

# Certificate of Analysis

## Reference Material SP116

**Recommended Gold Concentration: 18.091 µg/g**

**95% Confidence Interval: +/- 0.103 µg/g**

The above values apply only to product in jars or sachets which have an identification number within the following range: **508015–508592**.

**Prepared and Certified By:**

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Rocklabs Reference Materials  
Scott Technology  
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**Date of Certification:**

13 August 2021

**Certificate Status:**

Original

**Available Packaging:**

This reference material has been packed in wide-mouthed jars that contain 2.5 kg of product. The contents of some jars may be subsequently repacked into sealed polyethylene sachets.

**Origin of Reference Material:**

Feldspar minerals, basalt and iron pyrites with minor quantities of finely divided gold-containing minerals that have been screened to ensure there is no gold nugget effect.

**Supplier of Reference Material:**

ROCKLABS  
P O Box 18-142  
Glen Innes  
Auckland 1743  
**NEW ZEALAND**  
Email: [rocklabs.sales@scottautomation.com](mailto:rocklabs.sales@scottautomation.com)  
Website: [www.scottautomation.com](http://www.scottautomation.com)

**Description:**

The reference material is a light grey powder that has been well mixed and a homogeneity test carried out after the entire batch was packaged into wide-mouthed jars. There is no soil component. The product contains crystalline quartz and therefore dust from it should not be inhaled.

The approximate chemical composition is:  
(Uncertified Values)

	%
SiO <sub>2</sub>	55.22
Al <sub>2</sub> O <sub>3</sub>	15.76
Na <sub>2</sub> O	5.05
K <sub>2</sub> O	4.15
CaO	3.45
MgO	3.15
TiO <sub>2</sub>	0.93
MnO	0.08
P <sub>2</sub> O <sub>5</sub>	0.29
Fe <sub>2</sub> O <sub>3</sub>	4.66
Fe	3.06
S	3.5

**Intended Use:**

This reference material is designed to be included with every batch of samples analysed and the results plotted for quality monitoring and assessment purposes.

**Stability:**

The container (jar or sachet) and its contents should not be heated to, or stored at temperatures higher than 50 °C. Where the container remains unopened, the reference material will remain stable for more than 10 years from the date of certification.

When exposed to atmosphere iron pyrites are likely to oxidize. Tests have shown that the increase in weight of an exposed reference material of similar matrix, in the Auckland climate, is less than 0.1% per year.

**Method of Preparation:**

Following ILAC Guidelines G12:2000 and G13:2000, pulverized feldspar minerals, basalt rock and barren iron pyrites were blended with finely pulverized and screened gold-containing minerals. Once the powders were uniformly mixed the composite was placed into 578 wide-mouthed jars, each bearing a unique number. 16 jars were randomly

selected from the packaging run and material from these jars was used for both homogeneity and consensus testing.

### **Homogeneity Assessment:**

Sampling was performed by Rocklabs Reference Materials, and an independent laboratory carried out gold analysis by fire assay of 30 g portions, using a gravimetric finish. Steps were taken to minimize laboratory method variation in order to better detect any variation in the candidate reference material.

*Homogeneity:* A sample was removed from the top of each of the 16 jars randomly selected from the 578 jars in the batch. The results of analysis of the 16 samples (randomly ordered then consecutively numbered before being sent to the laboratory) produced a relative standard deviation of 0.4%

*Settling:* The contents of 2 randomly selected jars were compacted by vibration (to simulate the effect of freighting) and 5 samples were removed successively from top to bottom from each jar. In addition, 5 samples were removed from the last jar in the series. No top to bottom gradation in the gold values was observed.

### **Analytical Methodology:**

Once homogeneity had been established, two sub-samples were submitted to a number of well-recognized laboratories in order to assign a gold value by consensus testing. The sub-samples were drawn from 16 randomly selected jars and each laboratory received samples from two different jars.

Each laboratory was instructed to analyse the samples for gold using the method they believed would give the best results. Indicative concentration ranges were given.

The samples were analysed for gold by all participating laboratories using fire assay followed by either gravimetric or instrument finish (AAS or ICP). The amount of sample used in the analyses varied between laboratories, (range 10 - 50g).

### **Calculation of Certified Value:**

The 45 participating laboratories each returned replicate gold results using one finish method for both samples. Statistical analysis to identify outliers was carried out using the principles detailed in sections 7.3.2 – 7.3.4, ISO 5725-2: 1994. Assessment of each laboratory's performance was carried out on the basis of z-scores, partly based on the concept described in ISO/IEC Guide 43-1. Details of the criteria used in these examinations are available on request. As a result of these statistical analyses, 6 sets of results were excluded for the purpose of assigning a gold concentration value to this reference material. A recommended value was thus calculated from the average of the remaining n = 39 sets of replicate results. The 95% confidence interval was estimated using the formula:

$$X \pm ts/\sqrt{n}$$

(where X is the estimated average, s is the estimated standard deviation of the laboratory averages, and t is the 0.025 tail-value from Student's t-distribution with n-

1 degrees of freedom). The recommended value is provided at the beginning of the certificate in µg/g (ppm) units. A summary of the results used to calculate the recommended value is listed on page 4 and the names of the laboratories that submitted results are listed on page 5. The results are listed in increasing order of the individual laboratory averages.

Statistical analysis of the consensus test results has been carried out by independent statistician, Tim Ball.

### Summary of Results Used to Calculate Gold Value

(Listed in increasing order of individual laboratory averages)

Sample 1	Sample 2	Set average
16.982	17.078	17.0300
17.600	17.800	17.7000
17.950	17.550	17.7500
17.800	17.700	17.7500
17.800	17.700	17.7500
17.700	17.800	17.7500
17.850	17.700	17.7750
17.700	18.000	17.8500
18.200	17.500	17.8500
18.032	17.780	17.9060
17.910	18.010	17.9600
18.000	17.924	17.9620
17.982	17.953	17.9675
17.800	18.150	17.9750
18.050	17.950	18.0000
17.900	18.100	18.0000
18.075	17.950	18.0125
18.100	18.000	18.0500
18.183	18.000	18.0915
18.150	18.100	18.1250
18.160	18.100	18.1300
18.190	18.090	18.1400
18.300	18.000	18.1500
18.300	18.050	18.1750
18.300	18.100	18.2000
18.245	18.220	18.2325
18.260	18.210	18.2350
18.420	18.060	18.2400
18.500	18.000	18.2500
18.152	18.437	18.2945
18.350	18.350	18.3500
18.450	18.250	18.3500
18.300	18.400	18.3500
18.400	18.300	18.3500
18.350	18.450	18.4000
18.400	18.450	18.4250
18.395	18.497	18.4460
18.900	18.500	18.7000
19.025	18.744	18.8845
Average of the 39 sets		18.091 ppm
Standard deviation of 39 sets		0.318 ppm
Relative Standard Deviation		1.8%
95% Confidence interval for average		+/- 0.103 ppm

**Note:** Neither the Standard deviation nor the Confidence interval should be used as a basis to set control limits when plotting individual laboratory results. See notes under "Instructions and Recommendations for Use" (pg 6)

# Participating Laboratories

<b>Australia</b>	ALS Minerals, Kalgoorlie ALS Minerals, Perth ALS Minerals, Townsville Bureau Veritas Amdel, Adelaide Intertek Genalysis Laboratory Services, Perth SGS Minerals Services, Townsville
<b>Burkina Faso</b>	ALS Minerals, Burkina Faso SEMAFO Burkina Faso S.A.
<b>Canada</b>	ALS Minerals, Val-d'Or ALS Minerals, Vancouver Bourlamaque Assay Laboratories, Quebec Bureau Veritas Commodities Canada Ltd, Ontario Bureau Veritas Commodities Canada Ltd, Vancouver MSALABS Inc., Langley BC SGS Minerals Services, Lakefield, Ontario SGS Minerals Services, Vancouver Techni-Lab S.G.B. Abitibi Inc/Actlabs, Ste-Germaine-Boule Techni-Lab S.G.B. Abitibi Inc.Val d'Or
<b>China</b>	Fujian Zijin Mining and Metallurgical Testing Technology Co., Ltd
<b>Côte d'Ivoire</b>	Bureau Veritas Mineral Laboratories, Abidjan
<b>Ghana</b>	ALS Minerals, Kumasi Intertek Minerals, Samahu
<b>Guyana</b>	A2 Global Inc
<b>Ireland</b>	ALS Minerals, Loughrea
<b>Kyrgyz Republic</b>	Stewart Assay and Environmental Laboratories LLC, Kara-Balta
<b>Laos</b>	ALS Geochemistry, Vientiane
<b>Mexico</b>	Inspectorate de Mexico - Bureau Veritas Group
<b>Mongolia</b>	ALS Minerals. Ulaanbaatar
<b>Morocco</b>	REMINEX Research Center, Casablanca
<b>New Zealand</b>	SGS New Zealand Ltd, Otago SGS New Zealand Ltd, Waihi
<b>Peru</b>	ALS Minerals, Lima Inspectorate Services Perú S.A.C., Callao Minera Yanacocha SRL – Newmont, Lima
<b>Romania</b>	ALS Minerals, Rosia Montana
<b>South Africa</b>	ALS Minerals, Edenvale - Johannesburg
<b>Turkey</b>	Acme Analitik Laboratuar Hizmetleri Ltd, Sirketi ALS Minerals, Izmir
<b>USA</b>	ALS Minerals, Reno Barrick Goldstrike – Met Services, Nevada Bureau Veritas Commodities and Trade, Sparks Nevada Gold Mines, Carlin Nevada Gold Mines, Lone Tree Nevada Gold Mines, Twin Creeks
<b>Zimbabwe</b>	Performance Laboratories, Ruwa

### **Instructions and Recommendations for Use:**

Weigh out quantity usually used for analysis and analyse for total gold by normal procedure. Do not dry before weighting.

We quote a 95% confidence interval for our estimate of the declared value. This confidence interval reflects our uncertainty in estimating the true value for the gold content of the reference material. The interval is chosen such that, if the same procedure as used here to estimate the declared value were used again and again, then 95% of the trials would give intervals that contained the true value. It is a reflection of how precise the trial has been in estimating the declared value. It **does not** reflect the variability any particular laboratory will experience in its own repetitive testing.

Some users have used our consensus testing statistical data to establish control limits for assessing acceptance of laboratory results. Our certification process produces precise statistical data based on the proficiency program and not on an individual laboratory. Such use inevitably leads to many apparent out-of-control points, leading to doubts about the laboratory's testing, or of the reference material itself.

Our suggested best practice would be to accumulate a history of the test results obtained, and plot them on a control chart to determine any laboratory bias and variability. The appropriate centre line and control limits for this chart should be based on the average level and variation exhibited in the laboratory's **own** data. This chart will provide a clear picture of the long-term stability or otherwise of the laboratory testing process, providing good clues as to the causes of any problems. To help our customers do this, we can provide a free Excel template that will produce sensible graphs, with intelligently chosen limits, from the customer's own data.

Our instructions are recommendations for appropriate use of reference materials. If our statistical data is used for control limits due to practicality and particular circumstances, please consult with us and we will be happy to assist and advise.

### **Legal Notice:**

This certificate and the reference material described in it have been prepared with due care and attention. However, Scott Technology Ltd and Tim Ball Ltd accept no liability for any decisions or actions taken following the use of the reference material.

### **References:**

For further information on the preparation and validation of this reference material please contact Eoin Foster.

### **Certifying Officer**



Eoin Foster  
Manufacturing Manager

### **Independent Statistician**



Tim Ball BSc (Hons)