intertek minerals

Schedule of Services & Charges 2025

Minerals Services
Indonesia

Providing services across the resources supply chain.

Intertek is a leading Total Quality Assurance provider to industries worldwide. Our network of more than 1,000 laboratories and offices and over 46,000 people in more than 100 countries, delivers innovative and bespoke Assurance, Testing, Inspection and Certification solutions for our customers' operations and supply chains. Intertek supports companies' success in the global marketplace, by helping customers to meet end users' expectations for safety, sustainability, performance, integrity and desirability in virtually any market worldwide.

Our network of mineral laboratories offer world class geochemical assay and testing services including sample preparation, fire assay and precious metal analysis, exploration geochemistry, environmental testing, mine-site laboratories, coal testing and inspection, consulting minerals inspection, robotics and automated laboratory systems.

Quality analysis, efficient, independent, & cost-effective service. Global scope, local presence.

100 Countries.
1000 Laboratories.
46,000 Employees.

Intertek Minerals
Global Centre of Excellence

A technology and innovation centre with a focus on automation and sustainability to provide our clients with faster, safer, higher quality, and more efficient analytical solutions.

Minerals Global Centre of Excellence, is located in Perth, Western Australia, a key global centre for the minerals and mining industry. This new bespoke space consolidates Minerals operations into a 20,000sqm facility housing over 500 employees. The state-of-the-art laboratory supports our customers in the mining and minerals industry, giving them access to trusted expertise in mineral testing, inspections and analysis. Providing a broad portfolio of services under one roof significantly enhances delivery of our Total Quality Assurance (TQA) customer promise and streamlines our superior customer service.

The new facility was established to inspire innovation and sustainability across the minerals supply chain, with advanced technology, automation and robotics.

Robotics and Automation

As the leader in operating automated robotic laboratory systems for the mining industry, Intertek's new facility includes a range of robotic automated systems, including sample preparation and XRF systems. Utilising advanced technology and innovation with a strong focus on automation, Intertek provides our customers with faster, more efficient analytical options that increase production without compromising on quality.

Specialised testing services

- Supporting the industry to drive a low carbon society.
- Rare earth and alkali earth and battery metals utilising a range of cutting-edge geochemistry techniques.
- High-quality analysis of platinum group elements.
- Consultative customised solutions.

MineralSpace

A key feature of the new Intertek Minerals Global Centre of Excellence is MineralSpace, a unique multifunctional dedicated customer space. This collaborative, immersive and multiple configurational venue is available to our customers and industry bodies for presentations, technical seminars, workshops and events.

- Multiple configurable venue space.
- 4.8-metre interactive screen allowing 32 separate touchpoints.
- Instant access to our world-class technical experts and services.

Sustainability

True to our purpose, Bringing Quality, Safety and Sustainability to Life, this facility features 1.235 MW of panels with a 1 MW inverter, making it one of largest commercial rooftop solar installations in Western Australia.

Technology and Innovation

Metallurgical Services

Intertek strengthens global minerals offering with acquisition of Base Metallurgical Laboratories Ltd. and Base Met Labs US Ltd. ("Base Met Labs"), a leading provider of metallurgical testing services for the Minerals sector based in North America.

Base Met Labs' specialist focus on metallurgy capabilities complements Intertek Minerals existing strengths in geochemistry, mine site laboratories and trade inspection, creating attractive commercial synergies within Intertek's high-quality service portfolio.

With a testing focus on gold, copper and other critical metals, Base Met Labs benefits from growing demand for minerals testing underpinned by strong fundamentals, with significant growth potential in battery and energy metals that will help the world's leading mining companies accelerate into a sustainable future.

Founded in 2014 and operating from laboratories in Kamloops, British Columbia and Tucson, Arizona, Base Met Labs' specialist focus on metallurgy capabilities complements Intertek Minerals existing strengths in geochemistry, mine site laboratories and trade inspection, creating attractive commercial synergies within Intertek's high-quality service portfolio. The acquisition broadens the Group's differentiated ATIC offering in the Minerals industry, expanding its Americas footprint to access the largest and growing market for mining activity globally, across Canada, the United States and Central and South America.

With over 40 specialists operating from laboratories in Canada and the USA, Base Met Labs provides a comprehensive range of metallurgical capabilities including;

- Flotation testing
- Fully quantitative mineralogical studies
- Mineral processing
- Gravity concentration and beneficiation testing
- Comminution capabilities
- Cyanidation leaching studies
- Dewatering
- Assaying services
- Mineral extraction

With the expansion of metallurgical services through Base Met Labs, Intertek assists clients optimise mineral processing operations and maximise resource potential.

Minalyzer CS

Partnering with Minalyze has allowed Intertek Minerals to install a Minalyzer CS into our Global Centre of Excellence allowing our clients geological data acquisition and access to related software for data visualisation.

MINALYZE

Minalyzer CS is a scanner which is a contactless and non-destructive service that generates geochemical data, high-resolution images, rock quality designation (RQD), structures, specific gravity and bulk density for drill cores and other drill samples. The patented scanner is designed for handling large volumes of drill samples and is capable of scanning drill cores directly in core trays. A laser (LiDAR) generates a 3D-model of the topology of the core and trays, which enables the control and precision of the continuous XRF scanning. RQD and structures are also derived based on the 3D-model.

The objective, continuous and consistent nature of the datasets as well as the high but compact data density generated by the scanning technology is paramount in machine learning and deep learning applications and approaches to geology. Machine learning and deep learning have been demonstrated to be effectively used, based on the data from the scanning, for the prediction of host rock lithologies.

A range of datasets are available generated from one scan;

- **Photography:** High-resolution digital image of sample of spatial resolution of 12 pixels/mm with consistent light conditions.
- **Topography:** High-resolution grey scale or colorized digital topology model of sample in 3D X,Y and Z point cloud format.
- **Chemical Analysis:** Continuous X-ray Fluorescence (XRF) analysis on 1 m, 10 cm and custom intervals. Elemental range between Sodium (Na) to Uranium (U) depending on settings.
- **Specific Gravity/Bulk Density:** Specific Gravity (SG) estimations using the X-SG method or bulk density using volumetric estimation depending on core type.
- **Rock Quality Designation:** Rock quality designation (RQD) on desired intervals. Client can generate it digitally by using Minalogger and designating which fractures are mechanical or natural.
- **Structural logging:** Measurement of Alpha and Beta angles on structural features. Client can measure it digitally by using Minalogger where core have orientation line, and Alpha angle could be measured on.

Access to the Minalyze cloud-based software www.minalogger.com can be provided for visualisation and generation of datasets through digital tools and allows for remote access to a digital version of the drill sample.

PhotonAssay

Intertek Minerals has installed four Chrysos PhotonAssay units at our Minerals Global Centre of Excellence. This complements our fleet of two in West Africa.

CHRYSOS PhotonAssay

Using much higher energies than traditional X-ray methods, Chrysos PhotonAssay detects and counts atoms of gold in as little as two minutes. PhotonAssay allows large samples to be measured and provides a true bulk reading independent of the chemical or physical form of the sample. Using uniquely numbered sample jars, the process is completely non-destructive, and all samples can be retained for further analysis or testing if required. The technology is also measurably safer and more environmentally friendly than previous assay processes, something that aligns with Intertek's stated purpose of bringing quality, safety, and sustainability to life.

For gold producers PhotonAssay delivers faster, more accurate gold analysis on larger samples with lower costs.

- More representative sample analysis and results
- Improved definition of reserves and resources
- Lower labour requirements, less chance of human error and/or accident
- Reduced supply chain cost, reliance and management

Applications

The most common methods offered are listed in this Schedule, however this is not an exhaustive list of services and not all services are available at all locations, We encourage clients to discuss their projects with us and where possible visit the laboratories to assist with the selection of the most appropriate analytical solutions for the particular application.

Contents

Sample Preparation

The production of a homogeneous sub-sample, representative of the material submitted to the laboratory is the primary purpose of sample preparation. Correct preparation is critical to obtaining meaningful analytical results. The selection of the actual sample preparation procedures will depend on the type and size of the sample, the mineralogy as well as the client's analytical and budgetary requirements.

Segregation into high and low grade sample preparation areas and utilisation of techniques such as vacuuming pulveriser vessels and/or quartz washes between samples reduces the potential for contamination. Robotic preparation employing quartz washes is also available at some facilities.

Close and ongoing consultation with your laboratory manager or sales representative will ensure that optimal sample preparation techniques are employed thus maximising the value added in the analytical process.

Sample Submission

Correct submission and receipt of samples is critical in retaining the integrity of the sample chain of custody and facilitating efficient processing of samples. Detailed instructions can be found on Page 32 and submission forms can be downloaded from the Intertek website www.intertek.com/minerals

Sample submission and freight information emailed prior to despatch will expedite the sample receipt process. Upon receipt, samples are issued with a unique barcode ID through the LIMS. Clients are encouraged to submit pre barcoded samples to enable efficient sample receipt and reconciliation.

Description	Price
Minimum invoice charge	Rp3,018,750
Processing fee	Rp431,250
Waste disposal fee	Rp3,600/sample

Sample Storage

All solid samples (assay pulps, bulk pulps and residues) will be stored without charge for 90 days after completion of analysis. After this time all samples will be stored at a daily rate until the client's written advice regarding return, collection or disposal is received.

Description	Code	Price
Storage of pulps	ST102	Rp24/pulp/day
Storage of bulk residues	ST202	Rp160/residue/day
Storage of coarse residue	ST203	Rp175/residue/day
Labour for handling pulps/residues	ST204	Rp400,000/m^3 (min Rp362,500)
Disposal of pulps / residues	ST205	Rp1,000,000/m^3 (Rp1,015,000)
Packing of samples to be returned	RT201	POA

Samples submitted as liquids will be stored (at ambient temperature) without charge for 90 days after completion of analysis and then discarded unless advised otherwise in writing.

Freight

Freight expenses incurred will be passed on at cost.

Sample Preparation Packages

To facilitate easy selection of sample preparation procedures, commonly used techniques have been packaged together.

Partial Preparation Package

Description	Code	Price
Sort, dry (105°C), crush (95%<5mm), riffle split, pulverise 1.5kg (95%<75µm) up to 2.0kg	SP123	Rp76,125
Additional weight	SP124	Rp12,760/kg
Sort, dry (105°C), crush (95%<2mm), riffle split, pulverise1.5 kg (95%<75µm) up to 2.0kg	SP132	Rp84,100
Additional weight	SP133	Rp17,545/kg

Total Preparation Package

Description	Code	Price
Sort, dry (105°C), pulverise all (95%<75µm) up to 1.5kg	SP111	Rp79,750
Additional weight	SP113	Rp23,925/kg

Soil and Stream Sediment

Description	Code	Price
Sort, dry (105°C), pulverise all (95%<75µm) up to 1.5kg	SP101	Rp58,000
Additional weight	SP103	Rp13,558/kg

Sample Preparation Procedures

Drying

Sample drying procedures will vary due to the sample type and mass, moisture content and analyisis required.

Description	Code	Price
Sort and dry samples at 105°C	SD02	Rp7,975/kg
Sort and dry samples at 60°C	SD03	Rp11,962/kg

Crushing

Samples with a volume or dimensions exceeding that which the pulverising vessels can accommodate may require crushing and/or splitting prior to pulverising. Crushing may also be required to achieve an optimum particle size to split to a representative sub sample for further particle size reduction.

Description	Code	Price
Crush to ~5mm	CR07	Rp9,570/kg
Crush to ~2mm	CR02	Rp10,368/kg

Quartz wash packages are available on request.

Splitting

Splitting of samples may be done to achieve a more cost effective option in reducing the volume of sample for further particle size reduction steps.

Two types of splitters are used; the riffle splitter sometimes called a Jones Splitter and the Rotary Splitter. It is important to select the correct size splitter for the product being split, correct technique is also important in order that samples are split without introducing bias.

Description	Code	Price
Riffle splitting – Up to 6kg retain reject	RF02	Rp9,570/kg/sample
Rotary or arcual splitting	RS01	Rp11,962/kg/sample

Pulverising

Pulverising is carried out on crushed or fine products to achieve a fine homogeneous powder to enable small sub-samples to be taken for analysis that will be representative of the larger coarse sample. For most sample types at least 95% of material will be pulverised to 75µm or better.

All devices used in the crushing and pulverising of samples can impart trace levels of contaminants. Low chrome steel is often the preferred material of choice for pulverising vessels as the chrome and iron contamination is usually negligible compared with the levels commonly encountered in most geological materials.

Description	Code	Price
Fine pulverise, 95%<75µm, up to 1.5kg	PU102	Rp36,602
Fine pulverise, 95%<75µm, additional weight	PU104	Rp34,676

Sieving

Sieving may be performed on unprocessed samples to determine the mass distribution of the various size fractions or alternatively, on crushed or pulverised products to ascertain the effectiveness of the processes.

Description	Code	Price
Dry sieve specified mesh size 1 fraction	SV101	Rp17,545/kg
Dry sieve to specified mesh sizes additional fractions	SV101A	Rp8,772/kg/fraction
Wet sieve (retain oversize only)	SV102	Rp26,318
Wet sieve (recovering undersize & oversize)	SV102A	Rp55,825
Quality control check sizing - 75µm	SV203	Rp7,975/check
Quality control check sizing - 2mm	SV208	Rp7,975/check

Miscellaneous Procedures

Description	Code	Price
Client specified preparation	CP01	Rp478,500/hr
Roasting, pulp only up to 200g	PR01	Rp28,710
Reporting weights of samples, wet or dry	WT01	Rp9,570
Compositing / Homogenising <= 2kg	CM201	Rp38,280
Additional weight	CM202	Rp9,570

Other sample preparation processes (preparation of carbons, magnetic or heavy media separation, compositing & homogenising etc) are also available. Please contact the laboratory to discuss your requirements.

Density

Element	Description	Detection Limit	Code	Price
DE	Density / core and rocks uncoated		DBD	Rp131,660
DE	Density / core and rocks wax coated		DBDW	Rp450,793
SG	Pulp density (gas pycnometer method)		PYC	Rp189,144

Precious Metals Analysis

A diverse range of precious metal analytical techniques are available for a wide range of applications ranging from grassroots exploration, where sub ppb sensitivities are required, to accurate resource estimation and grade control.

Lead collection fire assay remains the classic method for gold, platinum and palladium, however, aqua regia digestion, accelerated cyanide leach and BLEG (bulk leach extractable gold) are available for specific purposes. The full suite of platinum group elements can be quantified using nickel sulfide collection fire assay. Please contact us to discuss your specific requirements.

Lead Collection Fire Assay

Fire assay flux recipes have been carefully formulated to optimise precious metal recovery in diverse mineralogical matrices. Further flux modification and reduction in charge weight can be used to improve recoveries in difficult sample matrices.

Element	Description	Detection Limit	Code	Price
Au	30g fire assay / AAS	0.01ppm	FA30/AA	Rp149,132
Au	50g fire assay / AAS	0.01ppm	FA51/AA	Rp157,905
Au	50g fire assay / AAS	0.005ppm	FA50/AA	Rp166,678
Au	50g fire assay / GF AAS	1ppb	FA50/GF	Rp228,085
Pt, Pd	As additional element			Rp74,168 / element
Au	30g fire assay / Gravimetric	6ppm	FA30/GR200	Rp210,540
Au	50g fire assay / Gravimetric	3ppm	FA50/GR200	Rp228,085

*A Rp10,000 surcharge will apply for new pots

Concentrates, metallurgical and high grade samples POA

Screen Fire Assay

Screen fire assays utilise a large sample mass, typically 1kg, and find application where the precious metal compositional and distributional heterogeneity in a pulp is such that a conventional fire assay would be accompanied by an unacceptable sampling error. The pulp sample is screened and the entire coarse fraction is fired assayed to recover the gold and/or PGEs. Duplicate assays are carried out on the more reproducible undersize fraction. The precious metal content is reported as a mass weighted mean along with the individual fractions' results.

Element	Description	Detection Limit	Code	Price
Au	Screen fire assay 106µm / AAS	0.01ppm	SF106/AA	Rp446,600
Au	Screen fire assay 75µm / AAS	0.01ppm	SF75/AA	Rp478,500
	Additional oversize firing			Rp166,678
Pt, Pd	Available on request			POA

Nickel Sulfide Collection Fire Assay

The specialised nickel sulfide collection fire assay method has been designed to quantitatively recover all of the platinum group elements. The precious metals are collected in a nickel sulfide matte which is dissolved leaving the Au and PGEs as a residue. This residue is filtered off, dissolved in aqua regia and read on an ICP-MS for low ppb detection limits.

Element	Description	Detection Limit	Code	Price
Au	25g NiS fire assay low level / ICP-MS	2ppb - 500ppb	NS25L/MS	POA
Pt, Pd, Rh, Ru, Ir, Os		1ppb - 500ppb		
Au	25g NiS fire assay ore grade / ICP-MS	5ppb - 100ppm	NS25H/MS	POA
Pt, Pd, Rh, Ru, Ir, Os				

Aqua Regia Digestion

Aqua regia is a low level, cost effective option for analysing gold and other elements in oxide, sulfide and carbonate minerals. It is an empirical method with tightly controlled digest conditions to optimise long term reproducibility. Refractory minerals and silicates may remain largely undigested. Pre roasting is required when samples contain appreciable non-carbonate carbon. Aqua regia digestion is a useful exploration tool and gold analysis can be coupled with multi element packages found under the Exploration Geochemistry section.

Element	Description	Detection Limit	Code	Price
Au	30g aqua regia / AAS	0.05ppm	AR30/AAS	Rp106,865
Au	50g aqua regia / AAS	0.02ppm	AR50/AAS	Rp115,638
	Pre-roasting (ashing) to remove graphitic / other organic material		R/	Rp28,710

Cyanide Leaches

Cyanide extractable gold analysis is used in a range of applications from identification of low level anomalies by BLEG in grassroots exploration to accelerated leaches mimicking metallurgical recovery processes.

BLEG (Bulk Leach Extractable Gold) – Low Level Gold

Element	Description	Detection Limit	Code	Price
Au	<5.0kg leach / AAS	0.1- 25ppb	CN5000/AAS	Rp350,900
Au	5.0 – 10.0kg leach / AAS	0.1- 25ppb	CN5000-1/AAS	Rp438,625
Ag, Cu	As additional element		/AA	Rp26,318 / element

BLEG (Bulk Cyanide Leach) - Zinc Collection Low Level Gold

Element	Description	Detection Limit	Code	Price
Au	2.0kg leach Zn collection / AAS	0.02ppb	CZ2000/AAS	Rp438,625
Au	5.0kg leach Zn collection / AAS	0.01ppb	CZ5000/AAS	Rp526,350
Au	>5.0kg leach Zn collection / AAS	0.01ppb	CZ5000-1/AAS	Rp614,075
Ag, Cu	As additional element		/AA	Rp26,318 / element

Accelerated Cyanide Leach LeachWELL™

High grade cyanide leaches utilise the LeachWELL™ accelerant to determine the cyanide extractable gold and provide an indication of potential recoveries in metallurgical processes and circuits. Recovery and analysis of the residues provide the option of reporting total gold values and thus determining the refractory gold fraction.

Element	Description	Detection Limit	Code	Price
Au	200g leach / AAS	0.01ppm	LW200/AA	Rp69,382
Ag	As an additional element	1ppm	/AA	Rp26,318 / element

Tail recovery, entire tail washed, reground and 50g fire assay Au

Element	Description	Detection Limit	Code	Price
Au	200g wash / grind / fire assay / AAS	0.01ppm	TR200/AA	Rp159,500

Cyanide Bottle Roll – Ore Grade

Element	Description	Detection Limit	Code	Price
Au	<1.0kg leach / AAS	0.01ppm	CNB1000/AAS	Rp263,175
Ag	As additional element	1ppm	/AA	Rp26,318 / element
Cu	As additional element	2ppm	/AA	Rp26,318 / element

Other Cyanide Methods

Element	Description	Detection Limit	Code	Price
Au	5g leach / AAS	0.01ppm	CN5/AAS	Rp69,382
Ag	As additional element	1ppm	/AA	Rp26,318 / element
Cu	As additional element	2ppm	/AA	Rp26,318 / element

Exploration Geochemistry

The challenge of identifying geochemical anomalies related to concealed mineral deposits has driven innovation and development in analytical geochemistry.

Advances in instrumentation and methodology offer significant improvements in aligning detection limits with elemental crustal abundances and provide exceptional long term data reproducibility.

A number of exploration methods are offered including partial selective leaches, biogeochemical analyses, aqua regia digestions and near-total four acid digestions. The selection of the most appropriate method is critical to achieving the most successful outcome for your exploration project.

The most commonly used analytical procedures are listed, however this is not an exhaustive list and we encourage you to contact your local manager to discuss your specific requirements. Not all methods and packages listed are available at all locations.

Aqua Regia Digestion Packages

Aqua regia digestion coupled with ICP-OES and ICP-MS offers a cost effective option for gold and multi-element packages.

The 1g options are primarily intended as a multi-element scanning tool. The precious metal results may be indicative only and should be interpreted with caution owing to the deportment of these elements in geological many sample types. Larger sample masses (e.g. 10g or 25g) can offer a more reliable precious metal analysis. Individual elements are available on request.

0.5g Aqua Regia ICP-OES Package

Element	Range ppm			Element	Range ppm			Element	Range ppm		
Ag	0.1	-	200	K	0.01%	-	10%	Se	5	-	2000
Al	0.01%	-	10%	La	1	-	2000	Sn	5	-	2000
As	2	-	1%	Li	1	-	1%	Sr	1	-	2000
Ba	1	-	2000	Mg	0.01%	-	10%	Ta	5	-	1000
Bi	2	-	2000	Mn	1	-	2%	Te	5	-	2000
Ca	0.01%	-	10%	Mo	1	-	1%	Ti	0.01%	-	1%
Cd	0.2	-	2000	Na	0.01%	-	10%	V	1	-	4000
Co	1	-	1%	Nb	1	-	2000	W	10	-	2000
Cr	1	-	2%	Ni	1	-	1%	Y	1	-	2000
Cu	1	-	1%	Pb	2	-	1%	Zn	1	-	1%
Fe	0.01%	-	10%	Sb	1	-	2000	Zr	1	-	2000
Ga	2	-	2000	Sc	1	-	2000				

Aqua regia digestion 0.5g / ICP-OES	AR005/OE01	Rp240,845

1g Aqua Regia Standard ICP-OES & MS Package

Element	Range ppm			Element	Range ppm			Element	Range ppm		
Ag	0.05	-	250	Hg	0.05	-	100	S	100	-	5%
Al	20	-	10%	In	0.05	-	1000	Sb	0.05	-	5000
As	1	-	1%	K	20	-	5%	Sc	1	-	500
B	10	-	1%	La	0.01	-	500	Se	1	-	5000
Ba	1	-	2000	Li	0.1	-	1000	Sn	0.5	-	200
Be	0.5	-	1000	Mg	0.01%	-	20%	Sr	0.2	-	5000
Bi	0.05	-	5000	Mn	1	-	1%	Ta	0.05	-	200
Ca	0.01%	-	40%	Mo	0.1	-	5000	Te	0.05	-	1000
Cd	0.05	-	1000	Na	0.01%	-	5%	Th	0.05	-	500
Ce	0.01	-	1000	Nb	0.2	-	200	Ti	5	-	1000
Co	0.1	-	5000	Ni	1	-	2%	Tl	0.05	-	1000
Cr	1	-	1%	P	20	-	2%	U	0.05	-	5000
Cs	0.02	-	500	Pb	0.5	-	5000	V	2	-	1000
Cu	1	-	2%	Pd*	10ppb	-	500pp	W	0.1	-	200
Fe	0.01%	-	50%	Pt*	5ppb	-	500ppb	Y	0.05	-	200
Ga	0.1	-	500	Rb	0.05	-	1000	Zn	1	-	2%
Hf	0.05	-	200	Re	0.05	-	500	Zr	0.5	-	200

Aqua regia digestion 1g / ICP-OES & ICP-MS	AR01/OM210	Rp542,300

Note: * Pt, Pd are indicative only on 1g option and must be interpreted with extreme caution

Legend		
Complete recovery for most samples	Near complete recovery for most samples	Not complete recovery

Aqua Regia Comprehensive ICP-OES & MS Package – Ultra Trace Levels

Element	Range ppm			Element	Range ppm			Element	Range ppm		
Ag	0.05	-	250	Hg	0.01	-	100	S	50	-	5%
Al	20	-	10%	Ho	0.01	-	200	Sb	0.02	-	5000
As	1	-	1%	In	0.005	-	1000	Sc	0.1	-	500
B	10	-	1%	K	20	-	5%	Se	1	-	5000
Ba	1	-	2000	La	0.01	-	500	Sm	0.01	-	500
Be	0.05	-	1000	Li	0.1	-	1000	Sn	0.05	-	200
Bi	0.01	-	5000	Lu	0.005	-	200	Sr	0.02	-	5000
Ca	0.01%	-	40%	Mg	0.01%	-	20%	Ta	0.01	-	200
Cd	0.01	-	1000	Mn	1	-	1%	Tb	0.005	-	200
Ce	0.01	-	1000	Mo	0.1	-	5000	Te	0.01	-	1000
Co	0.1	-	5000	Na	0.01%	-	5%	Th	0.01	-	500
Cr	1	-	1%	Nb	0.02	-	200	Ti	5	-	1000
Cs	0.01	-	500	Nd	0.01	-	500	Tl	0.01	-	1000
Cu	0.5	-	2%	Ni	0.5	-	2%	Tm	0.01	-	100
Dy	0.01	-	200	P	20	-	2%	U	0.01	-	5000
Er	0.01	-	200	Pb	0.5	-	5000	V	2	-	1000
Eu	0.01	-	200	Pd*	10ppb	-	500ppb	W	0.05	-	200
Fe	0.01%	-	50%	Pr	0.005	-	500	Y	0.02	-	200
Ga	0.05	-	500	Pt*	5ppb	-	500pp	Yb	0.01	-	200
Gd	0.05	-	200	Rb	0.02	-	1000	Zn	1	-	2%
Hf	0.01	-	200	Re	0.001	-	500	Zr	0.1	-	200
Aqua regia digestion 1g / ICP-OES & ICP-MS				AR01/0M200							Rp781,550

Note: * Pt, Pd are indicative only on 1g option and must be interpreted with extreme caution

A selection of individual elements and customised packages are offered to suit your specific needs, or where only a few elements are required. Please consult your local manager for details.

Elements where the concentration exceeds the upper limit will be re-digested by the appropriate analytical method which will incur additional charges.

Four Acid Digestion Multi-Element Analysis

Four acid digestion offers a "near total" dissolution of almost all minerals species, targeting silicates not dissolved in less aggressive aqua regia digests. Carefully staged digestion steps minimise losses due to volatilisation of some elements.

Highly resistant refractory minerals such as zircon, cassiterite, columbite-tantalite, ilmenite, xenotime rutile, barite and wolframite will require a fusion digestion to guarantee complete dissolution.

Packages range from basic ICP-OES only suites through to a comprehensive element list utilising both ICP-OES and ICP-MS for ultra-trace levels. Individual elements are available on request.

Four Acid ICP-OES Package

Element	Range ppm			Element	Range ppm			Element	Range ppm		
Ag	0.5	-	500	K	20	-	10%	Sb	5	-	1%
Al	50	-	15%	La	20	-	5000	Sc	1	-	5000
As	10	-	2000	Li	1	-	2000	Sn	5	-	2000
Ba	2	-	5000	Mg	20	-	40%	Sr	1	-	1%
Bi	5	-	1%	Mn	1	-	1%	Te	5	-	2000
Ca	50	-	40%	Mo	2	-	1%	Ti	5	-	1%
Cd	0.5	-	2000	Na	20	-	10%	V	1	-	5000
Co	1	-	1%	Ni	1	-	1%	W	5	-	2000
Cr	5	-	1%	P	50	-	5%	Zn	1	-	1%
Cu	1	-	1%	Pb	5	-	1%				
Fe	100	-	50%	S	50	-	10%				
Acid digestion				4A/OE01							Rp350,900

Four Acid Standard ICP-OES & MS Package

Element	Range ppm			Element	Range ppm			Element	Range ppm		
Ag	0.1	-	500	In	0.05	-	2000	Se	2	-	1%
Al	50	-	15%	K	20	-	10%	Sn	0.1	-	2000
As	2	-	2000	Li	0.1	-	2000	Sr	0.5	-	1%
Ba	1	-	5000	Mg	20	-	40%	Ta	0.05	-	2000
Be	0.5	-	2000	Mn	1	-	1%	Te	0.1	-	2000
Bi	0.05	-	1%	Mo	0.1	-	1%	Th	0.05	-	5000
Ca	50	-	40%	Na	20	-	10%	Ti	5	-	1%
Cd	0.05	-	2000	Nb	0.1	-	2000	Tl	0.02	-	2000
Co	0.1	-	1%	Ni	1	-	1%	U	0.05	-	1%
Cr	5	-	1%	P	50	-	5%	V	1	-	5000
Cs	0.1	-	2000	Pb	1	-	1%	W	0.1	-	2000
Cu	1	-	1%	Rb	0.1	-	2000	Y	0.1	-	2000
Fe	100	-	50%	Re	0.05	-	2000	Zn	1	-	1%
Ga	0.1	-	2000	S	50	-	10%	Zr	0.5	-	2000
Ge	0.1	-	2000	Sb	0.1	-	1%				
Hf	0.1	-	2000	Sc	1	-	5000				
				4A/OM10							Rp638,000

A selection of individual elements and customised packages are offered to suit your specific needs, or where only a few elements are required.

Elements where the concentration exceeds the upper limit will be re-digested by the appropriate analytical method which will incur additional charges.

Legend		
Complete recovery for most samples	Near complete recovery for most samples	Not complete recovery

Two Acid Digestion for Multi-Elements

This digest features a high temperature perchloric acid oxidative attack with a hydrochloric acid final leach that is suitable for the analysis of many base metal oxides and sulfides, however silicates and refractory minerals may only be partially attacked. Quantification is offered by an AAS finish.

This digest provides a useful scanning tool. Upper limits are relatively low for some elements, after which re-analysis by a more appropriate method is required.

Two Acid AAS Individual Elements

Element	Range ppm			Element	Range ppm			Element	Range ppm		
Ag	1	-	100	Cu	2	-	1%	Pb	4	-	4000
As	50	-	1%	Fe	0.01%	-	8%	Zn	1	-	1%
Cd	4	-	1%	Mn	5	-	1%				
Co	4	-	1%	Ni	4	-	1%				

Description		Code	Price
2 acid digestion	/ AAS first element C_2H_2	2A/AA201	Rp42,268
	/ per additional element C_2H_2		Rp14,355
2 acid digestion	/ AAS first element N_2O	2A/AA202	Rp47,850
	/ per additional element N_2O		Rp19,140

Pressed Powder XRF for Trace Elements

Pressed powder XRF is a useful technique for the rapid analysis of trace to minor quantities of single elements using quick matrix correction. The pulverised sample is mixed with a binder and pressed into a briquette which removes the need for digestion and facilitates the analysis of elements present in refractory minerals. Control of grinding parameters reduces errors due to particle size and mineralogical effects.

The pressed powder method is suitable for light matrices. Samples may be diluted with silica to expand the range and reduce matrix effects.

Element	Range ppm			Element	Range ppm			Element	Range ppm		
As	1	-	5000	Sb	3	-	5000	Te	5	-	5000
Ba	10	-	5000	Se	4	-	5000	Tl	4	-	5000
Bi	10	-	5000	Si	50	-	5000	W	5	-	5000
Mo	1	-	5000	Sn	3	-	5000	Zr	5	-	5000
Pb	10	-	5000	Ta	4	-	5000				

Description		Code	Price
Pressed powder	/ XRF including first element	PP/XRF201	Rp79,750
	/ per additional element		Rp26,318
Over range elements, dilution including first element		PP/XRF202	Rp95,700
	/ per additional element		Rp26,318

Legend		
Complete recovery for most samples	Near complete recovery for most samples	Not complete recovery

Ores & Commodities

A diverse suite of procedures provide optimum precision and accuracy of the target element typically required in advanced exploration and resource evaluation. Techniques include multi-acid and fusion digests, useful for characterisation of geological samples where total dissolution of the sample is required, coupled with ICP-OES, ICP-MS and XRF instrumentation.

Trade commercial grade sample analysis where results are used for umpire or commercial settlement are available on request, see the Minerals Trade Services section on page 34.

Ores and High Grade Materials

Acid Digestion

High grade sulfide ores are readily quantified using a 4 acid digest formulated to retain low-solubility elements such as Pb and Ag in solution at higher concentrations. This is a near total dissolution however elements incorporated in high refractory minerals may not be completely digested.

Four Acid Ore Grade AAS Individual Elements

Element	Range ppm	Element	Range ppm	Element	Range ppm
Ag	5	Cu	0.01	Pb	0.01
Cd	5	Fe	0.01	Zn	0.01
Co	0.01	Ni	0.01		

Ore grade 4 acid digest / AAS first element	4AH2/AA		Rp153,918
/ per additional element			Rp26,318

Four Acid Ore Grade ICP-OES Package

Element	Range ppm	Element	Range ppm	Element	Range ppm
Ag	0.5	K	0.01%	Sn	10
Al	0.01%	La	1	Sr	1
As	5	Li	1	S	50
Ba	2	Mg	0.01%	Ta	5
Bi	5	Mn	2	Te	10
Ca	0.01%	Mo	1	Ti	0.01%
Cd	1	Na	0.01%	V	1
Co	2	Nb	5	W	10
Cr	2	Ni	1	Y	1
Cu	2	Pb	2	Zn	2
Fe	0.01%	Sb	5	Zr	5
Ga	10	Sc	2		

ICP-OES package	4 acid ore grade digestion	4AH2/OE201	Rp290.290

Four Acid Ore Grade ICP-OES Individual Elements

ICP-OES elements are available individually. Please see table above for elements and detection limits.

Description		Code	Price
Four Acid Ore Grade	/ ICP-OES first element	4AH2/OM	Rp166,678
	/ per additional element		Rp8,772

Specialised and Classical Methods

Analyte	Description	Code	Price
Acid soluble Cu	Dilute H_2SO_4 leach / AAS	AS/AA	Rp89,320
Cyanide soluble Cu	Ambient temperature cyanide leach / AAS	CU1/AA	Rp69,382
Cu in Cu concentrates	Short iodide titration	CU2/VOL	Rp398,750
Zn in Zn concentrates	EDTA titration	ZN1/VOL	Rp478,500

Legend		
Complete recovery for most samples	Near complete recovery for most samples	Not complete recovery

Specific Commodities

Iron Ore

X-ray fluorescence spectroscopy (XRF) is the preferred method of analysis for iron ore samples. Accuracy, long term reproducibility and high throughput means XRF is unparalleled in the modern geochemical laboratory for the analysis of the major components of iron ores.

Pulverised samples are fused with a lithium borate flux and cast into disks using semi or fully automated technology. The use of fusion disks eliminates physical effects such as particle size and reduces matrix effects which can compromise the accuracy of XRF analysis. High quality data is produced using either simultaneous or sequential wavelength dispersive instrumentation.

Single point Loss on Ignition (LOI) is determined at 1000°C and is included in the analytical package rate. Customised multiple point LOI analysis, as determined by Thermo Gravimetric Analysis(TGA), are available on request.

Basic Iron Ore XRF Package

Suitable for exploration and resource modeling this suite is intended to quantify the essential major and minor oxide components of an iron ore sample.

Element	Range %			Element	Range %			Element	Range %		
Fe_2O_3	0.01	-	100	MgO	0.01	-	100	SiO_2	0.01	-	100
Al_2O_3	0.01	-	100	MnO	0.01	-	100	TiO_2	0.01	-	100
CaO	0.01	-	100	Na_2O	0.01	-	100	V_2O_5	0.005	-	10
Cr_2O_3	0.005	-	10	P	0.001	-	45	LOI 1000°C	0.01	-	100
K_2O	0.01	-	100	S	0.001	-	2				

Li borate fusion / XRF	FB1/XRF210	Rp574,998
Additional LOI	FB1/XRF210-1	Rp41,071

Extended Suite Packages

Suitable for exploration and resource modeling as well as quantification of additional accessory and deleterious elements. These elements are less abundant in most iron ores however, they may affect the quality of the ore if present in significant quantities.

Iron Ore Extended Suite - Standard Detection Limits XRF Package

Element	Range %			Element	Range %			Element	Range %		
Fe_2O_3	0.01	-	100	Cu	0.005	-	2	S	0.001	-	2
Al_2O_3	0.01	-	100	K_2O	0.01	-	100	SiO_2	0.01	-	100
As	0.005	-	5	MgO	0.01	-	100	Sn	0.005	-	5
BaO	0.005	-	5	MnO	0.01	-	100	TiO_2	0.01	-	100
CaO	0.01	-	100	Na_2O	0.01	-	100	V_2O_5	0.005	-	10
Cl	0.005	-	5	Ni	0.005	-	20	Zn	0.005	-	2
Co	0.005	-	5	P	0.001	-	45	LOI 1000°C	0.01	-	100
Cr_2O_3	0.005	-	10	Pb	0.005	-	2				

Li borate fusion / XRF	FB1/XRF11	Rp657,140
Multiple point LOI per additional temperature point	FB1/XRF11-1	Rp41,071

Multi-point LOI values are cumulative unless requested otherwise.

Aluminium Ore (Bauxite)

XRF analysis of bauxite is the preferred method to return total values of the component oxides such as alumina and silica. A single point LOI is done at 1000°C. As bauxites are highly hygroscopic, all data is corrected to the dry sample.

Of more fundamental importance are the available alumina and reactive silica components of the bauxite ores. The available alumina is the alumina component that can be extracted using the sodium hydroxide leaching Bayer process. The reactive silica is the silica component that dissolves in the Bayer process and reacts with some of the dissolved alumina and sodium hydroxide, whereby both alumina and sodium are lost to the process. Reactive silica and available alumina are determined in the Perth dedicated bauxite analysis facility.

Bauxite XRF Package

Element	Range %			Element	Range %			Element	Range %		
Al_2O_3	0.01	-	100	MgO	0.01	-	100	TiO_2	0.01	-	100
BaO	0.01	-	100	MnO	0.01	-	100	V_2O_5	0.005	-	100
CaO	0.01	-	100	Na_2O	0.01	-	100	ZrO_2	0.01	-	100
Cr_2O_3	0.005	-	100	P_2O_5	0.002	-	100	LOI 1000°C	0.01	-	100
Fe_2O_3	0.01	-	100	SiO_2	0.01	-	100				
K_2O	0.01	-	100	S	0.002	-	2				

Li borate fusion / XRF	FB1/XRF230	Rp459,998

Rare Earth Elements

Rare earth elements will play a significant role in the push towards net zero. The rare earth packages provided cover the 15 rare earth elements from Yttrium to Lutetium. Some of the rare earths are not particularly rare e.g. Ce which is more abundant than Cu, Co and Pb. Economic concentrations of these ores are only found in certain rock types, therefore correct analysis for your samples is imperative. Two fusion packages are offered for rare earth elemental analysis; a peroxide fusion and a borate fusion. These samples can be analysed via ICP-MS-QQQ for an interference free analysis of rare earths to achieve the low detection limits required for exploration samples. An XRF package is offered for precise quantification of the high concentration samples.

Ree Mineralisation Sodium Peroxide Fusion MS Package

Element	Range ppm	Finish	Element	Range ppm	Finish	Element	Range ppm	Finish
La	0.2 - 20%	MS	Eu	0.1 - 5%	MS	Er	0.1 - 5%	MS
Ce	0.5 - 30%	MS	Gd	0.1 - 5%	MS	Tm	0.1 - 1%	MS
Pr	0.1 - 10%	MS	Tb	0.1 - 2%	MS	Yb	0.1 - 5%	MS
Nd	0.1 - 20%	MS	Dy	0.1 - 5%	MS	Lu	0.1 - 1%	MS
Sm	0.1 - 10%	MS	Ho	0.1 - 2%	MS			
Sodium peroxide fusion Ni crucible			/MS			FP6/MS14		Rp544,314

Sodium Peroxide Fusions

Sodium peroxide fusions offer total dissolution of the sample and can be performed in either nickel or zirconium crucibles to preclude the presence of unwanted contaminant metals thus allowing different element suites to be tailored for various purposes. Sodium peroxide fusions are useful for samples in which the elements of interest are hosted in minerals that may resist acid digestions. These include, amongst others, minerals and ores containing rare earth elements (REE) and the high field strength elements (HFSE), Sn, W, Ti, Ta, Nb and V.

Zirconium Crucible Fusion Individual Elements by ICP-OES & ICP-MS Suitable for Majors, Boron and Base Metals

Element	Range ppm	Finish	Element	Range ppm	Finish	Element	Range ppm	Finish
Al	100 - 50%	ICP-OES	Ge	1 - 0.1%	ICP-MS	Se	20 - 2%	ICP-MS
As	20 - 20%	ICP-MS	In	0.1 - 5%	ICP-MS	Si	0.1% - 50%	ICP-OES
B	50 - 10%	ICP-OES	K	500 - 20%	ICP-OES	Sn	100 - 50%	ICP-MS
Ba	1 - 2%	ICP-MS	Li	1 - 20%	ICP-MS	Sr	20 - 20%	ICP-MS
Be	1 - 2%	ICP-MS	Mg	100 - 60%	ICP-OES	Ta	0.1 - 50%	ICP-MS
Bi	0.1 - 10%	ICP-MS	Mn	20 - 75%	ICP-OES	Te	2 - 2%	ICP-MS
Ca	0.1% - 70%	ICP-OES	Mo	1 - 10%	ICP-MS	Th	0.1 - 2%	ICP-MS
Cd	10 - 5%	ICP-MS	Ni	20 - 70%	ICP-OES	Ti	100 - 60%	ICP-OES
Co	1 - 20%	ICP-MS	Pb	20 - 70%	ICP-MS	Tl	0.5 - 2%	ICP-MS
Cr	50 - 40%	ICP-OES	Rb	0.5 - 5%	ICP-MS	U	0.1 - 60%	ICP-MS
Cs	0.1 - 1%	ICP-MS	Re	0.1 - 1%	ICP-MS	V	20 - 20%	ICP-OES
Cu	20 - 70%	ICP-OES	S	500 - 60%	ICP-OES	W	1 - 50%	ICP-MS
Fe	100 - 75%	ICP-OES	Sb	0.5 - 10%	ICP-MS	Y	0.5 - 50%	ICP-MS
Ga	1 - 5%	ICP-MS	Sc	10 - 5%	ICP-OES	Zn	20 - 70%	ICP-OES
Sodium peroxide fusion Zr crucible			/ ICP first element / secondary instrument first element / per additional element			FP1/OM		Rp279,512 Rp106,131 Rp15,762
Sodium peroxide fusion Zr crucible 42 element package						FP1/OM42		Rp761,830

Legend		
Complete recovery for most samples	Near complete recovery for most samples	Not complete recovery

Nickel Crucible Fusion ICP-OES & ICP-MS Individual Elements Suitable for Majors and Boron

Element	Range ppm			Finish	Element	Range ppm			Finish	Element	Range ppm			Finish
Al	100	-	50%	ICP-OES	Ho	0.1	-	2%	ICP-MS	Se	20	-	2%	ICP-MS
Ag	5	-	2%	ICP-MS	In	0.1	-	5%	ICP-MS	Si	0.1%	-	50%	ICP-OES
As	20	-	20%	ICP-MS	K	500	-	20%	ICP-OES	Sm	0.1	-	10%	ICP-MS
B	50	-	10%	ICP-OES	La	0.2	-	20%	ICP-MS	Sn	2	-	50%	ICP-MS
Ba	1	-	2%	ICP-MS	Li	5	-	20%	ICP-MS	Sr	20	-	20%	ICP-MS
Be	1	-	2%	ICP-MS	Lu	0.1	-	1%	ICP-MS	Ta	0.1	-	50%	ICP-MS
Bi	0.1	-	10%	ICP-MS	Mg	100	-	60%	ICP-OES	Tb	0.1	-	2%	ICP-MS
Ca	0.1%	-	70%	ICP-OES	Mn	0.2%	-	75%	ICP-OES	Te	1	-	2%	ICP-MS
Cd	1	-	5%	ICP-MS	Nb	10	-	30%	ICP-MS	Th	0.1	-	2%	ICP-MS
Ce	0.5	-	30%	ICP-MS	Nd	0.1	-	20%	ICP-MS	Ti	500	-	60%	ICP-OES
Cr	500	-	40%	ICP-OES	P	100	-	50%	ICP-OES	Tl	0.5	-	2%	ICP-MS
Cs	0.1	-	1%	ICP-MS	Pb	20	-	70%	ICP-MS	Tm	0.1	-	1%	ICP-MS
Dy	0.1	-	5%	ICP-MS	Pr	0.1	-	10%	ICP-MS	U	0.1	-	60%	ICP-MS
Er	0.1	-	5%	ICP-MS	Rb	0.5	-	5%	ICP-MS	V	50	-	20%	ICP-OES
Eu	0.1	-	5%	ICP-MS	Re	0.1	-	1%	ICP-MS	W	1	-	50%	ICP-MS
Fe	100	-	75%	ICP-OES	S	500	-	60%	ICP-OES	Y	0.5	-	50%	ICP-MS
Ga	1	-	5%	ICP-MS	Sb	0.5	-	10%	ICP-MS	Yb	0.1	-	5%	ICP-MS
Gd	0.1	-	5%	ICP-MS	Sc	10	-	5%	ICP-OES	Zr	5	-	50%	ICP-MS
Hf	0.1	-	5%	ICP-MS										

Sodium peroxide fusion Ni crucible	/ ICP first element / secondary instrument first element / per additional element	FP6/OM	Rp332,053 Rp132,400 Rp15,762
Sodium peroxide fusion Ni crucible package 55 element package		FP6/OM55	Rp975,142

Chromium Ore

Chromium ores are usually found associated with ultramafic rocks and may be accurately analysed by fusion XRF with a single point LOI (1000°C). The highly refractory nature of chromite ores requires a specialist approach in the fusion process to ensure that the spinel structure is decomposed and the entire sample is dissolved in the fusion disk. The LOI is usually negative in higher grade ores due to the oxidation of ferrous iron in the spinel structure. The major element analysis can be used to classify the chromite ore.

Chromite Ore XRF Package

Element	Range %			Element	Range %			Element	Range %		
Cr_2O_3	0.005	-	100	MgO	0.01	-	100	S	0.002	-	2
Al_2O_3	0.01	-	100	MnO	0.01	-	100	TiO_2	0.01	-	100
CaO	0.01	-	100	Na_2O	0.01	-	100	V_2O_5	0.005	-	100
Fe_2O_3	0.01	-	100	P_2O_5	0.002	-	100	LOI 1000°C	0.01	-	100
K_2O	0.01	-	100	SiO_2	0.01	-	100				

Li borate fusion / XRF	FB1/XRF235	Rp624,283

Nickel Laterite Ores

The oxidised nature of nickel laterite ore and the low sulfur contents make XRF with a single point LOI an ideal technique for the chemical characterisation of these ores. XRF can accurately quantify the nickel and cobalt contents of the ore, important trace elements such as cobalt and zinc, as well as the major oxide components which are used to classify the laterite ore type. Nickel laterite ores can be hygroscopic with high moisture contents. Moisture is therefore corrected for routinely and all results are reported on a dry basis.

Nickel Laterite Ore Standard XRF Package

Element	Range %			Element	Range %			Element	Range %		
Ni	0.01	-	25	Cr_2O_3	0.005	-	10	P_2O_5	0.002	-	15
Al_2O_3	0.01	-	50	Fe_2O_3	0.01	-	95	SiO_2	0.01	-	100
CaO	0.01	-	55	MgO	0.01	-	50	TiO_2	0.01	-	48
Co	0.005	-	5	MnO	0.01	-	30	LOI 1000°C	0.01	-	100

Li borate fusion / XRF	FB1/XRF240	Rp427,141

Nickel Laterite Ore Extended XRF Package

Element	Range %			Element	Range %			Element	Range %		
Ni	0.005	-	20	Cr_2O_3	0.005	-	100	P_2O_5	0.002	-	100
Al_2O_3	0.01	-	100	Fe_2O_3	0.01	-	100	SiO_2	0.01	-	100
CaO	0.01	-	100	K_2O	0.01	-	100	SO_3	0.002	-	100
Cl	0.002	-	2	MgO	0.01	-	100	TiO_2	0.01	-	100
Co	0.005	-	5	MnO	0.01	-	100	Zn	0.005	-	2
Cu	0.005	-	2	Na_2O	0.01	-	100	LOI 1000°C	0.01	-	100
Li borate fusion / XRF				FB1/XRF241							Rp509,283

Manganese Ore

XRF, with a single point LOI (1000°C), is routinely used in the accurate quantification of the chemical components of manganese ores. A complete suite is analysed which includes lead and barium. These two elements can be important components of the ore and the concentrations of these elements are required to do the requisite matrix corrections in the XRF analysis.

Manganese Ore XRF Package

Element	Range %			Element	Range %			Element	Range %		
MnO	0.01	-	100	Fe_2O_3	0.01	-	100	SiO_2	0.01	-	100
Al_2O_3	0.01	-	100	K_2O	0.01	-	100	S	0.002	-	2
BaO	0.01	-	100	MgO	0.01	-	100	TiO_2	0.01	-	100
CaO	0.01	-	100	Na_2O	0.01	-	100	V_2O_5	0.005	-	100
Cr_2O_3	0.005	-	100	P_2O_5	0.002	-	100	LOI 1000°C	0.01	-	100
Cu	0.005	-	2	Pb	0.005	-	2				
Li borate fusion / XRF				FB1/XRF225							Rp624,283

Industrial Minerals

XRF is a very useful technique for the analysis of diverse rock types and is the favored routine method for the full chemical characterisation of assorted industrial mineral feedstocks and products such as attapulgite, kaolinite, pyrophyllite, limestone, dolomite, phosphates, cement, mica and feldspar.

Clays, Limestones & Dolomites

Clay, Limestone & Dolomite XRF Package - suitable for samples containing <500ppm uranium.

Element	Range %			Element	Range %			Element	Range %		
Al_2O_3	0.01	-	100	MgO	0.01	-	100	S	0.002	-	2
CaO	0.01	-	100	MnO	0.01	-	100	TiO_2	0.01	-	100
Cr_2O_3	0.01	-	100	Na_2O	0.01	-	100	LOI 1000°C	0.01	-	100
Fe_2O_3	0.01	-	100	P_2O_5	0.002	-	100				
K_2O	0.01	-	100	SiO_2	0.01	-	100				
Li borate fusion / XRF				FB1/XRF250							Rp427,141
Li borate fusion / XRF				FB1/XRF260							Rp427,141

Zircon Sand XRF Package

Element	Range %			Element	Range %			Element	Range %		
ZrO_2	0.01	-	100	HfO_2	0.02	-	5	P_2O_5	0.01	-	15
Zr	0.01	-	74	K_2O	0.01	-	5	SiO_2	0.01	-	100
Al_2O_3	0.01	-	29	MgO	0.01	-	25	TiO_2	0.01	-	10
CaO	0.01	-	30	MnO	0.01	-	30	LOI 1000°C	0.01	-	100
Fe_2O_3	0.01	-	30	Na_2O	0.01	-	3				
Li borate fusion / XRF				FB1/XRF256							Rp624,283

Copper

A spectrum of analytical techniques are offered that add value to the copper industry supply chain. These include ultra-sensitive exploration methods, ore grade characterization and empirical digestion techniques that target copper in different forms. Acid soluble copper refers to the metal content extractable using dilute sulfuric acid. This includes the most common oxide copper species malachite, azurite and chrysocolla. Other copper minerals may also be partially dissolved. Cyanide soluble copper includes most oxide minerals, common sulfide minerals but not chalcopyrite. These techniques are empirical in that the recovery depends on the conditions of the digest, the degree of comminution and the deportment of the metal in the ore. Total copper is offered by four acid digest. Umpire and commercial exchange assay services are available at Intertek's specialist LSI laboratory, see Minerals Trade Services.

Specialised Copper Methods

Element	Description	Range	Code	Price
Cu	Aqua regia digest / ICP-OES	1 - 1%	Cu-AR1/OE	Rp143,550
Cu	4 acid digest / ICP-OES for more complete digestion of complex matrices	1 - 2%	Cu-4A/OE	Rp207,350
Cu	Ore grade 4 acid digest / ICP-OES	5 - 70%	Cu-4AO/OE	Rp153,918
Cu	Assay for commercial settlement (Intertek LSI)	-		POA
Cu	Multi acid digest / short iodide titration	-	Cu-VOL	Rp717,750
Cu Acid Soluble	Acid soluble copper (options available)	Various	Cu-AS/OE	Rp89,320
Cu CN Soluble	Cyanide soluble copper (options available)	Various	Cu-CN	Rp73,370
Cu Sequential	Acid soluble followed by cyanide soluble copper	Various	Cu-SQ	Rp478,500
Cu Sequential	Water soluble followed by acid and cyanide	Various	Cu-SQ3	Rp551,870
Cu Sequential	Water soluble followed by acid and cyanide with tail assay	Various	Cu-SQ4	Rp705,788

Legend		
Complete recovery for most samples	Near complete recovery for most samples	Not complete recovery

Individual Methods

Element	Description	Detection Limit	Code	Price
Hg	Specialised acid digest / cold vapour AAS	0.01ppm	HG1/CV	Rp131,588
FeO	Acid digestion / titration	0.1%	AD71/VOL	Rp542,300

Gravimetric Determinations

Element	Description	Detection Limit	Code	Price
LOD	Loss on drying (105°C or client nominated temperature)	0.01%	LOD/GR	Rp79,750
LOI	Loss on ignition (1000°C or client nominated temperatures)	0.01%	LOI/GR	Rp47,850
	Multiple temperatures each additional			Rp39,875

Carbon and Sulfur Analysis

Carbon and sulfur analyses using a variety of spectroscopic or gravimetric methods with the option of pretreatments for targeting specific forms of the analyte element.

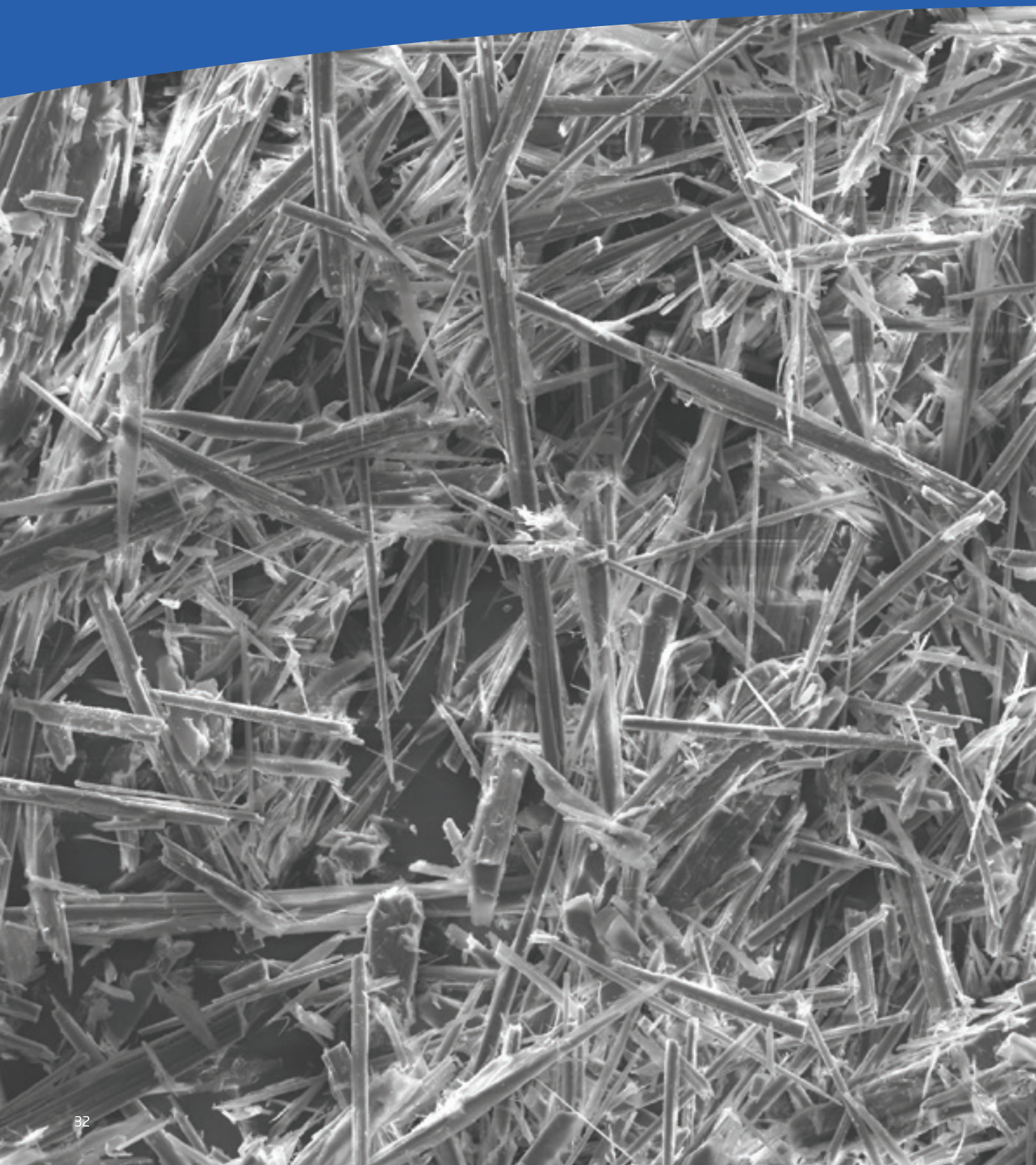
Element	Description	Detection Limit	Code	Price
C,S	Total carbon & sulfur / CS analyser first element	0.01% - 50%	CSA03	Rp132,385
	/ per additional element			Rp27,115
C non carbonate	Weak acid digestion / CS analyser 0.01%	0.01% - 50%	C71/CSA	Rp175,450

Sulfur Speciation

Classification of the forms of sulfur present maybe required for certain metallurgical processes. The following method utilizes a carbonate leach to dissolve any soluble sulfate mineralisation and the residual sample is analysed for sulfur.

Element	Description	Detection Limit	Code	Price
S_SCIS	Carbonate Insoluble sulfur	0.01% - 70%	CSA104	Rp175,450
S_AP	Sulfur after Pyrolysis	0.01 - 70%	CSA106	Rp169,733
SNIS	Sulfur insoluble nitric	0.01-70%	CSA105	Rp169,733

Mineralogy



Mineralogy

Applied mineralogy is the study of the mineral phases of materials which contrasts with and complements a traditional chemical analysis. Applied mineralogy identifies the nature of the mineral phase, the grain size and morphology, textures, mineral associations and other parameters. Applied mineralogy has important applications in mineral exploration, mineral processing, mineral waste disposal and treatment, hydrometallurgy, pyrometallurgy and refining. It is also utilised in the oil and gas, coal and environmental industries.

Various ores and commodities can be analysed such as base metal ores, precious metal ores, iron ores, bauxite, chromite, nickel, uranium, rare earths, industrial minerals (including graphite), refractory minerals and clays.

A comprehensive suite of applied mineralogy analyses are available, however not all services are available at all locations. Please call our Perth laboratory to discuss the options best suited to your requirements with Intertek's XRD specialist.

Bulk Mineralogy

X-Ray Diffraction

Powder X-ray diffraction (XRD) is an analytical technique primarily employed for the identification and quantification of crystalline materials in bulk samples, both natural and synthetic.

The results given are either qualitative (descriptive of the sample make-up) or quantitative. Quantitative results can include the non-crystalline (amorphous) content of the sample.

Qualitative X-Ray Diffraction Analysis

Sample Preparation

Description	Code	Price
Low temperature dry crush -2mm, rotary split 800g, pulverise 800g to < 60µm	XRD13	POA

Analysis

Description	Code	Price
Qualitative analysis for complete mineralogy	XRDQual	POA

Quantitative X-Ray Diffraction Analysis

A number of qualitative and quantitative options are available. Please contact the laboratory to discuss your specific requirements.

Sample Preparation

Description	Code	Price
Low-temperature dry, pulverise <800g to < 60 µm, micronise	XRD16	POA

Analysis

Description	Code	Price
Quantitative analysis for complete mineralogy and amorphous content	XRDQuant01	POA

Clay Mineralogy

Clays are important constituents of soils, mudstones, shales and some ores that often require specialist attention. A range of analytical tests are available, including:

- Clay separation from bulk materials
- Qualitative or quantitative XRD analysis from the bulk sample
- Clay mineral identification (XRD) (from glycolation and heating regimes)

Sample Preparation

Description	Code	Price
Separation of clay fraction, <2 µm	CLAYF	POA
Separation of clay fraction, <2 µm, in iron-rich samples	CLAYFFe	POA

X-Ray Diffraction Analysis

Description	Code	Price
Qualitative analysis of clays (incl. glycolation and heating)	XRDClay	POA

Infra-Red Spectroscopy

TerraSpec Near-Infrared Spectroscopy (NIR)

The TerraSpec 4 Hi Res spectrometer offers a rapid scan for the identification and characterisation of minerals visible in the NIR range. Minerals and mineral groups include haematite, goethite, garnet, pyroxene, amphibole, epidote, apatite, tourmaline, topaz, clay, mica, chlorite, serpentine, carbonates, hydrous silicates and rare earth minerals. The scan information can be used to identify, characterise and map alteration zones associated with various ore forming processes.

For best results, it is recommended that the characterisation of the mineral analysis be confirmed by XRD analysis on either a continuum or a selected subset of samples.

ASD Terraspec Scan

Description	Code	Price
TerraSpec 4 Hi Res scan	NIR	POA
TSG Post processing mineralogy report - standard report (includes scan)	NIR01	POA
aiSIRIS™ Post processing mineralogy report - standard report (includes scan)	NIR03	POA

Fourier-Transform Infrared Spectroscopy (FTIR)

Fourier-Transform Infrared Spectroscopy (FTIR) offers a rapid scan technique for the qualitative and quantitative analysis of organic and inorganic materials and minerals. Regression and calibration methods enable quantitative determination of mineralogy. This non-destructive technique requires minimal sample preparation.

Description	Code	Price
FTIR Scan	FTIR	POA
Quantitative determination*	FTIR02	POA
FTIR Quantitative model development	FTIRMD	POA

*Quantitative models are tailored to individual client resources, and must be developed in consultation with each client.

Micro Mineralogy

QEMSCAN/Nanomin

Automated mineralogy via QEMSCAN (Quantitative Evaluation of Minerals by Scanning Electron Microscopy) is used to identify mineral phases, in situ, at the micron scale on polished blocks or thin sections.

As well as identifying the minerals present, the processing of the data allows the visualisation of the textural and spatial arrangements of the minerals. The processing can thus determine grain sizes and shapes as well as provide information for mineral associations, mineral liberation, elemental deportment and elemental mapping.

The technique is best used in conjunction with the bulk mineralogical data obtained from XRD. Please contact us for options.

Minalyzer Analyser

Minalyzer is a scanner which is a contactless and non-destructive service that generates geochemistry, high-resolution images, rock quality designation (RQD), structures, specific gravity and bulk density for drill cores and other drill samples. The core will be scanned to pre-agreed settings and configuration by Intertek personnel and quantified with involvement from Minalyze. The core will be sent for sub-sequent analysis by the client using conventional techniques. The primary calibration will be based on pressed pellets of OREAS 24b and OREAS 624.. After scanning a sub-set of the assays spanning over the range of elements and quantities will be used as a custom calibration.

Continuous XRF Core Scanning

Scanning of core with high resolution camera as well as the LiDAR and a continuous XRF measurement along the core. There are different options of detectors, X-ray tubes and atmosphere conditions available that determine the elemental range and detection limits delivered. This enables calculation of RQD and Structural Logging through Minalogger Cloud. Standard speed is 10 mm/s and highest resolution quantified intervals would be 10cm intervals. A helium purge can be added for improved detection on lighter elements sodium, magnesium, aluminium, silica and phosphorus.

Description	Code	Price
Minalyze XRF scan	MINZ-01	POA
Minalyze XRF scan with helium purge	MINZ-01HP	POA
Minalyze scan two settings	MINZ-02	POA
Minalyze scan two settings with helium purge	MINZ-02HP	POA

Delivered datasets, photography, topology and elemental analysis. Enables, volume bulk density/X-SG, rock quality designation and structural logging.

High-Resolution XRF Core Scanning

Scanning of core with high resolution camera as well as the LiDAR and a continuous XRF measurement along the core in high-resolution. There are different options of detectors, X-ray tubes and atmosphere conditions available that determine the elemental range and detection limits delivered. This enables calculation of RQD and Structural Logging through Minalogger Cloud. Standard speed is 1 mm/s and highest resolution quantified intervals would be 1 cm intervals. A helium purge can be added for improved detection on lighter elements sodium, magnesium, aluminium, silica and phosphorus.

Description	Code	Price
Minalyze high-resolution scan	MINZ-HR	POA
Minalyze high-resolution scan with helium purge	MINZ-HRHP	POA

Delivered datasets, photography, topology and elemental analysis. Enables, volume bulk density/X-SG, rock quality designation and structural logging.

Photography and Topology Core Scanning

This service includes scanning of core with high-resolution camera as well as the LiDAR, generating a sample photograph as well as a point cloud 3D model of the sample. This enables calculation of RQD and Structural Logging through Minalogger Cloud.

Description	Code	Price
Photography and topology	MINZ-PT	POA

Delivered datasets, photography and topology. Enables, volume bulk density/X-SG, rock quality designation and structural logging.

Volume Bulk Density Core Scanning

Calculation of material bulk density per core tray. The core tray is weighed before scanning, and the LiDAR topology dataset is used to derive the sample volume in the tray. It requires at least a topology and photography service to have been performed. This method works well on friable and broken material.

Description	Code	Price
Volume bulk density	MINZ-VBD	POA

X-SG Specific Gravity Core

Calculation of specific gravity on desired intervals along the drill core. This service requires a continuous X-ray Fluorescence scan to have been performed on the intervals of interest. A calibration dataset must be provided with known specific gravity for a sub-set of the cores that are being scanned either based on pycnometry or submersion methods. This method works well on crystalline and competent core.

Description	Code	Price
X-SG specific gravity	MINZ-XSG	POA

Point XRF Chips and Pulp Core Scanning

Scanning of RC chips or pulps with high-resolution camera and a point XRF measurement in each compartment of a standard chip tray. There are different options of detectors, X-ray tubes and atmosphere conditions available that determine the elemental range and detection limits delivered. A helium purge can be added for improved detection on lighter elements sodium, magnesium, aluminium, silica and phosphorus.

Description	Code	Price
XRF chips and pulp scanning	MINZ-CPS	POA
XRF chips and pulp scanning with helium purge	MINZ-CPSHP	POA

Delivered datasets, photography, topology and elemental analysis.

MINALOGGER – WEB BASED CLOUD SOFTWARE

A cloud-based software www.minalogger.com is available for visualisation and generation of datasets through digital tools which facilitates remote access to a digital version of drill samples. Intertek can refer clients to Minalyze for Minalogger licencing options.

Additional Information

Sample Despatch

To assist with the efficient processing of your samples please email all assay instructions and any freight information prior to or at the time of despatch. Sample submissions received without written instructions cannot be processed until adequate written instructions are received from the client.

All discrepancies between submission sheets and actual samples received will be reported prior to commencement of the processing.

We recommend that all submissions of samples are clearly labelled and packaged in a concise and systematic order and are accompanied by accurate and detailed paperwork. To facilitate safe manual handling we would appreciate that samples be packaged in units not exceeding 25kg each. Sample submissions poorly labelled or packaged may incur additional sorting charges. Please "flag" the bag containing the paperwork.

Sample submission pads and pre-addressed stick-on labels are available upon request free of charge. A sample submission form is available from our web site. We offer an online submission service or the option to print a submission to be either emailed or faxed.

The minimum information required on any sample submission sheet is:

1. Client name
2. List or range of sample numbers
3. Sample preparation required
4. Elements required for analysis
5. Methods of analysis preferred
6. Result destination(s)
7. Electronic data format
8. Invoice destination
9. Sample storage requirements
10. Appropriate warnings if any samples are potentially hazardous
11. Indication of any samples that may cause problems during the preparation or analysis. This includes the presence of normally trace elements at percent levels, visible gold, graphitic shales, etc.

Certain samples may require classification as dangerous goods, for the purpose of transport, processing and storage. Compliance is the client's responsibility, please ensure that the samples have been classified, marked and transported in accordance with the requirements of dangerous goods legislation.

Your co-operation with sample submissions will eliminate unnecessary delays in turnaround.

Importation of Samples into Indonesia

Indonesia does not possess the same Quarantine import restrictions as found in Australia. However, correct procedures and paperwork must be submitted to minimise delays. Intertek Indonesia has an import licence and your local manager is able to assist clients with the necessary information.

When importing mineral samples into Indonesia from International sources the following document requirements are required; a Commercial Invoice and an Intertek Indonesia Sample Submission Form.

These documents may be downloaded from www.Intertek.com/minerals or by contacting the Jakarta Office.

Expenses related to the importation will be charged at cost. Intertek Indonesia does not guarantee that samples submitted will be cleared by Indonesian Customs.

Service Fees and Surcharges

Prices in this schedule are effective from 1st January 2025.

Intertek Indonesia applies a minimum invoice charge of Rp3,018,750 and a processing fee of Rp431,250 is also applicable.

When sample submissions include largely differing sample matrices and/or differing analytical requirements, they may be treated as separate submissions and multiple jobs may be generated for each discrete grouping, each possibly attracting minimum job fees or small batch size surcharges.

A waste disposal levy is applicable for samples which produce lead, alkaline or cyanide based solid or liquid waste that requires specific hazardous waste disposal protocols at Rp3,600 per sample. Should disposal costs increase prices may be increased accordingly.

Discounts may apply for large batches – please contact Intertek Indonesia to discuss your needs.

All prices quoted in this schedule are in Indonesian Rupiah, and exclude Indonesian VAT.

Quality Assurance

Regular participation in international, national and internal proficiency round robins and client specific proficiency programs complements KAN ISO 17025 accreditation ensuring international standards are maintained in the laboratories' procedures, methodology, validation, QA/QC and data handling.

Certified Reference Materials and/or in house controls, blanks and replicates are analysed with each batch of samples. These quality control results are reported along with the sample values in the final report. Selected samples are also re-analysed to confirm anomalous results. Prices include the reporting of all QC data except where more than 10% repeats are considered necessary in cases such as poor reproducibility due to particulate gold, in which case additional repeats may be charged for.

Where the concentration of an element exceeds the capacity of the original method selected, re-analysis will be required using a more appropriate technique at the client's expense.

Ethics and Compliance

Intertek is committed to maintaining the total confidence of its customers and shareholders. One of the Group's primary business objectives is to ensure both compliance with local, national and international laws and the accuracy and validity of reports and certificates that it provides to customers.

The foundations of the policy rest with the Group's employees, each of whom must comply with the company's Code of Ethics and Zero Tolerance policies outlining the high standards expected of them in all business dealings.

Our compliance aims:

- To avoid conflicts of interest and to act openly, responsibly and within the confines of the law and internationally accepted guidelines.
- To implement current 'best practice' policies in all control procedures.
- To maintain a culture in which all employees know what is expected of them.
- To monitor adherence to organisational controls and reporting procedures.
- Compliance is a core component of Intertek's business strategy to ensure high standards of professional conduct and ensure ethical behaviour and integrity of services.

Occupational Health & Safety

Intertek is also committed to the ongoing Health and safety of our employees. In accordance with this commitment, Intertek Indonesia is accredited for OHSAS 18001, ensuring international standards of Occupational Health and Saftey are implemented including ongoing OHS training and health monitoring.

Value Added Services

Robotics and Automated Minerals Laboratory Systems

Intertek is the largest global commercial operator of automated and robotic mine site laboratories. Intertek automated and robotic sample systems are purpose built, ranging from individual cells to fully integrated systems, providing complete end-to-end sampling to analysis solutions. Using advanced robotic sample handling technology for minerals testing has distinct advantages, including rapid sample throughput, unparalleled consistency, exclusion of human error, a comprehensive audit trail, synchronised process control, reliability and fully programmable comminution parameters. Programmable parameters ensure that ores obtain the requisite treatment consistently. Robotic systems reduce OH&S exposure to employees, eliminating heavy lifting and isolating personnel from hazardous materials, significantly improving safety.

Minerals Trade Services

Intertek Minerals Trade Services provide independent inspection, sampling, testing and certification services which assist to protect the quantity and quality of mineral commodities to reduce commercial risk in the trading environment. Inspection and testing services are completed to appropriate international standards and procedures.

Non-ferrous commercial exchange assay services are provided by Intertek's industry recognised Laboratory Services International (LSI), based in Rotterdam, Netherlands. LSI is an established umpire laboratory providing analytical services to miners, traders and refiners with a long history of expertise in non-ferrous party and umpire analysis and is an industry leader for accuracy, service quality and independence.

The global Intertek Minerals Inspection Team also performs risk management and inspection services in load and discharge ports alike, offering a full scope of WSMD and party assays, in locations from the Americas, Africa to China and the Far East.

Mine and Port Site Laboratories

Intertek operates, designs and commissions dedicated mine site laboratories in remote locations to enhance its service to mining operations across multiple mineral commodities. Intertek provides clients with a complete solution for any scale of mine or port site laboratory installation, from concept phase to commissioning and ongoing management and operation.

Intertek's automated and robotic sample systems are purpose built, ranging from individual cells to fully integrated systems providing complete end-to-end sampling to analysis solutions. Intertek Robotic Laboratories (IRL) offers unmatched experience and expertise in the operation of fully automated laboratories in remote locations and is the largest commercial operator of fully automated laboratories globally.

Outsourcing of a mine-site laboratory offers the benefit of Intertek's world-class expertise and services and enables companies to focus resources and capital on their core business.

Mineralogy

Intertek's leading expertise and state-of-the-art facilities offer a range of mineralogical services. Technical specialists in XRF and XRD support local and global operations, producing quality reliable data with the reassurance of years of experience from onsite XRD specialists and instrumentation.

- Research quality lithogeochemical packages
- Applied bulk mineralogy
- Low cost XRF & spectral scanning
- TerraSpec Near-Infrared Spectroscopy
- FTIR Spectroscopy
- Applied Micro Mineralogy QEMSCAN

Minerals Environmental Testing Services

Intertek environmental laboratories support the minerals industry with water, soil and air testing to governmental, regulatory and industry standards.

- Water quality
- Sediment and soil analysis
- Acid sulphate soils
- Biological tissue analysis
- Waste analysis and characterisation
- Acid rock drainage prediction test
- Soil nutrient analysis

Total Sustainability. Assured.

Intertek is uniquely positioned to partner with our clients and meet their needs by delivering a wide variety of sustainability services that help them to manage risk and resilience with increased transparency and confidence, whilst supporting their ability to operate effectively and act responsibly. Intertek's Total Sustainability Assurance is a pioneering initiative that provides an end-to-end independent, systematic sustainability programme from both an operational and corporate perspective.

Intertek's Corporate Sustainability Certification programme, powered by our technical expertise and advanced software platforms, can help your organisation to authentically demonstrate and independently verify its commitment to sustainability across the entire value chain, building stakeholder trust and corporate value. Total Corporate Sustainability Certification is comprised of 10 comprehensive standards, aligned with the UN Sustainable Development Goals, that provide holistic quality, safety and sustainability assurance of operations, services and products, whilst fostering a culture of sustainability through awareness, training and engagement.

Production Services

Intertek's analytical and scientific services are focused on extending the longevity of plant and equipment and optimising operations.

- Oil Condition Monitoring
- Pipeline inspection and testing
- Refinery Representation and Superintending
- Fuel tank inspection and testing
- Tank/pump inspection and calibration
- Environmental chemistry

Business Assurance

Management systems auditing helps you find and implement best practices for continual improvement and adds strategic value to your business. Intertek's comprehensive auditing and certification services provide the tools you need to evaluate and continually improve your business processes.

As an accredited third-party registrar, we provide independent verification to ensure that your management system is effective in achieving your business objectives, while also certifying that it meets internationally recognised standards.

Industry Services

ntertek's Industry Services support the mining, oil and gas, power, construction, engineering, chemical and other heavy industries to manage operational risk and maximise returns. Applying leading inspection, testing, verification and monitoring practices, we assist clients to effectively manage product and process development, regulatory compliance, supply chain integrity and plant and asset maintenance.

- Technical Staffing Services (TSS)
- Technical Inspection Services (TIS)
- Intertek Surveying Services (ISS)
- Non-Destructive Testing (NDT)
- Asset Integrity Management (AIM)

Conversion Tables

Useful Chemical Conversion Factors

Element		Factor	Compound	Element		Factor	Compound	Element		Factor	Compound
Al	x	1.889	Al_2O_3	Fe	x	1.43	Fe_2O_3	Pb	x	1.155	PbS
As	x	1.32	As_2O_3	Fe	x	1.574	FeS	Rb	x	1.094	Rb_2O
B	x	3.22	B_2O_3	K	x	1.205	K_2O	Sb	x	1.197	Sb_2O_3
Ba	x	1.699	$BaSO_4$	La	x	1.173	La_2O_3	Si	x	2.139	SiO_2
Ba	x	1.117	BaO	Li	x	2.153	Li_2O	Sn	x	1.27	SnO_2
Be	x	2.775	BeO	Mg	x	1.658	MgO	Sr	x	1.183	SrO
Ca	x	1.399	CaO	Mg	x	3.468	$MgCO_3$	Ta	x	1.221	Ta_2O_5
Ca	x	2.497	$CaCO_3$	Mn	x	1.291	MnO	Th	x	1.138	ThO_2
Ce	x	1.228	CeO_2	Mn	x	1.582	MnO_2	Ti	x	1.668	TiO_2
Co	x	1.271	CoO	Mo	x	1.500	MoO_3	U	x	1.179	U_3O_8
Cr	x	1.462	Cr_2O_3	Mo	x	1.668	MoS_2	V	x	1.785	V_2O_5
Cs	x	1.06	Cs_2O	Na	x	1.348	Na_2O	W	x	1.261	WO_3
Cu	x	1.252	CuO	Nb	x	1.432	Nb_2O_5	Y	x	1.27	Y_2O_3
Cu	x	1.252	Cu_2S	Ni	x	1.273	NiO	Zn	x	1.245	ZnO
F	x	2.055	CaF2	P	x	2.291	P_2O_5	Zn	x	1.49	ZnS
Fe	x	1.287	FeO	Pb	x	1.077	PbO	Zr	x	1.351	ZrO_2

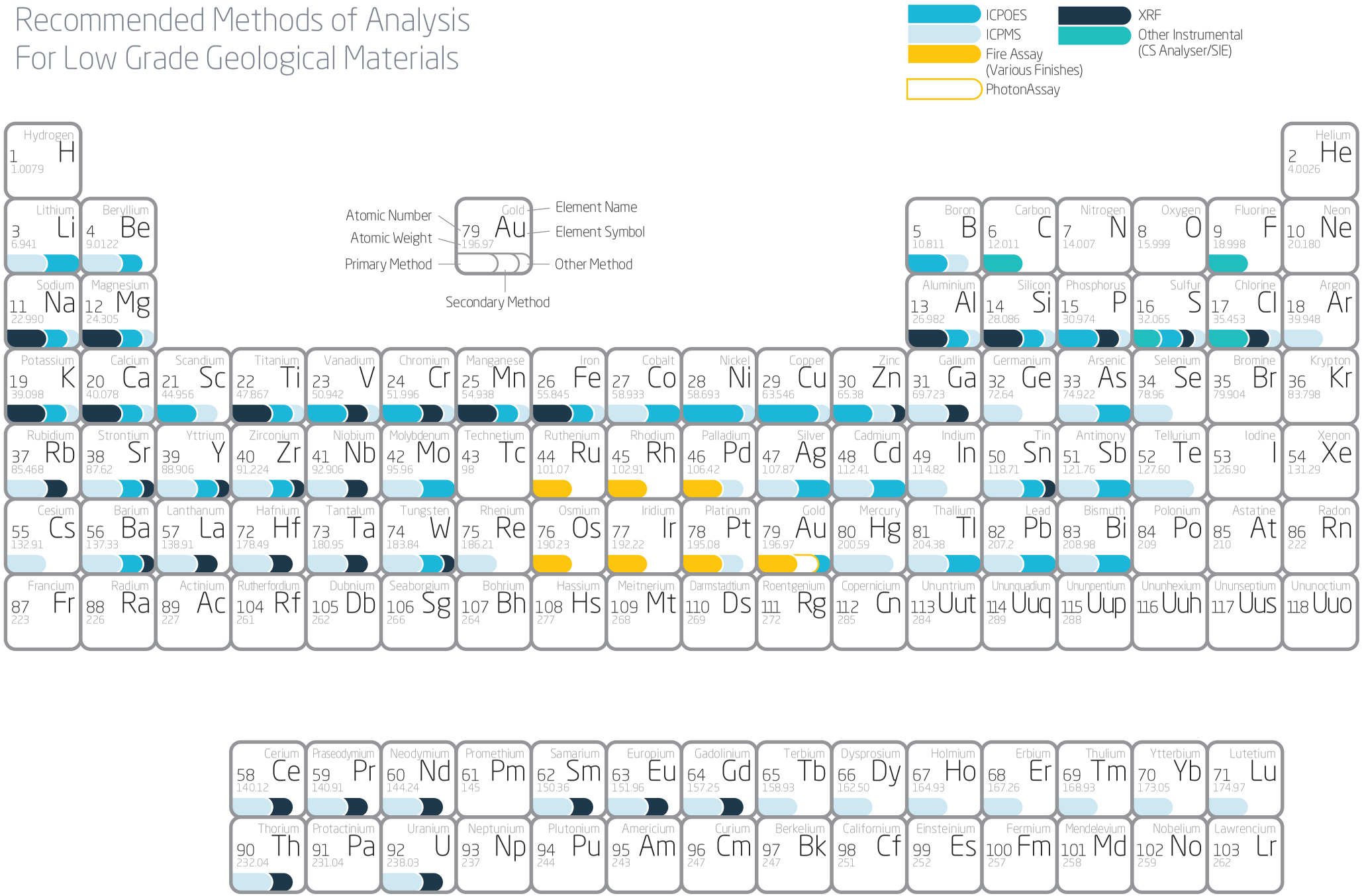
Common Equivalents

PPM	PPB	%	GRAMS / METRIC TONNE
1	1,000	0.0001	1
10	10,000	0.001	10
100	100,000	0.01	100
1,000	1,000,000	0.1	1,000
10,000	10,000,000	1	10,000

Drill Core Specifications

DRILL CORE	DIAMETER (MM)	VOLUME PER METER (CM3)		
		FULL	HALF	QUARTER
TT	35.0	960	480	240
BQ	36.4	1040	520	260
NQ	47.6	1780	890	445
HQ	63.5	3170	1585	793
BQ3	33.5	880	440	220
NQ3	45.1	1600	800	400
HQ3	61.1	2930	1465	733
Mass (g) = Volume/meter x SG x length (m)				

Recommended Methods of Analysis For Low Grade Geological Materials



Intertek Minerals Services Terms and Conditions (2024)

1.0 1.0 Unless otherwise specifically agreed in writing Intertek Minerals (hereinafter called "the Company") undertakes services in accordance with these general conditions (hereinafter called "General Conditions") and accordingly all offers or tenders of service are made subject to these General Conditions. All resulting contracts, agreements or other arrangements will in all respects be governed by these General Conditions, except only to the extent that the law of the place where such arrangements or contracts are made or carried out shall preclude any of the General Conditions and in such case such local law shall prevail wherever, but only to the extent that, it is at variance with these General Conditions.

1.1 For the purposes of these conditions the term "Intertek Minerals" comprises all of the Intertek subsidiaries carrying out Minerals testing and inspection activities including but not limited to Intertek, Intertek Minerals, Intertek Genalysis, Intertek Testing Services (Australia) Pty Ltd, Intertek Robotic Laboratories Pty Ltd, (IRL), PT Intertek Utama Services (IUS), ITS (PNG) Ltd, Genalysis Laboratory Services Pty Ltd, Intertek Genalysis South Africa Pty Ltd, Intertek NTEL, Intertek Minerals Limited, Intertek Testing Services Philippines Inc, Intertek Genalysis Namibia (Pty) Ltd, Intertek International Tanzania Ltd, ITS West Africa, Intertek Commodities Botswana, Intertek Genalysis (Zambia) Ltd, Intertek Genalysis SI Ltd, Intertek LSI, Laboratory Services International Rotterdam B.V.

2.0 The Company is an enterprise engaged in the trade of inspection and testing. As such, it:

2.1 carries out such standard services as are referred to in General Condition 6;

2.2 renders advisory and special services as may be agreed by the Company and as referred to in General Condition 7; and

2.3 issues reports and/or certificates as referred to in General Condition 8.

3.0 The Company acts for the persons or bodies from whom the instructions to act have originated (hereinafter called "the Principal"). No other party is entitled to give instructions, particularly on the scope of inspection or delivery of report or certificate, unless so authorized by the Principal and agreed by the Company. The Company will however be deemed irrevocably authorized to deliver at its discretion the report or the certificate to a third party if following instructions by the Principal a promise in this sense had been given to this third party or such a promise implicit follows from circumstances, trade custom, usage or practice.

4.0 The Company will provide services in accordance with:

4.1 the Principal's specific instructions as confirmed by the Company;

4.2 the terms of the Company's Standard Order Form, Sample Submission Form and/or Standard Specification Sheet if used;

4.3 any relevant trade custom, usage or practice; and

4.4 such methods as the Company shall consider appropriate on technical, operational and/or financial grounds.

5.0 5.1 All enquiries and orders for the supply of services must be accompanied by sufficient information specifications and instructions to enable the Company to evaluate and/or perform the services required.

5.2 Documents reflecting engagements contracted between the Principal and third parties, or third parties' documents, such as copies of contracts of sale, letters of credit, bills of lading, etc., are (if received by the Company) considered to be for information only, without extending or restricting the mission or obligations accepted by the Company.

6.0 The Company's standard services may include all or any of the following:

6.1 quantitative and/or qualitative inspection;

6.2 inspection of goods, plant, equipment, packing, tanks, containers and means of transport;

6.3 inspection of loading or discharging;

6.4 sampling;

6.5 laboratory analysis or other testing; and

6.6 surveys and audits.

7.0 Special services where the same exceed the scope of standard services as referred to in General Condition 6 will only be undertaken by the Company by particular arrangement. Such special services are illustratively not exhaustively:

7.1 qualitative and/or quantitative guarantees;

7.2 supply of technicians and other personnel;

7.3 pre-shipment inspection under government mandated import or customs schemes; and

7.4 advisory services.

8.0 8.1 Subject to the Principal's instructions as accepted by the Company, the Company will issue reports and certificates of inspection which reflect statements of opinion made with due care within the limitation of instructions received but the Company is under no obligation to refer to or report upon any facts or circumstances which are outside the specific instructions received.

8.2 Reports or certificates issued following testing or analysis of samples contain the Company's specific opinion on those samples as received only but do not express any opinion upon the bulk from which the samples were drawn. If an opinion on the bulk is requested special arrangements must be made in advance with the Company for the inspection and sampling of the bulk.

8.3 Upon payment of the total sum due to the Company by the Principal, the Principal shall have a perpetual, irrevocable, fully paid up and royalty free licence to use the final report or certificate. The Company shall own all analysis, data and intellectual property generated pursuant to the creation of the report or certificate.

9.0 The Principal will:

9.1 ensure that instructions to the Company and sufficient information are given in due time to enable the required services to be performed effectively;

9.2 procure all necessary access for the Company's representatives to enable the required services to be performed effectively;

9.3 supply, if required, any special equipment and personnel necessary for the performance of the required services;

9.4 ensure that all necessary measures are taken for safety and security of working conditions, sites and installations during the performance of services and will not rely, in this respect, on the Company's advice whether requested or not;

9.5 take all necessary steps to eliminate or remedy any obstruction to or interruptions in the performance of the required services;

9.6 inform the Company in advance of any known hazards or dangers, actual or potential, associated with any order or samples or testing including, for example, presence or risk of radiation, toxic or noxious or explosive elements or materials, environmental pollution or poisons; and

9.7 fully exercise all its rights and discharge all its liabilities under any related contract whether or not a report or certificate has been issued by the Company failing which the Company shall be under no obligation to the Principal.

10.0 The Company shall be entitled at its discretion to delegate the performance of the whole or any part of the services contracted for with the Principal to any agent or subcontractor. Where deemed appropriate by the company, prior consent will be sought from the Principal.

11.0 If the requirements of the Principal necessitate the analysis of samples by the Principal's or by any third party's laboratory the Company will pass on the result of the analysis but without responsibility for its accuracy. Likewise where the Company is only able to witness an analysis by the Principal's or by any third party's laboratory the Company will provide confirmation that the correct sample has been analysed but will not otherwise be responsible for the accuracy of any analysis or results.

12.0 12.1 The Company undertakes to exercise due care and skill in the performance of its services and accepts responsibility only where such skill and care is not exercised.

12.2 All samples submitted to the Company remain the property of the Principal. The Company shall not be liable for any claim whatsoever relating to deterioration, contamination, damage or loss of samples. The Principal indemnifies the Company against any claims or legal action resulting from damage, deterioration or loss of samples.

12.3 The liability of the Company in respect of any claims for loss, damage or expense of whatsoever nature and howsoever arising in respect of any breach of contract and/or any failure to exercise due skill and care by the Company shall in no circumstances exceed a total aggregate sum equal to Fifteen (15) times the amount of the fee or commission paid or payable in respect of the specific service or test required under the particular contract with the Company which gives rise to such claims, or US$15,000, whichever is least, provided however that the Company shall have no liability in respect of any claims for indirect or consequential loss including loss of profit and/or loss of future business and/or loss of production and/or cancellation of contracts entered into by the Principal. Where the fee or commission payable relates to a number of services and a claim arises in respect of one of those services the fee or commission may be apportioned for the purposes of this paragraph by reference to the estimated time involved in the performance of each service or the value of the individual services.

12.4 The limit of liability of the Company under the terms of Condition 12.2 may be increased upon request received by the Company in advance of the performance of the service to such figure as agreed in writing.

13.0 The Principal shall guarantee, hold harmless and indemnify the Company and its officers, employees, agents or subcontractors against all claims made by any third party for loss, damage or expense of whatsoever nature and howsoever arising relating to the performance, purported performance or non-performance of any services to the extent that the aggregate of any such claims relating to any one service exceed the limit mentioned in Condition 12.

14.0 Every officer, employee, agent or subcontractor of the Company shall have the benefit of the limitation of compensation and the indemnity contained in these General Conditions and so far as relates to such limitations any contract entered into by the Company is entered into not only on its own behalf but also as agent and trustee for every such person as aforesaid.

15.0 In the event that any unforeseen problems or expenditure arise in the course of carrying out any of the contracted services the Company shall be entitled to make reasonable additional charges to cover additional time and cost necessarily incurred to complete the service.

16.0 16.1 The Principal will punctually pay not later than Thirty (30) days after the relevant invoice date or upon receipt of invoice where credit is not extended or a credit limit is exceeded or within such other period as may have been agreed in writing by the Company all proper charges rendered by the Company failing which interest will become due at the rate of Eighteen per cent (18%) per annum or one and a half percent (1.5%) per month from the date of invoice until payment.

16.2 The Principal shall not be entitled to retain or defer payment of any sums due to the Company on account of any dispute, cross claim or set off which it may allege against the Company.

16.3 In the event of any suspension of payment arrangement with creditors, bankruptcy, insolvency, receivership or cessation of business by the Principal, or failure by the Principal to meet payment obligations in this clause 16 the Company shall be entitled to suspend all further performance of its services forthwith and without liability.

17.0 In the event of the Company being prevented by reason of any cause whatsoever outside the Company's control from performing or completing any service for which an order has been given or an agreement made, the Principal will pay to the Company:

17.1 the amount of all abortive expenditure actually made or incurred; and

17.2 a proportion of the agreed fee or commission equal to the proportion (if any) of the service actually carried out and the Company shall be relieved of all responsibility whatsoever for the partial or total non-performance of the required service.

18.0 The Company shall be discharged from all liability to the Principal for all claims for loss, damage or expense unless suit is brought within twelve (12) months after the date of the performance by the Company of the service which gives rise to the claim or in the event of any alleged non-performance within three (3) months of the date when such service should have been completed.

19.0 The Company is neither an insurer nor a guarantor and disclaims all liability in such capacity. Principals seeking a guarantee against loss or damage should obtain appropriate insurance.

20.0 No alteration, amendment or waiver of any of these General Conditions shall have any effect unless made in writing and signed by an officer of the Company

21.0 Upon completion of testing the Company shall provide a report to the Principal on the results of the testing. Where requested by the Principal provisional results may be provided however the Principal agrees that those results shall be subject to confirmation in a final report.

22.0 The Company agrees to take reasonable measures to ensure that the results of Inspection or Testing on behalf of the Principal and any other information provided to the Company are kept confidential provided that this provision will not apply where the results or other information are in the public domain.

23.0 The Company shall have no responsibility for any action or inaction of any carrier, shipping or delivering any sample to or from the Company premises.

24.0 Samples shall be stored free of charge for a period of sixty (60) days after provision of the invoice. Upon expiration of the free storage period, unless otherwise directed by the Principal storage fees and/or disposal charges shall apply.

25.0 All data will be retained for a seven (7) year period; fees may apply for retrieval of data if longer than three (3) months after the final report date.

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