SOVEREIGN METALS LIMITED
ASX:SVM

HIGH GRADE RUTILE RECOVERED FROM MALINGUNDE GRAPHITE TAILINGS

Sovereign Metals Limited ("the Company" or "Sovereign") is pleased to report **the discovery and successful metallurgical separation of high grade rutile (TiO_2)** from within the soft, saprolite-hosted graphite deposit at Malingunde in Malawi.

The Company is focused on future low-cost production of high quality graphite concentrates at Malingunde. Recent testwork highlighted the potential to produce **rutile as a valuable co-product** from the **graphite tailings**. Importantly, **clean rutile concentrates are produced** (with no cross-contamination with graphite) via a simple process flowsheet using traditional flotation for graphite and typical mineral sands separation methods.

HIGHLIGHTS:

- Rutile (TiO_2 95%-97%) and leucoxene (TiO_2 70%-92%) are high-value, premium natural titanium products normally mined from mineral sands deposits which are commonly consumed in the pigment industry (paint, paper, cosmetics, plastics)
- According to the world's largest rutile producer, Iluka Resources, supplies of natural rutile are in structural deficit[1]
- Rutile (TiO_2) is a highly sought after, high grade titanium feed source currently fetching ~US$900 – $1,050/tonne and projected to reach long term pricing of US$1,250/tonne (FOB) by 2019[2]. Leucoxene is priced at a discount to the prevailing rutile price, generally based on TiO_2 content.
- Results for a limited number of diamond drill-holes analysed to date include;
  - MGDD0003: 31m @ 1.26% TiO_2 as rutile-leucoxene & 7.1% TGC from surface
  - MGDD0006: 25m @ 1.45% TiO_2 as rutile-leucoxene & 11.3% TGC from surface
  - MGDD0007: 29m @ 1.37% TiO_2 as rutile-leucoxene & 13.1% TGC from surface
- Initial "proof of concept" metallurgical testwork conducted on tailings from bulk graphite flotation tests indicate that;
  - all TiO_2 mineral species are rutile or leucoxene
  - market specification rutile-leucoxene concentrates with TiO_2 content ranging from 78% to 90% can be easily produced by a simple, industry-standard flowsheet
- The Company controls a very large, >4,000km^2 ground position in central Malawi, providing significant potential for additional graphite-rutile/leucoxene discoveries

Sovereign's Managing Director Dr Julian Stephens commented, "Sovereign is focused on developing the world-class, low-cost graphite operation at Malingunde. The discovery of rutile-leucoxene as a potential co-product, produced from the graphite tailings via a simple process flowsheet provides the potential for additional revenue streams and enhanced project value. The Company intends to undertake further studies to advance work on this discovery, without compromising the focus upon the development of graphite operations at Malingunde."

ENQUIRIES ***Dr Julian Stephens – Managing Director***
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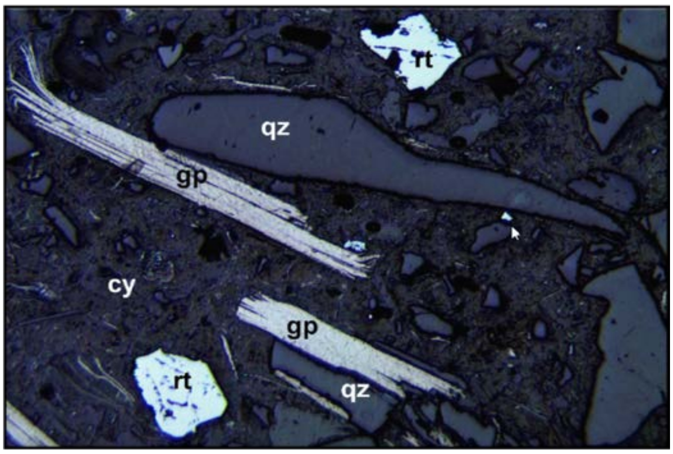
INTRODUCTION

During recent chemical analyses of bulk graphite metallurgical samples for flotation test-work from Malingunde it was noted that TiO_2 levels were significantly elevated. It was hypothesised that the elevated TiO_2 may be due to the presence of rutile and/or leucoxene, as the company had previously identified rutile within its Duwi graphite deposit, some 30km to the north-east of Malingunde (Figure 1).

Rutile (TiO_2) is a highly sought after, high grade titanium feed source with concentrates currently fetching ~US$900 – 1,050/tonne and projected to reach long term pricing of US$1,250/tonne (FOB) by 2019[2]. Leucoxene is priced at a discount to the prevailing rutile price, generally based on TiO_2 content.



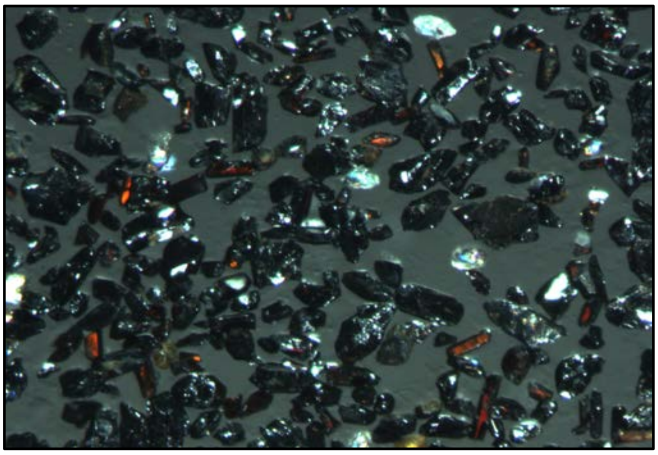


Figure 1(a). Coarse rutile grains in thin section of graphitic saprolite. Each rutile grain is approximately 100um across. rt – rutile, cy – clay, qz – quartz, gp – graphite. Field of view is about 800um across.

Figure 1(b). Rutile concentrate from south composite HTR non-magnetic fraction grading 89.93% TiO_2. Field of view is approximately 2,000um (2mm) across.

TESTWORK

The Company undertook a program to test the hypothesis that elevated TiO_2 levels at Malingunde were due to the presence of rutile and /or leucoxene, and if so, whether it may be recoverable as a saleable co-product to the graphite operation.

The following work program was undertaken;

- Selection of 80 samples from 5 diamond drill holes and multi-element chemical analysis, specifically targeting TiO_2
- Heavy liquid separation (HLS) work was undertaken at Allied Mineral Laboratories (AML) in Perth on 10 of the 80 samples above
- XRD (semi-quantitative) for bulk mineralogy on the 10 HLS concentrates
- Primary and secondary wet table separation on a composite tailings sample (South Composite)
- XRD mineralogy on 3 splits (concentrate, middlings and tailings) for the South Composite. TGC (total graphitic carbon) by Eltra on the 6 splits. Na-peroxide fusion ICP OES/MS on the 6 splits.
- Electrostatic (HTR) separation of the combined concentrate and middlings fraction for the South Composite
- Magnetic separation on the HTR middlings and conductor for the South Composite to produce final products.

ASSAY OF DRILL SAMPLES

A total of 5 sections of drill core (MGDD0003-MGDD0007) were selected for multi-element analysis and totalled 80 samples. These samples were also selected to represent a range of graphite grades from 0 to 30% and to cover all of the different weathering zones identified at Malingunde.

Significant results from within soft, free-dig saprolite analysed to date include;

- MGDD0003: 31m @ 1.26% TiO_2 as rutile-leucoxene & 7.1% TGC from surface
- MGDD0006: 25m @ 1.45% TiO_2 as rutile-leucoxene & 11.3% TGC from surface
- MGDD0007: 29m @ 1.37% TiO_2 as rutile-leucoxene & 13.1% TGC from surface

Holes MGDD0004 and MGDD0005 also showed similarly high TiO_2 values, however, these sections are mainly hosted in more competent saprolite and saprock and hence are not considered economically important. All assay results are listed in Appendix 1 with holes MGDD0006 and 0007 depicted in Figure 2.

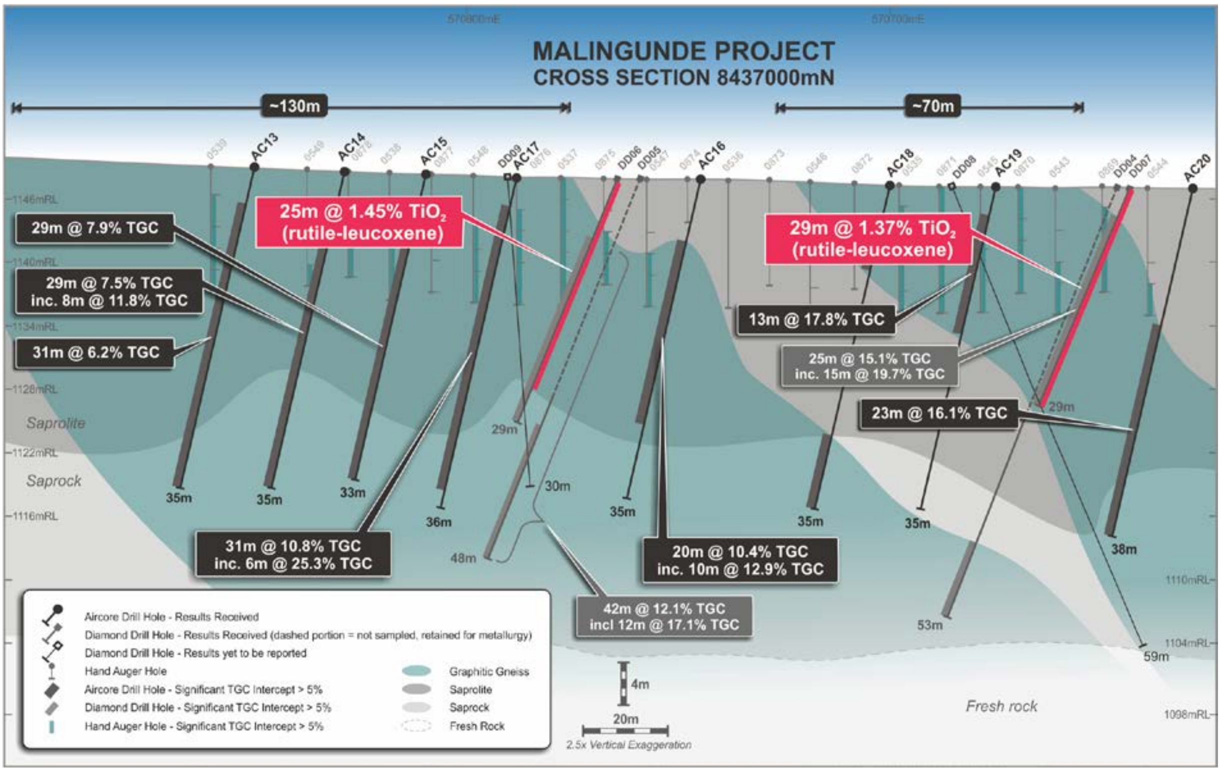


Figure 2. Cross-section showing high-grade TiO_2 (rutile-leucoxene) from selected drill intercepts within the broad, high grade saprolite-hosted graphite resource at Malingunde.

Overall, results show a minimum of 0.75%, a maximum of 2.52% and an average of 1.33% TiO_2 content. There appears to be a slightly negative correlation of TiO_2 to graphite (TGC) with a clearer negative correlation below about 10% TGC. TiO_2 appears highly enriched in soil (SOIL), and possibly enriched in the near surface ferruginous pedolith (FERP), both in areas where there is little to no graphite.

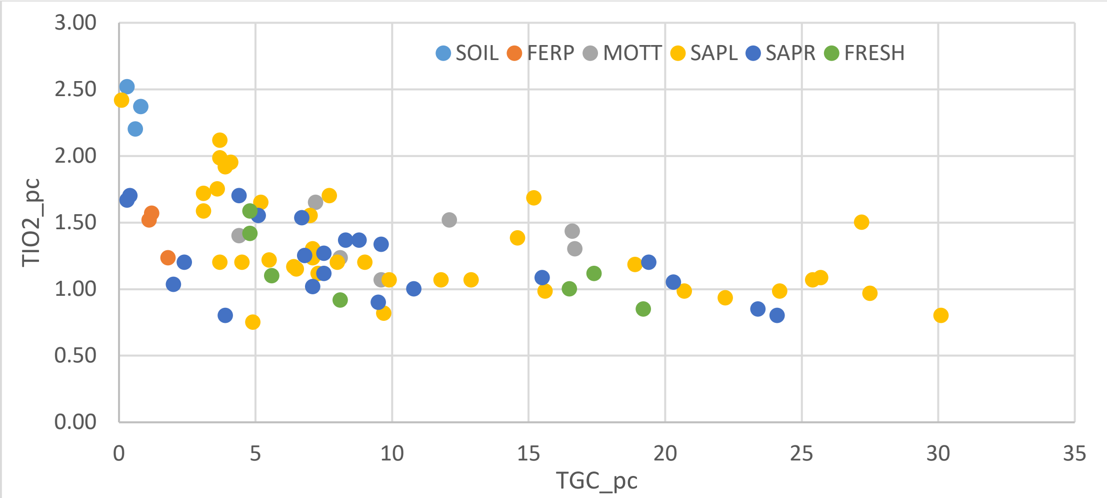


Figure 3. Graph of TiO_2 content v TGC content across various weathering zones. SOIL = soil normally 0-1m vertical, FERP = ferruginous pedolith 1-4m, MOTT = mottled saprolite 4-7m, SAPL = saprolite 7-25m, SAPR = saprock 25-35m, FRESH = fresh rock >35m.

HEAVY LIQUID SEPARATION

Heavy liquid separation (HLS) work was carried out at AML in Perth on 10 selected samples, making up the key MOTT and SAPL zones, of the 80-sample suite assayed and reported in the preceding section. The samples were subject to a standard deslime prior to the HLS work. Results are presented below in Appendix 2. Significant results include;

- Slimes range between 17% and 34% with higher slimes recorded in the near surface mottled zone (MOTT)
- Total heavy minerals (HM) recovered to concentrate ranged from 2.4% to 15.3%
- The TiO_2 content in the HM concentrates ranged from 5.4% to 28.1%
- TiO_2 recovery to the HM concentrate ranged from 52% to 79%
- Semi-quantitative XRD by Intertek Perth showed rutile content was between 5% and 22% of the total mass of the HM concentrates.
- Leucoxene was not discernible or quantifiable but was suspected to be present
- Overall TiO_2 recoveries to HLS concentrate ranged between 33% and 70%

WET TABLE, ELECTROSTATIC AND MAGNETIC SEPARATION

The encouraging results from the HLS work, where recovered rutile-leucoxene grades ranged between 0.5% and 0.9% (as a % of original ore), led the Company to initiate a program on bulk samples at AML in Perth.

This program involved taking two bulk composite samples split from graphite flotation test-work tailings. These were then subject to a primary wet table separator, with the primary middlings also subject to a secondary wet table separation for both samples.

XRD mineralogy was then undertaken on 3 splits (concentrate, middlings and tailings) for each of the South and North Composites (6 in total). TGC by Eltra and Na-peroxide fusion ICP OES/MS was conducted on the 6 splits.

Electrostatic (HTR) separation of the combined concentrate and middlings fraction for the North and South composites was completed.

Finally, magnetic separation on the HTR middlings and conductor for the South composite, and on the conductor for the North composite was completed (not enough mass to process the HTR middlings for the North composite).

Overall, results were highly encouraging and indicated that;

- South composite (1.49% TiO_2) produced a 0.86% recovered grade (from ore) to final concentrate of TiO_2, with 83.2% TiO_2 grade (combined HTR middlings and conductor fractions). These components separately represent 0.45% (from ore) @ 77.90% TiO_2 and 0.41% @ 89.93% TiO_2 for the middlings and conductor fractions respectively

- North composite (1.41% TiO_2) produced a 0.55% recovered grade (from ore) to concentrate of TiO_2, with a 76.7% TiO_2 grade from conductor non-mag fraction only. The middlings fractions did not have enough mass to conduct magnetic separation, so the result for this composite is only a partial result.

CONCLUSION AND NEXT STEPS

Rutile is a relatively common accessory mineral in reduced paragneisses and schists such as these in central Malawi. However, the occurrence of potentially economically recoverable grades of rutile-leucoxene at Malingunde and throughout the Lilongwe Plains area (mainly controlled by Sovereign) hosted within saprolite appears relatively unique.

The test-work program has shown that overall recovered grades of TiO_2 from raw ore into rutile-leucoxene concentrates, was 0.86% (South Composite).

Concentrates produced to date from these initial sighter tests (78% to 90% TiO_2) highlight the potential for the commercial production of leucoxene concentrate as a co-product produced from the graphite tailings. Further work needs to be undertaken to determine if high grade +95% TiO_2 rutile concentrates can be produced from the Malingunde tailings material.

Recovery of rutile-leucoxene from Malingunde tails should be further investigated as a possible, future extension to the proposed graphite operation at Malingunde.

Additionally, the regional rutile-leucoxene potential would seem substantial and is economically interesting for a number of reasons;

- The average in ground grade from samples analysed from Malingunde is about 1.3% TiO_2
- There appears to be no association to a weakly negative association of elevated TGC to TiO_2 indicating the high TiO_2 levels are likely to be widespread across these weathered rock-types in the area
- The relatively well-developed weathering profile appears to have concentrated rutile-leucoxene within the upper 5-10m parts of the weathering profile in the SOIL, FERP and possibly MOTT units
- The paragneiss rock package with mostly preserved weathering profile has substantial areal extent, in the order of 3,000km^2, the vast majority of which is controlled by Sovereign

The Company intends to undertake further studies to determine whether;

- a +95% TiO_2 concentrate can be produced from the Malingunde graphite tails
- sufficient additional project value could be added by incorporating a small plant to recover rutile-leucoxene from the graphite tails
- there could be large volumes at economic grades of rutile-leucoxene in rivers draining the Lilongwe Plain within the Sovereign's large >4,000km^2 ground package

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Competent Persons' Statements

The information in this report that relates to Exploration Results is based on information compiled by Dr Julian Stephens, a Competent Person who is a member of the Australian Institute of Geoscientists (AIG). Dr Stephens is the Managing Director of Sovereign Metals Limited and a holder of shares, options and performance rights in Sovereign Metals Limited. Dr Stephens has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken, to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Dr Stephens consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.

The information in this report that relates to Metallurgical Results is based on information compiled by Mr Gavin Diener, a Competent Person who is a member of the AusIMM. Mr Diener is the Chief Operating Officer of TZMI, an independent mineral sands consulting company and is not a holder of any equity type in Sovereign Metals Limited. Mr Diener has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken, to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Mr Diener consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.

Forward Looking Statement

This release may include forward-looking statements, which may be identified by words such as "expects", "anticipates", "believes", "projects", "plans", and similar expressions. These forward-looking statements are based on Sovereign's expectations and beliefs concerning future events. Forward looking statements are necessarily subject to risks, uncertainties and other factors, many of which are outside the control of Sovereign, which could cause actual results to differ materially from such statements. There can be no assurance that forward-looking statements will prove to be correct. Sovereign makes no undertaking to subsequently update or revise the forward-looking statements made in this release, to reflect the circumstances or events after the date of that release.

References

[1] *https://www.fnarena.com/index.php/2018/01/30/2018-looks-bright-for-iluka-resources/*

[2] *Credit Suisse 2017. Mineral Sands Forecast – Research Analyst Matthew Hope.*

Appendix 1

Table A. Diamond Drill Hole Collar Details

Hole ID	Easting UTM (Zone 36S)	Northing UTM (Zone 36S)	RL AMSL (m)	Final Depth (m)	Dip	Azi (UTM)	Hole Type
MGDD0003	571,934	8,436,002	1,140	47.6	-90	360	PQ3
MGDD0004	570,753	8,437,001	1,151	53.8	-45	270	PQ3
MGDD0005	570,637	8,437,001	1,152	47.5	-45	270	PQ3
MGDD0006	570,635	8,437,000	1,152	29.4	-45	270	PQ3
MGDD0007	570,758	8,437,000	1,150	29.4	-45	270	PQ3

Table B. TGC and TiO_2 assays for 80 selected samples from 5 diamond drill-holes

HoleID	From (m)	To (m)	Width (m)	Weathering	TGC %	TiO_2 %
MGDD0003	0.00	2.45	2.45	SOIL	0.6	2.20
MGDD0003	2.70	6.15	3.45	FERP	1.8	1.23
MGDD0003	6.40	7.26	0.86	SAPL	7.0	1.55
MGDD0003	8.61	9.75	1.14	SAPL	7.1	1.30
MGDD0003	10.00	10.91	0.91	SAPL	6.5	1.15
MGDD0003	11.61	13.00	1.39	SAPL	7.1	1.23
MGDD0003	13.00	15.00	2.00	SAPL	6.4	1.17
MGDD0003	15.00	16.00	1.00	SAPL	4.9	0.75
MGDD0003	16.25	17.61	1.36	SAPL	3.1	1.72
MGDD0003	18.16	20.00	1.84	SAPL	9.0	1.20
MGDD0003	20.00	22.00	2.00	SAPL	5.5	1.22
MGDD0003	22.00	24.00	2.00	SAPL	11.8	1.07
MGDD0003	24.00	26.00	2.00	SAPL	12.9	1.07
MGDD0003	26.00	27.60	1.60	SAPL	9.7	0.82
MGDD0003	27.85	30.00	2.15	SAPL	9.9	1.07
MGDD0003	30.00	31.00	1.00	SAPL	20.7	0.98
MGDD0003	31.00	32.00	1.00	SAPR	19.4	1.20
MGDD0003	32.25	34.00	1.75	SAPR	8.8	1.37
MGDD0003	34.00	36.00	2.00	FRESH	4.8	1.42
MGDD0003	36.25	38.00	1.75	FRESH	8.1	0.92
MGDD0003	38.00	40.97	2.97	FRESH	19.2	0.85
MGDD0003	41.20	42.00	0.80	FRESH	4.8	1.58
MGDD0003	42.00	44.00	2.00	FRESH	16.5	1.00
MGDD0003	44.00	46.00	2.00	FRESH	17.4	1.12
MGDD0003	46.25	47.61	1.36	FRESH	5.6	1.10
MGDD0004	28.00	29.00	1.00	SAPL	7.3	1.12
MGDD0004	29.00	30.00	1.00	SAPL	3.7	1.99
MGDD0004	30.00	31.75	1.75	SAPL	4.1	1.95
MGDD0004	32.00	34.00	2.00	SAPL	3.1	1.58
MGDD0004	34.00	36.00	2.00	SAPL	0.1	2.42

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HoleID	From (m)	To (m)	Width (m)	Weathering	TGC %	TiO_2 %
MGDD0004	36.00	37.55	1.55	SAPL	3.9	1.92
MGDD0004	37.80	39.75	1.95	SAPR	0.3	1.67
MGDD0004	39.75	42.00	2.25	SAPR	0.4	1.70
MGDD0004	42.00	44.00	2.00	SAPR	2.0	1.03
MGDD0004	44.00	46.15	2.15	SAPR	10.8	1.00
MGDD0004	46.37	48.00	1.63	SAPR	9.5	0.90
MGDD0004	48.00	49.67	1.67	SAPR	7.5	1.12
MGDD0004	49.92	52.00	2.08	SAPR	7.1	1.02
MGDD0004	52.00	53.79	1.79	SAPR	15.5	1.08
MGDD0005	28.30	30.00	1.70	SAPR	7.5	1.27
MGDD0005	30.25	31.70	1.45	SAPR	8.3	1.37
MGDD0005	31.70	33.00	1.30	SAPR	2.4	1.20
MGDD0005	33.00	36.00	3.00	SAPR	6.7	1.53
MGDD0005	36.00	38.52	2.52	SAPR	5.1	1.55
MGDD0005	38.52	40.00	1.48	SAPR	20.3	1.05
MGDD0005	40.00	41.75	1.75	SAPR	23.4	0.85
MGDD0005	42.00	44.52	2.52	SAPR	24.1	0.80
MGDD0005	44.52	46.41	1.89	SAPR	3.9	0.80
MGDD0005	46.41	47.52	1.11	SAPR	9.6	1.33
MGDD0006	0.86	2.00	1.14	SOIL	0.3	2.52
MGDD0006	2.00	4.25	2.25	FERP	1.2	1.57
MGDD0006	4.50	6.84	2.34	MOTT	9.6	1.07
MGDD0006	6.84	8.40	1.56	MOTT	7.2	1.65
MGDD0006	8.40	10.38	1.98	MOTT	8.1	1.23
MGDD0006	10.61	12.05	1.44	MOTT	16.6	1.43
MGDD0006	12.05	14.00	1.95	SAPL	8.0	1.20
MGDD0006	14.25	16.38	2.13	SAPL	14.6	1.38
MGDD0006	16.38	18.00	1.62	SAPL	15.2	1.68
MGDD0006	18.00	20.00	2.00	SAPL	27.2	1.50
MGDD0006	20.00	21.98	1.98	SAPL	22.2	0.93
MGDD0006	22.23	24.00	1.77	SAPL	7.7	1.70
MGDD0006	24.00	25.18	1.18	SAPL	3.6	1.75
MGDD0006	25.18	26.81	1.63	SAPR	4.4	1.70
MGDD0006	27.03	29.40	2.37	SAPR	6.8	1.25
MGDD0007	0.00	2.62	2.62	SOIL	0.8	2.37
MGDD0007	2.95	4.25	1.30	FERP	1.1	1.52
MGDD0007	4.25	5.75	1.50	MOTT	12.1	1.52
MGDD0007	6.00	8.42	2.42	MOTT	16.7	1.30
MGDD0007	8.42	10.62	2.20	MOTT	4.4	1.40
MGDD0007	10.62	12.00	1.38	SAPL	3.7	2.12
MGDD0007	12.00	13.32	1.32	SAPL	4.5	1.20
MGDD0007	13.54	14.55	1.01	SAPL	3.7	1.20
MGDD0007	14.55	16.00	1.45	SAPL	24.2	0.98

HoleID	From (m)	To (m)	Width (m)	Weathering	TGC %	TiO_2 %
MGDD0007	16.00	18.00	2.00	SAPL	27.5	0.97
MGDD0007	18.00	19.06	1.06	SAPL	30.1	0.80
MGDD0007	19.31	20.00	0.69	SAPL	25.4	1.07
MGDD0007	20.00	22.00	2.00	SAPL	25.7	1.08
MGDD0007	22.00	24.00	2.00	SAPL	18.9	1.18
MGDD0007	24.00	26.80	2.80	SAPL	15.6	0.98
MGDD0007	26.80	29.42	2.62	SAPL	5.2	1.65

Table C. HLS sample details with TGC (by Eltra) and TiO_2 (by Na-peroxide fusion ICP OES/MS)

Hole	From (m)	To (m)	Sample ID	weight (g)	TGC (%)	TiO_2%
MGDD0003	13	15	1650	1959	6.40	1.17
MGDD0003	20	22	1655	2217	5.50	1.22
MGDD0003	24	26	1657	2178	12.90	1.07
MGDD0007	6	8.42	1687	2076	16.70	1.30
MGDD0007	16	18	1694	1760	27.50	0.97
MGDD0007	24	26.8	1700	2727	15.60	0.98
MGDD0006	8.4	10.38	1731	1557	8.10	1.23
MGDD0006	12.05	14	1734	1858	8.00	1.20
MGDD0006	18	20	1738	2105	27.20	1.50
MGDD0006	22.23	24	1741	2109	7.70	1.70

Table D. Sample type, slimes (-53um) & sand (+53um) fractions and mass of HM in sand fraction

Weathering	Sample ID	Start weight (g)	+53µm weight (g)	-53µm weight (g)	+53µm % (sand)	-53µm % (slimes)	Mass % HM in +53 µm fraction
SAPL	1650	1938.7	1601.6	337.1	82.61	17.39	5.23
SAPL	1655	2196	1596.5	599.5	72.7	27.3	7.66
SAPL	1657	2156.8	1682.8	474	78.02	21.98	3.02
MOTT	1687	2055.5	1358	697.5	66.07	33.93	9.76
SAPL	1694	1740.3	1437.8	302.5	82.62	17.38	5.58
SAPL	1700	2689.2	2176.4	512.8	80.93	19.07	11.51
MOTT	1731	1536.6	1151.4	385.2	74.93	25.07	19.26
PSAP	1734	1837.1	1438.4	398.7	78.3	21.7	19.55
SAPL	1738	2083.1	1609.8	473.3	77.28	22.72	3.44
SAPL	1741	2084.1	1619.2	464.9	77.69	22.31	5.64

Table E. Total calculated HM as % of original ore samples, TiO_2 in HM concentrate (ICP), TiO_2 recovered to HM concentrate as % of original ore samples, semi-quantitative rutile % as measured by XRD, TiO_2 in original ore samples recovered as rutile

Sample ID	Tot calc. HM %	Calc. HM weight	ICP TiO_2 in HM %	% TiO_2 recovered to HLS	TiO_2 recovery % to HLS	XRD Rutile % in HLS	% Rutile recovered to HLS	% TiO_2 recovered conc.
1650	4.3	83.8	16.75	0.72	61.98	13.00	0.56	48.10%
1655	5.6	122.3	14.46	0.81	66.15	11.00	0.61	50.30%
1657	2.4	50.8	26.43	0.62	58.32	21.00	0.49	46.35%
1687	6.4	132.5	10.49	0.68	52.01	9.00	0.58	44.60%
1694	4.6	80.2	15.47	0.71	73.69	14.00	0.65	66.71%
1700	9.3	250.5	7.46	0.69	70.58	7.00	0.65	66.25%
1731	14.4	221.8	6.72	0.97	78.60	6.00	0.87	70.15%
1734	15.3	281.2	5.37	0.82	68.47	5.00	0.77	63.73%
1738	2.7	55.4	28.08	0.75	49.72	22.00	0.58	38.96%
1741	4.4	91.3	17.05	0.75	43.91	13.00	0.57	33.48%

Table F. South and North Composite wet table, electrostatic and magnetic separation results.

Sample ID	Description	Rutile XRD	TiO_2 XRF	% head (tails) feed	% head (raw ore) feed	TiO_2 Recovered grade from tails	Recovery of TiO_2 to conc from tails	TiO_2 Recovered grade from ore	Recovery of TiO_2 to conc from ore
North Composite									
#0534	HTR Cond	49	71.53	1.51	1.07	-	-	-	-
#0535	HTR Mid	47	63.47	0.40	0.28	-	-	-	-
#0536	HTR Non Cond	6	8.56	0.77	0.55	-	-	-	-
#0537	(Cond) IRM Mag	30	46.16	0.51	0.36	-	-	-	-
#0538	(Cond) IRM Non Mag	62	76.72	1.00	0.71	0.77%	51.50%	0.55%	36.61%
South Composite									
#0539	HTR Cond	57	73.41	0.83	0.67	-	-	-	-
#0540	HTR Mid	55	69.49	1.03	0.82	-	-	-	-
#0541	HTR Non Cond	5	7.31	1.76	1.41	-	-	-	-
#0542	*(HTR Mid) IRM Mag*	*32*	*42.92*	0.31	0.25	-	-	-	-
#0543	(HTR Mid) IRM Non Mag	57	77.90	0.72	0.57	0.56%	37.46%	0.45%	30.01%
0544	(HTR Cond) IRM Mag	40	53.43	0.31	0.25	-	-	-	-
#0545	(HTR Cond) IRM Non Mag	69	89.93	0.57	0.46	0.52%	34.61%	0.41%	27.72%
	HTR Mid+Cond combined (calc.)	-	83.25	-	-	1.07%	72.07%	0.86%	57.73%

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Appendix 2: JORC Code, 2012 Edition – Table 1

Section 1 Sampling Techniques and Data

Criteria	JORC Code explanation	Commentary
Sampling Techniques	*Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc.). These examples should not be taken as limiting the broad meaning of sampling.* *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.* *Aspects of the determination of mineralisation that are Material to the Public Report. In cases where 'industry standard' work has been done this would be relatively simple (e.g. 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (e.g. submarine nodules) may warrant disclosure of detailed information.*	PQ triple tube (PQ3) Diamond Drilling (DD) was employed to obtain drill core from surface, which was subsequently geologically and geotechnically logged. Whole diamond core has been quarter split and sampled at nominal 2m downhole intervals and submitted for Total Graphitic Carbon (TGC) analysis by Eltra (reported on 26th October 2016 and 15th March 2017). A selection of 80 pulps were taken from this work and re-analysed by Na-peroxide fusion ICP OES/MS to specifically target TiO_2 values. Remaining core was sealed in layflat tubing and stored in-doors for future metallurgical testwork. Heavy liquid separation (HLS) work was undertaken at AML in Perth on 10 samples which were selected from coarse rejects of the 80 pulps analysed above. XRD (semi-quantitative) for bulk mineralogy on the 10 HLS concentrates was undertaken at Intertek Perth. Primary and secondary wet table separation work was undertaken on two ~20kg composite tailings samples produced from earlier graphite flotation test-work (South Composite and North Composite). XRD mineralogy on 3 splits from each composite after tabling (concentrate, middlings and tailings) for the South Composite. TGC (total graphitic carbon) by Eltra was conducted on the 6 splits. Na-peroxide fusion ICP OES/MS was also conducted on the 6 splits. Electrostatic (HTR) separation of the combined concentrate and middlings fractions for each composite was undertaken, followed by magnetic separation on the HTR middlings and conductors to produce final products.
Drilling Techniques	*Drill type (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc.) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc.).*	Conventional wireline PQ triple tube (PQ_3) Diamond Drilling (DD) was employed to obtain all drill core from surface. Drilling was undertaken with an Atlas Copco Christensen CT14 truck mounted drilling rig. The nominal core diameter is 83mm with a nominal hole diameter is 122mm. Coring was completed with standard diamond impregnated tungsten carbide drilling bits. Drill runs were completed employing either a 3.0 or 1.5m length PQ core barrel.
Drill Sample Recovery	*Method of recording and assessing core and chip sample recoveries and results assessed.* *Measures taken to maximise sample recovery and ensure representative nature of the samples.* *Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.*	At the completion of each drill run the steel splits containing the drill core were pumped out of the retrieved core tube. Core was then carefully transferred from the drill split into plastic sleeves (layflat) which were secured in rigid PVC splits. The layflat was securely bound and sealed with tape prior to transferring PVC splits into plastic core trays. Core recovery was then recorded separately for each drilling run. Core recovery was closely monitored during drilling particularly through the mineralised zones. Standard industry drilling mud mixtures were employed to improve core recovery especially through the softer upper clay rich material and underlying saprolitic horizon. Other measures such as adjusting the quantity of water used during drilling, the amount of rotation used and use of different drill bit types appropriate for soft formation drilling were employed during drilling to improve core recovery. Drill hole MGDD0004 and MGDD0005 were re-drilled due to core loss sustained through a number of mineralised zones. An overall core recovery of 89% was achieved for all drill holes and the core recovery through mineralised zones (>=5% vv) averages 90%. Excluding MGDD0004 and MGDD0005, core recovery overall increases to 91% and in mineralised zones (>=5%vv) averages 95%.
Logging	*Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation mining studies and metallurgical studies.* *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc.) photography.* *The total length and percentage of the relevant intersection logged.*	All DD core was geologically logged, recording relevant data to a standard template on a geological interval basis. Hole MGDD0001-7 were geotechnically logged by trained company geologists. Hole MGDD0008-13 was geotechnically logged by a qualified geotechnical engineer and selected samples were collected for laboratory strength tests. In addition, samples have been selected for bulk density determinations. All logged data was codified to a set company codes system. This information is of a sufficient level of detail to support appropriate Mineral Resource estimation mining studies and metallurgical studies. Logging is both qualitative and quantitative. Geological logging included lithological features, and volumetric visual estimates of mineralisation percentages and flake characteristics. All drill core is digitally photographed prior to sampling for future reference. 100% of drill-hole samples have been geologically logged.

Sub-sampling techniques and sample preparation	*If core, whether cut or sawn and whether quarter, half or all core taken.* *If non-core, whether riffled, tube sampled, rotary split, etc. and whether sampled wet or dry.* *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.* *Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.* *Whether sample sizes are appropriate to the grain size of the material being sampled.*	Whole PQ3 drill core was manually split and/or cut using a motorised diamond blade core saw and quarter sampled for laboratory analysis. Sample preparation is conducted at the laboratory in Perth. Each entire sample is crushed to nominal 100% -3mm in a Boyd crusher then pulverised to 85% -75µm in a LM5. Approximately 100g pulp is collected and sent to Intertek-Genalysis Perth for chemical analysis. 10 heavy liquid separation (HLS) work samples were selected from coarse rejects of the 80 pulps analysed above. Primary and secondary wet table separation work was undertaken on two ~20kg composite tailings samples produced from earlier graphite flotation test-work (South Composite and North Composite).
Quality of assay data and laboratory tests	*The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* *For geophysical tools, spectrometers, handheld XRF instruments, etc., the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.* *Nature of quality control procedures adopted (e.g. standards, blanks, duplicate, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.*	The assaying and laboratory procedures are considered to be appropriate for reporting titanium mineralisation, according to industry best practice. Each entire sample was crushed to nominally 100% -3mm in a Boyd crusher then pulverised to 85% -75µm. Approximately 100g pulp is collected for analysis at Intertek-Genalysis Perth. A sample of 0.2g is removed from the 100 gram pulp and subject to by Na-peroxide fusion ICP OES/MS. Field QC procedures involve the use of certified reference material assay standards, blanks, duplicates, replicates for company QC measures, and laboratory standards, replicate assaying and barren washes for laboratory QC measures. The insertion rate of each of these averaged better than 1 in 20. XRD for bulk mineralogy on the 10 HLS concentrates is considered semi-quantitative only. Na-peroxide fusion ICP OES/MS on pulps and concentrate and tailings samples involves a full digest and is considered a complete analysis technique. Discrepancy between XRD rutile results and Na-peroxide fusion ICP OES/MS TiO_2 results is likely due to the presence of leucoxene in the concentrates.
Verification of sampling & assaying	*The verification of significant intersections by either independent or alternative company personnel.* *The use of twinned holes.* *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* *Discuss any adjustment to assay data.*	Significant mineralisation intersections were verified by alternative company personnel. Twinned holes were not used for this initial work on rutile-leucoxene. All data is initially collected on paper logging sheets and codified to the Company's templates. This data was hand entered to spreadsheets and validated by Company geologists. This data was then imported to a Microsoft Access Database then validated automatically and manually. No adjustments have been made to assay data.
Location of data points	*Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* *Specification of the grid system used.* *Quality and adequacy of topographic control.*	Collars were tape measured from 20m separated DGPS surveyed auger holes (accuracy 0.02m x/y). All collars will be picked-up by the Company's consulting surveyor used a Leica GPS System 1200 in RTK mode to define the drill-hole collar coordinates to centimetre accuracy. All down-hole surveying was carried out using a Reflex Ez-Trak multi-shot survey tool at 30m intervals down hole. WGS84 (GRS80) UTM Zone 36 South is the grid system used. The Company's consulting surveyor used a Leica DGPS System 1200 in RTK mode to accurately locate the x, y, z of drill collars. Previous checking of Hand Auger holes with the Shuttle Radar Topographic Mission (SRTM) 1-arc second digital elevation data has shown that the Leica GPS System produces consistently accurate results. Given the low topographic relief of the area it is believed that this represents high quality control.
Data spacing & distribution	*Data spacing for reporting of Exploration Results.* *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.* *Whether sample compositing has been applied.*	Diamond core drill holes occur along east-west sections spaced at between 100-400m north-south between 35,400mN to 37,200mN. No Mineral Resource Estimate (MRE) has been completed for rutile-leucoxene mineralisation at Malingunde and the data distribution is not yet sufficient to establish grade continuity appropriate for a MRE. No sample compositing has occurred.

Orientation of data in relation to geological structure	*Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known considering the deposit type* *If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.*	No bias attributable to orientation of sampling has been identified, however, it is also not yet possible to ascertain the geological orientation of the rutile-leucoxene mineralisation.
Sample security	*The measures taken to ensure sample security*	Samples are securely stored at the Company's compound in Lilongwe. Samples are labelled in accordance with HCS 2012 and kept for 5 years.
Audits or reviews	*The results of any audits or reviews of sampling techniques and data*	It is considered by the Company that industry best practice methods have been employed at all stages of work. Reviews of metallurgical and downstream test-work are undertaken by appropriately qualified independent consultants on a regular basis.

Section 2 Reporting of Exploration Results

Criteria	JORC Code explanation	Commentary
Mineral tenement & land tenure status	*Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environment settings.* *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.*	The Company owns 100% of 4 Exclusive Prospecting Licences (EPLs) in Malawi. EPL0355 renewed in 2017 for 2 years, EPL0372 renewed in 2018 for 2 years and EPL0413 renewed in 2017 for 2 years. EPL0492 was granted in 2018 for an initial period of three years (renewable). The tenements are in good standing and no known impediments to exploration or mining exist.
Exploration done by other parties	*Acknowledgement and appraisal of exploration by other parties.*	No other parties were involved in exploration.
Geology	*Deposit type, geological setting and style of mineralisation*	The rutile-leucoxene mineralisation occurs within graphitic gneisses, hosted within a broader Proterozoic paragneiss package. In the Malingunde area specifically, a deep tropical weathering profile is preserved, resulting in significant vertical thicknesses from near surface of saprolite-hosted rutile-leucoxene and graphite mineralisation.
Drill hole information	*A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes: easting and northings of the drill hole collar; elevation or RL (Reduced Level-elevation above sea level in metres of the drill hole collar); dip and azimuth of the hole; down hole length and interception depth; and hole length* *If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case*	All material information is presented in Tables A though F in Appendix 1. No material information has been excluded.
Data aggregation methods	*In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high-grades) and cut-off grades are usually Material and should be stated.* *Where aggregate intercepts incorporate short lengths of high-grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.* *The assumptions used for any reporting of metal equivalent values should be clearly stated.*	A 0% TiO_2 lower cut-off grade was applied. No short lengths of high grades occur. No metal equivalent values are used in this report.

Relationship between mineralisation widths & intercept lengths	*These relationships are particularly important in the reporting of Exploration Results.* *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.* *If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (e.g. 'down hole length, true width not known'.*	All reported widths are down-hole widths. The orientation and geometry of the rutile-leucoxene mineralisation is not currently well understood.
Diagrams	*Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported. These should include, but not be limited to a plan view of the drill collar locations and appropriate sectional views.*	See Figures within the main text of this report.
Balanced reporting	*Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high-grades and/or widths should be practiced to avoid misleading reporting of exploration results.*	Representative reporting of low and high-grades has been effected within this report.
Other substantive exploration data	*Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples - size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.*	No additional meaningful and material exploration data has been excluded from this report that has not previously been reported to the ASX.
Further work	*The nature and scale of planned further work (e.g. test for lateral extensions or depth extensions or large-scale step-out drilling).* *Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.*	The company is currently completing a pre-feasibility study on a potential flake graphite mining operation at Malingunde. Further work on the possibility of recovering rutile-leucoxene from the deposit will include additional chemical analyses of concentrates and additional metallurgical test-work in order to try to upgrade the concentrates to >95% TiO_2. Additionally, a desk-top study is planned to examine capital and operating costs of adding a rutile-leucoxene recovery circuit to the proposed plant at Malingunde. See Figures within the main text of this report for possible extensions to rutile-leucoxene mineralisation.