



**ALS Methods**  
**ME-MS61L™**  
**ME-MS41L™**  
**ME-MS41W™**

# Super Trace Analysis

## Improved Detection Limits for Key Pathfinders.

Continued improvement in instrumentation and sample introduction systems providing the Lowest Detection Limits (LDL) in the industry for near-total four acid and partial digestion methods.

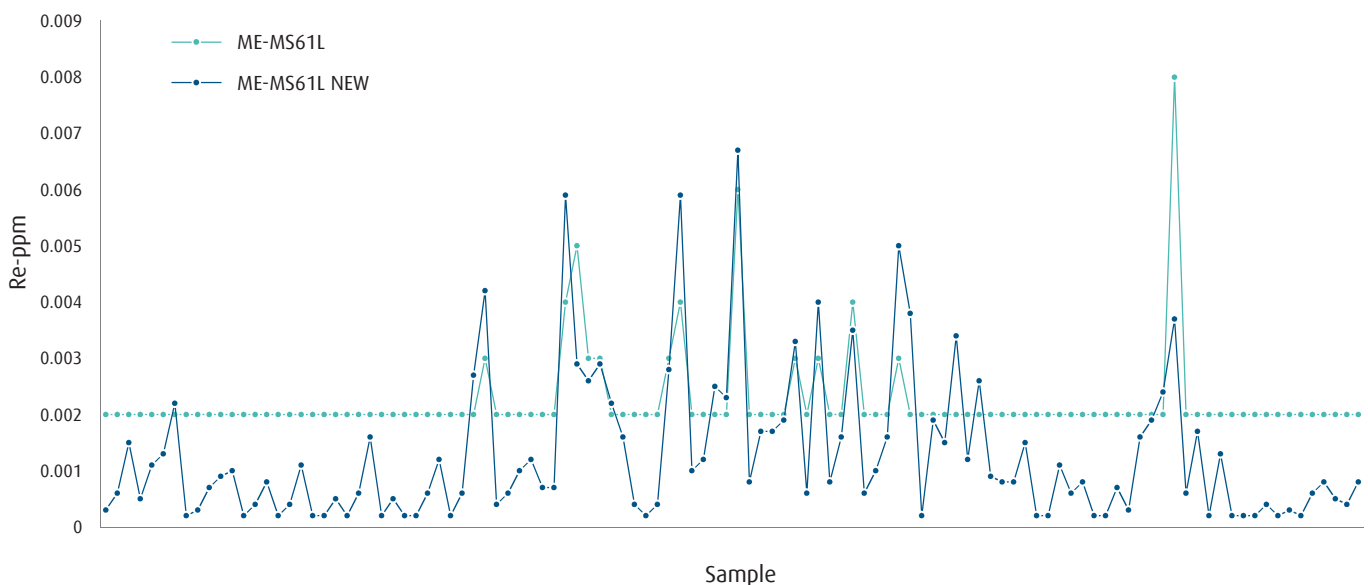
ALS continues to improve detection limits in our industry leading super trace ICP-MS methods. Both the four acid and aqua regia digestion methods have reduced detection limits for key elements of interest to exploration geologists as shown in the adjacent table.

The precision of a measurement depends on detection limit, the method's precision expectation, and concentration of the result. The improvements ALS has made in ICP-MS methodologies mean that not only are much lower detection limits achieved, but the exploration geochemist also has a much greater degree of confidence in the separation of anomaly from background, giving confidence in subtle anomalies in sampling programs.

*Improved Detection Limits*

Method	Analyte	Previous LDL ppm	New LDL ppm	Improvement factor
4-Acid	As	0.05	0.02	2.5
	Bi	0.005	0.002	2.5
	Re	0.002	0.0004	5
	Se	0.2	0.006	33.33
	Te	0.04	0.005	8
	Tl	0.004	0.002	2
Aqua Regia	Bi	0.001	0.0005	2
	Re	0.001	0.0002	5
	Se	0.1	0.003	33.33
	Te	0.01	0.003	3.33
	Tl	0.002	0.001	2

*Greater Re anomaly to background values for a set of samples analysed using Super Trace ME-MS61L™*



The applied improvements are displayed in the graphs adjacent for Se, Re and Te.

The lower detection limits produce data sets with a substantially lower proportion of results below detection and decrease the effect of binning at lower concentrations. The proportion of the Re results above detection, in this case improved from 25% to nearly 90%, and the binning of low values was substantially reduced. The latest reduction in detection limits for Re, Te and Se have pushed the detection limits for this method below the upper crustal abundance for these elements.

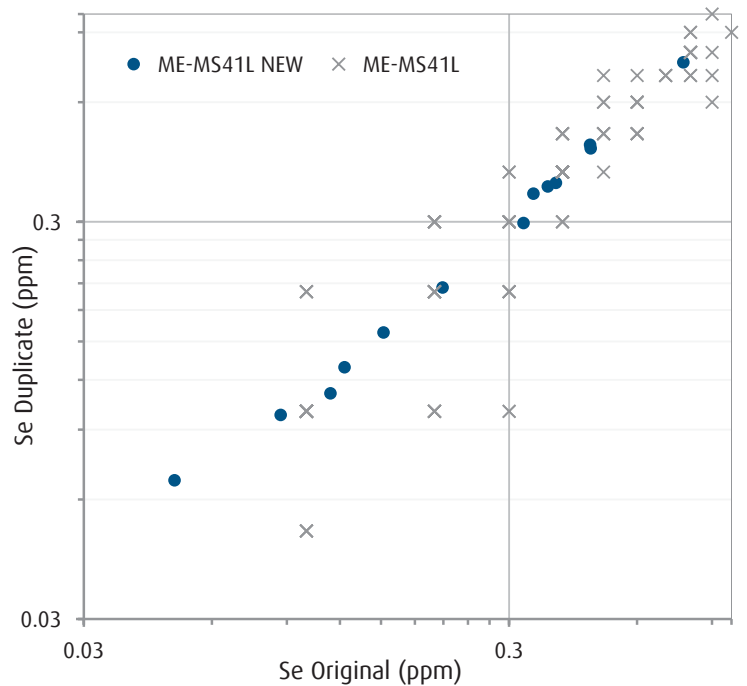
Our super trace packages provide robust results at levels well below the lowest regional backgrounds for most elements; allowing an unprecedented level of detail in major and trace element geochemistry on every sample. Importantly, detection limits are below regional background for key pathfinders like Tl, Sb, Te, Cd, Se, Re, and As, allowing clear definition of anomalous patterns and trends.

## Leading the Field in Analytical Innovation

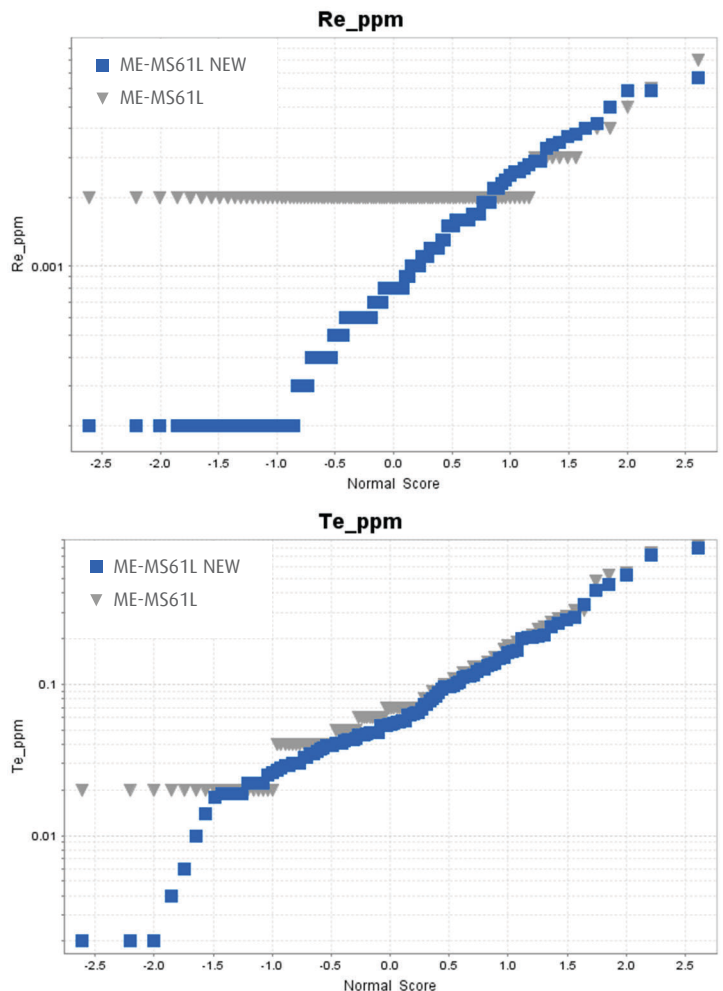
The expert method development team at ALS have achieved unrivaled detection limits with an advanced sample introduction system designed in-house. Benefits of this technology include higher signal to noise ratios, fewer oxide and polyatomic interferences, and low carry over effects. A major source of uncertainty in ICP-MS analysis is the formation of oxides in the plasma. The super trace methodology at ALS results in oxide formation of <0.5%, compared to ~3% achieved with other instrumentation.

In other words, the usual problems preventing ultra-low detection limits in ICP-MS analysis of geological materials are minimised, allowing a greater separation of geochemical anomaly from background and the ability to more finely detail changes in alteration and lithology using multivariate analysis.

*Increased confidence of exploration geochemical data at low concentrations with improved precision of low-level Se in sample duplicates.*



*Data set of ME-MS61L™ analysed with both the previous and new detection limits for Re and Te.*

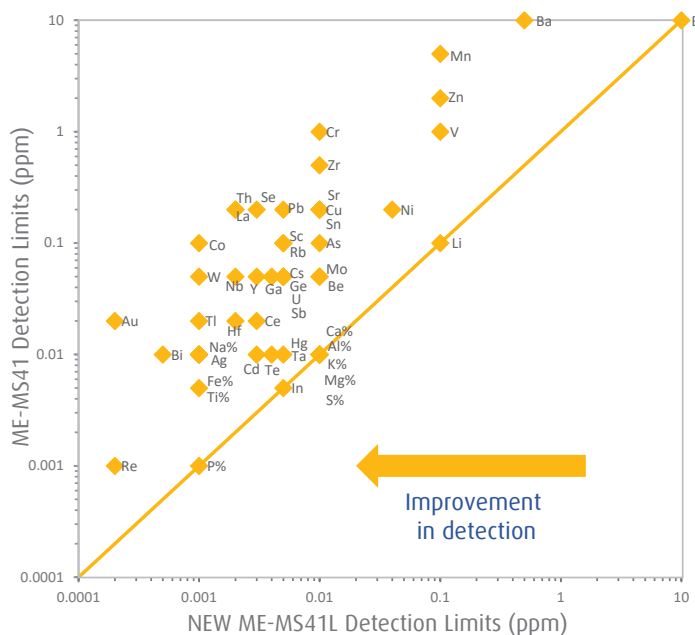


## Super Trace 53 Elements by Aqua Regia and ICP-MS/ICP-AES

The Super Trace method is available for samples processed using our standard aqua regia digestion (ME-MS41L™) or with our weak acid digestion (ME-MS41W™).

Both digestions are available for standard soils and sediments, as well as with our clay separation technique. The Super Trace method has been optimised for long-term ICP-MS signal stability, in particular for samples with very high Ca content.

Aqua regia is a partial digestion method that is useful for identifying anomalism through cover and in regional programs as mineral coatings are preferentially dissolved while silicate minerals remain undissolved.

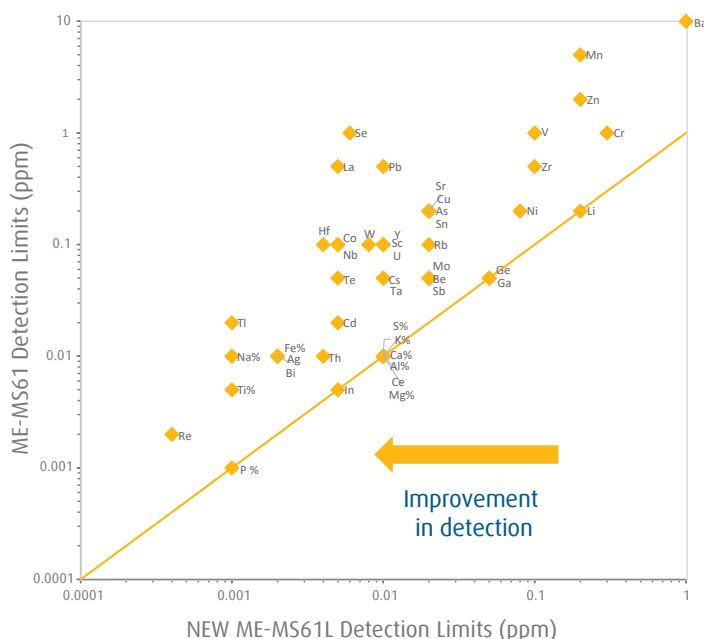


ME-MS41L™ / ME-MS41W™ ANALYTES & RANGES (ppm)											
Ag	0.001-100	Cd	0.001-1000	Hf	0.002-500	Na	0.001%-10%	S	0.01%-10%	Ti	0.001%-10%
Al	0.01%-25%	Ce	0.003-500	Hg	0.004-10,000	Nb	0.002-500	Sb	0.005-10,000	Tl	0.001-10,000
As	0.01-10,000	Co	0.001-10,000	In	0.005-500	Ni	0.04-10,000	Sc	0.005-10,000	U	0.005-10,000
Au	0.0002-25	Cr	0.01-10,000	K	0.01%-10%	P	0.001%-1%	Se	0.003-1000	V	0.1-10,000
B	10-10,000	Cs	0.005-500	La	0.002-10,000	Pb	0.005-10,000	Sn	0.01-500	W	0.001-10,000
Ba	0.5-10,000	Cu	0.01-10,000	Li	0.1-10,000	Pd	0.001-25	Sr	0.01-10,000	Y	0.003-500
Be	0.01-1000	Fe	0.001%-50%	Mg	0.01%-25%	Pt	0.002-25	Ta	0.005-500	Zn	0.1-10,000
Bi	0.0005-10,000	Ga	0.004-10,000	Mn	0.1-50,000	Rb	0.005-10,000	Te	0.003-500	Zr	0.01-500
Ca	0.01%-25%	Ge	0.005-500	Mo	0.01-10,000	Re	0.0002-50	Th	0.002-10,000		

## Super Trace 48 elements by Four Acid Digestion and ICP-MS/ICP-AES

Four acid multi-element analysis is an effective tool in mineral exploration because of its ability to provide a full pathfinder element suite as well as a cost-effective proxy for mineralogy.

In addition to the traditional mapping of base metal and trace element anomalies, major element results across an entire drill program can be used in lithochemical modeling when combined with standard whole rock analysis techniques on a smaller sample set. The addition of Si, Ti, Zr determined by pXRF (method pXRF-34) can provide valuable information to compliment the use of ME-MS61L data for rock type discriminating diagrams. Similarly, ME-MS61L™ can be used for bedrock lithomapping in residual soils. The information gained from near-total multi-element analysis adds value to minerals projects well beyond exploration and into geometallurgy and environmental planning.



The four acid digestion dissolves nearly all minerals in the majority of geological samples. The rare earth elements, which are not fully extracted in a four-acid digestion, may be added to this package on request. Mercury must be analysed separately.



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ME-MS61L™ ANALYTES & RANGES (ppm)					
Ag	0.002-100	Hf	0.004-500	Sb	0.02-10,000
Al	0.01%-50%	In	0.005-500	Sc	0.01-10,000
As	0.02-10,000	K	0.01%-10%	Se	0.006-1000
Ba	1-10,000	La	0.005-10,000	Sn	0.02-500
Be	0.02-1000	Li	0.2-10,000	Sr	0.02-10,000
Bi	0.002-10,000	Mg	0.01%-50%	Ta	0.01-500
Ca	0.01%-50%	Mn	0.2-100,000	Te	0.005-500
Cd	0.005-1,000	Mo	0.02-10,000	Th	0.004-10,000
Ce	0.01-500	Na	0.001%-10%	Ti	0.001%-10%
Co	0.005-10,000	Nb	0.005-500	Tl	0.002-10,000
Cr	0.3-10,000	Ni	0.08-10,000	U	0.01-10,000
Cs	0.01-500	P	0.001%-1%	V	0.1-10,000
Cu	0.02-10,000	Pb	0.01-10,000	W	0.008-10,000
Fe	0.002%-50%	Rb	0.02-10,000	Y	0.01-500
Ga	0.05-10,000	Re	0.0004-50	Zn	0.2-10,000
Ge	0.05-500	S	0.01%-10%	Zr	0.1-500

ALS METHOD CODE	DESCRIPTION
ME-MS41L™	Standard ALS aqua regia digestion, paired with new ICP-MS technologies that provide super-trace detection limits on key pathfinder elements.
ME-MS41W™	Weak acid leach using 1:1 ratio of nitric and hydrochloric acids, paired with new ICP-MS technologies that provide super-trace detection limits on key pathfinder elements. Designed to minimise background signal and allow geochemical anomalies in weakly-bound ions to stand out.
ME-MS61L™	HNO <sub>3</sub> -HClO <sub>4</sub> -HF acid digestion, HCl leach, dissolves nearly all minerals in the majority of geological samples, paired with ICP-MS and ICP-AES analysis provide super-trace detection limits.

ALS provides a wide range of specialised testing services covering all stages of your project's life cycle.

Please visit [alsglobal.com](http://alsglobal.com) for more information on our services and specialties.

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