

**SCOTTS HILL AND MT VULCAN PROJECT  
TASMANIA  
EL2/2017**

ANNUAL REPORT  
15<sup>TH</sup> AUGUST 2021 TO 14<sup>TH</sup> AUGUST 2022

**Tenement Holder/Manager**  
Tasmania Energy Metals Pty Ltd  
10 Victoria St, Hobart TAS 7000

**Prepared By:** Dr Pierre RICHARD - Director  
On behalf of Tasmania Energy Metals Pty Ltd

**Distribution:** Mineral Resources Tasmania  
Tasmania Energy Metals Pty Ltd

**Note: All figures and grids are according to the GDA94 datum and MGA94 grid system.**

## **ABSTRACT/EXECUTIVE SUMMARY**

The main focus of Tasmania Energy Metals Pty Ltd (“TEM” or “the Company”) at the Scotts Hill and Mt Vulcan Project is lateritic nickel-cobalt mineralisation. TEM aims to develop an open pit mining operation at Scotts Hill and Mt Vulcan with production of intermediate nickel (Ni) and cobalt (Co) products undertaken off-site in Tasmania.

Work completed in the reporting year 2021-2022 included a replication of the multi-stage leaching process and the application of a pre-treatment stage of magnetic separation works. The magnetic separation used scalable equipment to verify the effectiveness of Low Intensity Magnetic Separation (LIMS) and allow the planning of pilot scale testwork. In addition, commercial scale equipment was applied to test Wet High Intensity Magnetic Separation (WHIMS) to see whether further actionable Fe-rich by-products could be considered in further development assessment.

The development focus at Scotts Hill and Mt Vulcan is metallurgical testing and engineering works as part of the feasibility assessment of the project. It is considered that the joint development of the Scotts Hill and Mt Vulcan deposits with the nearby Barnes Hill deposits will give the project improved scale and greater commercial viability.

Exploration completed during the reporting period has included a verification of the 3-stage leaching flowsheet that has been developed through earlier testwork and the production of an iron (Fe) concentrate through the magnetic separation of contained magnetite. During this reporting period, the successful LIMS was followed-up through:

- a. a further set of LIMS tests performed on larger scale samples using fully commercially scalable equipment; and,
- b. by application of a more aggressive magnetic separation process using higher magnetic field strengths under a WHIMS system.

Work planned for the coming year will include Davis Tube Recovery (DTR) testwork resampling and geostatistical work to allow the estimation of a maiden JORC-compliant magnetite resource and the update of the scoping study to include production of a magnetite by-product.

## TABLE OF CONTENTS

1	INTRODUCTION .....	1
2	REVIEW OF PREVIOUS WORK AND GEOLOGICAL SETTING .....	2
3	EXPLORATION COMPLETED DURING THE REPORTING PERIOD .....	3
4	DISCUSSION OF RESULTS .....	3
5	CONCLUSIONS .....	7
6	PROPOSED EXPLORATION .....	7
7	ENVIRONMENTAL MANAGEMENT .....	8
8	EXPENDITURE .....	8
9	KEY REFERENCES .....	9

Digital files submitted with this report:

Filename	File format
EL022017_202208_01_Report.doc	<i>doc</i>

## 1 INTRODUCTION

The Scotts Hill and Mt Vulcan Project (EL2/2017) is located in northern Tasmania. The exploration licence contains a JORC 2012 inferred resource of 7.7Mt at 0.67% Ni and 0.047% Co (on a 0.5% Ni cut-off grade). The resource is made up of two interconnected resources known as the Scotts Hill and Mt Vulcan deposits (see Figure 1).

The Scotts Hill and Mt Vulcan Hill Project is located 5km west of the township of Beaconsfield near the Tamar River in northern Tasmania. The Scotts Hill and Mt Vulcan resource can be directly accessed using Tattersall's Road, just west of Beaconsfield.

The exploration licence covers an area of 13km<sup>2</sup> and was granted on 15<sup>th</sup> August 2017 for a period of five years. It is owned 100% by Tasmania Energy Metals Pty Ltd (TEM), having been transferred from previous holder Monclar Pty Ltd. It is not subject to any current agreements with other companies. The exploration target is lateritic nickel-cobalt mineralisation that can act as feed for the proposed development of the adjacent Barnes Hill mine (on Lease 1872P/M) also held by TEM.

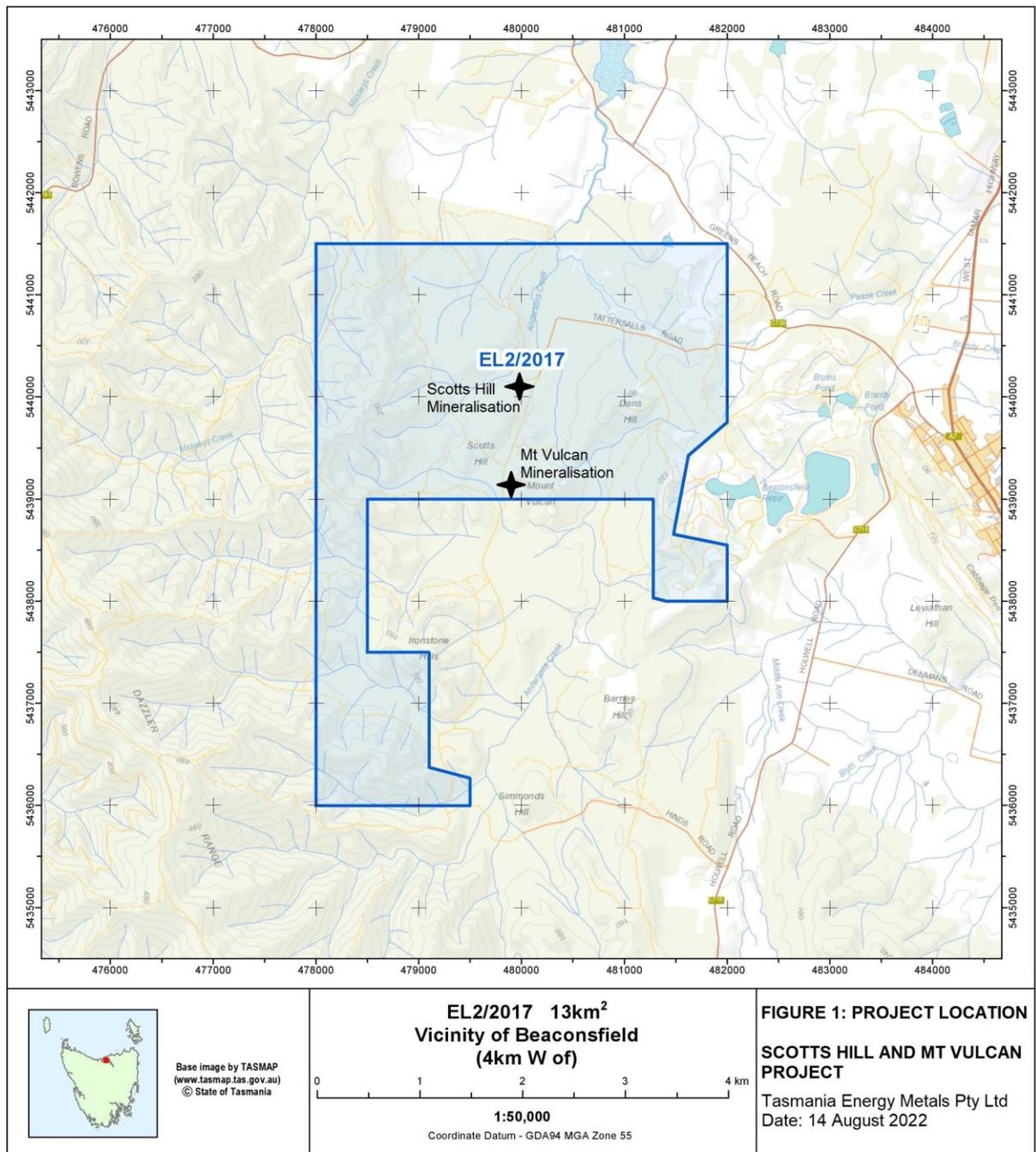
The land tenure plan shows EL2/2017 is covered by both Crown and Private Land. The Crown Land is variously classified. The private land only minorly impacts the Scotts Hill Ni-Co mineralisation to the east of the Tattersalls Road. Exploration and mining are permitted on Private Land but must be preceded by negotiation of an access and compensation agreement with the landowner and its lodgement with Mineral Resources Tasmania (MRT). However, no exploration is currently proposed for private land.

The relevant areas of Crown Land are classified either as Future Potential Production Forest (FPPF), Regional Reserve, and Conservation Area. The Scotts Hill mineralisation sits on FPPF, while Mt Vulcan sits on FPPF west of the Tattersalls Road and the Dans Hill Conservation Area east of the Tattersalls Road.

The development focus is metallurgical testing and engineering works as part of the feasibility assessment of the project. It is considered that the joint development of the Scotts Hill and Mt Vulcan deposits with the nearby Barnes Hill deposits will give the project improved scale and greater commercial viability.

Exploration completed during the reporting period has included a verification of the 3-stage leaching flowsheet that has been developed through earlier testwork and the production of an iron (Fe) concentrate through the magnetic separation of contained magnetite. During this reporting period, the successful Low Intensity Magnetic Separation (LIMS) was followed-up through:

- c. a further set of LIMS tests performed on larger scale samples using fully commercially scalable equipment; and,
- d. by application of a more aggressive magnetic separation process using higher magnetic field strengths under a Wet High Intensity Magnetic Separation (WHIMS) system.



**FIGURE 1 SUMMARY ACTIVITY MAP FOR SCOTTS HILL AND MT VULCAN**

## **2 REVIEW OF PREVIOUS WORK AND GEOLOGICAL SETTING**

Substantial exploration has been carried out at Scotts Hill and Mt Vulcan over the last 50 years. A summary table is included in the 2021 Annual Report (Richard, 2021).

A review of previous work and explanation of geological setting, being weather regolith associated with the Andersons Creek Ultramafic Complex (ACUC), as well as historical minerals resource and metallurgical testwork was presented in the 2017-2018 Annual report for EL 2/2017 (Richard, 2018) and may be used for reference.

### 3 EXPLORATION COMPLETED DURING THE REPORTING PERIOD

Pre-feasibility study level testwork in ongoing. This reporting period saw further samples drawn from the metallurgical composite (itself from the 2019 drilling program) and utilised in further leach testing to verify earlier results and to further pursue the extraction of a saleable Iron Ore concentrate through magnetic separation. This involved a larger scale test of the successful LIMS process and also the testing of an additional WHIMS process capable of extracting paramagnetic iron species. That work builds on the breakthrough confirmation of a substantial volume of liberated magnetite throughout the ore domains (see Table 1 below). These results were based on broad-based drilling sample composites that were subjected to Electron Probe Micro Analyzer (EPMA) assessment by CSIRO.

Ore Domain	Magnetite (%vol)
Limonite	19
Transitional	12
Saprolite	12
Saprock	9

TABLE 1 MAGNETITE BY VOLUME (CSIRO BY EPMA)

Following earlier work centred on LIMS by CSIRO, further pre-concentration beneficiation using WHIMS was identified as a potentially effective additional processing step. This drew on the low levels of nickel and cobalt reporting to the magnetic concentrates. Testwork was designed to assess whether similarly low extraction of the metals targeted by leaching would also be achieved under a higher magnetic field strength.

Specialist physical beneficiation consultants IHC Royal (formerly Robbins Metallurgical) then designed a LIMS/WHIMS program that would utilise a larger sample size to process the Scotts Hill/Mt Vulcan ore through commercially sized or scalable equipment. As was the case previously, LIMS on scrubbed ores was very successful and produced a Fe concentrate with low impurities that is likely to be suitable for sale. An initial market assessment with an international trading house and comparison to benchmark Iron ore indexes both supported a viable market for these by-products. The WHIMS program extracted Fe values, but significant nickel and cobalt were also extracted to these concentrates. This undermined the potential economic attractiveness of the method on most realistic commodity price scenarios. Only in extreme commodity price cases would the additional by-product volumes outweigh the losses of Ni and Co the proposed leaching operations.

### 4 DISCUSSION OF RESULTS

The results met expectations and have suggested a processing pathway for the development of the project. The main results are discussed in this section.

#### 4.1 Leaching Testwork

A verification leaching test was run by CSIRO in Perth on the optimal conditions identified in metallurgical assessment undertaken during the reporting year to August 2021. The testwork was undertaken on a separate new sample drawn from a different composite. The results of the additional tests were received on 5 August 2022.

The conditions used for the additional tests are given in Table 2. After the Primary leach step, Secondary ore and further water were added to the Primary leach slurry to conduct the Secondary leach step. Subsequently, dry Tertiary Ore was added to the Secondary leach slurry to neutralise acid generated during Secondary leaching. Final samples were taken to obtain

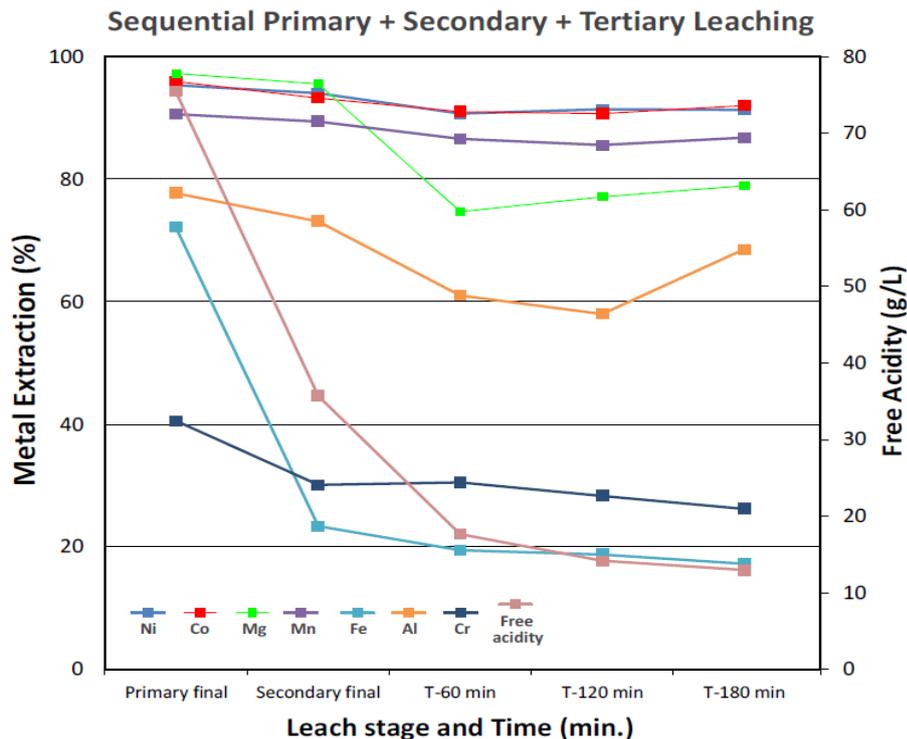
data for metal recovery and free acidity for the Primary and Secondary leach tests. During Tertiary leaching, samples were taken every hour for elemental and free acid analyses. It should be noted that the slurries were allowed to cool to ambient temperature between each leach step.

Test Condition	Ore Type		
	Primary ore	Secondary ore	Tertiary ore
Ore addition (g)	500	255	140
Ore proportion (%)	54	30	17
Water addition (g)	929	473	0
Acid addition (g)	475	0	0
Target Acid/Dry Ore (kg/t)	950	N/A	N/A
Target pulp density (% w/w)	26	35	N/A
Leach time (h)	6	3	5
Temperature (°C)	95	170	95

**TABLE 2 TEST CONDITIONS FOR ADDITIONAL SERIES OF LATERITE LEACH TESTS**

The results achieved similar Ni extractions in the Primary (~96%) and Secondary (~94%) leaches as had been achieved in the previous Primary and Secondary leach tests undertaken in previous sets of testwork. These were strong results confirming the Scotts Hill and Mt Vulcan ore as readily leachable under low-moderate intensity conditions.

In the course of the process, the single step addition of Tertiary ore to the post leach slurry from the Primary and Secondary leaches resulted in the nickel concentration in the leach solution increasing from 3720 mg/L at the end of Secondary leach to ~4300 mg/L in the Tertiary leach after 60 minutes. This value changed little thereafter suggesting that nickel (and also cobalt) leached readily and could be optimised with a limited residence time. The overall nickel extraction was around 91% for the Tertiary leach. Similar leaching trends were noted for Co and Mn. Extractions and free acidity over the course of the Primary, Secondary and Tertiary (measured at 60-minute intervals) leaching stages are summarised in Figure 2 below.



**FIGURE 2 METALS EXTRACTIONS WITH FREE ACIDITY ACROSS LEACHING STAGES**

Values of free acidity, pH and Eh values at the conclusion of the Primary and Secondary leaches and as a function of time in Tertiary leach are given in Table 3. The free acidity decreased from 35.7 g/L after the Secondary leach, to 17.6 g/L after 60 minutes and, to 10.7 g/L after 240 minutes of the Tertiary leach stage; there was little further change. This corresponds well with the iron concentration decreasing from 19,100 mg/L after the Secondary leach, to 15,700 mg/L after 240 minutes of the Tertiary leach stage. As nickel leaching was essentially complete after 60 minutes, neutralisation of the acid was correlated with increasing Mg extraction from 60 minutes to about 240 minutes. Similarly, Al extraction also increased during this period indicating the free acidity remained too high for its removal. Leaching during the Tertiary stage demonstrates the free acidity can be reduced from >35g/L to ~10 g/L in less 5 hours. Additional Ni, Co, Mg, Mn, Cr and Al were leached, while ~20% of the Fe was removed from solution.

Sample ID	pH	Free acidity (g/L)	Eh (mV Ag/AgCl)
Primary-final	0.20	75.5	489.1
Secondary-final	0.61	35.7	450.4
Tertiary - T-60 min	0.84	17.6	461.3
Tertiary - T-120 min	0.95	14.1	465.7
Tertiary - T- 180 min	1.15	12.9	465.4
Tertiary - T- 240 min	1.21	10.7	464.8
Tertiary -T- 300 min	1.28	10.4	464.8
Tertiary - final	1.32	9.61	469.0

**TABLE 3 FREE ACIDITY, PH AND EH FOR PRIMARY, SECONDARY AND TERTIARY LEACHING**

## **4.2 Magnetic Separation**

Following the CSIRO LIMS work a larger scale test was planned with IHC Royal. This sought to use a scalable Eriez L-8 drum separator (2tph capacity), being a unit approximately half the size of the usual commercial scale equipment. The Eriez L-8 is commonly used for pilot plants and also in low-capacity commercial applications (larger commercial models have the same design, but with a wider and larger diameter drum size). The operating principle is the same as the larger models allowing good approximation from this unit to commercial implementation. This equipment was an advance over the lab-scale Davis Tube Recovery method used previously and provided an opportunity to triangulate across potential error associated with the separation method. Approximation of actual performance from DTR results is subject to method bias (Murariu & Svoboda, 2003), and this additional testwork sought to overcome that potential source of error. This LIMS testwork applied a field strength of 1,000 gauss.

In addition, an additional stage of WHIMS testing was added to assess whether a more aggressive field strength of 8,000 gauss would extract a further fraction of weakly magnetic/paramagnetic Fe-rich minerals. The WHIMS test was performed on a commercial scale 40tph Heavy Minerals Developments (HMD) Wet High Intensity Magnetic Separator.

Under the experimental arrangement, each ore sample was processed through a simple particle classification and size reduction circuit (with grinding to P80 250µm for the Limonite and Transitional ores and grinding to P80 125µm for the Saprolite and Saprock ores), followed by magnetic separation by LIMS, with the LIMS non-magnetic (NM) fraction then passed through to the WHIMS circuit.

A short summary of the LIMS results is below. The %dry mass pulled was very good in all cases, though the larger mass pull (relative to the CSIRO results) also came with some reduction in the Fe grade. The IHC results (see Table 4 below) show the LIMS as performing well across all the ore types except for -38µm slimes. For the combined samples (i.e., not deslimed at 38µm) and deslimed +38µm fractions, LIMS significantly concentrated the Fe in the magnetic fraction (Mag) without drawing significant Ni. There was some loss of Co, but mainly in the very low Co Saprolite and Saprock ore feeds. In contrast, the LIMS Magnetic Concentrate (mags) slimes (being -38µm fraction) were all high Ni and similar to the non-magnetic fraction. For the saprolite samples, separation returned 1.06% Ni in the -38µm LIMS mag vs 1.23% for the -38µm non-magnetic fraction. For the Saprock samples separation returned 0.861% Ni in the -38µm LIMS mags vs 0.872% for the -38µm NM).

Ore Type	Fraction	Dry Mass %	Assay				Metals Distributions			
			Ni %	Co %	Mg %	Fe %	Ni %	Co %	Mg %	Fe %
Limonite Ore	LIMS Mag	44.2	0.34	0.08	0.83	60.7	26.8	23.2	24.7	62.2
	WHIMS Mag	20.1	0.73	0.28	1.67	36.7	26.0	35.0	22.6	17.1
	WHIMS Non-Mag	35.7	0.75	0.19	2.20	25.0	47.3	41.9	52.8	20.7
Transition Ore	LIMS Mag	16.9	0.19	0.06	0.50	64.0	4.6	7.1	3.1	37.1
	WHIMS Mag	20.0	1.14	0.31	2.94	28.3	32.4	41.2	21.9	19.5
	WHIMS Non-Mag	63.1	0.71	0.12	3.20	20.0	63.0	51.7	75.0	43.4
Saprolite Ore	+38µm LIMS Mag	20.1	0.33	0.06	1.83	55.1	7.0	18.2	5.7	51.7
	-38µm LIMS Mag	4.3	1.06	0.05	5.56	25.0	4.8	3.1	3.7	5.0
	+38µm WHIMS Mag	18.0	1.04	0.09	5.39	16.6	19.9	27.0	15.1	14.0
	-38µm WHIMS Mag	3.7	1.11	0.06	5.81	18.3	4.3	3.6	3.3	3.1
	+38µm WHIMS Non-Mag	43.1	1.10	0.06	9.08	9.5	50.3	41.1	60.7	19.2
	-38µm WHIMS Non-Mag	10.9	1.19	0.04	6.84	13.6	13.7	7.1	11.5	6.9
Saprock Ore	+38µm LIMS Mag	19.9	0.34	0.03	8.90	39.5	11.5	23.0	10.3	65.2
	-38µm LIMS Mag	5.6	0.86	0.03	16.90	9.7	8.2	6.0	5.5	4.5
	+38µm WHIMS Mag	13.2	0.59	0.04	18.30	7.8	13.3	21.8	14.0	8.6
	-38µm WHIMS Mag	1.9	0.72	0.05	16.50	11.8	2.3	3.6	1.8	1.9
	+38µm WHIMS Non-Mag	44.1	0.58	0.02	20.30	3.6	43.8	31.0	51.9	13.1
	-38µm WHIMS Non-Mag	15.3	0.81	0.02	18.70	5.3	20.9	14.5	16.6	6.7

**TABLE 4 MAGNETIC SEPARATION OF LATERITIC NICKEL ORE**

The LIMS non-magnetic fraction was then pass on the WHIMS to see whether further Fe values could be extracted. In contrast, the WHIMS results did not produce a sufficiently clean Fe-concentrate at any sizing. The WHIMS pulled an amount of Fe similar to the proportion of mass, such that there was no effective concentration. Moreover, the WHIMS Mag grades were not close to seaborne market standard Iron Ore Fe-levels (i.e., >56% Fe min). In most cases the Fe was so low as to be unviable for even blending consideration (being well below 40% Fe). The WHIMS also pulled significant Ni/Co. In the case of Ni, in all cases a greater proportion of the Ni was pulled than the %mass, concentrating the Ni to the magnetic concentrate. There was variability in the Co results, but in several cases very large proportions of the Co were pulled to the Mag concentrate, far in excess of the mass proportions. These suggests non-Fe species being pulled by the WHIMS, as those are themselves only low Ni/Co carriers. It is difficult without further mineralogical analysis to judge which species may be being pulled to drive that result in the WHIMS, but there is some indication of concentration of Mn and Cr across the WHIMS mag concentrates (so it could be paramagnetic chromite, or alternatively due to locking, where other minerals have been pulled with unliberated hematite/goethite).

## 5 CONCLUSIONS

The LIMS tests, which utilised a magnetic flux density of approximately 1,000 Gauss, were able to reject a significant portion of the iron content to the LIMS magnetic stream and in turn, reduce the iron content in the produced LIMS non-magnetic stream that would pass through to the leaching process. The LIMS tests also rejected <10% of the nickel and cobalt to the magnetic stream (with the exception of the Transition Ore sample). The LIMS magnetic separation was very successful and produced what has been preliminarily assessed to be a saleable Fe concentrate with low impurities. Importantly, the removal of an Fe by-product resulted in improved leach feed parameters including higher Ni/Co grades and lower Fe.

The WHIMS tests, which utilised a magnetic flux density of approximately 8,000 Gauss, did not achieve any meaningful upgrade in terms of selective iron rejection to the magnetic streams. The associated nickel losses to the WHIMS magnetic streams (>15%) are also not justified. Accordingly, the assessment of Wet Intensity Magnetic Separation (WHIMS) to address incremental recoverable hematite and goethite was not successful. The grade of the material was not considered sufficiently high for an Iron Ore product and there were significant losses of other metal values. There may be scope to consider such products as a feed into the cement industry, but this would rely on location advantages given the significantly lower per tonne values associated with that product market. Sales into the cement industry could be considered for the +38µm LIMS mags produced from saprolite and saprock ore feed, but initial calculation suggest these may be better blended into the limonite and transitional ore +38µm LIMS magnetic concentrates, as the weighted volume are still likely to be sufficient to meet minimum Fe grade requirements. Nevertheless, some further assessment of the sizing and specifications required for the cement industry market will now be considered to identify whether that would be an alternative should the volumes of lower Fe +38µm LIMS mags not be able to be blended.

Basically, LIMS was effective, but WHIMS was not. LIMS saw substantial Fe upgrading, with acceptable Ni/Co losses. This left a non-Mag with improved Ni and some improvement of Co (improved for Lim/Trans, similar for Sap, but lower for Saprock). In contrast, follow-up WHIMS on the LIMS non-Mag tended to pull a proportional amount of Ni/Co (i.e., WHIMS Mag had Ni and Co assays close to the WHIMS feed levels)

## 6 PROPOSED EXPLORATION

Work planned for the coming year will include:

- A program of geochemical analysis and associated systematic testwork will be undertaken over the next 12 months to allow the estimation of a JORC-compliant magnetite Mineral Resource Estimate. A proposal has been delivered by Snowden Mining Industry Consultants for this additional work. That may include some combination of magnetic susceptibility measurements and DTR across the retained samples and pulps to allow a resource estimate around the recoverable Iron Ore concentrate.
- Further grinding testwork is also to be performed on the low-grade LIMS magnetic fractions (from saprolite and saprock ore feeds) to see if a portion of the magnetic fraction can be brought to a saleable specification through a second stage of LIMS. The production and sale of an Iron Ore concentrate presents important benefits to the project, including boosting leach-feed nickel grades, reducing the volume of waste to be returned to tailings and generating additional revenues.

This work will allow an updated scoping study for the project to be released, one that integrates the production of an iron ore (magnetite) concentrate.

## 7 ENVIRONMENTAL MANAGEMENT

The site was visited several times during the period in preparation for environmental studies and to assess the status of previously implemented rehabilitation (following the 2019 sampling program). No extractive groundwork was undertaken in this reporting period. No new environmental or rehabilitation concerns were reported.

## 8 EXPENDITURE

Expenditure from 15<sup>th</sup> August 2021 to 14<sup>th</sup> August 2022 is summarised below for the Scotts Hill and Mt Vulcan EL2/2017 licence.

**TABLE 2 EXPENDITURE 15 AUGUST 2021 TO 14 AUGUST 2022.**

1. Geoscience	\$0
2. Drilling and Gridding	\$0
3. Land Access	\$0
4. Rehabilitation	\$0
5. Feasibility Studies	\$128,783.15
6. Other	\$0
7. Administration	\$1,988.57
<b>TOTAL - ELIGIBLE</b>	<b>\$130,771.73</b>

## **9 KEY REFERENCES**

**Jannink, A (2006)** JORC Indicated category confirmation letter for Barnes Hill, Scotts and Mt Vulcan Resources EL 18/2006 Beaconsfield, Tasmania. Douglas McKenna and Partners Pty Ltd (Author A Jannink), (12 December 2006)

**Murariu, V & Svoboda, J (2003)** The Applicability of Davis Tube Tests to Ore Separation by Drum Magnetic Separators 12 Physical Separation in Science and Engineering, Vol. 12(1): 1-11.

**Richard, P (2018)** EL2/2017 Annual Report 15th August 2017 to 14th August 2018. Scotts Hill and Mt Vulcan Project. Available from Mineral Resources Tasmania.

**Richard, P (2020)** EL2/2017 Annual Report 15th August 2019 to 14th August 2020. Scotts Hill and Mt Vulcan Project. Available from Mineral Resources Tasmania.

**Richard, P (2021)** EL2/2017 Annual Report 15th August 2020 to 14th August 2021. Scotts Hill and Mt Vulcan Project. Available from Mineral Resources Tasmania.