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Assessment Report on
Outcrop Stripping and Channel Sampling
at the Jackfish Property Mineral Claims
130628, 195337, 225463, 309242, 309243 and 332244

Syine Township

Thunder Bay Mining Division

District of Thunder Bay, Ontario

NTS 42D15

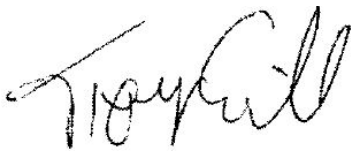
NAD83 Zone 16 UTM

504,107 mE 5,409,480 mN Latitude 48° 50’ 17.8”N Longitude 86° 56’ 38.5”W

August 4 – December 12, 2017

By Troy Gill, B.Sc., MAIG.
Sanatana Resources Inc.
#1910-925 West Georgia Street
VANCOUVER, BC, V6C 3L2
Cl. #409847

August 4, 2019



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Summary

The Jackfish property is located within the Syine Township, on the north shore of Lake Superior in northwestern Ontario, approximately 250 km east of Thunder Bay (Figure 1). In total, the Jackfish property comprises 281 combined single and boundary cell mining claims covering an area of 3,769 hectares, held under option by Sanatana Resources Inc. from three separate parties. The property is accessed by bush trails off of the Trans-Canada Highway 17. All co-ordinates quoted in text or appearing on maps are either latitude and longitude or Universal Transverse Mercator (UTM) metres easting and northing using the North American Datum 83 (NAD83) Zone 16.

The property is located in the Wawa terrane of the Superior Province of the Canadian Shield, specifically the Schreiber-Hemlo greenstone belt. The greenstone belt in the region consists of metavolcanic and metasedimentary rocks into which the Terrace Bay pluton was emplaced. The property encompasses the eastern half of the Terrace Bay pluton as well as the contact metamorphic zone and part of the the Schreiber-Hemlo greenstone belt supracrustal sequence of folded and foliated metavolcanic basalts and felsic flows and tuffs intercalated with metsedimentary rocks in the northern and eastern parts of the property. The Terrace Bay Pluton is host to numerous small historic gold and base metal occurrences and there is potential to find others, perhaps of economic significance in current times.

Historic mining and exploration on the property dates back to the late 19th century. Since then various companies explored in the area completing surveys, including geophysical surveys, mapping, trenching, sampling and drilling and discovered several mineral occurrences.

Outcrop stripping, washing, mapping, channel cutting and sampling was completed over six cell mining claims of the Jackfish property following up on high grade gold rock grab samples previously collected during prospecting field work over these claims. This report presents the mapping and assay results from the outcrop stripping and channel sampling and provides some interpretations that will help to guide future exploration work on the Jackfish property.

Introduction

Outcrop stripping, mapping and channel sampling was undertaken over the Jackfish property near Terrace Bay, Ontario for Sanatana Resources Inc. ("Sanatana") between the dates of August 4 and December 12, 2017. The purpose of the work was to assess the extent of potential gold and base metal mineralization indicated by high grade gold rock grab samples previously collected during prospecting field work over certain claims of the Jackfish property.

This report presents the mapping and assay results from the outcrop stripping and channel sampling and provides some interpretations that will help to guide future exploration work on the Jackfish property.

Property Location, Description and Access

The Jackfish property is located within the Syine Township, on the north shore of Lake Superior in northwestern Ontario, approximately 250 km east of Thunder Bay (Figure 1). The property is centered on 504,107 mE 5,409,480 mN (NAD 83 Zone 16) or at Latitude 48° 50' 17.8"N Longitude 86° 56' 38.5"W.

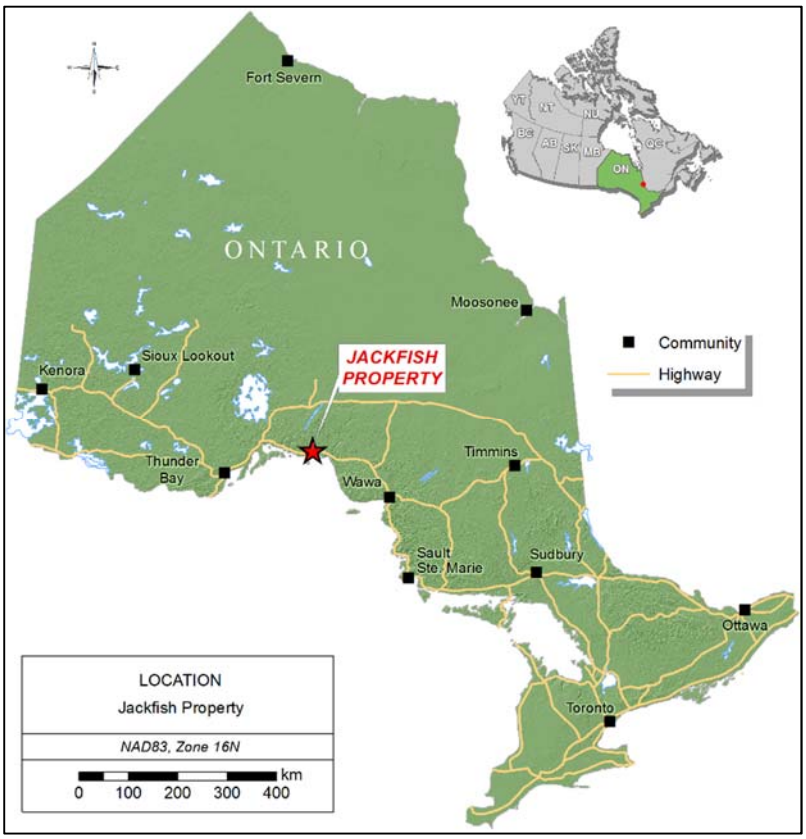


***Figure 1**: Property Location Map.*

In total, the Jackfish property comprises 281 combined single and boundary cell mining claims covering an area of 3,769 hectares, held under option by Sanatana with three optionor groups; Alto Ventures Ltd., Rudy Wahl and Richards *et al* (including Wayne Richards, Francine Richards and James Hamel) (Figure 2). The outcrop stripping, mapping and channel sampling work covered six cell mining claims of the Jackfish property held 100% by Rudy Wahl, as listed in Table 1.

The work was permitted under the existing Exploration Permit PR-17-11074 for the claims held by Rudy Wahl and an annual workplan outlining the proposed fieldwork was submitted in July, 2017 ahead of commencing the program.

***Table 1**: Outcrop Stripping, Mapping and Channel Sampling Cell Mining Claims.*

Tenure #	Township	Cell #	Type	Client ID	Holder
130628	SYINE	42D15E391	Boundary Cell Mining Claim	206079	100% Rudy Wahl
195337	SYINE	42D15E331	Boundary Cell Mining Claim	206079	100% Rudy Wahl
225463	SYINE	42D15E353	Boundary Cell Mining Claim	206079	100% Rudy Wahl
309242	SYINE	42D15E352	Single Cell Mining Claim	206079	100% Rudy Wahl
309243	SYINE	42D15E371	Single Cell Mining Claim	206079	100% Rudy Wahl
332244	SYINE	42D15E372	Single Cell Mining Claim	206079	100% Rudy Wahl

The property is accessed by travelling 20 km east of Terrace Bay or 63 km west from Marathon via Trans-Canada Highway 17. The mining claims are readily accessible off the Highway 17 by all-terrain vehicle (ATV) along bush trails (Figure 2).

The terrain around the property is quite rugged and vegetation cover is moderately thick. There is a sparse to moderate amount of bedrock outcrop on the property, mostly along cliffs and at highway road cuttings, but exposure in the forest is commonly masked by moss cover.

All co-ordinates quoted in text or appearing on maps are either latitude and longitude or Universal Transverse Mercator (UTM) metres easting and northing using the North American Datum 83 (NAD83) Zone 16.

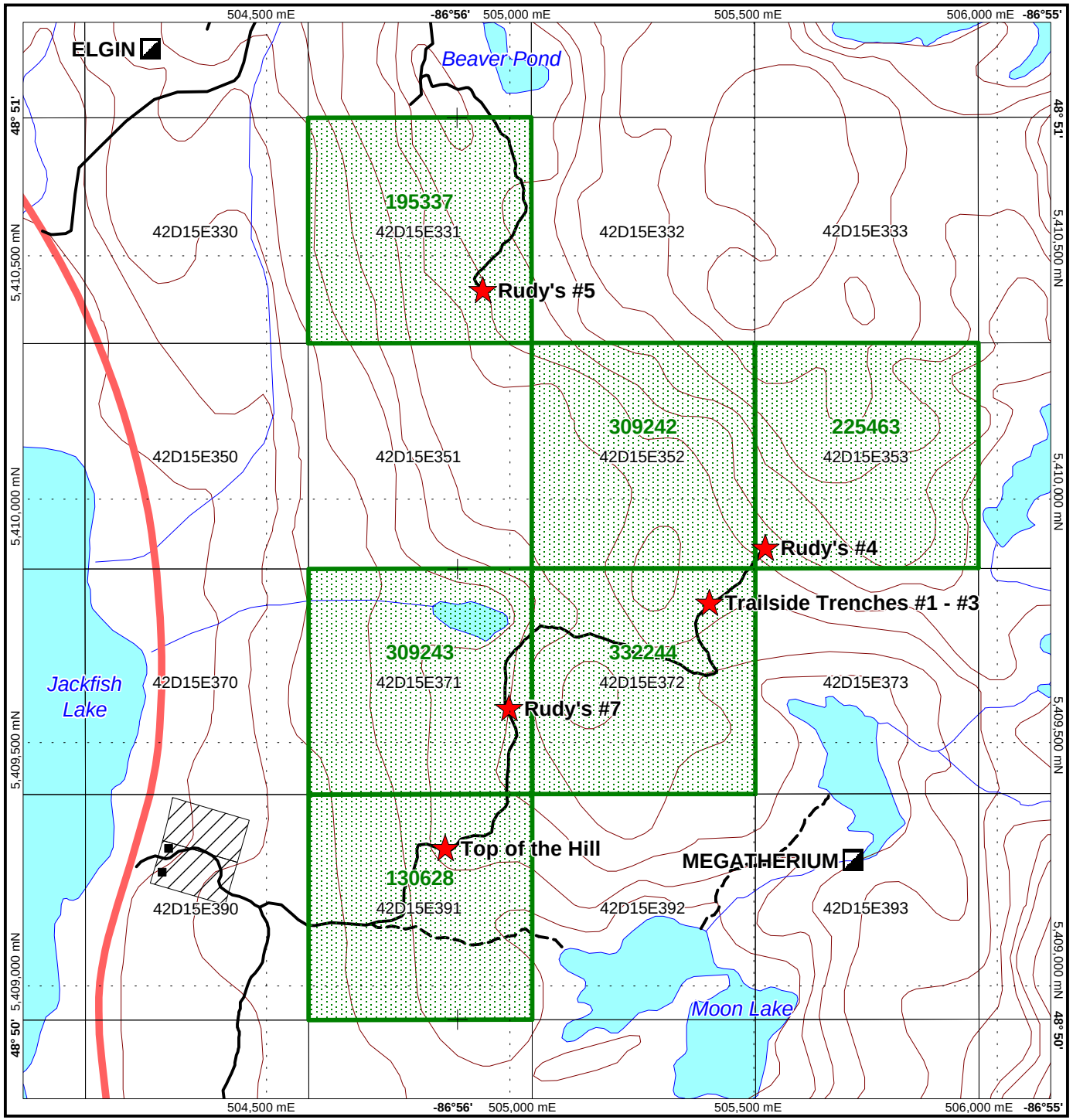
Property History

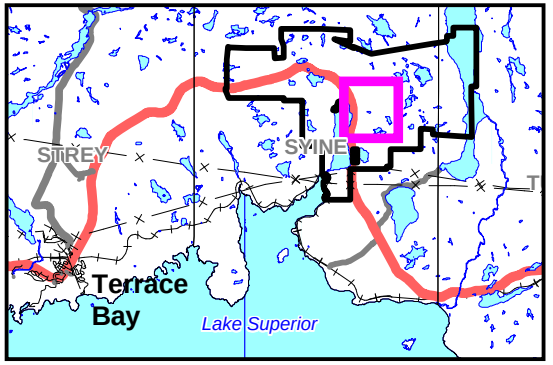
The exploration activity in the area of the Jackfish property started at the end of the 19th century sparked by the discovery of the Empress Mine in 1895 (Walker, 1967) in metavolcanic rocks of the Schreiber-Hemlo Greenstone Belt just north of the Terrace Bay Pluton. Relevant historical mining and exploration work conducted on the property, mostly sourced from assessment reports filed with the Ministry of Energy, Northern Development and Mines, is summarized in Table 2.

***Table 2**: Historical exploration work in the property area.*

Year	Company	Type of Work	Results	Assessment Report #
1882	Elgin Silver	Underground mining from 2 adits	No production data	42D15SW8353
1932	Siville-Ferrier Syndicate	Stripping, sampling	Up to 10.29 g/t Au over 0.91 m	42D15SW8353
1982	Micham Explorations Inc.	Magnetic and electromagnetic (VLF) surveys	No magnetic anomalies; several weak to moderate conductors	42D14SE1074
1983	Rose Resource Corp.	Magnetic and electromagnetic (VLF) surveys	10 EM conductors and no significant magnetic anomalies	42D15SE0128
1983	Wasabi Resources	Airborne magnetic and EM (VLF) survey	Identified 6 EM conductors	42D15SW0088
1983	Wasabi Resources	Ground proofing of airborne EM conductors	All 6 conductors sulfide iron formation with no Au values	42D15SW0066
1984	John Ferguson	Magnetic and electromagnetic surveys	No significant mag; 2 weak VLF anomalies	42D15SW0121
1984	Goldhurst Resources	Magnetic and electromagnetic surveys	No significant mag; 11 very weak EM conductors	42D15SW0116
1984	Goldhurst Resources	Drilling, 4 drill holes; total 305.1m (1001 feet)	Drill hole 84-04: 2.87 g/t Au over 2.44 m including 6.07g/t Au over 0.91m and 0.96g/t Au over 1.22m	42D15SW0118
1985	Micham Explorations Inc.	Mapping, trenching, sampling (58 rock samples)	Highest assay 13.54 g/t Au in quartz vein at N Siville showing outside of Jackfish claims	42D15SW0114
1985	Micham Explorations Inc.	Soil sampling (1521 samples)	Two anomalous areas: Empress structure W Siville showing; Mocan valley structure	42D15SW0115
1985	Micham Explorations Inc.	Diamond drilling 4 drill holes 482.9m (1584.2 ft)	Highest assays 1166 ppb Au over 1.52m; 1588 ppb Au over 1.83m, 44.23 g/t Au over 0.61 m	42D15SW0117
1986	John Ferguson	Stripping, de-watering, trenching; sampling	Highest assay 13.03 g/t Au; 4,075 g/t Ag	42D15SW0504
1986	John Ferguson	Magnetic and electromagnetic surveys	No significant results	42D15SW0111
1987	John Ferguson	Soil sampling	No significant results	42D15SW0106
1987	Forerunner Resources	Mapping, stripping, trenching, sampling	Highest assay 93.24 g/t Au; 109.03 g/t Ag; 1.2% Cu; 7.85% Pb	42D15SW0505
1987	Micham Explorations Inc.	Diamond drilling 10 drill holes 1674m	No assays recorded	42D15SW0109
1988	Beardmore Resources	Trenching, soil sampling, bedrock sampling	Highest assays: 21.05 g/t Au plus 13.3 g/t Ag and 11.45 g/t Au plus 0.2 g/t Ag	42D15SW8353
1989	J.R. Hamel	Sampling	Highest assay 93.26 g/t Au, 82.79 g/t Ag	42D15SW0110
1991	J.R. Hamel	Stripping and sampling	Highest assay 21.05 g/t Au and 26.06g/t Ag	42D15SW0102
1992	Beavercreek Exploration (J.R. Hamel)	Drilling 2 drill holes 28.04 m (92 ft)	Highest assay 12.21 g/t Au over 1.52 m	42D15SW0002
1994	Beavercreek Exploration (J.R. Hamel)	Drilling 5 drill holes 45.1 m (148 ft)	Best result: 0.51 g/t Au over 3.05 m	42D15SW0001
1995	George Daniels et al.	Stripping, trenching, sampling, line cutting, VLF survey	16.39 g/t Au on claim #1207882 Santoy Lake; 15.77 g/t Au Syine Twp. Historic claim #1224852	42D15NW0009
1996	Big Lake Geological Consulting on behalf of J. Ferguson	Mapping, sampling	Highest assays from trench 14.3 g/t Au and 16.39 g/t Au	42D15NW0038
1996	George Daniels	Prospecting, stripping, trenching	Highest assays from trench 21.94 g/t Au	42D15NW0028
1996	Rudolph Wahl et al.,	Rock sampling (100 samples); soil sampling	No significant results	42D15SW0008
1997	Landis Mining Corp.	Evaluation of previous exploration activity in the area	20 lb composite grab sample: 22.97 g/t Au over 3.05 m from Empress structure	42D15SW2002
1998	George Daniels	Sampling	Highest assays from Jon's showing 1.45 g/t Au	42D15SW2003
1999	Cameco Gold Inc.	Line cutting; mag., IP; trenching; re-logging & re-sampling	DDH 441087-9: 8.07 g/t Au; 93.8 g/t Ag over 0.52 m; DDH 44184-7: 7.09 g/t Au; 19.8 g/t Ag over 1.4 m	42D15SW2010

Year	Company	Type of Work	Results	Assessment Report #
2000	George Daniels	Trench cleaning, minor blasting	No results	42D15SW2013
2004	Brian Fowler	Line cutting; mag; prospecting, sampling (21)	Highest assay 324 ppb Au	42D15SW2024
2005	Phoenix Matachewan Mines	Prospecting sampling (19 rock samples)	Highest assay 262 ppb Au	20000001155
2007	Wayne Richards	Prospecting, mapping, stripping, sampling (4 samples)	No Au assays; two samples >100 g/t Ag	20000003831
2007	Alto Ventures Ltd.	Mapping, prospecting and sampling (47 rock samples)	Highest assay 2,278 ppb Au	20000002005
2008	Alto Ventures Ltd.	Drilling 2 drill holes 332 m on Empress structure	0.66 g/t Au over 2.3 m	20000003772
2009	Rudolph Wahl	Prospecting, mapping, sampling (22 samples)	No significant results	I20000004525
2010	Galahad Metals	Soil sampling (619 samples), mapping trenching, sampling (89 samples)	26.8 g/t Au and 119 g/t Ag; 24.7 g/t Au and 40.4 g/t Ag at creek showing	20000005783
2010	Bond et al.	Prospecting, mapping, rock samples (63 samples) and lake sediment samples (7 samples)	309 and 459 ppb Au	20000006073
2010	Bond et al.	Drilling 2 holes 240 m	No significant results	20000006073
2012	Rudolph Wahl	Prospecting, mapping, sampling (30 samples)	1.9 g/t Au sample # 997103	20000007183
2012	Hamel et al.	Prospecting , mapping, sampling (11 samples), diamond drilling	No significant results	20000007081, 2.53866
2014	Alto Ventures Ltd.	Bedrock sampling (21 samples)	No significant results	20000008044





- Historical Workings
- Building
- Stripped Showings
- Highway 17
- Watercourse
- Quad Trail
- Contour
- Walk Trail
- Rudy Wahl Cell Mining Claims
- Provincial Grid
- Land Disposition
- Waterbody

%

200 0 200 400

Metres

Jackfish Property Report Figure 2

2017 Outcrop Stripping Areas, Mining Claims and Key Locations

Author:	T. Gill	Date:	August 2019
Projection:	UTM NAD83 Zone 16	Scale:	1 : 12 000
Mapsheet:	NTS 042D15	MNDM:	Thunder Bay Mining Division

Regional Geological Setting

The property is located in the Wawa terrane of the Superior Province of the Canadian Shield, specifically the Schreiber-Hemlo greenstone belt (Figure 3). The greenstone belt in the region consists of metavolcanic and metasedimentary rocks into which the Terrace Bay pluton was emplaced.

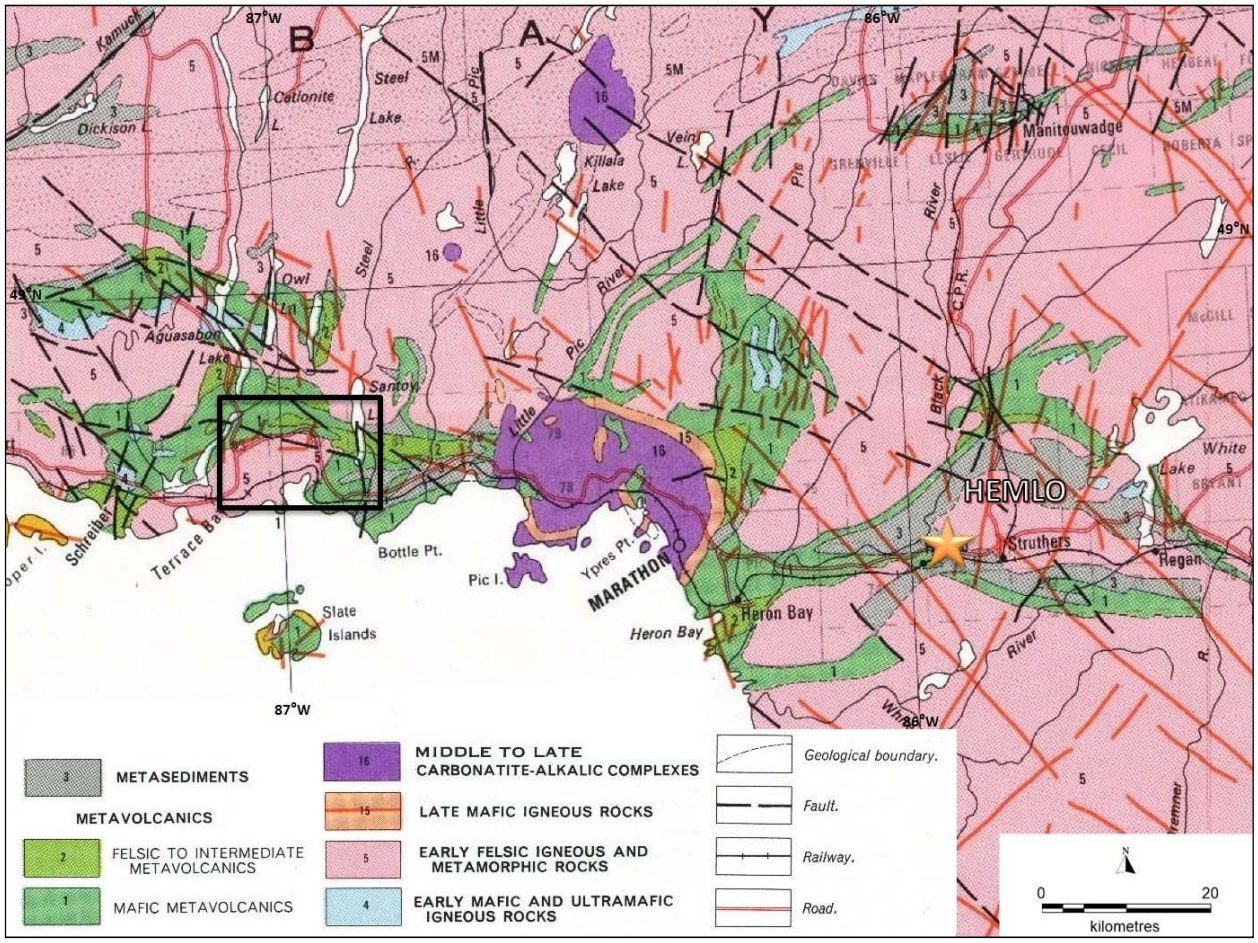
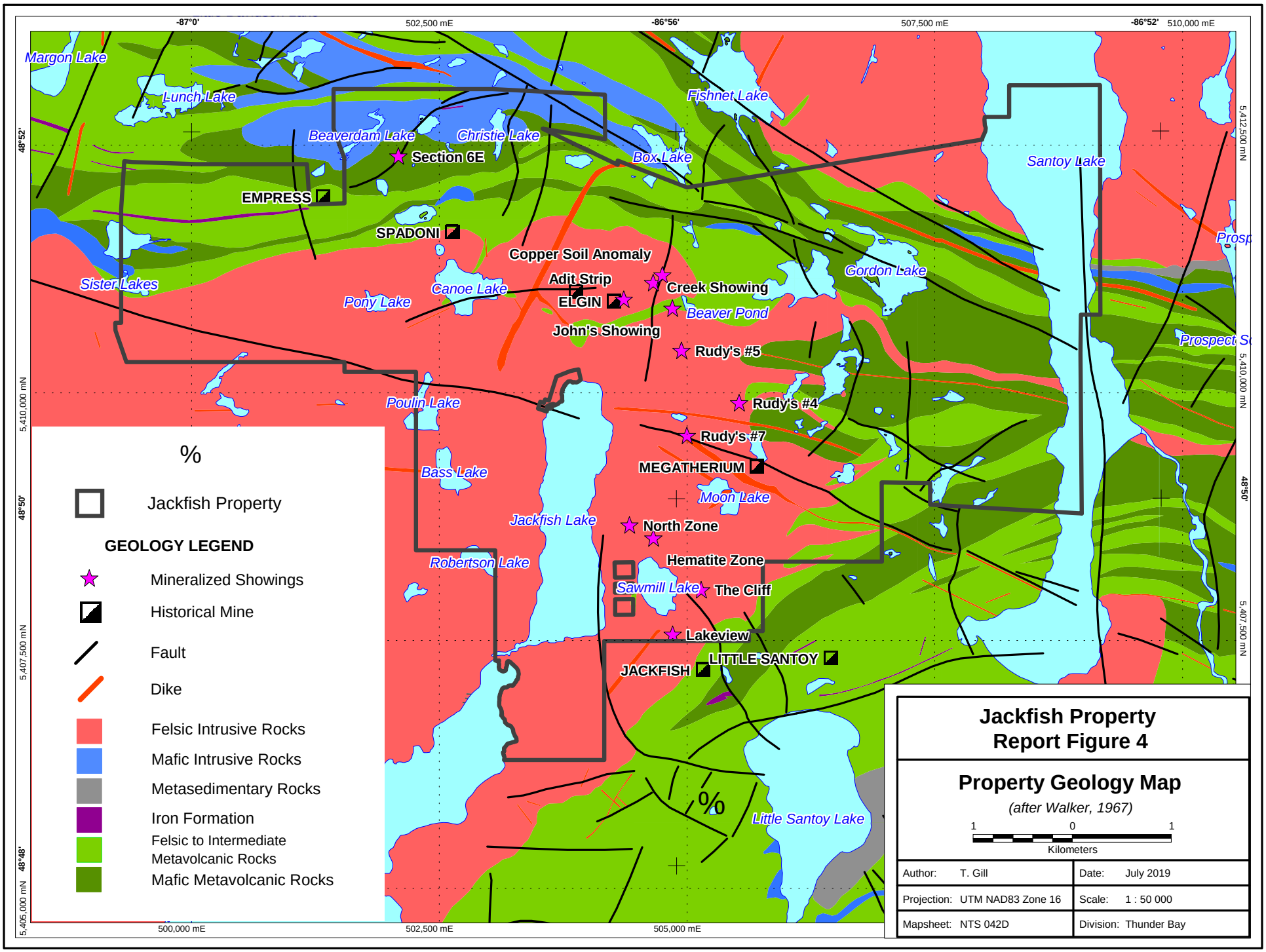


***Figure 3**: Regional Geological Setting Map (after Ayres et al, 1970).*

Property Geology and Mineralization

The Jackfish property straddles the eastern margin of the Terrace Bay Pluton where the granodiorite rocks of the intrusive come into contact with the folded and foliated supracrustal sequence of the Schreiber-Hemlo greenstone belt in a combination of an intrusive and structural setting. The various rock types that have been observed or interpreted to underlie the area are depicted on the property geology map in Figure 4.

Gold, silver and base metal mineralization is known to occur and has been mined historically from quartz-carbonate veins in three different settings across the region; as lenses or stringers within shear zones of the greenstone belt, as networks parallel to the contact between the pluton and supracrustal rocks and as fracture fill within the pluton. These styles of orogenic gold deposits are the key targets of focus for exploration activities on the Jackfish property. The more prominent historical workings and currently active mineralized showings are shown on Figure 4.


-87°0'
502,500 mE
-86°56'
507,500 mE
-86°52'
510,000 mE
48°52'
5,412,500 mN
5,410,000 mN
48°50'
5,407,500 mN
48°48'
5,405,000 mN
500,000 mE
502,500 mE
505,000 mE
Margon Lake
Lunch Lake
Beaverdam Lake
Christie Lake
Section 6E
EMPRESS
SPADONI
Fishnet Lake
Box Lake
Santoy Lake
Copper Soil Anomaly
Adit Strip
ELGIN
Creek Showing
Beaver Pond
John's Showing
Rudy's #5
Rudy's #4
Rudy's #7
MEGATHERIUM
Moon Lake
North Zone
Hematite Zone
The Cliff
Lakeview
LITTLE SANTOY
JACKFISH
Sister Lakes
Pony Lake
Canoe Lake
Gordon Lake
Poulin Lake
Bass Lake
Jackfish Lake
Robertson Lake
Sawmill Lake
Little Santoy Lake
%
Jackfish Property
GEOLOGY LEGEND
Mineralized Showings
Historical Mine
Fault
Dike
Felsic Intrusive Rocks
Mafic Intrusive Rocks
Metasedimentary Rocks
Iron Formation
Felsic to Intermediate Metavolcanic Rocks
Mafic Metavolcanic Rocks
Jackfish Property Report Figure 4
Property Geology Map
(after Walker, 1967)
1 0 1
Kilometers
Author: T. Gill
Date: July 2019
Projection: UTM NAD83 Zone 16
Scale: 1 : 50 000
Mapsheet: NTS 042D
Division: Thunder Bay

Exploration Work

The field program commenced on August 4, 2017 with clearing a trail out from existing access from Highway 17 past the Rudy #7 showing and on to Rudy #4 (Figure 2). Four areas of outcrop exhibiting sulphide minerals in quartz veins were revealed while clearing the trail and it was decided to cut some channel samples across these stripped areas as part of the program. These outcrops become known as Top of the Hill and Trailside Trenches #1, #2 and #3 (Figure 2). A second trail was established for access into Rudy #5 showing. All of the trail construction and outcrop stripping was undertaken by Richards Exploration of Terrace Bay, Ontario and was completed by October 31, 2017.

Outcrop washing, channel cutting and sampling started soon after the first outcrops were stripped off and was also completed by October 31, 2017. This work was carried out by Pathfinder Exploration Services from Neebing, Ontario. The channel samples were designed to traverse quartz veins and shear structures as close to perpendicular as practical. The channels were cut approximately 1 inch wide over 1 metre intervals, cutting down 2 inches deep on both sides and then broken out with a hammer and chisel. Unfortunately, no channels were cut at Rudy #5 because of the late time of the season. Only grab samples from the exposed quartz veins were collected from this location.

A total of 119 channel samples and two grab samples were collected over six of the stripped outcrops. Three different Certified Reference Material (CRM) standard samples purchased from Analytical Solutions Ltd. Of Murmur, Ontario, were inserted blindly into the sample stream along with blank material and lab duplicates (collected from the pulverised sample) at every tenth sample on a rotating basis in order top check the lab results for Quality Assurance and Quality Control (QA/QC). The samples were delivered to Activation Laboratories Ltd. (Actlabs) in Thunder Bay, Ontario by Sanatana personnel to ensure sample security and analysed for gold by 30 gram Fire Assay with an ICPOES (FA-ICP) finish, as per Actlab certificates (Appendix 1). The last batch of sample results were received on December 6, 2017.

The stripped outcrops were mapped in detail by Lakehead University Masters student Kyra Arnold of Thunder Bay, Ontario. The work was completed over three field stints from September 9 to 11, 17 to 19 and 30 to October 1, 201T with an additional three days compiling the maps and field data. The maps (Figures 5 to 11) show local geology and structure and the locations of each channel cut with the sample number for reference. A brief description of each sample was noted during the mapping and these were compiled along with the gold values for each stripped location once the assay results were received back from the lab (Appendix 2).

Figure 5: Top of the Hill Trench

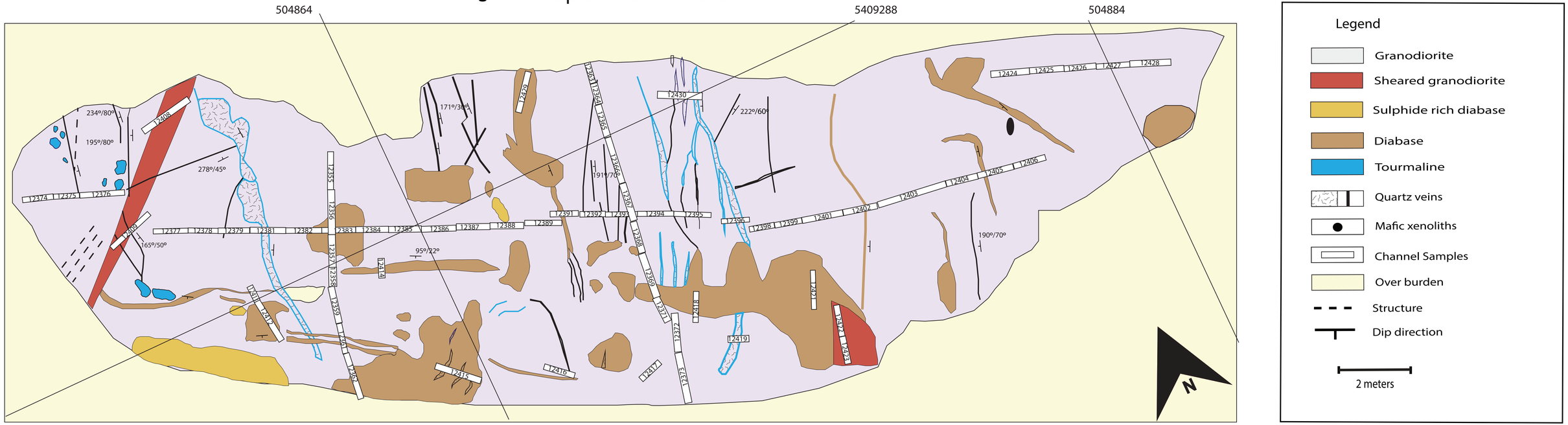


Figure 6: Trench # 1

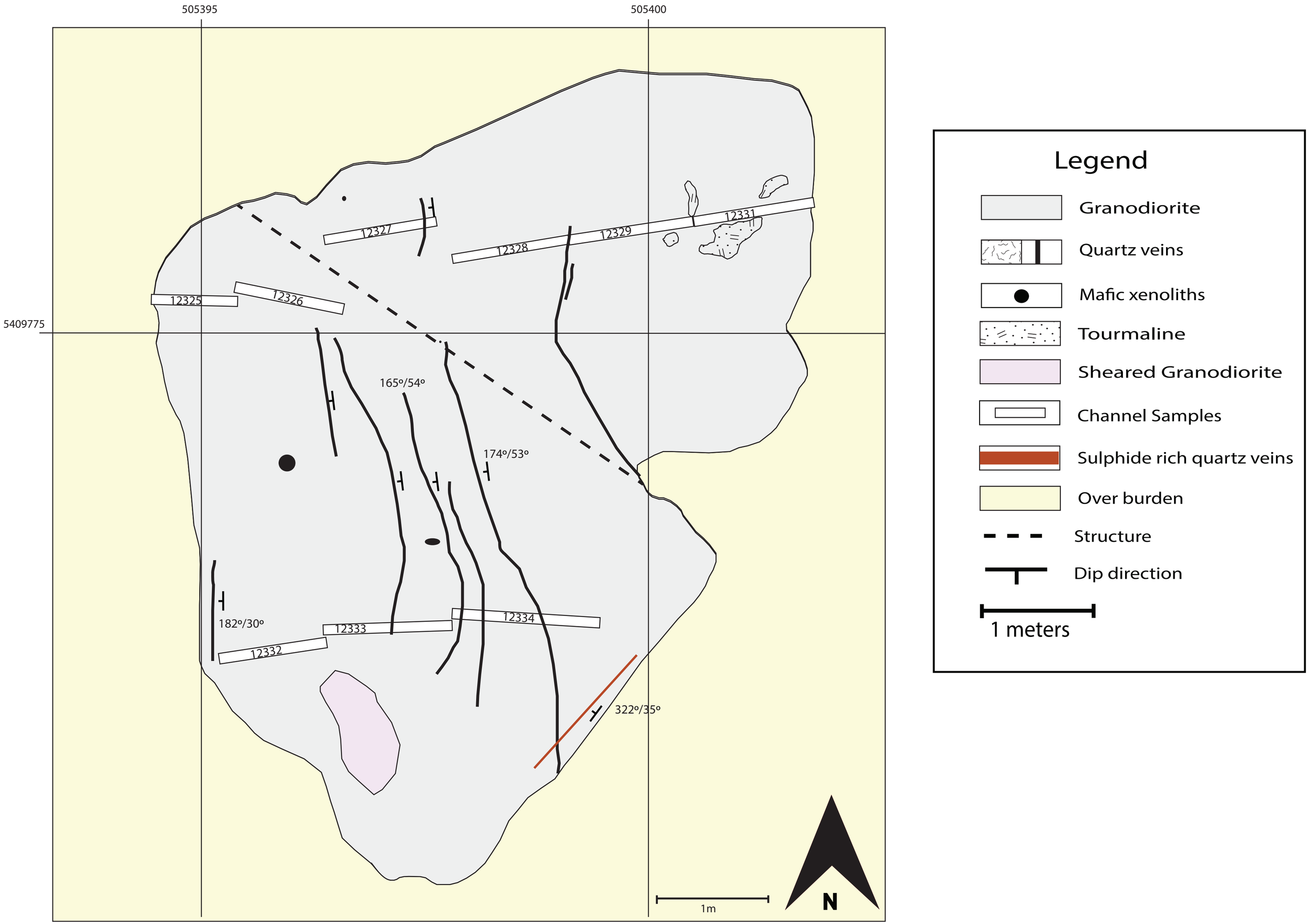
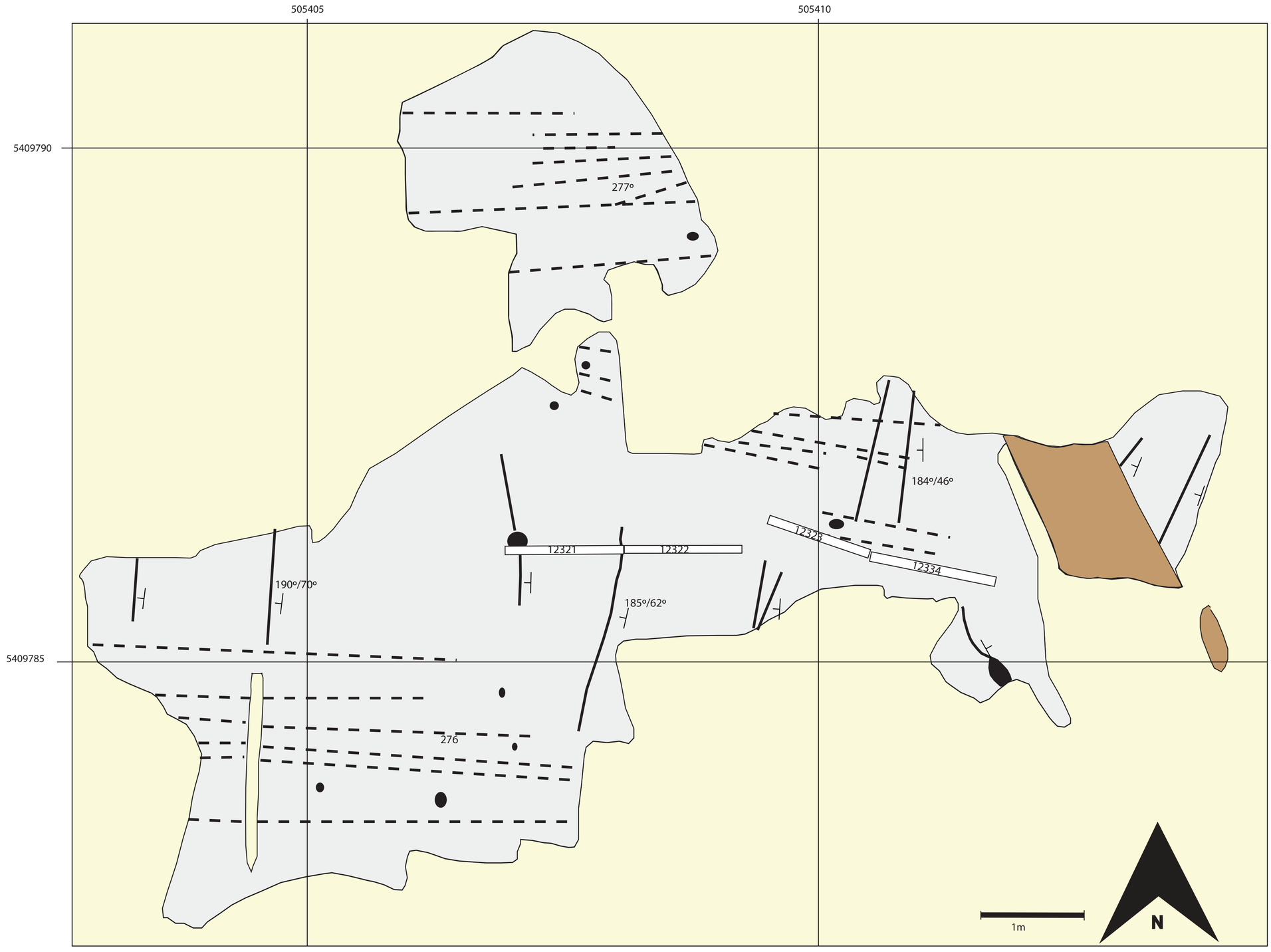


Figure 7: Trench #2

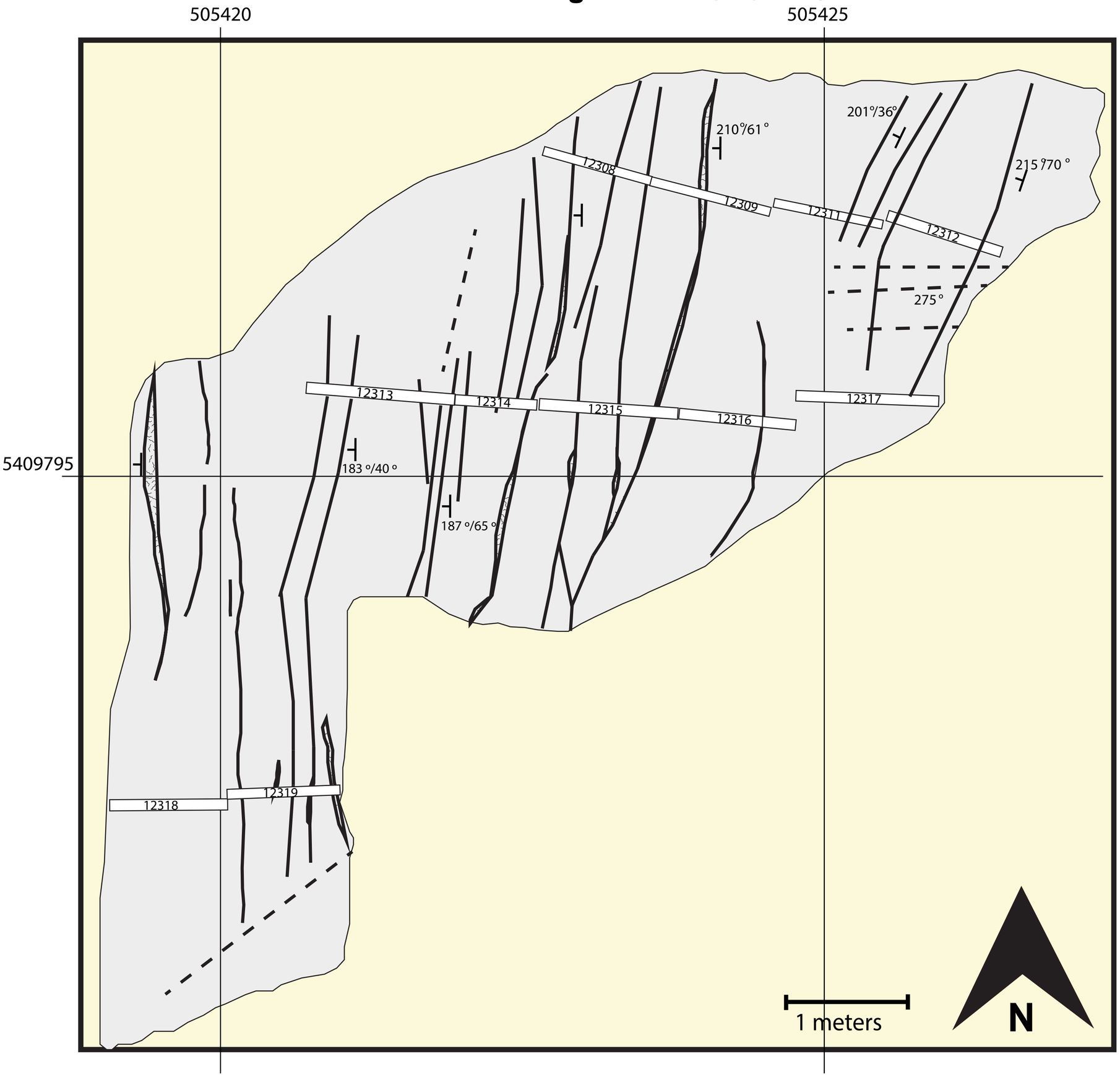


Legend

- Granodiorite
- Quartz veins
- Mafic xenoliths
- Channel Samples
- Diabase
- Over burden
- Structure
- Dip direction

1 meters

Figure 8: Trench # 3

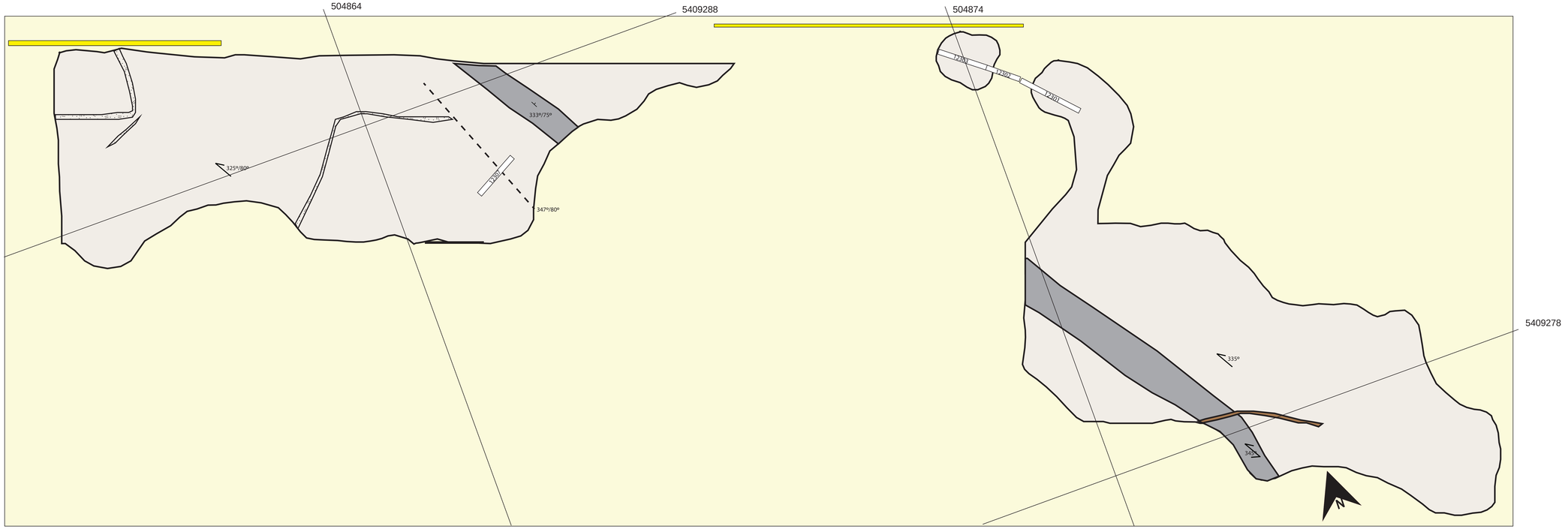


Legend

- Granodiorite
- Quartz veins
- Mafic xenoliths
- Channel Samples
- Over burden
- Structure
- Dip direction

1 meters

Figure 9: Trench #4 Horizontal

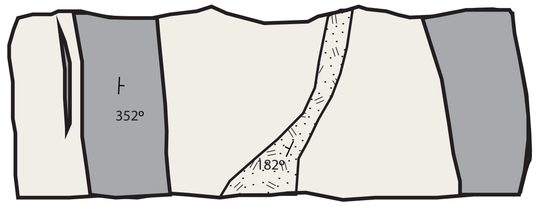


Legend

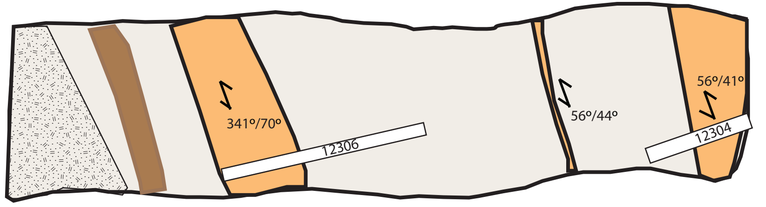
- Granodiorite
- Banded Metasedimentary
- Chlorite rich metasedimentary
- Sheared Metasediments
- Diabase
- Banding
- Folitation
- Channel Samples
- Over burden
- Structure
- Dip direction

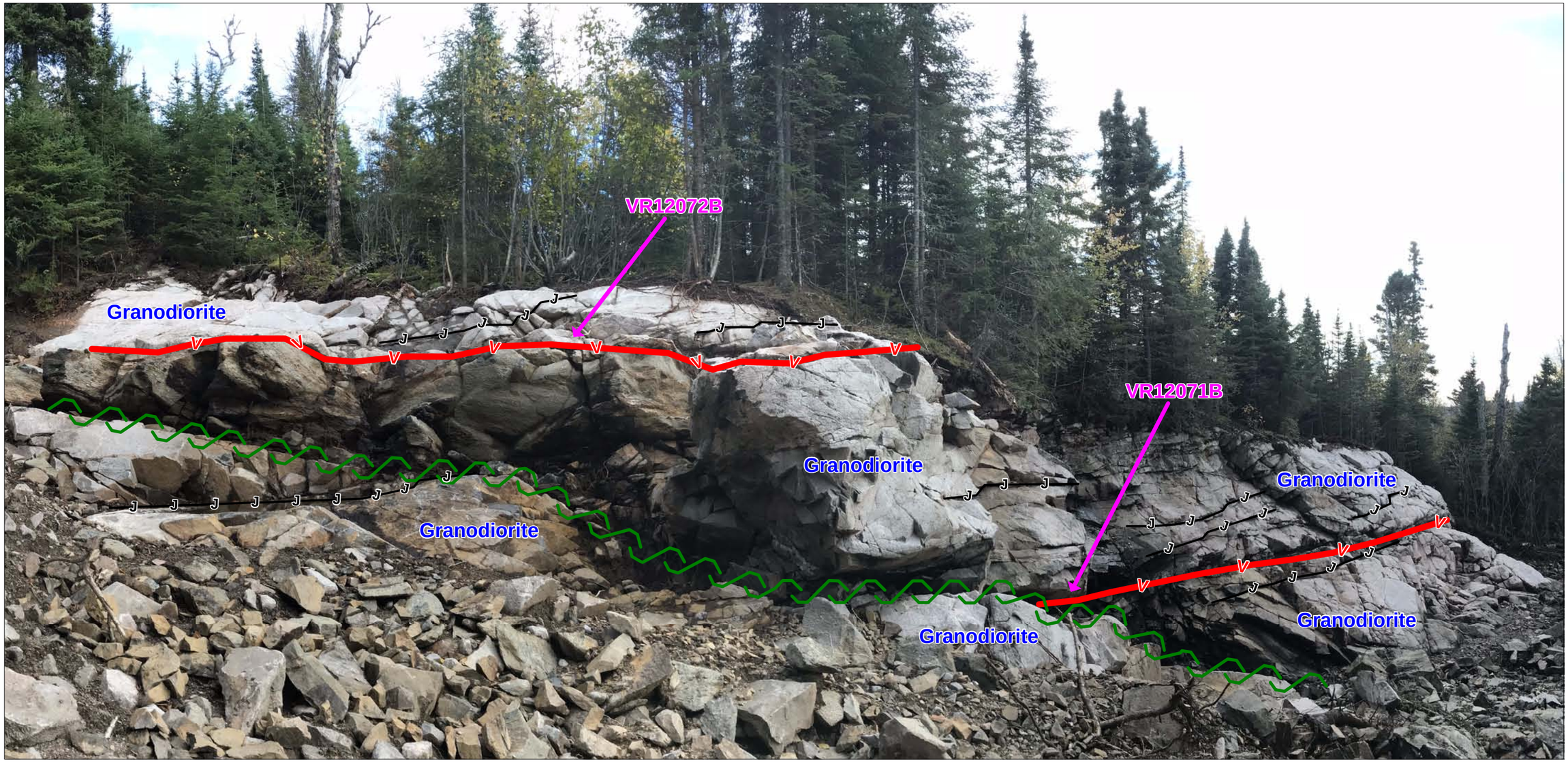
1 meters

Trench #4 Vertical



1 meters





Quartz Vein

Joint / Fracture

Chloritic Shear Zone

0 5

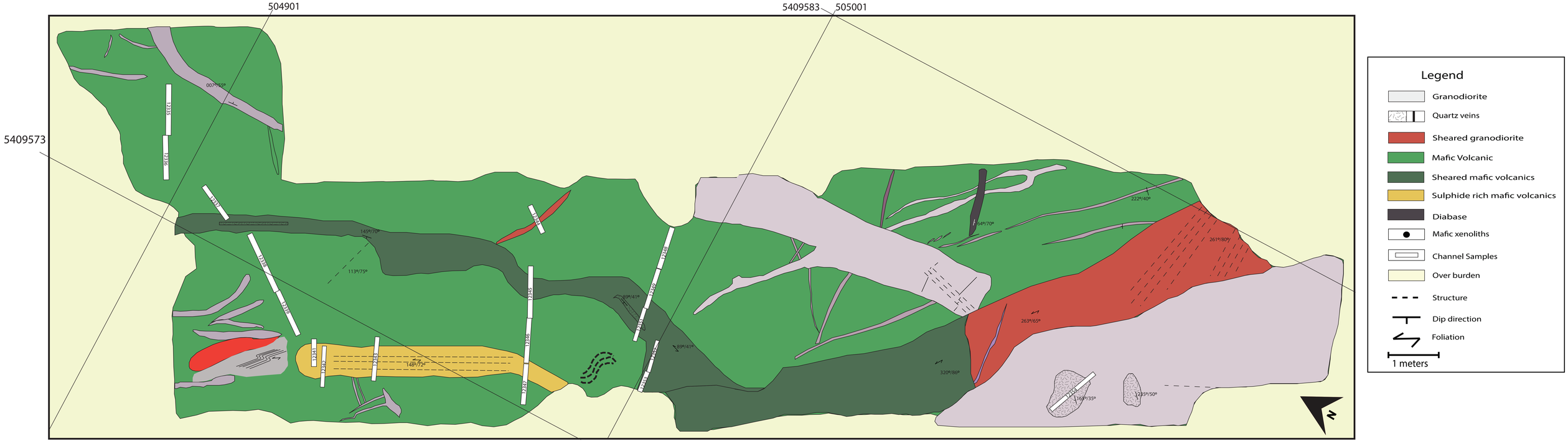
Metres

Jackfish Property
Report Figure 10

Trench #5 Photo Interpretation and Grab Sample Locations

Author:	T. Gill	Date:	August 2019
Projection:	UTM NAD83 Zone 16	Scale:	1 : 100
Mapsheet:	NTS 042D15	MNDM:	Thunder Bay Mining Division

Trench #7


504901
5409583
505001
5409573
007º/55º
12335
12336
12337
12338
12339
145º/70º
113º/75º
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12341
12342
12343
149º/72º
12344
12345
12346
12347
12348
12349
12350
12351
89º/41º
89º/41º
12352
12353
12354
320º/86º
049º/70º
222º/40º
2619º/80º
2639º/65º
12355
116º/35º
235º/50º
Legend
Granodiorite
Quartz veins
Sheared granodiorite
Mafic Volcanic
Sheared mafic volcanics
Sulphide rich mafic volcanics
Diabase
Mafic xenoliths
Channel Samples
Over burden
Structure
Dip direction
Foliation
1 meters

Interpretations

Once the lab results were received all the QA/QC data was reviewed to check for accuracy and precision of the data. Standard sample results were mostly found to be well within the two standard deviation limits for each of the CRM's as per their certificates (Appendix 1), although the higher grade standard OREAS 228 seemed to be reporting low. All the same, this indicates high precision of the lab processing and analysis for trace levels of gold. The duplicate samples returned similar values indicating acceptable accuracy of the sampling and results. No gold was measured in any of the blanks meaning there was no smearing of gold between samples due to lab processing. The Actlabs assay results were determined to be reliable.

No significant gold mineralization was encountered at the Top of the Hill outcrop or at the #1 - #4 stripped sites.

The grab samples from Rudy #5 are of high enough gold content 22.0g/t Au for the lower quartz vein and 12.8g/t Au for the upper quartz vein) to infer that the two quartz veins (Figure 10) could be part of a significantly mineralized system, although there is not enough exposure at present to indicate where that system could be or how it trends.

Rudy #7 returned significant gold values in assays of 1.0m @ 3.38 g/t Au, 1.0m @ 12.2g/t Au and 2.7m @ 5.95 g/t Au across three lines of channel sampling over 10 m of strike along a weathered shear zone with intermittent quartz veining. The shear zone is cut off at the southeast end of the stripped outcrop by a fault zone trending east-northeast that was interpreted to be mid continental rift timing related and therefore much younger than the mineralized shear zone. The shear zone disappears under cover to the northwest (Figure 11).

Conclusions and Recommendations

The results from outcrop stripping and sampling at Rudy #5 and Rudy #7 were promising enough to warrant further work to gauge the size and follow the trends of the mineralized systems at these locations. Close scale ground geophysics could be used to guide further stripping, starting as close to the current stripped areas as permitting will allow and stepping out along strike at first once the trends are realized. If structural measurements or geophysical modeling can provide a dip orientation to the mineralized trends, then this work could be used to plan a drill program to test the subsurface mineralized potential.

Cost Statement and Expenditure Distribution

The contractors who performed the trail building and outcrop stripping, sampling, mapping and sample assaying all make up the bulk of the costs of the program. These costs paid on invoices (Appendix 3) as a total charge for performing the work. Supervision of the field work program and compilation and interpretation of the resultant data was provided by Sanatana and involved some travel and accommodation for one person as per receipts (Appendix 3). All the costs are summarized in Table 3.

***Table 3**: Outcrop Stripping and Channel Sampling Summary Costs.*

Item	Description	Cost
Richards Exploration	Trail clearing and outcrop stripping with excavator and skidder for a total of 118.5 hours @ $110/hr	$ 14,795
	Wayne Richards fieldwork flagging trails and supporting mapping & sampling Six days @ $350/day	$ 2,100
	Fire watch helper to supervise excavator work Six days @ $300/day	$ 1,800
	Fire safety equipment rental (water tank, pump, hose) Six days @ $50/day	$ 300
	ATV rental 19 days @ $65/day	$ 1,235
	Six wheeler UTV rental @ $80/day	$ 240
	Float for excavator between sites @ fixed rate	$ 800
Pathfinder Exploration Services	Outcrop washing, channel cutting & sampling labour 19 days @ $400/day	$ 7,600
	Helper 18 days @ $300/day	$ 5,400
	Equipment rental at fixed price 2 x pump and hoses @ $500 and 2 x rock saw @ $245	$ 1,490
	Truck to and from site 2,350km @ $0.50	$ 1,175
	ATV rental 19 days @ $60/day	$ 1,140
	Accommodation 19 nights @ $90/night	$ 1,710
	Meals for 27 mandays @ $50/day	$ 1,350
	Supplies of 2 x rock saw blades @ $345 each	$ 690
	Fuel 220L @ $1.23/L	$ 271
Kyra Arnold	Mapping outcrops 5.5 days @ $350/day	$ 3,675
	Accommodation Jackfish Cottages six nights @ $89.95/night	$ 540
	Food for six days @ $25/day plus fixed item @ $38.39	$ 188
	Field Supplies as receipted	$ 138
	Vehicle use to and from site 1,410km @ $0.50/km	$ 705
	ATV rental eight days @ $65/day	$ 520
	Gas as receipted	$ 118
Actlabs	Processing and assay costs all inclusive @ $35.13/sample for a total of 133 channel samples (including QA/QC) as invoiced	$ 4,672
	Processing and assay costs all inclusive @ $39.50/sample for two grab samples samples	$ 79
Troy Gill	Company fieldwork and supervision of the project 17 days @ $500 per day.	$ 8,500
	Jackfish Cottages total accommodation 16 nights @ $85.58 / night.	$ 1,369
	Food total as receipted	$ 312
	Westjet Airlines airfare and airport taxi travel to and from the property total as invoiced	$ 1,208
	Truck from Thunder Bay to Terrace Bay return and daily to and from the field for a total 560km at $0.45 per km.	$ 252
	ATV use 17 days @ $80/day	$ 1,360
	Fuel as per receipt	$ 138
Total		$ 65,870

The cost of the entire Outcrop stripping and sampling program were distributed across the six cell mining claims depending on how many stripped locations are located within each mining claim and the number of samples collected from each location, approximately to the nearest whole dollar (Table 4). The Trailside Trenches #1 - #3 are small and almost continuous and therefore treated as one stripped area. Cell mining claim 309242 only had a small amount of trail clearing work over it and so it receives just a nominal amount to reflect that.

***Table 4**: Distribution of Expenditures across Rudy Wahl Cell Mining Claims.*

Tenure #	Grid Cell	Tsp	Title Type	Client ID	Holder	Stripping	Sampling	Geological	Supervision	Assays	Supplies / Rentals	Transport	Fuel	Lodging	Food	Total
130628	42D15E391	SYINE	BCMC	206079	Rudolf Wahl	$3,600.00	$2,600.00	$735.00	$1,700.00	$950.20	$523.60	$1,727.00	$105.40	$723.80	$370.00	$13,035.00
195337	42D15E331	SYINE	BCMC	206079	Rudolf Wahl	$3,600.00	$2,600.00	$735.00	$1,700.00	$950.20	$523.60	$1,727.00	$105.40	$723.80	$370.00	$13,035.00
225463	42D15E353	SYINE	BCMC	206079	Rudolf Wahl	$3,600.00	$2,600.00	$735.00	$1,700.00	$950.20	$523.60	$1,727.00	$105.40	$723.80	$370.00	$13,035.00
309242	42D15E352	SYINE	SCMC	206079	Rudolf Wahl	$695.00										$695.00
309243	42D15E371	SYINE	SCMC	206079	Rudolf Wahl	$3,600.00	$2,600.00	$735.00	$1,700.00	$950.20	$523.60	$1,727.00	$105.40	$723.80	$370.00	$13,035.00
332244	42D15E372	SYINE	SCMC	206079	Rudolf Wahl	$3,600.00	$2,600.00	$735.00	$1,700.00	$950.20	$523.60	$1,727.00	$105.40	$723.80	$370.00	$13,035.00
			Total	**206079**	**Rudolf Wahl**	**$18,695.00**	**$13,000.00**	**$3,675.00**	**$8,500.00**	**$4,751.00**	**$2,618.00**	**$8,635.00**	**$527.00**	**$3,619.00**	**$1,850.00**	**$65,870.00**

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Statement of Qualifications

Troy Gill
1910-925 West Georgia Street
Vancouver, BC, V6C 3L2
Telephone: 604-762-0380
Email: troy@sanatanaresources.com

I, Troy Gill, do hereby certify that:

1. I am employed as Exploration Manager for Sanatana Resources Inc.

2. I am responsible for the Report titled "Assessment Report on Outcrop Stripping and Channel Sampling at the Jackfish Property Mineral Claims 130628, 195337, 225463, 309242, 309243 and 332244, Syine Township, Thunder Bay Mining Division, District of Thunder Bay, Ontario, NTS 42D15" dated July 24, 2019, and prepared for Sanatana Resources Inc.

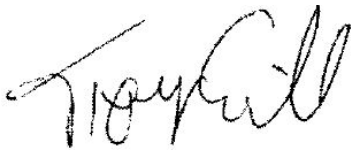
3. I hold the following academic qualifications: B.Sc. Geology (1993), University of Wollongong, NSW, Australia.

4. I am a member in good standing of the Australian Institute of Geoscientists (MAIG).

5. I have worked on a range of commodities including Au, Cu, Ni, diamonds, coal and iron ore in various geological settings in Australia and Canada since 1993.

6. This Report is compiled from data collected by or on behalf of Sanatana Resources Inc. in 2017. I conducted fieldwork, supervised the data acquisition and provided the data interpretation associated with this report.

Dated this 4th Day of August, 2019.



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Troy Gill, B.Sc., MAIG.

Exploration Manager, Sanatana Resources Inc.

Appendix 1: Jackfish Property Channel and Grab Sample Assay Lab Certificates

Quality Analysis ... *Innovative Technologies*

Date Submitted: 22-Aug-17
Invoice No.: A17-08943 (i)
Invoice Date: 25-Aug-17
Your Reference: Jackfish

Sanatana Resources
908-925 West Georgia st
Vancouver
BC V6C 3L2
Canada

ATTN: Troy Gill

CERTIFICATE OF ANALYSIS

34 Rock samples were submitted for analysis.

The following analytical package(s) were requested: Code 1A2-ICP Tbay Au-Fire Assay ICPOES 30g

REPORT **A17-08943 (i)**

Notes:

CERTIFIED BY:

Emmanuel Eseme , Ph.D.
Quality Control

ACTIVATION LABORATORIES LTD.
1201 Walsh Street West, Thunder Bay, Ontario, Canada, P7E 4X6
TELEPHONE +807 622-6707 or +1.888.228.5227 FAX +1.905.648.9613
E-MAIL Tbay@actlabs.com ACTLABS GROUP WEBSITE www.actlabs.com

Analyte Symbol	Au
Unit Symbol	ppb
Lower Limit	2
Method Code	FA-ICP
VR12301B	5
VR12302B	153
VR12303B	925
VR12304B	721
VR12305B	364
VR12306B	5
VR12307B	< 2
VR12308B	< 2
VR12309B	< 2
VR12310B	< 2
VR12311B	< 2
VR12312B	< 2
VR12313B	< 2
VR12314B	2
VR12315B	< 2
VR12316B	< 2
VR12317B	< 2
VR12318B	< 2
VR12319B	< 2
VR12320B	7810
VR12321B	< 2
VR12322B	< 2
VR12323B	< 2
VR12324B	3
VR12325B	4
VR12326B	< 2
VR12327B	2
VR12328B	< 2
VR12329B	< 2
VR12330B	< 2
VR12331B	10
VR12332B	< 2
VR12333B	< 2
VR12334B	< 2

Analyte Symbol	Au
Unit Symbol	ppb
Lower Limit	2
Method Code	FA-ICP
OREAS 218 Meas	539
OREAS 218 Cert	525
OREAS 224 (Fire Assay) Meas	2120
OREAS 224 (Fire Assay) Cert	2150
VR12310B Orig	< 2
VR12310B Dup	< 2
VR12321B Orig	6
VR12321B Dup	< 2
VR12331B Orig	15
VR12331B Dup	4
Method Blank	< 2
Method Blank	< 2

Quality Analysis ... *Innovative Technologies*

Date Submitted: 25-Aug-17
Invoice No.: A17-09165
Invoice Date: 29-Aug-17
Your Reference: Jackfish

Sanatana Resources
908-925 West Georgia st
Vancouver
BC V6C 3L2
Canada

ATTN: Troy Gill

CERTIFICATE OF ANALYSIS

20 Rock samples were submitted for analysis.

The following analytical package(s) were requested: Code 1A2-ICP Tbay Au-Fire Assay ICPOES 30g

REPORT **A17-09165**

Notes:

CERTIFIED BY:

Emmanuel Eseme , Ph.D.
Quality Control

ACTIVATION LABORATORIES LTD.
1201 Walsh Street West, Thunder Bay, Ontario, Canada, P7E 4X6
TELEPHONE +807 622-6707 or +1.888.228.5227 FAX +1.905.648.9613
E-MAIL Tbay@actlabs.com ACTLABS GROUP WEBSITE www.actlabs.com

Analyte Symbol	Au
Unit Symbol	ppb
Lower Limit	2
Method Code	FA-ICP
VR12335B	2
VR12336B	5
VR12337B	3380
VR12338B	11
VR12339B	6
VR12340B	< 2
VR12341B	30
VR12342B	< 2
VR12343B	9
VR12344B	7
VR12345B	12200
VR12346B	413
VR12347B	41
VR12348B	20
VR12349B	701
VR12350B	3400
VR12351B	6220
VR12352B	10900
VR12353B	138
VR12354B	147

Analyte Symbol	Au
Unit Symbol	ppb
Lower Limit	2
Method Code	FA-ICP
OREAS 218 Meas	519
OREAS 218 Cert	525
OREAS 224 (Fire Assay) Meas	2160
OREAS 224 (Fire Assay) Cert	2150
VR12344B Orig	7
VR12344B Dup	7
VR12354B Orig	184
VR12354B Dup	110
Method Blank	< 2

Quality Analysis ... *Innovative Technologies*

Date Submitted: 28-Aug-17
Invoice No.: A17-09236
Invoice Date: 21-Sep-17
Your Reference: Jackfish

Sanatana Resources
908-925 West Georgia st
Vancouver
BC V6C 3L2
Canada

ATTN: Troy Gill

CERTIFICATE OF ANALYSIS

79 Rock samples were submitted for analysis.

The following analytical package(s) were requested: Code 1A2-ICP Tbay Au-Fire Assay ICPOES 30g

REPORT **A17-09236**

Notes:

CERTIFIED BY:

Emmanuel Eseme , Ph.D.
Quality Control

ACTIVATION LABORATORIES LTD.
1201 Walsh Street West, Thunder Bay, Ontario, Canada, P7E 4X6
TELEPHONE +807 622-6707 or +1.888.228.5227 FAX +1.905.648.9613
E-MAIL Tbay@actlabs.com ACTLABS GROUP WEBSITE www.actlabs.com

Analyte Symbol	Au
Unit Symbol	ppb
Lower Limit	2
Method Code	FA-ICP
VR12355B	< 2
VR12356B	< 2
VR12357B	< 2
VR12358B	18
VR12359B	< 2
VR12360B	< 2
VR12361B	< 2
VR12362B	< 2
VR12363B	< 2
VR12364B	< 2
VR12365B	< 2
VR12366B	< 2
VR12367B	< 2
VR12368B	< 2
VR12369B	< 2
VR12370B	< 2
VR12371B	2
VR12372B	16
VR12373B	< 2
VR12374B	< 2
VR12375B	2
VR12376B	< 2
VR12377B	2
VR12378B	< 2
VR12379B	< 2
VR12380B	6070
VR12381B	7
VR12382B	< 2
VR12383B	< 2
VR12384B	< 2
VR12385B	< 2
VR12386B	< 2
VR12387B	< 2
VR12388B	2
VR12389B	2
VR12390B	< 2
VR12391B	4
VR12392B	< 2
VR12393B	< 2
VR12394B	< 2
VR12395B	< 2
VR12396B	2

Analyte Symbol	Au
Unit Symbol	ppb
Lower Limit	2
Method Code	FA-ICP
VR12397B	< 2
VR12398B	< 2
VR12399B	< 2
VR12400B	< 2
VR12401B	< 2
VR12402B	< 2
VR12403B	< 2
VR12404B	12
VR12405B	< 2
VR12406B	< 2
VR12407B	56
VR12408B	< 2
VR12409B	< 2
VR12410B	530
VR12411B	6
VR12412B	6
VR12413B	12
VR12414B	7
VR12415B	4
VR12416B	24
VR12417B	< 2
VR12418B	5
VR12419B	3
VR12420B	2
VR12421B	< 2
VR12422B	< 2
VR12423B	< 2
VR12424B	< 2
VR12425B	3
VR12426B	< 2
VR12427B	< 2
VR12428B	< 2
VR12429B	10
VR12430B	16
VR12431B	< 2
VR12432B	< 2
VR12433B	< 2

Analyte Symbol	Au
Unit Symbol	ppb
Lower Limit	2
Method Code	FA-ICP
OREAS 223 (Fire Assay) Meas	1740
OREAS 223 (Fire Assay) Cert	1780
OREAS 223 (Fire Assay) Meas	1790
OREAS 223 (Fire Assay) Cert	1780
OREAS 223 (Fire Assay) Meas	1760
OREAS 223 (Fire Assay) Cert	1780
OREAS 218 Meas	528
OREAS 218 Cert	531
OREAS 218 Meas	533
OREAS 218 Cert	531
OREAS 218 Meas	520
OREAS 218 Cert	531
VR12364B Orig	< 2
VR12364B Dup	< 2
VR12374B Orig	< 2
VR12374B Dup	< 2
VR12384B Orig	< 2
VR12384B Dup	< 2
VR12399B Orig	< 2
VR12399B Dup	< 2
VR12404B Orig	12
VR12404B Split PREP DUP	7
VR12404B Split PREP DUP	7
VR12409B Orig	< 2
VR12409B Dup	< 2
VR12419B Orig	4
VR12419B Dup	3
VR12428B Orig	< 2
VR12428B Dup	3
Method Blank	< 2
Method Blank	< 2
Method Blank	< 2
Method Blank	< 2
Method Blank	< 2
Method Blank	< 2

Quality Analysis ... *Innovative Technologies*

Date Submitted: 08-Nov-17
Invoice No.: A17-12642
Invoice Date: 06-Dec-17
Your Reference: Jackfish

Sanatana Resources
908-925 West Georgia st
Vancouver
BC V6C 3L2
Canada

ATTN: Troy Gill

CERTIFICATE OF ANALYSIS

4 Rock samples were submitted for analysis.

The following analytical package(s) were requested: Code 1A2-ICP Tbay Au-Fire Assay ICPOES 30g

Code 1F2-Tbay Total Digestion ICP(TOTAL)

REPORT **A17-12642**

Notes:

Values which exceed the upper limit should be assayed for accurate numbers.

CERTIFIED BY:

Emmanuel Eseme , Ph.D.
Quality Control

ACTIVATION LABORATORIES LTD.
1201 Walsh Street West, Thunder Bay, Ontario, Canada, P7E 4X6
TELEPHONE +807 622-6707 or +1.888.228.5227 FAX +1.905.648.9613
E-MAIL Tbay@actlabs.com ACTLABS GROUP WEBSITE www.actlabs.com

Analyte Symbol	Au	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	Hg	K	Mg	Li	Mn	Mo	Na	Ni	P
Unit Symbol	ppb	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	%	%	ppm	ppm	ppm	%	ppm	%
Lower Limit	2	0.3	0.01	3	7	1	2	0.01	0.3	1	1	1	0.01	1	1	0.01	0.01	1	1	1	0.01	1	0.001
Method Code	FA-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP
[redacted]																							
VR12071B	22000	78.6	0.81	< 3	28	< 1	146	0.26	2.3	76	94	592	6.63	6	< 1	0.19	0.23	5	134	33	0.45	331	0.013
VR12072B	12800	48.3	2.38	< 3	83	< 1	44	0.45	4.1	42	69	1600	6.98	8	< 1	0.23	0.06	2	177	41	1.64	104	0.019
[redacted]																							

Analyte Symbol	Pb	Sb	S	Sc	Sr	Te	Ti	Tl	U	V	W	Y	Zn	Zr
Unit Symbol	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	3	5	0.01	4	1	2	0.01	5	10	2	5	1	1	5
Method Code	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP
[redacted]														
VR12071B	> 5000	< 5	7.24	< 4	59	20	0.04	< 5	< 10	12	< 5	2	39	17
VR12072B	1240	< 5	6.98	< 4	990	27	0.05	< 5	< 10	11	7	4	212	38
[redacted]														

Analyte Symbol	Au	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	Hg	K	Mg	Li	Mn	Mo	Na	Ni	P
Unit Symbol	ppb	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	%	%	ppm	ppm	ppm	%	ppm	%
Lower Limit	2	0.3	0.01	3	7	1	2	0.01	0.3	1	1	1	0.01	1	1	0.01	0.01	1	1	1	0.01	1	0.001
Method Code	FA-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP
GXR-1 Meas		31.3	2.09	429	646	1	1380	0.88	3.1	9	12	1160	23.8	17	7	0.04	0.21	7	883	16	0.05	43	0.059
GXR-1 Cert		31.0	3.52	427	750	1.22	1380	0.960	3.30	8.20	12.0	1110	23.6	13.8	3.90	0.050	0.217	8.20	852	18.0	0.0520	41.0	0.0650
GXR-1 Meas		31.7	2.40	447	688	1	1380	0.89	3.6	9	31	1170	23.8	3	13	0.05	0.21	7	887	15	0.05	42	0.061
GXR-1 Cert		31.0	3.52	427	750	1.22	1380	0.960	3.30	8.20	12.0	1110	23.6	13.8	3.90	0.050	0.217	8.20	852	18.0	0.0520	41.0	0.0650
GXR-4 Meas		3.7	6.60	97	212	2	15	1.05	0.4	14	62	6470	3.03	16	< 1	1.34	1.69	12	163	316	0.53	45	0.131
GXR-4 Cert		4.0	7.20	98.0	1640	1.90	19.0	1.01	0.860	14.6	64.0	6520	3.09	20.0	0.110	4.01	1.66	11.1	155	310	0.564	42.0	0.120
GXR-4 Meas		3.3	6.49	101	167	2	16	1.04	0.4	15	39	6460	2.93	17	2	3.22	1.67	12	150	316	0.51	48	0.128
GXR-4 Cert		4.0	7.20	98.0	1640	1.90	19.0	1.01	0.860	14.6	64.0	6520	3.09	20.0	0.110	4.01	1.66	11.1	155	310	0.564	42.0	0.120
SDC-1 Meas			7.81	< 3	630	3		1.07		19	40	30	4.75	22	< 1	1.78	0.99	34	861		1.55	37	0.053
SDC-1 Cert			8.34	0.220	630	3.00		1.00		18.0	64.00	30.000	4.82	21.00	0.20	2.72	1.02	34	880.00		1.52	38.0	0.0690
SDC-1 Meas			8.04	5	630	3		1.08		19	52	28	4.73	22	< 1	1.99	1.01	34	904		1.54	36	0.057
SDC-1 Cert			8.34	0.220	630	3.00		1.00		18.0	64.00	30.000	4.82	21.00	0.20	2.72	1.02	34	880.00		1.52	38.0	0.0690
GXR-6 Meas		0.7	12.0	281	> 1000	1	< 2	0.17	< 0.3	14	62	67	5.47	27	< 1	1.01	0.59	34	1060	2	0.10	28	0.034
GXR-6 Cert		1.30	17.7	330	1300	1.40	0.290	0.180	1.00	13.8	96.0	66.0	5.58	35.0	0.0680	1.87	0.609	32.0	1010	2.40	0.104	27.0	0.0350
GXR-6 Meas		0.8	13.2	254	> 1000	1	< 2	0.17	0.6	16	52	68	5.63	30	< 1	1.92	0.62	34	1040	1	0.10	29	0.035
GXR-6 Cert		1.30	17.7	330	1300	1.40	0.290	0.180	1.00	13.8	96.0	66.0	5.58	35.0	0.0680	1.87	0.609	32.0	1010	2.40	0.104	27.0	0.0350
OREAS 14P Meas										681		9340	33.0									> 10000	
OREAS 14P Cert										750		9970	37.2									21000	
OREAS 14P Meas										695		9260	32.6									> 10000	
OREAS 14P Cert										750		9970	37.2									21000	
Oreas 72a (4 Acid Digest) Meas				9						155	269	331	9.35									6710	
Oreas 72a (4 Acid Digest) Cert				14.7						157	228	316	9.63									6930.000	
Oreas 72a (4 Acid Digest) Meas				< 3						148	186	321	9.46									6730	
Oreas 72a (4 Acid Digest) Cert				14.7						157	228	316	9.63									6930.000	
DNC-1a Meas					102					56	151	96		16				4				266	
DNC-1a Cert					118					57	270	100		15				5.2				247	
DNC-1a Meas					105					56	185	99		11				4				258	
DNC-1a Cert					118					57	270	100		15				5.2				247	
SBC-1 Meas				16	745	3	< 2		0.5	23	78	30		27				145		2		89	
SBC-1 Cert				25.7	788.0	3.20	0.70		0.40	22.7	109	31.0000		27.0				163		2		83	
SBC-1 Meas				25	721	3	< 2		0.3	23	76	28		28				138		3		82	
SBC-1 Cert				25.7	788.0	3.20	0.70		0.40	22.7	109	31.0000		27.0				163		2		83	
SdAR-M2 (U.S.G.S.) Meas					944	8	< 2		9.3	14	44	236		17	3			18		12		54	
SdAR-M2 (U.S.G.S.) Cert					990	6.6	1.05		5.1	12.4	49.6	236.0000		17.6	1.44			18		13		49	

Analyte Symbol	Au	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	Hg	K	Mg	Li	Mn	Mo	Na	Ni	P
Unit Symbol	ppb	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	%	%	ppm	ppm	ppm	%	ppm	%
Lower Limit	2	0.3	0.01	3	7	1	2	0.01	0.3	1	1	1	0.01	1	1	0.01	0.01	1	1	1	0.01	1	0.001
Method Code	FA-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP
SdAR-M2 (U.S.G.S.) Meas					> 1000	8	< 2		5.6	14	32	242		19	2			17		12		51	
SdAR-M2 (U.S.G.S.) Cert					990	6.6	1.05		5.1	12.4	49.6	236.0000		17.6	1.44			18		13		49	
OREAS 220 (Fire Assay) Meas	860																						
OREAS 220 (Fire Assay) Cert	828																						
OREAS 220 (Fire Assay) Meas	867																						
OREAS 220 (Fire Assay) Cert	828																						
OREAS 224 (Fire Assay) Meas	2270																						
OREAS 224 (Fire Assay) Cert	2150																						
OREAS 224 (Fire Assay) Meas	2140																						
OREAS 224 (Fire Assay) Cert	2150																						
[redacted]																							
[redacted]																							
Method Blank	< 2																						
Method Blank		< 0.3	< 0.01	< 3	< 7	< 1	< 2	< 0.01	< 0.3	< 1		< 1	< 0.01	< 1	< 1	< 0.01	< 0.01	< 1		< 1	< 0.01	< 1	< 0.001
Method Blank		< 0.3	< 0.01	< 3	< 7	< 1	< 2	< 0.01	< 0.3	< 1		< 1	< 0.01	< 1	< 1	< 0.01	< 0.01	< 1		< 1	< 0.01	< 1	< 0.001
Method Blank		< 0.3	< 0.01	< 3	< 7	< 1	< 2	< 0.01	< 0.3	< 1		< 1	< 0.01	< 1	< 1	< 0.01	< 0.01	< 1		< 1	< 0.01	< 1	< 0.001
Method Blank		< 0.3	< 0.01	< 3	< 7	< 1	< 2	< 0.01	< 0.3	< 1		< 1	< 0.01	< 1	< 1	< 0.01	< 0.01	< 1		< 1	< 0.01	< 1	< 0.001
Method Blank		< 0.3	< 0.01	< 3	< 7	< 1	< 2	< 0.01	< 0.3	< 1		< 1	< 0.01	< 1	< 1	< 0.01	< 0.01	< 1		< 1	< 0.01	< 1	< 0.001
Method Blank		< 0.3	< 0.01	< 3	< 7	< 1	< 2	< 0.01	< 0.3	< 1		< 1	< 0.01	< 1	< 1	< 0.01	< 0.01	< 1		< 1	< 0.01	< 1	< 0.001
Method Blank		< 0.3	< 0.01	< 3	< 7	< 1	< 2	< 0.01	< 0.3	< 1		< 1	< 0.01	< 1	< 1	< 0.01	< 0.01	< 1		< 1	< 0.01	< 1	< 0.001
Method Blank	< 2																						

Analyte Symbol	Pb	Sb	S	Sc	Sr	Te	Ti	Tl	U	V	W	Y	Zn	Zr
Unit Symbol	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	3	5	0.01	4	1	2	0.01	5	10	2	5	1	1	5
Method Code	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP
GXR-1 Meas	731	37	0.25	< 4	286	9	0.03	< 5	40	81	158	34	746	38
GXR-1 Cert	730	122	0.257	1.58	275	13.0	0.036	0.390	34.9	80.0	164	32.0	760	38.0
GXR-1 Meas	745	38	0.26	< 4	287	11	0.03	< 5	20	84	161	34	746	39
GXR-1 Cert	730	122	0.257	1.58	275	13.0	0.036	0.390	34.9	80.0	164	32.0	760	38.0
GXR-4 Meas	54	< 5	1.77	8	221	10	0.29	< 5	< 10	90	37	15	69	48
GXR-4 Cert	52.0	4.80	1.77	7.70	221	0.970	0.29	3.20	6.20	87.0	30.8	14.0	73.0	186
GXR-4 Meas	44	< 5	1.76	7	209	< 2	0.29	< 5	< 10	86	33	15	70	39
GXR-4 Cert	52.0	4.80	1.77	7.70	221	0.970	0.29	3.20	6.20	87.0	30.8	14.0	73.0	186
SDC-1 Meas	16	< 5		16	174		0.11	< 5	< 10	39	< 5		98	35
SDC-1 Cert	25.00	0.54		17.00	180.00		0.606	0.70	3.10	102.00	0.80		103.00	290.00
SDC-1 Meas	24	< 5		16	177		0.33	< 5	< 10	68	< 5		96	50
SDC-1 Cert	25.00	0.54		17.00	180.00		0.606	0.70	3.10	102.00	0.80		103.00	290.00
GXR-6 Meas	93	< 5	0.03	26	37	3		< 5	< 10	170	< 5	12	124	77
GXR-6 Cert	101	3.60	0.0160	27.6	35.0	0.0180		2.20	1.54	186	1.90	14.0	118	110
GXR-6 Meas	94	< 5	0.02	27	37	< 2		< 5	< 10	129	< 5	12	126	66
GXR-6 Cert	101	3.60	0.0160	27.6	35.0	0.0180		2.20	1.54	186	1.90	14.0	118	110
OREAS 14P Meas														
OREAS 14P Cert														
OREAS 14P Meas														
OREAS 14P Cert														
Oreas 72a (4 Acid Digest) Meas			1.72											
Oreas 72a (4 Acid Digest) Cert			1.74											
Oreas 72a (4 Acid Digest) Meas			1.64											
Oreas 72a (4 Acid Digest) Cert			1.74											
DNC-1a Meas	< 3	< 5		32	141		0.29			144		18	57	34
DNC-1a Cert	6.3	0.96		31	144		0.29			148		18.0	70	38.0
DNC-1a Meas	7	< 5		33	138		0.29			145		17	60	35
DNC-1a Cert	6.3	0.96		31	144		0.29			148		18.0	70	38.0
SBC-1 Meas	42	< 5		20	176		0.46	< 5	< 10	216	< 5	32	187	98
SBC-1 Cert	35.0	1.01		20.0	178.0		0.51	0.89	5.76	220.0	1.60	36.5	186	134.0
SBC-1 Meas	30	< 5		21	171		0.51	< 5	< 10	215	< 5	33	175	100
SBC-1 Cert	35.0	1.01		20.0	178.0		0.51	0.89	5.76	220.0	1.60	36.5	186	134.0
SdAR-M2 (U.S.G.S.) Meas	815			4	140				< 10	27	9	30	772	107
SdAR-M2 (U.S.G.S.) Cert	808			4.1	144				2.53	25.2	2.8	32.7	760	259
SdAR-M2 (U.S.G.S.) Meas	800			4	148				< 10	26	7	30	773	107

Analyte Symbol	Pb	Sb	S	Sc	Sr	Te	Ti	Tl	U	V	W	Y	Zn	Zr
Unit Symbol	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lower Limit	3	5	0.01	4	1	2	0.01	5	10	2	5	1	1	5
Method Code	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP	TD-ICP
SdAR-M2 (U.S.G.S.) Cert	808			4.1	144				2.53	25.2	2.8	32.7	760	259
OREAS 220 (Fire Assay) Meas														
OREAS 220 (Fire Assay) Cert														
OREAS 220 (Fire Assay) Meas														
OREAS 220 (Fire Assay) Cert														
OREAS 224 (Fire Assay) Meas														
OREAS 224 (Fire Assay) Cert														
OREAS 224 (Fire Assay) Meas														
OREAS 224 (Fire Assay) Cert														
[redacted]														
[redacted]														
Method Blank														
Method Blank	< 3	< 5	< 0.01	< 4	< 1	< 2	< 0.01	< 5	< 10	< 2	< 5	< 1	< 1	< 5
Method Blank	< 3	< 5	< 0.01	< 4	< 1	< 2	< 0.01	< 5	< 10	< 2	< 5	< 1	< 1	< 5
Method Blank	< 3	< 5	< 0.01	< 4	< 1	< 2	< 0.01	< 5	< 10	< 2	< 5	< 1	< 1	< 5
Method Blank	< 3	< 5	< 0.01	< 4	< 1	< 2	< 0.01	< 5	< 10	< 2	< 5	< 1	< 1	< 5
Method Blank	< 3	< 5	< 0.01	< 4	< 1	< 2	< 0.01	< 5	< 10	< 2	< 5	< 1	1	< 5
Method Blank	< 3	< 5	< 0.01	< 4	< 1	< 2	< 0.01	< 5	< 10	< 2	< 5	< 1	< 1	< 5
Method Blank	< 3	< 5	< 0.01	< 4	< 1	< 2	< 0.01	< 5	< 10	< 2	< 5	< 1	< 1	< 5
Method Blank														

ORE RESEARCH & EXPLORATION P/L ABN 28 006 859 856
37A Hosie Street · Bayswater North · VIC 3153 · AUSTRALIA
61 3 9729 0333 Fax 61 3 9729 8338
info@ore.com.au www.ore.com.au

CERTIFICATE OF ANALYSIS FOR

GOLD ORE

CERTIFIED REFERENCE MATERIAL

OREAS 215

Table 1. Certified Values, SD's, 95% Confidence and Tolerance Limits for OREAS 215

Constituent	Certified Value	1SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
Fire Assay						
Au, Gold (ppm)	3.54	0.097	3.51	3.57	3.53*	3.56*
Aqua Regia Digestion						
Au, Gold (ppm)	3.41	0.129	3.36	3.46	3.39†	3.42†

*Gold Tolerance Limits for typical 30g fire assay charge weight determined from 20 x 85mg NAA results and the Sampling Constant (Ingamells & Switzer, 1973);
†Gold Tolerance Limits for typical 25g aqua regia sample weight determined as above;
Please note: intervals may appear asymmetric due to rounding.

The homogeneity of OREAS 215 is of a level such that ***no sampling error exists*** for a conventional fire assay or aqua regia determination.

INTRODUCTION

OREAS reference materials are intended to provide a low cost method of evaluating and improving the quality of analysis of geological samples. To the geologist they provide a means of implementing quality control in analytical data sets generated in exploration from the grass roots level through to prospect evaluation, and in grade control at mining operations. To the analyst they provide an effective means of calibrating analytical equipment, assessing new techniques and routinely monitoring in-house procedures.

SOURCE MATERIALS

Certified Reference Material (CRM) OREAS 215 was prepared from a blend of Archean greenstone-hosted Wilber Lode primary ore from the Andy Well Gold Mine and barren Cambrian greenstone sourced from a quarry north of Melbourne, Australia. The Wilber Lode is a shear-hosted, narrow vein, quartz lode-style gold deposit situated within the Meekatharra-Wydgee greenstone belt in the Archean Yilgarn Craton of Western Australia. The common primary mineral assemblage, as stated by Mason and Harris (2011, 2012, cited in Hingston et al, 2014), is quartz, calcite, chlorite, fuchsite, pyrite, galena, sphalerite, chalcopyrite and gold. The host rock consists of a complex sequence of Archean meta-basalt and meta-porphyritic rocks derived from a primary mineralogy of albite, actinolite, chlorite, sericite, biotite, calcite, zoisite, muscovite, quartz and titanate. The Andy Well deposit is located approximately 45km north of Meekatharra in the Murchison region of Western Australia.

The approximate major and trace element composition of OREAS 215 is provided in Table 2. The non-certified values contained in this table are the means of duplicate assays from one laboratory.

Table 2. Approximate major and trace element data for OREAS 215.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Fire Assay								
Pd	ppb	*10*	Pt	ppb	*12*			
Borate Fusion ICP								
Al	wt.%	*6.42*	Ho	ppm	*0.64*	Sn	ppm	*1.00*
Ba	ppm	*179*	K	wt.%	*0.423*	Sr	ppm	*85*
Ca	wt.%	*5.81*	La	ppm	*4.70*	Ta	ppm	*0.20*
Ce	ppm	*10.8*	Lu	ppm	*0.29*	Tb	ppm	*0.48*
Cr	ppm	*342*	Mg	wt.%	*4.39*	Th	ppm	*0.94*
Cs	ppm	*0.36*	Mn	wt.%	*0.116*	Ti	wt.%	*0.480*
Dy	ppm	*2.92*	Na	wt.%	*1.84*	Tm	ppm	*0.28*
Er	ppm	*1.81*	Nb	ppm	*3.10*	TOT_ICP	wt.%	*100.62*
Eu	ppm	*0.73*	Nd	ppm	*6.95*	U	ppm	*0.26*
Fe	wt.%	*6.86*	P	wt.%	*0.033*	V	ppm	*246*
Ga	ppm	*14.1*	Pr	ppm	*1.45*	W	ppm	*6.00*
Gd	ppm	*2.60*	Rb	ppm	*13.3*	Y	ppm	*16.6*
Ge	ppm	*< 5*	Si	wt.%	*25.43*	Yb	ppm	*1.78*
Hf	ppm	*1.55*	Sm	ppm	*1.92*	Zr	ppm	*61*
Thermogravimetry								
LOI^{1000}	wt.%	*4.77*						

Table 2 continued.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Infrared Combustion								
C	wt.%	*0.470*	S	wt.%	*0.410*			
4-Acid Digestion								
Ag	ppm	*0.650*	Li	ppm	*20.0*	Sc	ppm	*35.0*
Cd	ppm	*0.60*	Mo	ppm	*< 1*	Zn	ppm	*81*
Co	ppm	*40.0*	Ni	ppm	*141*			
Cu	ppm	*145*	Pb	ppm	*16.5*			
Aqua Regia Digestion								
As	ppm	*32.8*	In	ppm	*0.023*	Se	ppm	*0.80*
Bi	ppm	*0.33*	Re	ppm	*0.002*	Te	ppm	*0.17*
Hg	ppm	*0.074*	Sb	ppm	*0.32*	Tl	ppm	*0.060*

COMMINUTION AND HOMOGENISATION PROCEDURES

The material constituting OREAS 215 was prepared in the following manner:

- drying to constant mass at 105°C;
- crushing and milling of the barren material to 95% minus 75 microns;
- crushing and milling of the ore material to 100% minus 30 microns;
- blending in appropriate proportions to achieve the desired grade;
- packaging in 60 and 100g units sealed in laminated foil pouches and 1kg units in plastic jars.

ANALYTICAL PROGRAM

Thirty-three commercial analytical laboratories participated in the program to certify gold (as reported in Table 1) by the following methods:

- Gold via 25-40g fire assay with AAS (25 labs) or ICP-OES (7 labs) finish;
- Instrumental neutron activation analysis for Au on 20 x 85mg subsamples to confirm homogeneity (1 laboratory).
- Gold via 15-50g aqua regia digestion with ICP-MS (11 labs), AAS (7 labs) or ICP-OES (1 lab) finish.

For the round robin program, twenty 1.4kg test units were taken at predetermined intervals during the bagging stage, immediately following homogenisation and are considered representative of the entire batch. The six samples received by each laboratory were obtained by taking two 120g scoop splits from each of three separate 1.4kg test units. This format enabled a nested Analysis of Variance (ANOVA) treatment of the results to evaluate homogeneity, i.e. to ascertain whether between-unit variance is greater than within-unit variance. Table 1 presents the certified values together with their associated 1SD's, 95% confidence and tolerance limits. Table 2 provides indicative major and trace element data and Table 3 shows the gold neutron activation analysis (NAA) results for twenty 85mg subsamples determined by the Australian Nuclear Science & Technology Organisation (ANSTO) located in Lucas Heights, NSW, Australia. Table 4 provides

performance gate intervals for the certified values of each method group based on their pooled 1SD's. Tabulated results of all elements (including Au NAA analyses) together with uncorrected means, medians, standard deviations, relative standard deviations and percent deviation of lab means from the corrected mean of means (PDM[3]) are presented in the detailed certification data for this CRM (**OREAS 215 Datapack.xlsx**).

Table 3. Neutron Activation Analysis of Au on 20 x 85mg subsamples.

Replicate No	NAA 0.09g
1	3.63
2	3.70
3	3.58
4	3.57
5	3.55
6	3.53
7	3.71
8	3.80
9	3.69
10	3.72
11	3.75
12	3.65
13	3.62
14	3.66
15	3.63
16	3.70
17	3.72
18	3.66
19	3.51
20	3.58
Mean	3.65
Median	3.66
Std Dev.	0.078
Rel.Std.Dev.	2.13%
PDM[3]	2.95%

STATISTICAL ANALYSIS

Certified Values, Confidence Limits, Standard Deviations and Tolerance Limits (Table 1) have been determined for gold by two methods: fire assay and aqua regia digestion. These statistics were calculated following the removal of individual, laboratory dataset (batch) and 3SD outliers (single iteration). For individual outliers within a laboratory batch the z-score test is used in combination with a second method that determines the per cent deviation of the individual value from the batch median. Outliers in general are selected on the basis of z-scores > 2.5 and with per cent deviations (i) > 3 and (ii) more than three times the average absolute per cent deviation for the batch. In certain instances statistician's prerogative has been employed in discriminating outliers. Each laboratory data set mean is tested for outlying status based on z-score discrimination and rejected if > 2.5. After individual and laboratory data set (batch) outliers have been eliminated a non-iterative 3 standard deviation filter is applied, with those values lying outside this window also relegated to outlying status.

Certified Values are the means of accepted laboratory means after outlier filtering. The NAA data is omitted from determination of the certified value for gold and is used solely for the calculation of Tolerance Limits and homogeneity evaluation of OREAS 215.

95% Confidence Limits are inversely proportional to the number of participating laboratories and inter-laboratory agreement. It is a measure of the reliability of the certified value. A 95% confidence interval indicates a 95% probability that the true value of the analyte under consideration lies between the upper and lower limits. *95% Confidence Limits should not be used as control limits for laboratory performance.*

Standard Deviation values (1SDs) are reported in Table 1 and provide an indication of a level of performance that might reasonably be expected from a laboratory being monitored by this CRM in a QA/QC program. The SD's take into account errors attributable to measurement uncertainty and CRM variability. For an effective CRM the contribution of the latter should be negligible in comparison to measurement errors. The SD values thus include all sources of measurement uncertainty: between-lab variance, within-run variance (precision errors) and CRM variability. OREAS prepared reference materials have a level of homogeneity such that the observed variance from repeated analysis has its origin almost exclusively in the analytical process rather than the reference material itself.

The SD for each analyte's certified value is calculated from the same filtered data set used to determine the certified value, i.e. after removal of any individual, lab dataset (batch) and 3SD outliers (single iteration). These outliers can only be removed after the absolute homogeneity of the CRM has been independently established, i.e. the outliers must be confidently deemed to be analytical rather than arising from inhomogeneity of the CRM. **The standard deviation is then calculated for each analyte from the pooled accepted analyses generated from the certification program.**

In the application of SD's in monitoring performance it is important to note that not all laboratories function at the same level of proficiency and that different methods in use at a particular laboratory have differing levels of precision. Each laboratory has its own inherent SD (for a specific concentration level and analyte-method pair) based on the analytical process and this SD is not directly related to the round robin program.

The majority of data generated in the round robin program was produced by a selection of world class laboratories. The SD's thus generated are more constrained than those that would be produced across a randomly selected group of laboratories. To produce more generally achievable SD's the 'pooled' SD's provided in this report include inter-lab bias. This 'one size fits all' approach may require revision at the discretion of the QC manager concerned following careful scrutiny of QC control charts.

Table 4 shows **Performance Gates** calculated for two and three standard deviations. As a guide these intervals may be regarded as warning or rejection for multiple 2SD outliers, or rejection for individual 3SD outliers in QC monitoring, although their precise application should be at the discretion of the QC manager concerned. A second method utilises a 5% window calculated directly from the certified value. Standard deviation is also shown in relative percent for one, two and three relative standard deviations (1RSD, 2RSD and 3RSD) to facilitate an appreciation of the magnitude of these numbers and a comparison with the 5% window. Caution should be exercised when concentration levels approach lower limits of detection of the analytical methods employed as performance gates calculated from standard deviations tend to be excessively wide whereas those determined by the 5% method are too narrow.

Table 4. Performance Gates for OREAS 215.

Constituent	Certified Value	Absolute Standard Deviations					Relative Standard Deviations			5% window	
		1SD	2SD Low	2SD High	3SD Low	3SD High	1RSD	2RSD	3RSD	Low	High
Fire Assay											
Au, ppm	3.54	0.097	3.35	3.74	3.25	3.83	2.72%	5.45%	8.17%	3.37	3.72
Aqua Regia Digestion											
Au, ppm	3.41	0.129	3.15	3.67	3.02	3.80	3.79%	7.58%	11.37%	3.24	3.58

Tolerance Limits (ISO Guide 3207) were determined by NAA using the reduced analytical subsample method which utilises the known relationship between standard deviation and analytical subsample weight (Ingamells and Switzer, 1973). In this approach the sample aliquot is substantially reduced to a point where most of the variability in replicate assays should be due to inhomogeneity of the reference material and measurement error becomes negligible. In this instance a subsample weight of 85 milligrams was employed and the 1RSD (across the twenty subsamples) of 2.13%, or 0.11% at a conventional 30g fire assay charge weight, confirms the exceptional level of gold homogeneity in OREAS 215. The homogeneity is of a level such that ***no sampling error exists*** for a conventional fire assay or aqua regia determination.

The meaning of tolerance limits may be illustrated for gold by fire assay, where 99% of the time (1-α=0.99) at least 95% of subsamples (ρ=0.95) will have concentrations lying between 3.53 and 3.56ppm. Put more precisely, this means that if the same number of subsamples were taken and analysed in the same manner repeatedly, 99% of the tolerance intervals so constructed would cover at least 95% of the total population, and 1% of the tolerance intervals would cover less than 95% of the total population (ISO Guide 35).

The homogeneity of OREAS 215 has also been evaluated in a **nested ANOVA** of the round robin program. Each of the thirty-three round robin laboratories received six samples per CRM and these samples were made up of paired samples from three different, non-adjacent sampling intervals. The purpose of the ANOVA evaluation is to test that no statistically significant difference exists in the variance between-units to that of the variance within-units. This allows an assessment of homogeneity across the entire prepared batch of OREAS 215. The test was performed using the following parameters:

- Gold Fire Assay – 192 samples (32 laboratories each providing analyses on 3 pairs of samples);
- Aqua Regia Digestion – 114 samples (19 laboratories each providing analyses on 3 pairs of samples);
- Significance Level α = P (type I error) = 0.05;
- Null Hypothesis, H_0: Between-unit variance is no greater than within-unit variance (reject H_0 if *p*-value < 0.05);
- Alternative Hypothesis, H_1: Between-unit variance is greater than within-unit variance.

P-values are a measure of probability where values less than 0.05 indicate a greater than 95% probability that the observed differences in within-unit and between-unit variances are real. The dataset was filtered for both individual and laboratory data set (batch) outliers prior to the calculation of the *p*-value. This process derived *p*-values of 0.97 for Au by fire assay

and 0.99 for Au by aqua regia digestion. Both p-values are insignificant and the Null Hypothesis is retained.

It is important to note that ANOVA is not an absolute measure of homogeneity. Rather, it establishes whether or not the analytes are distributed in a similar manner throughout the packaging run of OREAS 215 and whether the variance between two subsamples from the same unit is statistically distinguishable to the variance from two subsamples taken from any two separate units. A reference material therefore, can possess poor absolute homogeneity yet still pass a relative homogeneity test if the within-unit heterogeneity is large and similar across all units.

Based on the statistical analysis of the results of the inter-laboratory certification program it can be concluded that OREAS 215 is fit-for-purpose as a certified reference material (see 'Intended Use' below).

PARTICIPATING LABORATORIES

1. Actlabs, Ancaster, Ontario, Canada
2. ALS, Brisbane, QLD, Australia
3. ALS, Johannesburg, South Africa
4. ALS, Lima, Peru
5. ALS, Loughrea, Galway, Ireland
6. ALS, Perth, WA, Australia
7. ALS, Reno, Nevada, USA
8. ALS, Vancouver, BC, Canada
9. American Assay Laboratories, Sparks, Nevada, USA
10. ANSTO, Lucas Heights, NSW, Australia
11. Bureau Veritas Commodities Canada Ltd, Vancouver, BC, Canada
12. Bureau Veritas Geoanalytical, Adelaide, SA, Australia
13. Bureau Veritas Geoanalytical, Perth, WA, Australia
14. Bureau Veritas Minerals, Santiago, Chile
15. Inspectorate America Corporation (BV), Sparks, Nevada, USA
16. Inspectorate de Mexico (BV), S.A. de C.V., Hermosillo, Sonora, Mexico
17. Intertek Genalysis, Adelaide, SA, Australia
18. Intertek Genalysis, Perth, WA, Australia
19. Intertek Testing Services, Cupang, Muntinlupa, Philippines
20. Intertek Testing Services, Hidden Valley, Wau, PNG
21. Intertek Testing Services, Shunyi, Beijing, China
22. McClelland Laboratories Inc., Sparks, Nevada, USA
23. Ok Tedi Mine Lab, Mt Fubilan, Western Province, PNG
24. PT Geoservices Ltd, Cikarang, Jakarta Raya, Indonesia
25. PT Intertek Utama Services, Jakarta Timur, DKI Jakarta, Indonesia
26. SGS Australia Mineral Services, Perth (Newburn), WA, Australia
27. SGS Canada Inc., Vancouver, BC, Canada
28. SGS del Peru, Lima, Peru
29. SGS Geosol Laboratorios Ltda, Vespasiano, Minas Gerais, Brazil
30. SGS Lakefield Research Ltd, Lakefield, Ontario, Canada
31. SGS Mineral Services, Townsville, QLD, Australia
32. SGS South Africa Pty Ltd, Booysens, Gauteng, South Africa
33. Skyline, Sparks, Nevada, USA
34. TSL Laboratories Inc., Saskatoon, Saskatchewan, Canada

PREPARER AND SUPPLIER OF THE REFERENCE MATERIAL

Reference material OREAS 215 has been prepared, certified and is supplied by:

ORE Research & Exploration Pty Ltd	Tel: +613-9729 0333
37A Hosie Street	Fax: +613-9729 8338
Bayswater North VIC 3153	Web: www.ore.com.au
AUSTRALIA	Email: info@ore.com.au

It is available in unit sizes of 60 and 100g (single-use laminated foil pouches) and 1kg (plastic jars).

INTENDED USE

OREAS 215 is intended for the following uses:

- for the monitoring of laboratory performance in the analysis of gold by fire assay and aqua regia digestion in geological samples;
- for the verification of gold fire assay and aqua regia digestion methods;
- for the calibration of instruments used in the determination of gold.

STABILITY AND STORAGE INSTRUCTIONS

OREAS 215 has been prepared from primary gold ore diluted with barren greenstone. It is low in reactive sulphide (~0.4 wt.%) and in its unopened state and under normal conditions of storage has a shelf life beyond ten years. Its stability will be monitored at regular intervals and purchasers notified if any changes are observed.

INSTRUCTIONS FOR CORRECT USE

The certified values for OREAS 215 refer to the concentration level in its packaged state. It should not be dried prior to weighing and analysis.

HANDLING INSTRUCTIONS

Fine powders pose a risk to eyes and lungs and therefore standard precautions such as the use of safety glasses and dust masks are advised.

TRACEABILITY

The analytical samples were selected in a manner to represent the entire batch of prepared CRM. This ‘representivity’ was maintained in each submitted laboratory sample batch and ensures the user that the data is traceable from sample selection through to the analytical results that underlie the consensus values. Each analytical data set has been validated by its assayer through the inclusion of internal reference materials and QC checks during analysis. The laboratories were chosen on the basis of their competence

(from past performance in inter-laboratory programs) for a particular analytical method, analyte or analyte suite, and sample matrix. Most of these laboratories have and maintain ISO 17025 accreditation. The certified values presented in this report are calculated from the means of accepted data following robust statistical treatment as detailed in this report.

LEGAL NOTICE

Ore Research & Exploration Pty Ltd has prepared and statistically evaluated the property values of this reference material to the best of its ability. The Purchaser by receipt hereof releases and indemnifies Ore Research & Exploration Pty Ltd from and against all liability and costs arising from the use of this material and information.

QMS ACCREDITED

ORE Pty Ltd is accredited to ISO 9001:2008 by Lloyd's Register Quality Assurance Ltd for its quality management system including development, manufacturing, certification and supply of CRMs.

CERTIFYING OFFICER

Craig Hamlyn (B.Sc. Hons - Geology), Technical Manager - ORE P/L

REFERENCES

Ingamells, C. O. and Switzer, P. (1973), Talanta 20, 547-568.
ISO Guide 30 (1992), Terms and definitions used in connection with reference materials.
ISO Guide 31 (2000), Reference materials – Contents of certificates and labels.
ISO Guide 3207 (1975), Statistical interpretation of data - Determination of a statistical tolerance interval.
ISO Guide 35 (2006), Certification of reference materials - General and statistical principals.

OREAS
Certified Reference Materials

ORE RESEARCH & EXPLORATION P/L ABN 28 006 859 856
37A Hosie Street · Bayswater North · VIC 3153 · AUSTRALIA
61 3 9729 0333 Fax 61 3 9729 8338
info@ore.com.au www.ore.com.au

CERTIFICATE OF ANALYSIS FOR

GOLD ORE

CERTIFIED REFERENCE MATERIAL

OREAS 218

Table 1. Certified Values, SD's, 95% Confidence and Tolerance Limits for OREAS 218.

Constituent	Certified Value	1SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
Pb Fire Assay						
Au, Gold (ppm)	0.531	0.017	0.526	0.536	0.508*	0.554*
Aqua Regia Digestion						
Au, Gold (ppm)	0.524	0.020	0.516	0.532	0.499†	0.549†
Gas / Liquid Pycnometry						
SG, Specific Gravity (Unity)	3.01	0.059	2.98	3.04	2.98	3.04

*Gold Tolerance Limits for typical 30g fire assay charge weight determined from 20 x 1g INAA results and the Sampling Constant (Ingamells & Switzer, 1973);
†Gold Tolerance Limits for typical 25g aqua regia sample weight determined as above;
Please note: intervals may appear asymmetric due to rounding.

The homogeneity of OREAS 218 is of a level such that ***sampling error is minor*** for a conventional fire assay or aqua regia determination.

INTRODUCTION

OREAS reference materials are intended to provide a low cost method of evaluating and improving the quality of analysis of geological samples. To the geologist they provide a means of implementing quality control in analytical data sets generated in exploration from the grass roots level through to prospect evaluation, and in grade control at mining operations. To the analyst they provide an effective means of calibrating analytical equipment, assessing new techniques and routinely monitoring in-house procedures.

SOURCE MATERIALS

Certified Reference Material (CRM) OREAS 218 was prepared from a blend of Archean greenstone-hosted Wilber Lode primary ore from the Andy Well Gold Mine and barren Cambrian greenstone sourced from a quarry north of Melbourne, Australia. The Wilber Lode is a shear-hosted, narrow vein, quartz lode-style gold deposit situated within the Meekatharra-Wydgee greenstone belt in the Archean Yilgarn Craton of Western Australia. The common primary mineral assemblage, as stated by Mason and Harris (2011, 2012, cited in Hingston et al, 2014), is quartz, calcite, chlorite, fuchsite, pyrite, galena, sphalerite, chalcopyrite and gold. The host rock consists of a complex sequence of Archean meta-basalt and meta-porphyritic rocks derived from a primary mineralogy of albite, actinolite, chlorite, sericite, biotite, calcite, zoisite, muscovite, quartz and titanate. The Andy Well deposit is located approximately 45km north of Meekatharra in the Murchison region of Western Australia.

The approximate major and trace element composition of OREAS 218 is provided in Table 2. The non-certified values contained in this table are the means of duplicate assays from one laboratory.

COMMINUTION AND HOMOGENISATION PROCEDURES

The material constituting OREAS 218 was prepared in the following manner:

- drying to constant mass at 105°C;
- crushing and milling of the barren material to 98% minus 75 microns;
- crushing and milling of the ore material to 100% minus 30 microns;
- blending in appropriate proportions to achieve the desired grade;
- packaging in 60g units sealed in laminated foil pouches and 1kg units in plastic jars.

ANALYTICAL PROGRAM

Thirty commercial analytical laboratories participated in the program to certify gold (as reported in Table 1) by the following methods:

- Gold via 10-50g fire assay with AAS (24 labs) or ICP-OES (6 labs) finish;
- Instrumental neutron activation analysis for Au on 20 x 1g subsamples to confirm homogeneity (1 laboratory).
- Gold via 15-50g aqua regia digestion with ICP-MS (12 labs), AAS (8 labs) or ICP-OES (1 lab) finish. It is important to note that in the analytical industry there is no

standardisation of the aqua regia digestion process. Aqua regia is a partial empirical digest and differences in recoveries for various analytes are commonplace. These are caused by variations in the digest conditions which can include the ratio of nitric to hydrochloric acids, acid strength, temperatures, leach times and secondary digestions.

- Specific gravity by gas (15 labs) or liquid (4 labs) pycnometry.

For the round robin program twenty 1.5kg test units were taken at predetermined intervals during the bagging stage, immediately following final blending, and are considered representative of the entire batch. The six samples received by each laboratory were obtained by taking two 110g scoop splits from each of three separate 1kg test units. This format enabled nested ANOVA treatment of the results to evaluate homogeneity, i.e. to ascertain whether between-unit variance is greater than within-unit variance. Table 1 presents the certified values together with their associated 1SD's, 95% confidence and tolerance limits and Table 2 shows 66 indicative values for major and trace element composition. Gold homogeneity has been evaluated and confirmed by instrumental neutron activation analysis (INAA) on twenty 1 gram sample portions (see Table 3 below) and by a nested ANOVA program for both fire assay and aqua regia digestion (see '**nested ANOVA**' section). Table 4 provides performance gate intervals for the certified values based on their pooled 1SD's. Tabulated results of all elements (including Au INAA analyses) together with uncorrected means, medians, standard deviations, relative standard deviations and percent deviation of lab means from the corrected mean of means (PDM[3]) are presented in the detailed certification data for this CRM (**OREAS 218 DataPack.xlsx**).

Table 2. Approximate major and trace element data for OREAS 218.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Pb Fire Assay								
Pd	ppb	*8.33*	Pt	ppb	*10.0*			
Borate Fusion XRF								
Al_2O_3	wt.%	*13.50*	K_2O	wt.%	*0.233*	P_2O_5	wt.%	*0.103*
CaO	wt.%	*10.10*	MgO	wt.%	*7.10*	S	wt.%	*0.144*
Cl	ppm	*10.0*	MnO	wt.%	*0.190*	SiO_2	wt.%	*49.20*
Fe_2O_3	wt.%	*12.05*	Na_2O	wt.%	*2.90*	TiO_2	wt.%	*1.12*
Thermogravimetry								
LOI^{1000}	wt.%	*3.16*						
Laser Ablation								
Ag	ppm	*0.150*	Hf	ppm	*1.67*	Sm	ppm	*2.60*
As	ppm	*4.60*	Ho	ppm	*0.83*	Sn	ppm	*1.20*
Ba	ppm	*144*	In	ppm	*0.038*	Sr	ppm	*113*
Be	ppm	*0.40*	La	ppm	*3.74*	Ta	ppm	*0.18*
Bi	ppm	*0.060*	Lu	ppm	*0.36*	Tb	ppm	*0.57*
Cd	ppm	*0.10*	Mn	wt.%	*0.147*	Te	ppm	*< 0.2*
Ce	ppm	*9.72*	Mo	ppm	*1.00*	Th	ppm	*0.34*
Co	ppm	*48.3*	Nb	ppm	*3.36*	Ti	wt.%	*0.640*
Cr	ppm	*203*	Nd	ppm	*7.64*	Tl	ppm	*< 0.2*
Cs	ppm	*0.18*	Ni	ppm	*99*	Tm	ppm	*0.33*

Note: the number of significant figures reported is not a reflection of the level of certainty of stated values. They are instead an artefact of ORE's in-house CRM-specific LIMS.

Table 2 continued.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Laser Ablation continued								
Cu	ppm	*152*	Pb	ppm	*2.50*	U	ppm	*0.013*
Dy	ppm	*3.92*	Pr	ppm	*1.53*	V	ppm	*304*
Er	ppm	*2.38*	Rb	ppm	*3.68*	W	ppm	*1.13*
Eu	ppm	*0.99*	Re	ppm	*0.008*	Y	ppm	*21.7*
Ga	ppm	*14.9*	Sb	ppm	*0.45*	Yb	ppm	*2.48*
Gd	ppm	*2.84*	Sc	ppm	*42.0*	Zn	ppm	*85*
Ge	ppm	*1.45*	Se	ppm	*< 5*	Zr	ppm	*60*

Note: the number of significant figures reported is not a reflection of the level of certainty of stated values. They are instead an artefact of ORE's in-house CRM-specific LIMS.

STATISTICAL ANALYSIS

Certified Values, Confidence Limits, Standard Deviations and Tolerance Limits (Table 1) have been determined for each analyte following removal of individual, laboratory dataset (batch) and 3SD outliers (single iteration). For individual outliers within a laboratory batch the z-score test is used in combination with a second method that determines the per cent deviation of the individual value from the batch median. Outliers in general are selected on the basis of z-scores > 2.5 and with per cent deviations (i) > 3 and (ii) more than three times the average absolute per cent deviation for the batch. In certain instances statistician's prerogative has been employed in discriminating outliers. Each laboratory data set mean is tested for outlying status based on z-score discrimination and rejected if > 2.5. After individual and laboratory data set (batch) outliers have been eliminated a non-iterative 3 standard deviation filter is applied, with those values lying outside this window also relegated to outlying status.

Certified Values are the means of accepted laboratory means after outlier filtering. The INAA data (see Table 3) is omitted from determination of the certified value for Au and is used solely for the calculation of Tolerance Limits and homogeneity evaluation of OREAS 218.

95% Confidence Limits are inversely proportional to the number of participating laboratories and inter-laboratory agreement. It is a measure of the reliability of the certified value. A 95% confidence interval indicates a 95% probability that the true value of the analyte under consideration lies between the upper and lower limits. *95% Confidence Limits should not be used as control limits for laboratory performance.*

Indicative (uncertified) values (Table 2) are provided for the major and trace elements determined by borate fusion XRF (Al_2O_3 to TiO_2) and laser ablation with ICP-MS (Ag to Zr) and are the means of duplicate assays from Bureau Veritas, Perth. Additional indicative values by other analytical methods are present where the number of laboratories reporting a particular analyte is insufficient (< 5) to support certification or where inter-laboratory consensus is poor.

Standard Deviation values (1SDs) are reported in Table 1 and provide an indication of a level of performance that might reasonably be expected from a laboratory being monitored by this CRM in a QA/QC program. The SD's take into account errors attributable to measurement uncertainty and CRM variability. For an effective CRM the contribution of

the latter should be negligible in comparison to measurement errors. The SD values thus include all sources of measurement uncertainty: between-lab variance, within-run variance (precision errors) and CRM variability. OREAS prepared reference materials have a level of homogeneity such that the observed variance from repeated analysis has its origin almost exclusively in the analytical process rather than the reference material itself.

The SD for each analyte's certified value is calculated from the same filtered data set used to determine the certified value, i.e. after removal of any individual, lab dataset (batch) and 3SD outliers (single iteration). These outliers can only be removed after the absolute homogeneity of the CRM has been independently established, i.e. the outliers must be confidently deemed to be analytical rather than arising from inhomogeneity of the CRM. **The standard deviation is then calculated for each analyte from the pooled accepted analyses generated from the certification program.**

In the application of SD's in monitoring performance it is important to note that not all laboratories function at the same level of proficiency and that different methods in use at a particular laboratory have differing levels of precision. Each laboratory has its own inherent SD (for a specific concentration level and analyte-method pair) based on the analytical process and this SD is not directly related to the round robin program.

The majority of data generated in the round robin program was produced by a selection of world class laboratories. The SD's thus generated are more constrained than those that would be produced across a randomly selected group of laboratories. To produce more generally achievable SD's the 'pooled' SD's provided in this report include inter-lab bias. This 'one size fits all' approach may require revision at the discretion of the QC manager concerned following careful scrutiny of QC control charts.

Table 4 shows **Performance Gates** calculated for two and three standard deviations. As a guide these intervals may be regarded as warning or rejection for multiple 2SD outliers, or rejection for individual 3SD outliers in QC monitoring, although their precise application should be at the discretion of the QC manager concerned. A second method utilises a 5% window calculated directly from the certified value. Standard deviation is also shown in relative percent for one, two and three relative standard deviations (1RSD, 2RSD and 3RSD) to facilitate an appreciation of the magnitude of these numbers and a comparison with the 5% window. Caution should be exercised when concentration levels approach lower limits of detection of the analytical methods employed as performance gates calculated from standard deviations tend to be excessively wide whereas those determined by the 5% method are too narrow.

Tolerance Limits (ISO Guide 3207) were determined by INAA using the reduced analytical subsample method that utilises the known relationship between standard deviation and analytical subsample weight (Ingamells and Switzer, 1973). In this approach the sample aliquot is substantially reduced to a point where most of the variability in replicate assays should be due to inhomogeneity of the reference material (a sampling error is thereby induced) and measurement error becomes negligible.

In this instance a subsample weight of 1 gram was employed and the 1RSD of 1.35% calculated for a 30g fire assay or aqua regia sample (7.22% at 1g weight) confirms the high level of gold homogeneity in OREAS 218. The homogeneity is of a level such that ***sampling error is minor*** for a conventional fire assay or aqua regia determination.

Please note that these RSD's and tolerance limits pertain to the homogeneity of the CRM only and should not be used as control limits for laboratory performance.

Table 3. Instrumental Neutron Activation Analysis of Au (ppm) on 20 x 1g subsamples.

Replicate No	INAA 1g
1	0.489
2	0.545
3	0.522
4	0.465
5	0.506
6	0.506
7	0.536
8	0.541
9	0.534
10	0.475
11	0.516
12	0.468
13	0.566
14	0.506
15	0.588
16	0.579
17	0.542
18	0.521
19	0.503
20	0.598
Mean	0.525
Median	0.522
Std Dev.	0.038
Rel.Std.Dev.	7.22%
PDM[3]	-1.10%

The meaning of tolerance limits may be illustrated for gold by fire assay, where 99% of the time (1-α=0.99) at least 95% of subsamples (ρ=0.95) will have concentrations lying between 0.508 and 0.554ppm. Put more precisely, this means that if the same number of subsamples were taken and analysed in the same manner repeatedly, 99% of the tolerance intervals so constructed would cover at least 95% of the total population, and 1% of the tolerance intervals would cover less than 95% of the total population (ISO Guide 35).

The gold homogeneity of OREAS 218 has also been evaluated in a **nested ANOVA** of the round robin program. Each of the thirty round robin laboratories received six samples per CRM and these samples were made up of paired samples from three different, non-adjacent sampling intervals. The purpose of the ANOVA evaluation is to test that no statistically significant difference exists in the variance between-units to that of the variance within-units. This allows an assessment of homogeneity across the entire prepared batch of OREAS 218. The test was performed using the following parameters:

- Gold fire assay – 174 samples (29 laboratories each providing analyses on 3 pairs of samples);
- Gold aqua regia digestion – 126 samples (21 laboratories each providing analyses on 3 pairs of samples);

- Null Hypothesis, H_0: Between-unit variance is no greater than within-unit variance (reject H_0 if *p*-value < 0.05);
- Alternative Hypothesis, H_1: Between-unit variance is greater than within-unit variance.

P-values are a measure of probability where values less than 0.05 indicate a greater than 95% probability that the observed differences in within-unit and between-unit variances are real. The dataset was filtered for both individual and laboratory data set (batch) outliers prior to the calculation of the *p*-value. This process derived *p*-values of 1.00 for Au by fire assay and 0.99 for Au by aqua regia digestion. Both p-values are insignificant and the Null Hypothesis is retained.

It is important to note that ANOVA is not an absolute measure of homogeneity. Rather, it establishes whether or not the analytes are distributed in a similar manner throughout the packaging run of OREAS 218 and whether the variance between two subsamples from the same unit is statistically distinguishable to the variance from two subsamples taken from any two separate units. A reference material therefore, can possess poor absolute homogeneity yet still pass a relative homogeneity test if the within-unit heterogeneity is large and similar across all units.

Based on the statistical analysis of the results of the inter-laboratory certification program it can be concluded that OREAS 218 is fit-for-purpose as a certified reference material (see 'Intended Use' below).

Table 4. Performance Gates for OREAS 218.

Constituent	Certified Value	Absolute Standard Deviations					Relative Standard Deviations			5% window	
		1SD	2SD Low	2SD High	3SD Low	3SD High	1RSD	2RSD	3RSD	Low	High
Pb Fire Assay											
Au, ppm	0.531	0.017	0.497	0.565	0.480	0.582	3.21%	6.41%	9.62%	0.505	0.558
Aqua Regia Digestion											
Au, ppm	0.524	0.020	0.484	0.564	0.464	0.584	3.85%	7.69%	11.54%	0.498	0.550
Gas / Liquid Pycnometry											
SG, Unity	3.01	0.059	2.89	3.13	2.83	3.19	1.96%	3.93%	5.89%	2.86	3.16

PARTICIPATING LABORATORIES

1. Actlabs, Ancaster, Ontario, Canada
2. Actlabs, Coquimbo, Curarta, Chile
3. ALS, Brisbane, QLD, Australia
4. ALS, Lima, Peru
5. ALS, Loughrea, Galway, Ireland
6. ALS, Perth, WA, Australia
7. ALS, Vancouver, BC, Canada
8. American Assay Laboratories, Sparks, Nevada, USA
9. Bureau Veritas Commodities Canada Ltd, Vancouver, BC, Canada

10. Bureau Veritas Geoanalytical, Adelaide, SA, Australia
11. Bureau Veritas Geoanalytical, Perth, WA, Australia
12. Bureau Veritas Kalassay, Kalgoorlie, WA, Australia
13. Bureau Veritas Minerals, Hermosillo, Sonora, Mexico
14. Bureau Veritas, Abidjan, Cote D'ivoire
15. Intertek Genalysis, Perth, WA, Australia
16. Intertek Testing Services, Cupang, Muntinlupa, Philippines
17. Kinross Brasil Mineração, Paracatu, Minas Gerais, Brazil
18. McClelland Laboratories Inc., Sparks, Nevada, USA
19. MinAnalytical Services, Perth, WA, Australia
20. Nagrom, Perth, WA, Australia
21. Newcrest Laboratory Services, Orange, NSW, Australia
22. PT Geoservices Ltd, Cikarang, Jakarta Raya, Indonesia
23. PT Intertek Utama Services, Jakarta Timur, DKI Jakarta, Indonesia
24. SGS Australia Mineral Services, Perth, WA, Australia
25. SGS del Peru, Lima, Peru
26. SGS Lakefield Research Ltd, Lakefield, Ontario, Canada
27. SGS Mineral Services, Townsville, QLD, Australia
28. SGS, Randfontein, Gauteng, South Africa
29. Shiva Analyticals Ltd, Bangalore North, Karnataka, India
30. Sucofindo Mineral Lab, Cibitung, West Java, Indonesia

PREPARER AND SUPPLIER

Certified reference material OREAS 218 is prepared, certified and supplied by:

ORE RESEARCH & EXPLORATION

ORE Research & Exploration Pty Ltd
37A Hosie Street
Bayswater North VIC 3153
AUSTRALIA

Tel: +613-9729 0333
Fax: +613-9729 8338
Web: www.ore.com.au
Email: info@ore.com.au

It is available in unit sizes of 60 and 100g (single-use laminated foil pouches) and 1kg (plastic jars).

INTENDED USE

OREAS 218 is intended for the following uses:

- for the monitoring of laboratory performance in the analysis of gold by fire assay, gold by aqua regia digestion and specific gravity by pycnometry in geological samples;
- for the verification of analytical methods (gold fire assay, gold aqua regia digestion and specific gravity by pycnometry);
- for the calibration of instruments used in the determination of gold or specific gravity.

STABILITY AND STORAGE INSTRUCTIONS

OREAS 218 has been prepared from primary gold ore diluted with barren greenstone. It is low in reactive sulphide (~0.14 wt.% S) and in its unopened state and under normal conditions of storage has a shelf life beyond ten years. Its stability will be monitored at regular intervals and purchasers notified if any changes are observed.

INSTRUCTIONS FOR CORRECT USE

The certified values for OREAS 218 refer to the concentration level in its packaged state. It should not be dried prior to weighing and analysis.

HANDLING INSTRUCTIONS

Fine powders pose a risk to eyes and lungs and therefore standard precautions such as the use of safety glasses and dust masks are advised.

TRACEABILITY

The analytical samples were selected in a manner to represent the entire batch of prepared CRM. This 'representivity' was maintained in each submitted laboratory sample batch and ensures the user that the data is traceable from sample selection through to the analytical results that underlie the consensus values. Each analytical data set has been validated by its assayer through the inclusion of internal reference materials and QC checks during analysis. The laboratories were chosen on the basis of their competence (from past performance in inter-laboratory programs) for a particular analytical method, analyte or analyte suite, and sample matrix. Most of these laboratories have and maintain ISO 17025 accreditation. The certified values presented in this report are calculated from the means of accepted data following robust statistical treatment as detailed in this report.

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QMS ACCREDITED

ORE Pty Ltd is accredited to ISO 9001:2008 by Lloyd's Register Quality Assurance Ltd for its quality management system including development, manufacturing, certification and supply of CRMs.

CERTIFYING OFFICER

Craig Hamlyn (B.Sc. Hons - Geology), Technical Manager - ORE P/L

REFERENCES

Ingamells, C. O. and Switzer, P. (1973), Talanta 20, 547-568.

ISO Guide 30 (1992), Terms and definitions used in connection with reference materials.

ISO Guide 31 (2000), Reference materials – Contents of certificates and labels.

ISO Guide 3207 (1975), Statistical interpretation of data - Determination of a statistical tolerance interval.

ISO Guide 35 (2006), Certification of reference materials - General and statistical principals.

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ORE RESEARCH & EXPLORATION P/L ABN 28 006 859 856
37A Hosie Street · Bayswater North · VIC 3153 · AUSTRALIA
61 3 9729 0333 Fax 61 3 9729 8338
info@ore.com.au www.ore.com.au

OREAS
Certified Reference Materials

CERTIFICATE OF ANALYSIS FOR

GOLD ORE

CERTIFIED REFERENCE MATERIAL

OREAS 228

Table 1. Certified Values, SD's, 95% Confidence and Tolerance Limits for OREAS 228.

Constituent	Certified Value	1SD	95% Confidence Limits		95% Tolerance Limits	
			Low	High	Low	High
Pb Fire Assay						
Au, Gold (ppm)	8.73	0.279	8.63	8.83	8.62	8.84
Aqua Regia Digestion						
Au, Gold (ppm)	8.72	0.390	8.54	8.90	8.60	8.84
Gas / Liquid Pycnometry						
SG, Specific Gravity (Unity)	2.74	0.049	2.71	2.78	2.72	2.77

*Gold Tolerance Limits for typical 30g fire assay charge weight determined from 20 x 1g INAA results and the Sampling Constant (Ingamells & Switzer, 1973);
†Gold Tolerance Limits for typical 25g aqua regia sample weight determined as above;
Please note: intervals may appear asymmetric due to rounding.

The homogeneity of OREAS 228 is of a level such that ***sampling error is negligible*** for a conventional fire assay or aqua regia determination.

INTRODUCTION

OREAS reference materials are intended to provide a low cost method of evaluating and improving the quality of analysis of geological samples. To the geologist they provide a means of implementing quality control in analytical data sets generated in exploration from the grass roots level through to prospect evaluation, and in grade control at mining operations. To the analyst they provide an effective means of calibrating analytical equipment, assessing new techniques and routinely monitoring in-house procedures.

SOURCE MATERIALS

Certified Reference Material (CRM) OREAS 228 was prepared from Archean greenstone-hosted Wilber Lode primary ore from the Andy Well Gold Mine. The Wilber Lode is a shear-hosted, narrow vein, quartz lode-style gold deposit situated within the Meekatharra-Wydgee greenstone belt in the Archean Yilgarn Craton of Western Australia. The common primary mineral assemblage, as stated by Mason and Harris (2011, 2012, cited in Hingston et al, 2014), is quartz, calcite, chlorite, fuchsite, pyrite, galena, sphalerite, chalcopyrite and gold. The host rock consists of a complex sequence of Archean meta-basalt and meta-porphyritic rocks derived from a primary mineralogy of albite, actinolite, chlorite, sericite, biotite, calcite, zoisite, muscovite, quartz and titanate. The Andy Well deposit is located approximately 45km north of Meekatharra in the Murchison region of Western Australia.

The approximate major and trace element composition of OREAS 228 is provided in Table 2. The non-certified values contained in this table are the means of duplicate assays from one laboratory.

COMMINUTION AND HOMOGENISATION PROCEDURES

The material constituting OREAS 228 was prepared in the following manner:

- drying to constant mass at 105°C;
- crushing and milling of the ore material to 100% minus 30 microns;
- blending in appropriate proportions to achieve the desired grade;
- packaging in 60g units sealed in laminated foil pouches and 1kg units in plastic jars.

ANALYTICAL PROGRAM

Thirty commercial analytical laboratories participated in the program to certify gold (as reported in Table 1) by the following methods:

- Gold via 25-50g fire assay with AAS (22 labs), ICP-OES (4 labs) or gravimetric (1 lab) finish;
- Instrumental neutron activation analysis for Au on 20 x 1g subsamples to confirm homogeneity (1 laboratory).
- Gold via 15-50g aqua regia digestion with ICP-MS (13 labs), AAS (7 labs) or ICP-OES (1 lab) finish. It is important to note that in the analytical industry there is no standardisation of the aqua regia digestion process. Aqua regia is a partial

empirical digest and differences in recoveries for various analytes are commonplace. These are caused by variations in the digest conditions which can include the ratio of nitric to hydrochloric acids, acid strength, temperatures, leach times and secondary digestions.

- Specific gravity by gas (12 labs) or liquid (4 labs) pycnometry.

For the round robin program twenty 1.5kg test units were taken at predetermined intervals during the bagging stage, immediately following final blending, and are considered representative of the entire batch. The six samples received by each laboratory were obtained by taking two 110g scoop splits from each of three separate 1kg test units. This format enabled nested ANOVA treatment of the results to evaluate homogeneity, i.e. to ascertain whether between-unit variance is greater than within-unit variance. Table 1 presents the certified values together with their associated 1SD's, 95% confidence and tolerance limits and Table 2 shows 66 indicative values for major and trace element composition. Gold homogeneity has been evaluated and confirmed by instrumental neutron activation analysis (INAA) on twenty 1 gram sample portions (see Table 3 below) and by a nested ANOVA program for both fire assay and aqua regia digestion (see '**nested ANOVA**' section). Table 4 provides performance gate intervals for the certified values based on their pooled 1SD's. Tabulated results of all elements (including Au INAA analyses) together with uncorrected means, medians, standard deviations, relative standard deviations and percent deviation of lab means from the corrected mean of means (PDM^3) are presented in the detailed certification data for this CRM (**OREAS 228 DataPack.xlsx**).

Table 2. Approximate major and trace element data for OREAS 228.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Pb Fire Assay								
Pd	ppb	*3.33*	Pt	ppb	*< 5*			
Borate Fusion XRF								
Al_2O_3	wt.%	*9.99*	K_2O	wt.%	*0.916*	P_2O_5	wt.%	*0.065*
BaO	ppm	*300*	MgO	wt.%	*7.30*	S	wt.%	*0.883*
CaO	wt.%	*5.62*	MnO	wt.%	*0.090*	SiO_2	wt.%	*59.96*
Fe_2O_3	wt.%	*6.34*	Na_2O	wt.%	*1.55*	TiO_2	wt.%	*0.360*
Thermogravimetry								
LOI^{1000}	wt.%	*6.06*						
Laser Ablation								
Ag	ppm	*2.10*	Hf	ppm	*1.42*	Sm	ppm	*1.24*
As	ppm	*71*	Ho	ppm	*0.37*	Sn	ppm	*0.60*
Ba	ppm	*233*	In	ppm	*0.075*	Sr	ppm	*84*
Be	ppm	*1.40*	La	ppm	*6.08*	Ta	ppm	*0.14*
Bi	ppm	*0.65*	Lu	ppm	*0.18*	Tb	ppm	*0.32*
Cd	ppm	*0.35*	Mn	wt.%	*0.079*	Te	ppm	*< 0.2*
Ce	ppm	*10.6*	Mo	ppm	*6.30*	Th	ppm	*1.86*
Co	ppm	*34.3*	Nb	ppm	*1.93*	Ti	wt.%	*0.228*

Note: the number of significant figures reported is not a reflection of the level of certainty of stated values. They are instead an artefact of ORE's in-house CRM-specific LIMS.

Table 2 continued.

Constituent	Unit	Value	Constituent	Unit	Value	Constituent	Unit	Value
Laser Ablation continued								
Cr	ppm	*663*	Nd	ppm	*4.92*	Tl	ppm	*0.30*
Cs	ppm	*0.71*	Ni	ppm	*206*	Tm	ppm	*0.16*
Cu	ppm	*128*	Pb	ppm	*40.0*	U	ppm	*0.47*
Dy	ppm	*1.35*	Pr	ppm	*1.43*	V	ppm	*135*
Er	ppm	*0.93*	Rb	ppm	*30.1*	W	ppm	*15.0*
Eu	ppm	*0.42*	Re	ppm	*0.008*	Y	ppm	*10.6*
Ga	ppm	*12.4*	Sb	ppm	*1.00*	Yb	ppm	*1.00*
Gd	ppm	*1.56*	Sc	ppm	*12.7*	Zn	ppm	*68*
Ge	ppm	*1.08*	Se	ppm	*< 5*	Zr	ppm	*54*

Note: the number of significant figures reported is not a reflection of the level of certainty of stated values. They are instead an artefact of ORE's in-house CRM-specific LIMS.

STATISTICAL ANALYSIS

Certified Values, Confidence Limits, Standard Deviations and Tolerance Limits (Table 1) have been determined for each analyte following removal of individual, laboratory dataset (batch) and 3SD outliers (single iteration). For individual outliers within a laboratory batch the z-score test is used in combination with a second method that determines the per cent deviation of the individual value from the batch median. Outliers in general are selected on the basis of z-scores > 2.5 and with per cent deviations (i) > 3 and (ii) more than three times the average absolute per cent deviation for the batch. In certain instances statistician's prerogative has been employed in discriminating outliers. Each laboratory data set mean is tested for outlying status based on z-score discrimination and rejected if > 2.5. After individual and laboratory data set (batch) outliers have been eliminated a non-iterative 3 standard deviation filter is applied, with those values lying outside this window also relegated to outlying status.

Certified Values are the means of accepted laboratory means after outlier filtering. The INAA data (see Table 3) is omitted from determination of the certified value for Au and is used solely for the calculation of Tolerance Limits and homogeneity evaluation of OREAS 228.

95% Confidence Limits are inversely proportional to the number of participating laboratories and inter-laboratory agreement. It is a measure of the reliability of the certified value. A 95% confidence interval indicates a 95% probability that the true value of the analyte under consideration lies between the upper and lower limits. *95% Confidence Limits should not be used as control limits for laboratory performance.*

Indicative (uncertified) values (Table 2) are provided for the major and trace elements determined by borate fusion XRF (Al_2O_3 to TiO_2) and laser ablation with ICP-MS (Ag to Zr) and are the means of duplicate assays from Bureau Veritas, Perth. Additional indicative values by other analytical methods are present where the number of laboratories reporting a particular analyte is insufficient (< 5) to support certification or where inter-laboratory consensus is poor.

Standard Deviation values (1SDs) are reported in Table 1 and provide an indication of a level of performance that might reasonably be expected from a laboratory being monitored by this CRM in a QA/QC program. The SD's take into account errors attributable to measurement uncertainty and CRM variability. For an effective CRM the contribution of the latter should be negligible in comparison to measurement errors. The SD values thus include all sources of measurement uncertainty: between-lab variance, within-run variance (precision errors) and CRM variability. OREAS prepared reference materials have a level of homogeneity such that the observed variance from repeated analysis has its origin almost exclusively in the analytical process rather than the reference material itself.

The SD for each analyte's certified value is calculated from the same filtered data set used to determine the certified value, i.e. after removal of any individual, lab dataset (batch) and 3SD outliers (single iteration). These outliers can only be removed after the absolute homogeneity of the CRM has been independently established, i.e. the outliers must be confidently deemed to be analytical rather than arising from inhomogeneity of the CRM. **The standard deviation is then calculated for each analyte from the pooled accepted analyses generated from the certification program.**

In the application of SD's in monitoring performance it is important to note that not all laboratories function at the same level of proficiency and that different methods in use at a particular laboratory have differing levels of precision. Each laboratory has its own inherent SD (for a specific concentration level and analyte-method pair) based on the analytical process and this SD is not directly related to the round robin program.

The majority of data generated in the round robin program was produced by a selection of world class laboratories. The SD's thus generated are more constrained than those that would be produced across a randomly selected group of laboratories. To produce more generally achievable SD's the 'pooled' SD's provided in this report include inter-lab bias. This 'one size fits all' approach may require revision at the discretion of the QC manager concerned following careful scrutiny of QC control charts.

Table 4 shows **Performance Gates** calculated for two and three standard deviations. As a guide these intervals may be regarded as warning or rejection for multiple 2SD outliers, or rejection for individual 3SD outliers in QC monitoring, although their precise application should be at the discretion of the QC manager concerned. A second method utilises a 5% window calculated directly from the certified value. Standard deviation is also shown in relative percent for one, two and three relative standard deviations (1RSD, 2RSD and 3RSD) to facilitate an appreciation of the magnitude of these numbers and a comparison with the 5% window. Caution should be exercised when concentration levels approach lower limits of detection of the analytical methods employed as performance gates calculated from standard deviations tend to be excessively wide whereas those determined by the 5% method are too narrow.

Tolerance Limits (ISO Guide 3207) were determined by INAA using the reduced analytical subsample method that utilises the known relationship between standard deviation and analytical subsample weight (Ingamells and Switzer, 1973). In this approach the sample aliquot is substantially reduced to a point where most of the variability in replicate assays should be due to inhomogeneity of the reference material (a sampling error is thereby induced) and measurement error becomes negligible.

In this instance a subsample weight of 1 gram was employed and the 1RSD of 0.39% calculated for a 30g fire assay or aqua regia sample (2.14% at 1g weight) confirms the

high level of gold homogeneity in OREAS 228. The homogeneity is of a level such that ***sampling error is negligible*** for a conventional fire assay or aqua regia determination.

Please note that these RSD's and tolerance limits pertain to the homogeneity of the CRM only and should not be used as control limits for laboratory performance.

Table 3. Instrumental Neutron Activation Analysis of Au (ppm) on 20 x 1g subsamples.

Replicate No	INAA 1g
1	9.10
2	8.69
3	8.91
4	8.89
5	8.63
6	8.85
7	8.68
8	9.19
9	8.76
10	8.81
11	8.50
12	8.91
13	8.64
14	8.98
15	8.64
16	8.46
17	8.81
18	8.99
19	8.93
20	8.87
Mean	8.81
Median	8.83
Std Dev.	0.189
Rel.Std.Dev.	2.14%
PDM[3]	0.98%

The meaning of tolerance limits may be illustrated for gold by fire assay, where 99% of the time (1-α=0.99) at least 95% of subsamples (ρ=0.95) will have concentrations lying between 8.62 and 8.84ppm. Put more precisely, this means that if the same number of subsamples were taken and analysed in the same manner repeatedly, 99% of the tolerance intervals so constructed would cover at least 95% of the total population, and 1% of the tolerance intervals would cover less than 95% of the total population (ISO Guide 35).

The gold homogeneity of OREAS 228 has also been evaluated in a **nested ANOVA** of the round robin program. Each of the thirty round robin laboratories received six samples per CRM and these samples were made up of paired samples from three different, non-adjacent sampling intervals. The purpose of the ANOVA evaluation is to test that no statistically significant difference exists in the variance between-units to that of the variance within-units. This allows an assessment of homogeneity across the entire prepared batch of OREAS 228. The test was performed using the following parameters:

- Gold fire assay – 156 samples (26 laboratories each providing analyses on 3 pairs of samples);
- Gold aqua regia digestion – 120 samples (20 laboratories each providing analyses on 3 pairs of samples);
- Null Hypothesis, H_0: Between-unit variance is no greater than within-unit variance (reject H_0 if *p*-value < 0.05);
- Alternative Hypothesis, H_1: Between-unit variance is greater than within-unit variance.

P-values are a measure of probability where values less than 0.05 indicate a greater than 95% probability that the observed differences in within-unit and between-unit variances are real. The dataset was filtered for both individual and laboratory data set (batch) outliers prior to the calculation of the *p*-value. This process derived *p*-values of 0.905 for Au by fire assay and 0.968 for Au by aqua regia digestion. Both p-values are insignificant and the Null Hypothesis is retained.

It is important to note that ANOVA is not an absolute measure of homogeneity. Rather, it establishes whether or not the analytes are distributed in a similar manner throughout the packaging run of OREAS 228 and whether the variance between two subsamples from the same unit is statistically distinguishable to the variance from two subsamples taken from any two separate units. A reference material therefore, can possess poor absolute homogeneity yet still pass a relative homogeneity test if the within-unit heterogeneity is large and similar across all units.

Based on the statistical analysis of the results of the inter-laboratory certification program it can be concluded that OREAS 228 is fit-for-purpose as a certified reference material (see 'Intended Use' below).

Table 4. Performance Gates for OREAS 228.

Constituent	Certified Value	Absolute Standard Deviations					Relative Standard Deviations			5% window	
		1SD	2SD Low	2SD High	3SD Low	3SD High	1RSD	2RSD	3RSD	Low	High
Pb Fire Assay											
Au, ppm	8.73	0.279	8.17	9.29	7.89	9.57	3.20%	6.40%	9.61%	8.29	9.16
Aqua Regia Digestion											
Au, ppm	8.72	0.390	7.94	9.50	7.55	9.89	4.47%	8.94%	13.42%	8.28	9.16
Gas / Liquid Pycnometry											
SG, Unity	2.74	0.049	2.65	2.84	2.60	2.89	1.80%	3.59%	5.39%	2.61	2.88

PARTICIPATING LABORATORIES

1. Actlabs, Ancaster, Ontario, Canada
2. ALS, Brisbane, QLD, Australia
3. ALS, Lima, Peru
4. ALS, Loughrea, Galway, Ireland
5. ALS, Perth, WA, Australia

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11. Inspectorate (BV), Lima, Peru
12. Intertek Genalysis, Adelaide, SA, Australia
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15. MinAnalytical Services, Perth, WA, Australia
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17. Newcrest Services Laboratory (NSL), Orange, NSW, Australia
18. PT Geoservices Ltd, Cikarang, Jakarta Raya, Indonesia
19. PT Intertek Utama Services, Jakarta Timur, DKI Jakarta, Indonesia
20. SGS, Randfontein, Gauteng, South Africa
21. SGS Australia Mineral Services, Kalgoorlie, WA, Australia
22. SGS Australia Mineral Services, Perth, WA, Australia
23. SGS del Peru, Lima, Peru
24. SGS Lakefield Research Ltd, Lakefield, Ontario, Canada
25. SGS Mineral Services, Townsville, QLD, Australia
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37A Hosie Street
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AUSTRALIA

Tel: +613-9729 0333
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QMS ACCREDITED

ORE Pty Ltd is accredited to ISO 9001:2008 by Lloyd's Register Quality Assurance Ltd for its quality management system including development, manufacturing, certification and supply of CRMs.

CERTIFYING OFFICER

Craig Hamlyn (B.Sc. Hons - Geology), Technical Manager - ORE P/L

REFERENCES

Ingamells, C. O. and Switzer, P. (1973), Talanta 20, 547-568.

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Appendix 2: Jackfish Property Channel and Grab Sample Rock Descriptions and Gold Assays

Trench	Sample #	Length (m)	Au (ppb)	Report #	Description
Top of the Hill	VR12355B	1.17	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12356B	0.99	< 2	A17-09236	Granodiorite, massive, medium grained, some disease cross-cutting
Top of the Hill	VR12357B	1.00	< 2	A17-09236	Granodiorite, massive, medium grained with some diabase
Top of the Hill	VR12358B	0.48	18	A17-09236	Quartz veins, granodiorite, some diabase, massive cubic pyrite, rusty from sulphides
Top of the Hill	VR12359B	1.10	< 2	A17-09236	Granodiorite, disseminated sulphides, multiple small quartz veins
Top of the Hill	VR12361B	0.85	< 2	A17-09236	Granodiorite, massive, medium grained, couple small quartz veins
Top of the Hill	VR12362B	0.93	< 2	A17-09236	Diabase very fine grained, small blebs of granodiorite
Top of the Hill	VR12363B	1.10	< 2	A17-09236	Granodiorite, massive, medium grained, two 1cm quartz veins
Top of the Hill	VR12364B	1.07	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12365B	1.05	< 2	A17-09236	Granodiorite, massive, medium grained, 0.5 cm tourmaline vein
Top of the Hill	VR12366B	1.06	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12367B	1.00	< 2	A17-09236	Granodiorite, massive, medium grained, 1 cm quartz vein
Top of the Hill	VR12368B	1.07	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12369B	0.96	< 2	A17-09236	Fine grained diabase, some blebs of granodiorite
Top of the Hill	VR12371B	0.50	2	A17-09236	Quartz veins, disseminated sulphides, some granodiorite
Top of the Hill	VR12372B	1.00	16	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12373B	1.10	< 2	A17-09236	Granodiorite, massive, medium grained, quartz veins
Top of the Hill	VR12374B	0.73	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12375B	0.88	2	A17-09236	Granodiorite, massive, medium grained, structure making it less competent
Top of the Hill	VR12376B	1.03	< 2	A17-09236	Granodiorite, massive, medium grained, disseminated sulphides, couple small quartz / tourmaline veins
Top of the Hill	VR12377B	0.77	2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12378B	1.02	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12379B	1.01	< 2	A17-09236	Granodiorite, massive, medium grained, couple small 1cm quartz veins
Top of the Hill	VR12381B	0.58	7	A17-09236	Quartz vein 35 cm wide, clusters of pyrite and chalcopyrite, tourmaline with the quartz, some small areas of granodiorite
Top of the Hill	VR12382B	0.71	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12383B	0.98	< 2	A17-09236	Granodiorite, massive, medium grained, sharp contact with diabase
Top of the Hill	VR12384B	1.02	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12385B	1.03	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12386B	1.03	< 2	A17-09236	Granodiorite, massive, medium grained, couple small 1cm quartz veins
Top of the Hill	VR12387B	1.02	< 2	A17-09236	Granodiorite has more amphibole, diabase
Top of the Hill	VR12388B	1.00	2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12389B	1.05	2	A17-09236	Granodiorite, massive, medium grained, some diabase
Top of the Hill	VR12391B	0.54	4	A17-09236	Diabase, quartz veins, granodiorite
Top of the Hill	VR12392B	0.76	< 2	A17-09236	Granodiorite, medium grained, crosscut by diabase
Top of the Hill	VR12393B	1.06	< 2	A17-09236	Granodiorite, massive, medium grained, couple small 1cm quartz veins
Top of the Hill	VR12394B	1.00	< 2	A17-09236	Granodiorite, massive, medium grained, small quartz / tourmaline vein 1cm
Top of the Hill	VR12395B	1.03	< 2	A17-09236	Granodiorite, crosscut by many 1cm quartz veins
Top of the Hill	VR12396B	0.87	2	A17-09236	30 cm quartz veins, sulphides, granodiorite
Top of the Hill	VR12397B	0.75	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12398B	0.90	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12399B	1.02	< 2	A17-09236	Granodiorite, massive, medium grained

Trench	Sample #	Length (m)	Au (ppb)	Report #	Description
Top of the Hill	VR12401B	0.96	< 2	A17-09236	Granodiorite, massive, medium grained, diabase dyke 5 cm
Top of the Hill	VR12402B	0.99	< 2	A17-09236	Granodiorite, massive, medium grained, areas of diabase
Top of the Hill	VR12403B	1.03	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12404B	1.03	12	A17-09236	Granodiorite, massive, medium grained, multiple 1 cm quartz veins
Top of the Hill	VR12405B	1.03	< 2	A17-09236	Granodiorite, massive, medium grained, diabase dyke 3 cm
Top of the Hill	VR12406B	1.10	< 2	A17-09236	2 cm quartz veins, with vugs
Top of the Hill	VR12407B	0.87	56	A17-09236	4-5 cm quartz / tourmaline veins, disseminated sulphides in granodiorite
Top of the Hill	VR12408B	1.20	< 2	A17-09236	Granodiorite, massive, medium grained, sheared, couple 2 cm quartz / tourmaline veins
Top of the Hill	VR12409B	1.04	< 2	A17-09236	Granodiorite, massive, medium grained, sheared- deep red Kspar, large 2 cm quartz / tourmaline veins
Top of the Hill	VR12411B	0.55	6	A17-09236	Granodiorite with diabase and quartz veins, disseminated sulphides
Top of the Hill	VR12412B	1.14	6	A17-09236	Granodiorite, diabase, quartz veins, chlorite dyke
Top of the Hill	VR12413B	0.58	12	A17-09236	Quartz veins 23 cm, mixed with tourmaline, sulphides, crosscut by chlorite
Top of the Hill	VR12414B	0.50	7	A17-09236	Quartz veins 28 cm wide, sulphides, very little granodiorite
Top of the Hill	VR12415B	1.20	4	A17-09236	Diabase very fine grained, three 2 cm quartz veins crosscutting
Top of the Hill	VR12416B	0.75	24	A17-09236	Granodiorite, massive, medium grained, 3 cm quartz tourmaline vein
Top of the Hill	VR12417B	0.55	< 2	A17-09236	Granodiorite, quartz veins 2 cm, disseminated sulphides
Top of the Hill	VR12418B	0.52	5	A17-09236	Quartz veins, diabase and granodiorite
Top of the Hill	VR12419B	0.47	3	A17-09236	27 cm quartz veins tourmaline, areas of granodiorite and disseminated sulphides
Top of the Hill	VR12421B	0.75	< 2	A17-09236	Granodiorite, massive, medium grained, diabase
Top of the Hill	VR12422B	0.75	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12423B	0.85	< 2	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12424B	0.95	< 2	A17-09236	Quartz veins, siliceous granodiorite
Top of the Hill	VR12425B	1.03	3	A17-09236	Granodiorite, massive, medium grained
Top of the Hill	VR12426B	1.00	< 2	A17-09236	Granodiorite, massive, medium grained, more mafic
Top of the Hill	VR12427B	1.02	< 2	A17-09236	Granodiorite, massive, medium grained, two 0.5 cm quartz veins
Top of the Hill	VR12428B	0.92	< 2	A17-09236	Granodiorite, massive, medium grained, more mafic, quartz veins 3 cm
Top of the Hill	VR12429B	0.78	10	A17-09236	10 cm quartz vein with some tourmaline, some diabase
Top of the Hill	VR12431B	0.84	< 2	A17-09236	One 10 cm quartz vein, many 1 cm quartz vein
Top of the Hill	VR12432B	0.80	< 2	A17-09236	Granodiorite, massive, medium grained, 5 cm quartz vein
Top of the Hill	VR12433B	1.07	< 2	A17-09236	Granodiorite, massive, medium grained, 10 cm quartz veins, multiple 1 cm quartz veins
Trench 1	VR12325B	1.04	4	A17-08943	Massive Granodiorite, Medium grained, some hematite, Kspar alteration
Trench 1	VR12326B	0.96	< 2	A17-08943	Massive Granodiorite, Medium grained
Trench 1	VR12327B	1.03	2	A17-08943	Massive Granodiorite, Medium grained
Trench 1	VR12328B	1.00	< 2	A17-08943	Massive Granodiorite, Medium grained
Trench 1	VR12329B	0.99	< 2	A17-08943	Massive Granodiorite, Medium grained
Trench 1	VR12331B	1.06	10	A17-08943	Massive Granodiorite, Medium grained, sporadic tourmaline
Trench 1	VR12332B	1.05	< 2	A17-08943	Massive Granodiorite, Medium grained, sheared areas have more Kspar and amphibole
Trench 1	VR12333B	1.18	< 2	A17-08943	Massive Granodiorite, Medium grained, cross cuts couple small 1cm quartz veins
Trench 1	VR12334B	1.18	< 2	A17-08943	Massive Granodiorite, Medium grained, cross cutting quartz veins
Trench 2	VR12321B	1.18	< 2	A17-08943	Massive Granodiorite, Medium grained, 1 cm quartz vein

Trench	Sample #	Length (m)	Au (ppb)	Report #	Description
Trench 2	VR12322B	1.23	< 2	A17-08943	Massive Granodiorite, Medium grained
Trench 2	VR12323B	1.12	< 2	A17-08943	Massive Granodiorite, Medium grained
Trench 2	VR12324B	1.17	3	A17-08943	Massive Granodiorite, Medium grained, some areas have clusters of amphiboles
Trench 3	VR12308B	1.01	< 2	A17-08943	Massive Granodiorite, Medium grained, two 2cm quartz veins, couple small quartz veins
Trench 3	VR12309B	1.00	< 2	A17-08943	Massive Granodiorite, Medium grained, one 2cm quartz veins, couple small quartz veins
Trench 3	VR12311B	0.95	< 2	A17-08943	Massive Granodiorite, Medium grained, couple small quartz veins
Trench 3	VR12312B	1.23	< 2	A17-08943	Massive Granodiorite, Medium grained, couple small quartz veins
Trench 3	VR12313B	1.10	< 2	A17-08943	Massive Granodiorite, Medium grained, couple small quartz and tourmaline veins
Trench 3	VR12314B	0.89	2	A17-08943	Massive Granodiorite, Medium grained, couple quartz veins
Trench 3	VR12315B	0.97	< 2	A17-08943	Massive Granodiorite, Medium grained, quartz vein
Trench 3	VR12316B	0.98	< 2	A17-08943	Massive Granodiorite, Medium grained, quartz veins
Trench 3	VR12317B	1.05	< 2	A17-08943	Massive Granodiorite, Medium grained
Trench 3	VR12318B	1.07	< 2	A17-08943	Massive Granodiorite, Medium grained
Trench 3	VR12319B	1.00	< 2	A17-08943	Massive Granodiorite, Medium grained, one small quartz vein, three 2-3cm quartz veins
Rudy #4	VR12301B	1.13	5	A17-08943	Sheared, metaseds, very fine grained
Rudy #4	VR12302B	0.80	153	A17-08943	Sheared, disseminated sulphides, very fine grained
Rudy #4	VR12303B	1.00	925	A17-08943	" boulder" sulphides, metaseds
Rudy #4	VR12304B	1.00	721	A17-08943	Sheared, metaseds, very fine grained
Rudy #4	VR12305B	0.70	364	A17-08943	Sheared, sulphides, very fine grained metaseds
Rudy #4	VR12306B	1.30	5	A17-08943	Highly sheared sulphides rich, very fine grained, metaseds
Rudy #4	VR12307B	0.86	< 2	A17-08943	Metasedimentary, very fine grained, foliated, disseminated sulphides
Rudy #5	VR12071B	N/A	22000	A17-12642	Grey to white, opaque quartz vein with minor granodiorite host rock and trace sulphides, mostly pyrite, some galena
Rudy #5	VR12072B	N/A	12800	A17-12642	Grey to white, opaque quartz vein with minor granodiorite host rock and trace sulphides, mostly pyrite
Rudy #7	VR12335B	1.01	2	A17-09165	Very fine grained, mafic volcanic, disseminated sulphides
Rudy #7	VR12336B	1.00	5	A17-09165	Very fine grained, mafic volcanic disseminated sulphides
Rudy #7	VR12337B	1.00	3380	A17-09165	Mafic volcanic very fine grained, with granitic pods 1-3 cm
Rudy #7	VR12338B	1.00	11	A17-09165	Mafic volcanic very fine grained, loaded with sulphides
Rudy #7	VR12339B	1.00	6	A17-09165	Granodiorite then mafic volcanic rich with sulphides then quartz veins 20 cm wide with chlorite/epidote
Rudy #7	VR12341B	0.51	30	A17-09165	Altered mafic volcanic, quartz veins, rich in sulphides
Rudy #7	VR12342B	1.01	< 2	A17-09165	Very fine grained mafic volcanic, sheared with disseminated sulphides
Rudy #7	VR12343B	0.91	9	A17-09165	Sulphide rich, mafic volcanic, sheared, rotten with sulphides
Rudy #7	VR12344B	0.80	7	A17-09165	Mafic volcanic very fine grained, crosscut by dykes looks like diabase with areas that looks like altered granodiorite
Rudy #7	VR12345B	1.04	12200	A17-09165	Very fine grained, mafic volcanic, 12 cm quartz veins, sheared volcanics
Rudy #7	VR12346B	0.83	413	A17-09165	Mafic volcanic, very fine grained, then medium grained granodiorite, sheared quartz veins
Rudy #7	VR12347B	1.03	41	A17-09165	30% sulphides, bands of sulphides, sheared mafic volcanics, very fine grained
Rudy #7	VR12348B	0.83	20	A17-09165	Very fine grained, mafic volcanic, disseminated sulphides
Rudy #7	VR12349B	1.00	701	A17-09165	Mafic volcanic, very fine grained, altered some disseminated sulphides
Rudy #7	VR12351B	0.78	6220	A17-09165	Sheared mafic volcanic, quartz veins 7 cm wide, sulphides, very fine grained
Rudy #7	VR12352B	0.91	10900	A17-09165	Sheared mafic volcanic sulphide rich, fine grained, some quartz veins

Trench	Sample #	Length (m)	Au (ppb)	Report #	Description
Rudy #7	VR12353B	0.40	138	A17-09165	Sheared mafic volcanic, very fine grained, some quartz veins
Rudy #7	VR12354B	1.30	147	A17-09165	Granodiorite, sulphides, medium grained, Kspar is prominent, quartz veins

QA/QC Results

Sample #	Au (ppb)	Report #	Type
VR12309B	< 2	A17-08943	Original
VR12310B	< 2	A17-08943	Duplicate
VR12320B	7810	A17-08943	OREAS 228
VR12329B	< 2	A17-08943	Original
VR12330B	< 2	A17-08943	Duplicate
VR12340B	< 2	A17-09165	Blank
VR12350B	3400	A17-09165	OREAS 215
VR12360B	< 2	A17-09236	Blank
VR12369B	< 2	A17-09236	Original
VR12370B	< 2	A17-09236	Duplicate
VR12380B	6070	A17-09236	OREAS 228
VR12390B	< 2	A17-09236	Blank
VR12399B	< 2	A17-09236	Original
VR12400B	< 2	A17-09236	Duplicate
VR12410B	530	A17-09236	OREAS 218
VR12420B	2	A17-09236	Blank
VR12429B	10	A17-09236	Original
VR12430B	16	A17-09236	Duplicate