kinetics. Detailed metallurgical balance including head and leach residue assays. Additional options include: - Examination of the effect of additional reagents - Modification of test parameters such as oxygen levels, temperature and particle size In conjunction with other mineral beneficiation processes.		AU-CN03

GOLD

DESCRIPTION	DETECTION RANGE (ppm)			CODE
Trace level – Fire Assay/AAS finish	0.005	-	10	MET-FA1
Ore grade – Fire Assay/AAS finish	0.01	-	100	MET-FA2
Concentrate – Fire Assay/ Gravimetric finish	0.9	-	10,000	MET-FA3

SILVER

DESCRIPTION	DETECTION RANGE (ppm)			CODE
Concentrate – Fire Assay/ Gravimetric finish	50	-	10,000	MET-FA5

GOLD & SILVER

DESCRIPTION		DETECTION RANGE (ppm)			CODE
Concentrate – Fire Assay/Gravimetric Finish	Au	0.9	-	10,000	MET-FA7
	Ag	50	-	10,000	
Gold ore grade – Fire Assay/AAS finish and Silver ore grade – Aqua Regia digestion/ICP-ES finish	Au	0.01	-	100	MET-FA8
	Ag	1	-	1,500	

GOLD, PLATINUM & PALLADIUM

DESCRIPTION		DETECTION RANGE (ppm)			CODE
Trace Level – Fire Assay/ICP-ES finish	Au, Pd	0.002	-	10	PGM-133
	Pt	0.005	-	10	
Ore Grade – Fire Assay/ICP-ES finish	Au, Pt, Pd:	0.01	-	100	PGM-233

AQUA REGIA

DETECTION RANGE (% UNLESS OTHERWISE NOTED)												CODE
ICP-ES												33 ELEMENTS
Ag	1	-	1,500ppm	Fe	0.05	-	50	Pb	0.001	-	5	
Al	0.05	-	50	Ga	0.01	-	5	S	0.05	-	10	
As	0.001	-	10	Hg	0.001	-	5	Sb	0.001	-	5	
Ba	0.01	-	5	K	0.05	-	50	Sc	0.001	-	5	
Be	0.01	-	5	La	0.005	-	5	Sr	0.001	-	5	
Bi	0.01	-	5	Mg	0.05	-	25	Ti	0.05	-	50	MET-420
Ca	0.05	-	50	Mn	0.01	-	25	Tl	0.005	-	5	
Cd	0.001	-	1	Mo	0.001	-	5	V	0.001	-	5	
Co	0.001	-	2	Na	0.05	-	50	W	0.005	-	5	
Cr	0.001	-	5	Ni	0.001	-	5	Zn	0.001	-	15	
Cu	0.001	-	10	P	0.005	-	25	Zr	0.001	-	2	
Individual Element (xx – insert element symbol)												INA-8xx

4-ACID

DETECTION RANGE (% UNLESS OTHERWISE NOTED)												CODE
ICP-ES												29 ELEMENTS
Ag	1	-	1,000ppm	Cu	0.001	-	40	Pb	0.01	-	20	
Al	0.05	-	30	Fe	0.05	-	50	S	0.05	-	10	
As	0.005	-	10	K	0.1	-	30	Sb	0.005	-	5	
Ba	0.005	-	5	La	0.005	-	5	Sr	0.01	-	10	
Be	0.001	-	1	Mg	0.05	-	50	Ti	0.05	-	30	MET-440
Bi	0.005	-	5	Mn	0.01	-	10	Tl	0.005	-	5	
Ca	0.05	-	50	Mo	0.001	-	5	V	0.001	-	10	
Cd	0.001	-	1	Na	0.05	-	30	W	0.01	-	5	
Co	0.001	-	5	Ni	0.001	-	10	Zn	0.01	-	40	
Cr	0.001	-	10	P	0.01	-	10					
Individual Element (xx – insert element symbol)												INF-8xx

PEROXIDE FUSION

DETECTION RANGE (% UNLESS OTHERWISE NOTED)												CODE
ICP-ES												18 ELEMENTS
Al	0.01	-	50	Fe	0.05	-	70	Pb	0.01	-	30	
As	0.01	-	10	K	0.1	-	30	S	0.01	-	60	
Ca	0.05	-	50	Li	0.05	-	30	Si	0.1	-	50	MET-510
Co	0.002	-	30	Mg	0.01	-	30	Sn	0.01	-	30	
Cr	0.01	-	30	Mn	0.01	-	50	Ti	0.01	-	30	
Cu	0.005	-	30	Ni	0.005	-	30	Zn	0.01	-	30	
Individual Element (xx – insert element symbol)												MET-5xx

SOLUTIONS

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)													CODE
DIRECT READ				ICP-ES									30 ELEMENTS
Ag	0.05	-	10	**Cu**	0.05	-	1,000	**Pb**	0.5	-	1,000		
Al	5	-	10,000	**Fe**	5	-	10,000	**S**	5	-	10,000		
As	0.2	-	1,000	**K**	5	-	10,000	**Sb**	0.2	-	1,000		
Ba	1	-	1,000	**La**	1	-	1,000	**Sn**	0.05	-	1,000		
Be	0.05	-	100	**Mg**	5	-	10,000	**Ti**	5	-	10,000		DIR-ICP
Bi	0.2	-	1,000	**Mn**	0.5	-	2,000	**Tl**	0.5	-	1,000		
Ca	5	-	10,000	**Mo**	0.05	-	1,000	**V**	0.05	-	1,000		
Cd	0.05	-	100	**Na**	5	-	10,000	**W**	0.5	-	1,000		
Co	0.05	-	1,000	**Ni**	0.05	-	1,000	**Zn**	0.2	-	1,000		
Cr	0.05	-	1,000	**P**	0.5	-	10,000	**Zr**	0.5	-	1,000		
Individual Element (xx – insert element symbol)													DIR-ICxx

CARBON & SULFUR ANALYSIS

DETECTION RANGE (ppm UNLESS OTHERWISE NOTED)					CODE
Total C + Total S	C	0.01	-	50	MET-750
	S	0.01	-	50	

METALLURGICAL SERVICES

Our partner laboratory works on the principle that effective process development in extractive metallurgy requires more than just a set of lab tests. It recognizes that every customer and project require support at numerous levels of process development.

The team will help identify the best testing methodologies at each stage of the process development cycle: whether it be mineral beneficiation or metal production.

Testing services include:

GRAVITY CONCENTRATION

Centrifugal gravity concentration, Shaking tables, Spirals, MAT table. Mathematical modelling of full size gravity concentration circuits.

FROTH FLOTATION

Preliminary scoping, detail optimization, closed circuit (locked-cycle) and column options on sulphide, oxide, and industrial minerals.

DENSE MEDIA SEPARATION

Bench-scale and pilot-scale options, heavy liquid, ferrosilicon or magnetite-based media.

CLASSIFICATION

Crushing, grinding, screening, de-sliming and particle size analysis, Bond Ball Mill Work Index.

HYDROMETALLURGY

Cyanide leach test work, including bottle roll, reactor and column leaches, acid and caustic leach testing, Ion exchange and solvent extraction.

PILOT-SCALE ROTARY SCRUBBER TESTING, USED FOR DEPOSITS WITH POTENTIAL CLAY ISSUES

To break up agglomerates or lumps in clay-like deposits to liberate encased target minerals prior to beneficiation.

SETTLING TESTS

Coagulant & flocculent selection, column settling rate measurement.

USEFUL INFORMATION

GRAVIMETRIC FACTORS

GRAVIMETRIC FACTORS		
ELEMENT	OXIDE	CONVERSION FACTOR
Al	Al_2O_3	1.889
Ba	$BaSO_4$	1.669
Ba	BaO	1.116
Be	BeO	2.775
C	CO_2	3.666
Ca	CaO	1.399
Ca	$CaCO_3$	2.497
Cr	Cr_2O_3	1.461
F	CaF_2	2.055
Fe	FeO	1.286
Fe	Fe_2O3	1.430
K	K_2O	1.205
Mg	MgO	1.658
Mg	$MgCO_3$	3.468
Mn	MnO	1.291
Na	Na_2O	1.348
Nb	Nb_2O_5	1.431
Ni	NiO	1.273
P	P_2O_5	2.291
Rb	Rb_2O	1.094
Si	SiO_2	2.139
Sn	SnO_2	1.270
Sr	SrO	1.185
Ta	Ta_2O_5	1.221
Th	ThO_2	1.138
Ti	TiO_2	1.668
U	U_3O_8	1.179
V	V_2O_5	1.785
W	WO_3	1.261
Y	Y_2O_3	1.270
Zr	ZrO_2	1.351

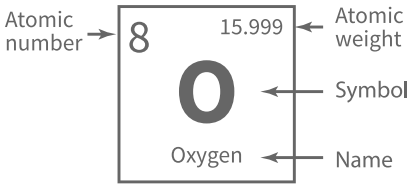
CONVERSION FACTORS

CONVERSION FACTORS	
1 ppm	1,000 ppb
1 ppm	1 g/tonne
1 troy oz/ton	34.286 g/tonne
1 g/tonne	0.0292 troy oz/ton
1%	10,000 ppm

SIEVE SIZES

COMMON SIEVE SIZES	
TYLER MESH	OPENING (µm)
4	4760
10	1680
20	841
35	500
48	297
60	250
80	177
100	149
150	105
200	74
230	63
270	53
325	44
400	37

PERIODIC TABLE



Chemistry is a branch of physical science that studies the composition, structure, properties and change of matter

1 1.008 H Hydrogen																	2 4.0026 He Helium
3 6.938 Li Lithium	4 9.012 Be Beryllium											5 10.806 B Boron	6 12.0096 C Carbon	7 14.0064 N Nitrogen	8 15.999 O Oxygen	9 18.998 F Fluorine	10 20.1797 Ne Neon
11 22.989 Na Sodium	12 24.304 Mg Magnesium											13 26.9815 Al Aluminium	14 28.084 Si Silicon	15 30.974 P Phosphorus	16 32.059 S Sulfur	17 35.446 Cl Chlorine	18 39.948 Ar Argon
19 39.0983 K Potassium	20 40.078 Ca Calcium	21 44.9559 Sc Scandium	22 47.867 Ti Titanium	23 50.9415 V Vanadium	24 51.9961 Cr Chromium	25 54.938 Mn Manganese	26 55.845 Fe Iron	27 58.933 Co Cobalt	28 58.6934 Ni Nickel	29 63.546 Cu Copper	30 65.38 Zn Zinc	31 69.723 Ga Gallium	32 72.630 Ge Germanium	33 74.922 As Arsenic	34 78.971 Se Selenium	35 79.901 Br Bromine	36 83.798 Kr Krypton
37 85.4678 Rb Rubidium	38 87.62 Sr Strontium	39 88.9058 Y Yttrium	40 91.224 Zr Zirconium	41 92.906 Nb Niobium	42 95.95 Mo Molybdenum	43 (98) Tc Technetium	44 101.07 Ru Ruthenium	45 102.9055 Rh Rhodium	46 106.42 Pd Palladium	47 107.8682 Ag Silver	48 112.414 Cd Cadmium	49 114.818 In Indium	50 118.710 Sn Tin	51 121.760 Sb Antimony	52 127.60 Te Tellurium	53 126.904 I Iodine	54 131.293 Xe Xenon
55 132.905 Cs Caesium	56 137.327 Ba Barium	57-71 Lanthanoids*	72 178.49 Hf Hafnium	73 180.948 Ta Tantalum	74 183.84 W Tungsten	75 186.207 Re Rhenium	76 190.23 Os Osmium	77 192.217 Ir Iridium	78 195.084 Pt Platinum	79 196.967 Au Gold	80 200.592 Hg Mercury	81 204.382 Tl Thallium	82 207.2 Pb Lead	83 208.980 Bi Bismuth	84 (209) Po Polonium	85 (210) At Astatine	86 (222) Rn Radon
87 (223) Fr Francium	88 (226) Ra Radium	89-103 Actinoids**	104 (267) Rf Rutherfordium	105 (268) Db Dubnium	106 (269) Sg Seaborgium	107 (270) Bh Bohrium	108 (277) Hs Hassium	109 (278) Mt Meitnerium	110 (281) Ds Darmstadtium	111 (282) Rg Roentgenium	112 (285) Cn Copernicium	113 (286) Nh Nihonium	114 (289) Fl Flerovium	115 (290) Mc Moscovium	116 (293) Lv Livermorium	117 (294) Ts Tennessine	118 (294) Og Oganesson

*Lanthanoids	57 138.905 La Lanthanum	58 140.116 Ce Cerium	59 140.908 Pr Praseodymium	60 144.242 Nd Neodymium	61 (145) Pm Promethium	62 150.36 Sm Samarium	63 151.964 Eu Europium	64 157.25 Gd Gadolinium	65 158.925 Tb Terbium	66 162.500 Dy Dysprosium	67 164.930 Ho Holmium	68 167.259 Er Erbium	69 168.934 Tm Thulium	70 173.045 Yb Ytterbium	71 174.9668 Lu Lutetium
**Actinoids	89 (227) Ac Actinium	90 232.0377 Th Thorium	91 231.036 Pa Protactinium	92 238.029 U Uranium	93 (237) Np Neptunium	94 (244) Pu Plutonium	95 (243) Am Americium	96 (247) Cm Curium	97 (247) Bk Berkelium	98 (251) Cf Californium	99 (252) Es Einsteinium	100 (257) Fm Fermium	101 (258) Md Mendelevium	102 (259) No Nobelium	103 (266) Lr Lawrencium

Alkali metal
Alkaline earth metal
Lanthanide
Actinide
Transition metal
Post-transition metal
Metalloid
Polyatomic nonmetal
Diatomic nonmetal
Noble gas
Unknown chemical properties

CONTACT DETAILS

Corporate Head Office

Head Office

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MSALABS

EVERY SAMPLE **SAFELY** MEASURED
EVERY RESULT **RELIABLY** DELIVERED

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