Memo

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From: Brent Butler

cc: Graeme Campbell & Phil Scott

Date: 17 March 2020

Re: Brief description of Medcalf geology

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1 GEOLOGY

1.1 Introduction and background

The Medcalf Project lies in the Archaean aged Lake Johnston greenstone belt in the Yilgarn Craton. This belt contains komatiite lava flows, subvolcanic intrusions, mafic volcanic rocks, felsic volcanic rocks, banded iron formation (BIF) and sedimentary rocks. The deposit is hosted by the Medcalf layered sill, which is a flat lying igneous body which has intruded parallel to the enclosing basalts. The sill is comprised of an upper gabbroic zone, a middle pyroxenite zone, with a lower amphibolite zone.

The deposit was discovered by Union Laporte Miniere in the 1960s. Historic exploration in the 1970s and 1980s by Amoco defined three separate areas of vanadium mineralisation known as the Vesuvius, Fuji and Egmont Prospects.

The Medcalf deposit is located in the Archaean aged Lake Johnston greenstone belt in the southern portion of the Youanmi Terrane, part of the Yilgarn Craton (Figure 1). This belt is a narrow north-northwest trending belt, approximately 110 km in length. It is located near the south margin of the Yilgarn Craton, midway between the southern ends of Norseman-Wiluna and the Forrestonia-Southern Cross greenstone belts.

The eastern and northern limits of the Lake Johnston Greenstone Belt are defined by the large northwest-trending Koolyanobbing shear zone. To the west, the greenstones are bound by grantoids and gneissic rocks which extend some 70 km west to the Forrestonia-

Southern Cross greenstone belts. To the south, the greenstones appear to pinch out in granites.

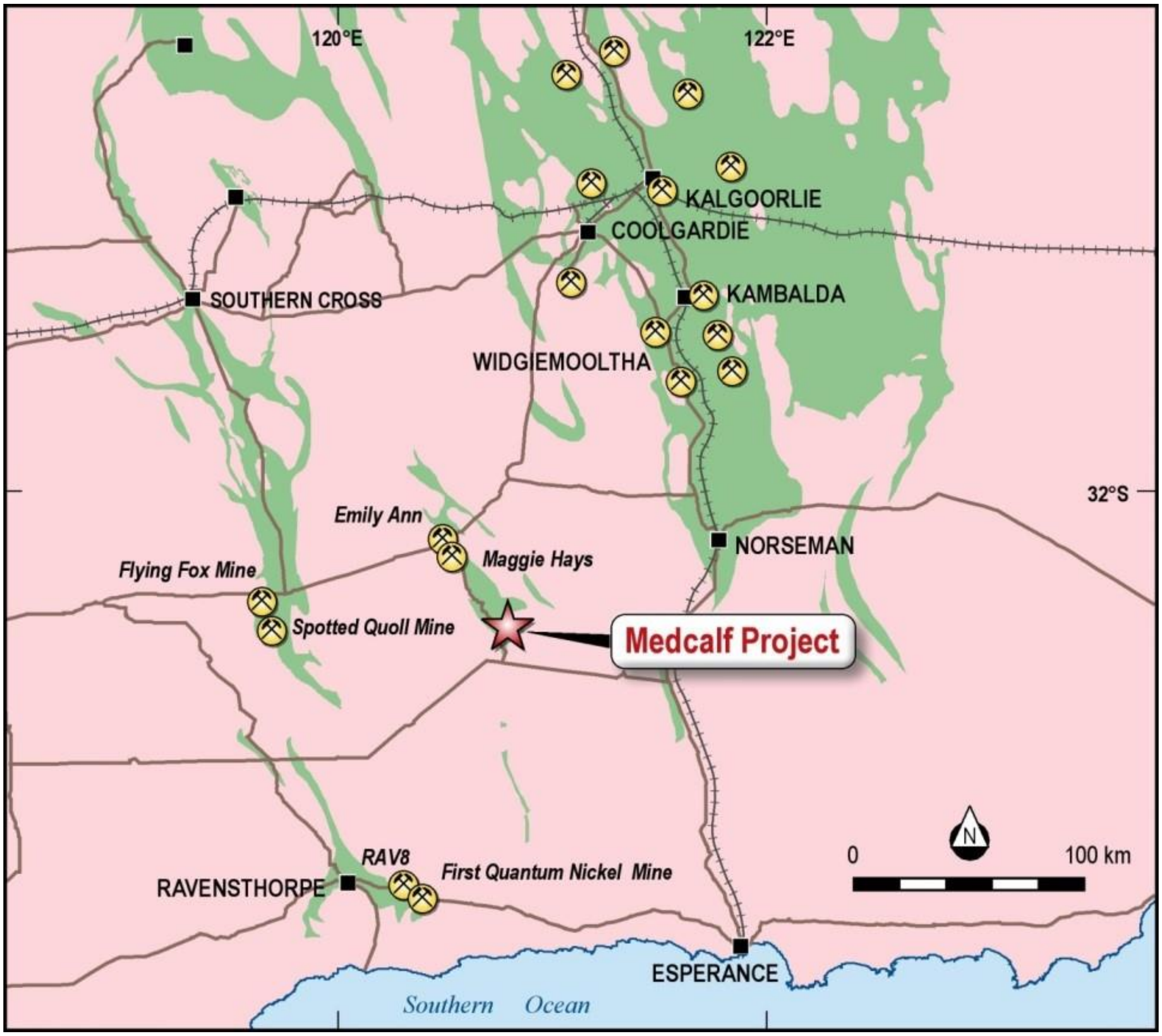

Figure 1: Regional geology showing greenstone belts and mine locations

The western margin of the Lake Johnston greenstone belt consists of a west facing succession of mafic and felsic volcanics, some sediment horizons, Banded Iron Formation (BIF) and three ultramafic units.

The volcanics and sediments are flanked and intruded by granitic rocks which disrupt the continuity of the greenstone belt. Pegmatitic doleritic dykes are common. The sequence is extensively faulted, and gently inclined. North and south plunging folds have been recognised. The boundaries of the greenstone belt are thought to be largely defined by strike parallel shears and faults.

The bedrock geology is widely masked by lateritic duricrust, deep oxidation and transported material. The average thickness of the regolith and weathered bedrock is 60 to 80 m. Weathering of ultramafic rock types is often intense with widespread development of silica-rich “cap-rock” in the saprolite zone.

1.1.1 Regional structure

The Regional structure strike approximates 330^0 with the foliation dipping most commonly steeply to the east, with the only major exception being dips within the metabasalt along the western edge of Lake Johnston to the west.

The Lake Johnston greenstone belt is considered to be a western overturned limb of a broad regional anticline. The eastern limb is no longer preserved having been removed by one or a combination of the following factors:

- Faulted out to a higher position followed by erosion to present levels
- Obliterated by late stage granite intrusion
- The unit corresponds to a thinner and less developed section of the pile

The third point above is also considered to be the reason for the general lensing out of the main layered intrusive toward the southern end.

The Medcalf layered sill has been intruded low in the greenstone succession and appears to be in the hinge zone of a major, gently north plunging regional anticline. The succession to the west of Medcalf is west-facing but is generally overturned, with steep easterly dips. To the east of Medcalf are the granite intruded remnants of the east-facing eastern limb of the regional anticline.

1.1.2 Regional mineralisation

Mineralisation in the Lake Johnston area includes nickel, base metals, vanadium, iron, titanium and gold.

Nickel is the dominant commodity in the area where there are several mines in the area. Western Areas Limited operate two underground mines at Forrestonia, Flying Fox and the Spotted Quoll mines which produce on average 25,000 t/a of nickel concentration per year. Poseidon Nickel Ltd (Poseidon) own the two underground nickel mines Emily Ann and Maggie Hays (both on care and maintenance) in the Lake Johnston area.

Audalia's Medcalf Project located some 50 km south of the Maggie Hays Nickel Mine. The mineralisation is contained within a pyroxenite sill and was drilled during 2013 by Audalia for Resource definition. The latest JORC (2012) Resource of 32Mt @ 0.47% V_2O_5, 8.98% TiO_2 and 49.2% Fe_2O_3 was announced to the market on August 31st, 2018.

The Medcalf Project lies within the Medcalf layered sill, which is a flat lying igneous body which has intruded parallel to the enclosing volcanic strata basalt, prior to regional metamorphism. It is a layered basic sill of the gravity differentiated type. The sill is comprised of an upper gabbroic zone, a middle pyroxenite zone, with a lower amphibolite zone in the footwall. Four separate zones of vanadium, titanium and iron mineralisation have been identified within the project area and named the Egmont, Vesuvius, Fuji and Pinatubo prospects. In the Medcalf deposit vanadium, iron and titanium have been concentrated in a pyroxenite unit, which has subsequently been enriched in these metals through weathering and regolith formation.

In the mineralised area (Figure 2) the magnetite-rich sequence is deeply weathered, with +60m of saprolite showing vertical zonation of weathering minerals due to progressive weathering. Mineralogy of the vanadium rich zone is dominated by hematite-goethite and kaolinite with minor ilmenite, diaspore, gibbsite, anatase, rutile, magnetite, quartz and mica.

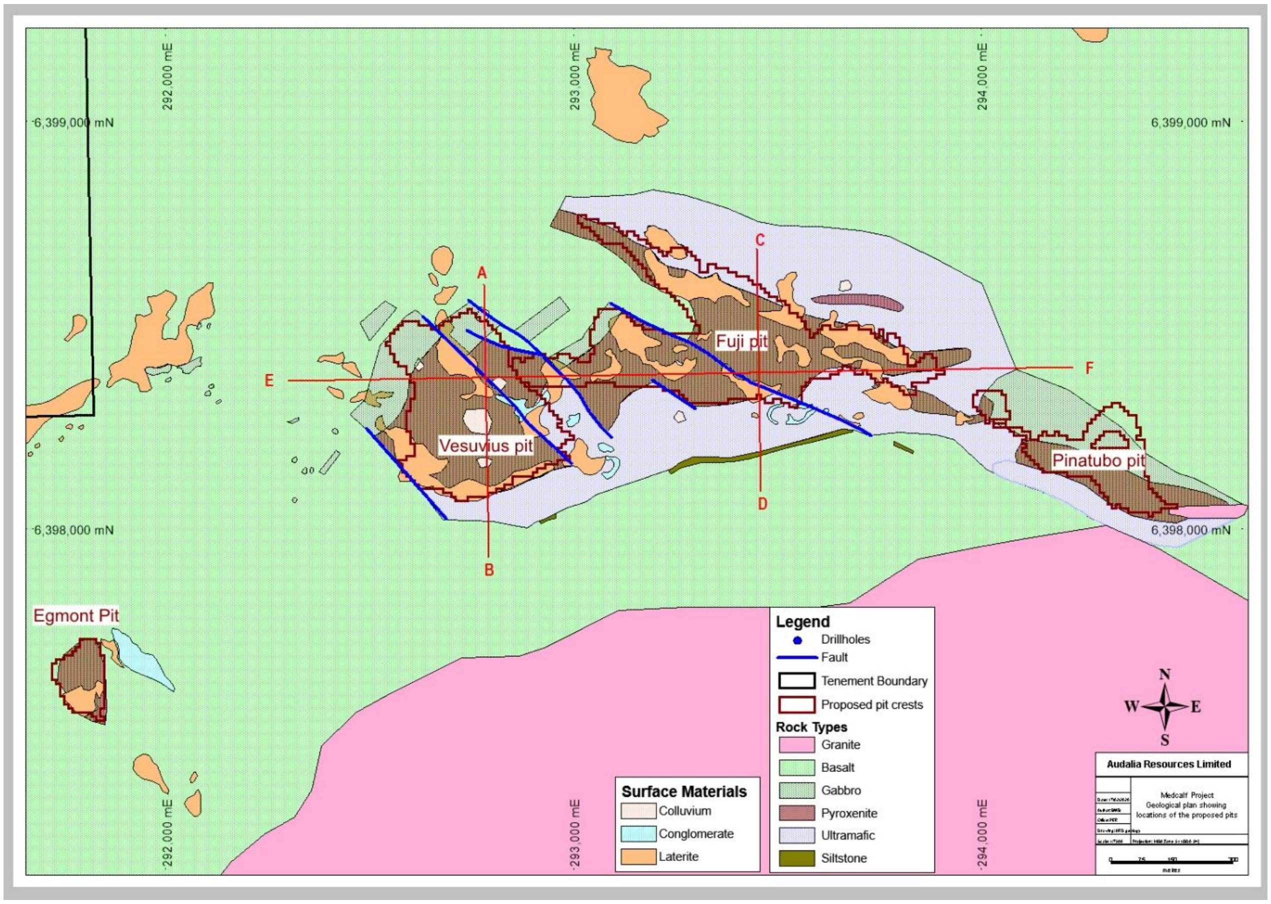

Figure 2 - Medcalf deposit geology

The fully developed lateritic weathering profile is divisible into four zones. Starting from the top, they are lateritic residuum, mottled zone, saprolite and saprock. All vanadium, iron and titanium mineralisation lie in the saprolitic zone. Saprolite extends to the bottom of all the holes drilled by Audalia.

The following figures (Figures 3 & 4) provide north-south oriented cross section views through the deposit, and an east-west oriented long section view (Figure 5) through the deposit.

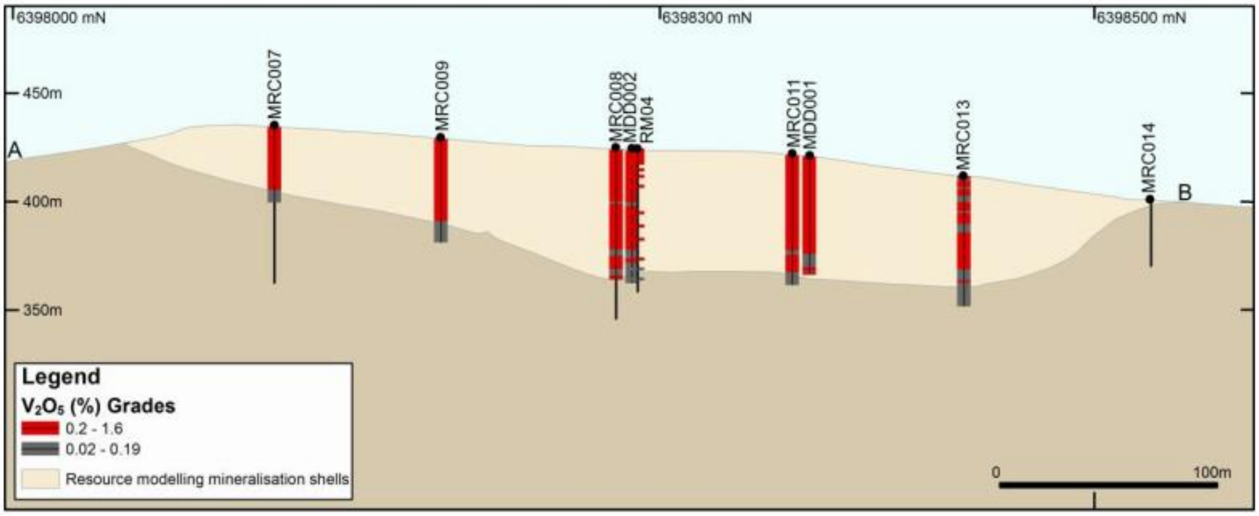

Figure 3 - Cross section A - B through the Vesuvius deposit

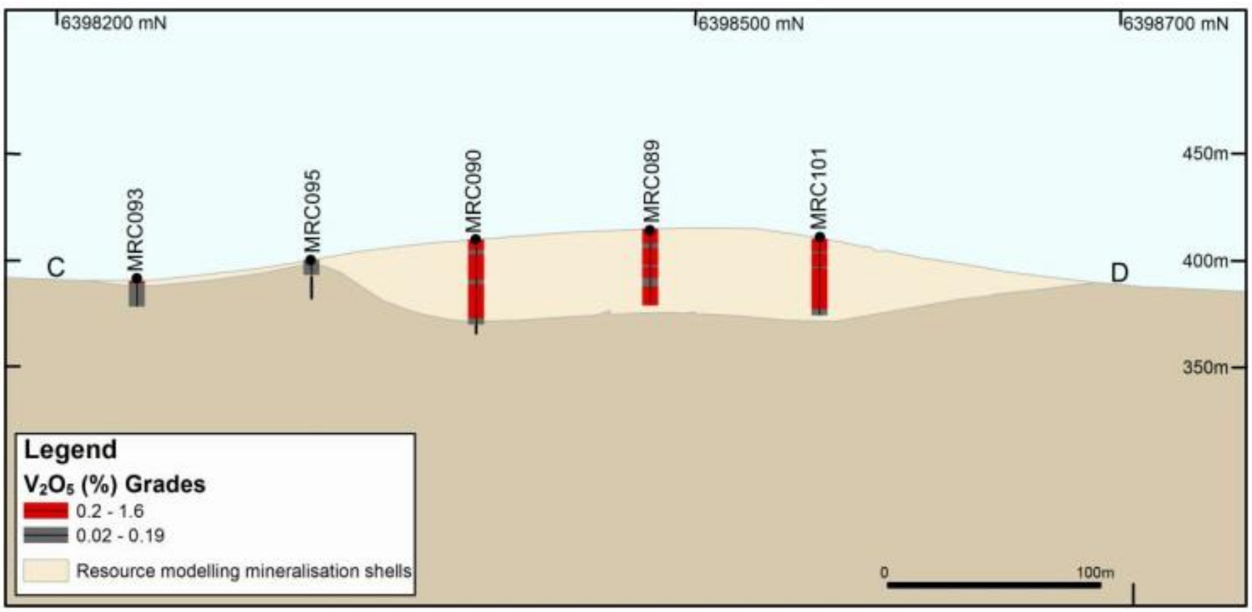

Figure 4 - Cross section C - D through the Fuji deposit

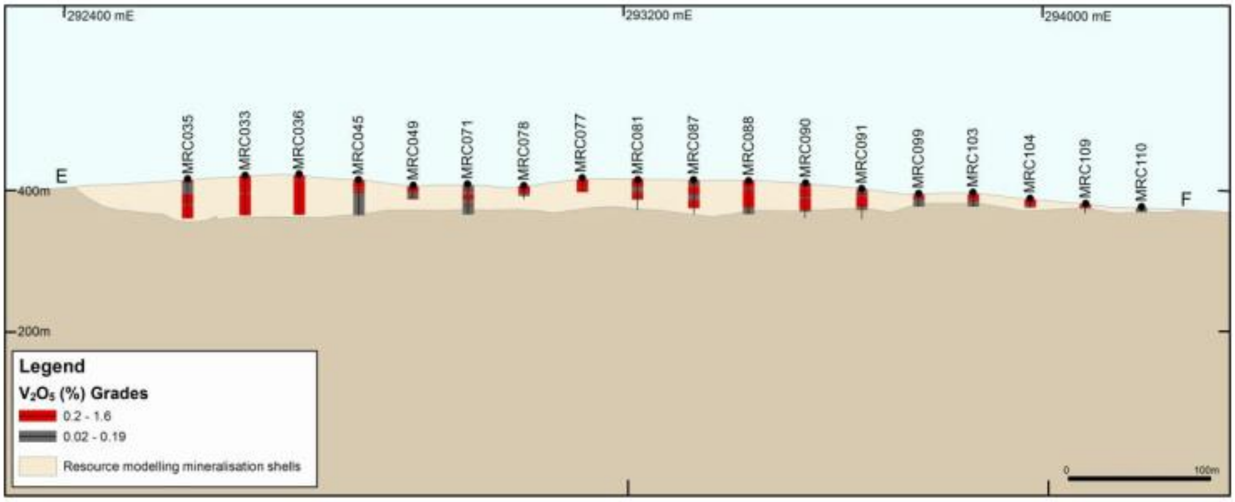

Figure 5 Long section E - F through the Vesuvius and Fuji deposits

1.2 Stratigraphy, structure, mineralisation and weathering controls

1.2.1 Stratigraphy

The stratigraphy in the Medcalf area is summarised in Table 1 below.

Medcalf Stratigraphy	
Geological period	**Lithologies**
Cainozoic	Soil, scree cover, minor alluvium, lateritic weathering profile
Proterozoic	Widgiemooltha mafic dykes
Archean	Quartz veins
	Pegmatites
	Granitic rocks
	Tholeiitic basalt and associated mafic sills
	Medcalf layered sill
	Siltsone (?)
	Biotite feldspar +/- quartz schist

Table 1 - Medcalf Stratigraphy

Individual lithologies are described in more detail below.

1.2.1.1 Archean

i. Siltstone

A finely-laminated haematitic saprolitc siltstone was intersected between 20.5 m and 24.0 m in vertical diamond drillhole MDD002 during Audalia's 2013 metallurgical core drilling programme located at GDA94 zone 51 - 292,780E, 6,398,286N.

This was possibly a carbonaceous siltstone originally (Figure 6). Pyroxenite occurs both above and below, suggesting that it is a sedimentary raft incorporated into the sill during intrusion.

Figure 6. Diamond drillhole MDD002 at 23.9 m

ii. Biotite Feldspar +/- Quartz Schist

Audalia's 2013 drill programme identified biotite feldspar +/- quartz schists up to several tens of metres thick in the Vesuvius deposits, at the base of the Medcalf Sill. In some drill holes it is absent, with basalt abutting the base of the sill.

Quartz feldspar biotite schist and gneiss were also recorded by Amoco in diamond drill hole LJ1, 3 km ESE of Vesuvius where it occupies a similar stratigraphic position beneath the Medcalf Sill.

This rock is interpreted as a metamorphosed siltstone, shale or airfall tuff. This interpretation is based on mineralogy, lateral extent and position in a thick subaqueous mafic volcanic sequence. Prior to metamorphism, this bed formed a zone of weakness along which the Medcalf Sill intruded.

Note that biotite-rich schists also occur in the middle of the pyroxenite unit. In upper greenschist facies, biotite can form in both sediments and mafic lithologies. A historic report by Amoco interprets these biotite-rich schists as shears.

iii. Basalt and Associated Dolerite Sills

Tholeiitic basalts form thick sequences above and below the Medcalf sill. They range from massive to schistose and generally subcrop as scattered fresh cobbles and boulders in red soil. Slightly coarser variants, up to about 1 mm grain size, are classified as dolerite, but they are not necessarily subvolcanic sills. The coarse grain size may result from metamorphism. Alternatively, coarse grain size could have developed in the slowly cooling interior of thick lava flows.

iv. Medcalf Layered Sill

Harris (1982) divides the Medcalf mafic sill into three units. From top down, they are:

- Gabbro at least 50 m thick
- Pyroxenite 36 m
- Peridotite 44 m

The sill is traceable along strike for at least 4 km and is roughly 130 m thick. The zones thicken and thin along strike; in some places they are absent altogether. Whether this is a primary feature related to intrusion, or to a later structural event is uncertain.

Distinguishing between mafic and ultramafic lithologies in weathered drill chips relied heavily on textures, sizes and percentage of relic black opaques. These opaques have survived metamorphism relatively unaltered, except where the rocks are strongly schistose.

v. Gabbro Zone

The gabbro has a grain size of 2 to 5 mm and ranges from massive to moderately foliated. It commonly subcrops as unweathered cobbles and boulders in red soil. Historic diamond drill holes LJ1 and LJ2 indicate gabbro is at least 50 m thick.

vi. Pyroxenite Zone

The pyroxenite has been metamorphosed to a tremolite-rich rock with variable amounts of black opaques. The highest TiO_2 analysis was 43.3 %, between 1 and 2 m in Audalia's RC drillhole MRC044. If all the titanium is contained in ilmenite, this mineral occupies 82 weight percent of the rock. Pyroxenite with higher volumes of black opaques is massive, as shown in drillhole MDD002 at 35.6m (Figure 7) whereas those with lower content tend to be more foliated (Figure 8).

In general, estimating percentage of black opaques in RC chip samples is difficult. The +2 mm opaques are retained, whereas the associated saprolitic clays (mainly weathered tremolite) pass through the 2 mm sieve aperture. In fresh rock, the opaques consist of magnetite and ilmenite. In the lower parts of the lateritic profile, they are partially weathered to haematite. Higher up, limonite takes the place of haematite. Under a 10x power hand lens 2 mm opaques are roughly equidimensional and frequently exhibit complex crystal faces.

On the western side of Vesuvius Hill, in the vicinity of Audalia's RC drillhole MRC017, banding in outcropping saprolitic pyroxenite is delineated by variations in the volume of black opaques. This is interpreted as primary layering, developed during cooling in a subhorizontal sill.

Figure 7. Diamond drillhole MDD002 at 35.6 m

The pyroxenite is 40 m thick in diamond drill hole LJ1, 1.5km southeast of Pinatubo. However, the 53 m pyroxenite interval in LJ2 passing through the eastern part of Fuji includes gabbroic and peridotitic bands. Departures from the simple zoning inferred for the Medcalf Sill are also seen in diamond drill hole MDD001. Two elevated zones of chromium (~0.5 to 1 % Cr) occur at about 25 m and 45 m in pyroxenite in MDD002, suggesting intervals of ultramafic within the pyroxenite.

Figure 8. Diamond drillhole MDD001 at 24.0 m

vii. Ultramafic Zone

The ultramafic zone is variously represented by serpentinite, talcose tremolite chlorite schist and pale orange jasper. Talc is stable through the weathering profile and can still be identified in iron-rich or clay-rich material otherwise lacking diagnostic features. The ultramafic zone intersected in Audalia's RC drilling programme consisted of brown to pale grey green clay with subordinate orange chert. Relic textures in the grey green clay were restricted to disseminated 1 to 5 %, bimodal 0.2 mm and 2 mm black opaques. The 2 mm opaques are probably original. The 0.2 mm may be metamorphic, derived from exsolution during transformation of olivine to serpentine. Similar textures occur in the orange chert, showing that it is a silicified equivalent. Ultramafic intersected in the lower parts of diamond drill holes MDD001 and MDD002 consist of brown puggy clay, as shown in Figure 9.

Figure 9 Diamond drillhole MDD002 at 60.2 m

Talc carbonate schists located during mapping are interpreted as shear zones within the ultramafic.

viii. Granite and Pegmatite

Foliated granite occupies the south-central part of the tenement. Non-foliated pegmatite occurs along the margin of the granite and as dykes up to a few metres wide intruding the greenstones.

ix. Quartz Veins

Quartz veins range up to 2 m thick, commonly in lenticular pods up to a few tens of metres long. Some veins can be traced discontinuously for more than 200 m.

1.2.1.2 Proterozoic

No outcropping Widgiemooltha mafic dykes were identified.

1.2.1.3 Cainozoic

Soil and scree cover over 50% of the Medcalf tenements. Cainozoic lateritic weathering within the pyroxenite zone has been critical in upgrading the vanadium, iron & titanium mineralisation to ore grade.

1.2.2 Structure

Structure is currently poorly understood. Polyphase deformation, upper greenschist facies metamorphism, deep weathering and sparse outcrop are all contributing factors.

1.2.2.1 Folding

Previous workers have interpreted a broad west-plunging anticline in the tenement block.

Near the base of the pyroxenite on the southern margin of Vesuvius schistosity dips about 30^0 north. This roughly parallels the pyroxenite-ultramafic contact outlined by drilling to the north and suggests tight to isoclinal folding.

Most measurements on schistosity within the Medcalf tenements dip steeply to moderately to the north on both limbs. This could be interpreted as folds overturned to the south.

1.2.2.2 Faulting

Deposit-scale faulting is interpreted in the mineralised areas based on displacement of the pyroxenite ultramafic contact.

The ultramafic zone in the Medcalf sill forms a weak zone along which faulting could preferentially develop. Early thrusting could explain the apparently out of sequence zones in the Medcalf sill, especially east of Fuji.

1.2.2.3 Schistosity

Schistosity in the greenstones strikes roughly northwest with dips ranging from vertical to moderately northeast. Foliation in the granite has a similar strike, but dips moderately to steeply to the southwest.

1.2.2.4 Banding in Medcalf Sill

Alternating centimetre to decimetre-scale iron-rich and iron-poor layers in the pyroxenite zone crop out on the southwest side of Vesuvius, near drill hole Audalia's RC drillhole MRC017. These layers dip 12^0 to 15^0 to the north and define the dip of the Medcalf Sill in this area.

1.2.3 Ore types

Two types of vanadium, iron and titanium mineralisation were recognised as "in-situ" and "conglomerate".

The conglomerate mineralisation forms a veneer on the flanks of Vesuvius and Egmont. A vertical face of conglomerate ore on the southeast side of Egmont is 3 m high. In-situ mineralisation varies with its position in the weathering profile, as it passes downwards from lateritic residuum through the mottled zone into saprolite.

1.2.4 Mineralisation genesis and controls

1.2.4.1 Geometry

Geometry of the Medcalf vanadium, iron & titanium mineralisation is controlled by several factors. These include:

1. Stratigraphic control, with mineralisation confined to approximately a 50m thick pyroxenite zone within the Medcalf Sill.
2. Depth of lateritic weathering, where weathering has increased grades to economic levels.
3. Structural deformation. Both folding and faulting occur, but which dominates at ore body scale is uncertain.
4. Primary geometry of the mineralisation, prior to deformation and metamorphism

1.2.4.2 Stratigraphic Controls

The known deposits are confined to the approximately 50 m thick pyroxenite zone within the Medcalf Sill. This sill can be traced discontinuously in outcrop and by aeromagnetics for five kilometres across the tenement block.

1.2.4.3 Structural Controls

Surface mapping and drill information suggests a structurally complex picture in the Vesuvius area. Ironstone bands outcropping over Vesuvius and Fuji are interpreted as iron-titanium-rich bands within the pyroxenite.

1.2.4.4 Metamorphism

Biotite-bearing schists and the apparent absence of garnet indicate upper greenschist facies metamorphism. There is also some evidence that the Medcalf sequence has undergone a degree of late-stage contact metamorphism-metasomatism due to the granite intrusion.

1.2.4.5 Regolith Controls

The fully developed lateritic weathering profile is divisible into four zones. Starting from the top, they are lateritic residuum, mottled zone, saprolite and saprock.

Small areas of lateritic residuum are represented by massive dark red haematite-rich outcrops located at (Figure 10) and "conglomerate ore" (Figure 11) over the Vesuvius, Fuji and Egmont deposits. Massive (Figure 13) and pisolitic (Figure 14) mineralisation illustrate variants of lateritic residuum in diamond drill core.

Figure 10. Massive vanadium, iron and titanium mineralisation outcrop (292,860E, 6,39,8140N)

Figure 11. Conglomeratic vanadium, iron and titanium mineralisation (292,932E 6,398,311N)

The yellow brown interval from 2 to 11 m vertical depth in Audalia's RC drillhole MRC008 (Figure 15) is the mottled zone, based on correlation with mottled zone in adjacent diamond drill hole MDD002 (Figure 14).

Most of the vanadium, iron & titanium mineralisation lies in the saprolitic zone Figure 5 and Figure 6 are typical. Saprolite extends to the bottom of all the holes drilled by Audalia. The purple-red haematitic interval from 11 m to 43 m in MRC008 (Figure 7) includes high grade vanadium and titanium mineralisation in the saprolitic zone. The low-grade interval between 23 m and 28 m in MRC008 is interpreted to be siltstone, based on siltstone identified in adjacent drill hole MDD002. This siltstone was not recognised during logging of the chips. There are no obvious differences in Ti and V grades moving upwards from the saprolite to mottled zone.

1.2.4.6 Other

Figure 12 shows lateritic residuum for diamond drillhole MDD002 at 2.0m (central channel). Interval 1.4 to 2.3m assayed 1.0 % V_2O_5, 21.4 % TiO_2 and 43.7 % Fe_2O_3.

Figure 13 shows lateritic residuum with pisolites for diamond drillhole MDD002 at 2.6 m. Interval 2.3 to 3.2 m assayed 1.12 % V_2O_5, 25.8 % TiO_2 and 38.8 % Fe_2O_3. Cutans, consisting of a thin rind of limonite on the pisolites, indicates that they developed in-situ.

Figure 14 shows mottled zone for diamond drillhole MDD002 at 6.1 m. This correlates to the yellow brown interval down to 11 m vertical depth in Figure 15.

Figure 15 shows RC drillhole MRC008, collar situated 8 m north of diamond drill hole MDD002. Wooden peg marks start of hole. Contact between limonitic mottled zone and dusky red saprolite at 11 m vertical depth. Contact between pyroxenite and underlying ultramafic marked by change from dusky red (haematite-rich) to light brown at 44 m.

Figure 12. Diamond drillhole MDD002 at 2.0 m

Figure 13. Diamond drillhole MDD002 at 2.6 m

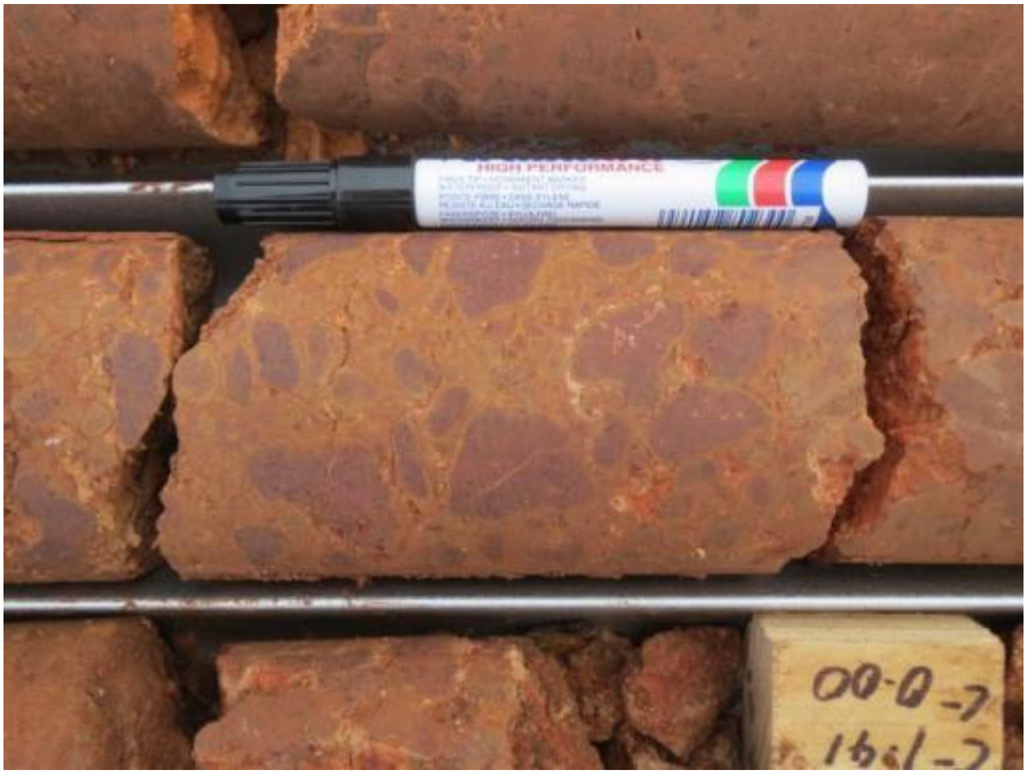

Figure 14. Diamond drillhole MDD002 at 6.1 m

Figure 15. RC drillhole MRC008, Weathering and water table

The Medcalf Project lies on topographic highs some 50 m plus above the lower lying topography.

Distribution of the vanadium, iron and titanium deposits is controlled by several factors. One is depth of lateritic weathering, where weathering has increased grades to economic levels. As described in the Local geology Section, the depth of weathering is greater than 60 m and not one of Audalia's RC drillholes drilled in the deposits intersected the water table. The deepest hole was drilled to 102m from 413mRL.

The weathering profile is divided into four zones, lateritic residuum, mottled zone, saprolite and saprock. The strongest vanadium, iron and titanium grades have been developed near surface where the pyroxenite unit has been strongly weathered where most of the calcium, magnesium and silica have been removed from the rock by the lateritic weathering processes thus resulting in residual concentrations of vanadium and titanium.

Original silica minerals have been weathered to clay minerals predominately kaolinite but some gibbsite and diaspore. Magnetite is almost completely altered to hematite (martite) and goethite. Larger ilmenite grains have survived the weathering, but exsolved ilmenite platelets within other minerals have been altered to pseudorutile.

QEMSCAN (Figure 16) and XRD analysis (Figure 17 & Table 2) of 16 core samples taken from Audalia's core drilling programme in 2013, (MDD001 and MDD002) were carried out by Bureau Veritas (BV) in Canning Vale, Perth in 2013.

Neither the QEMSCAN nor the XRD studies were able to detect any vanadium minerals thus determining that vanadium was present in the samples as microscopic and sub microscopic constituents of hematite, goethite and several other iron minerals.

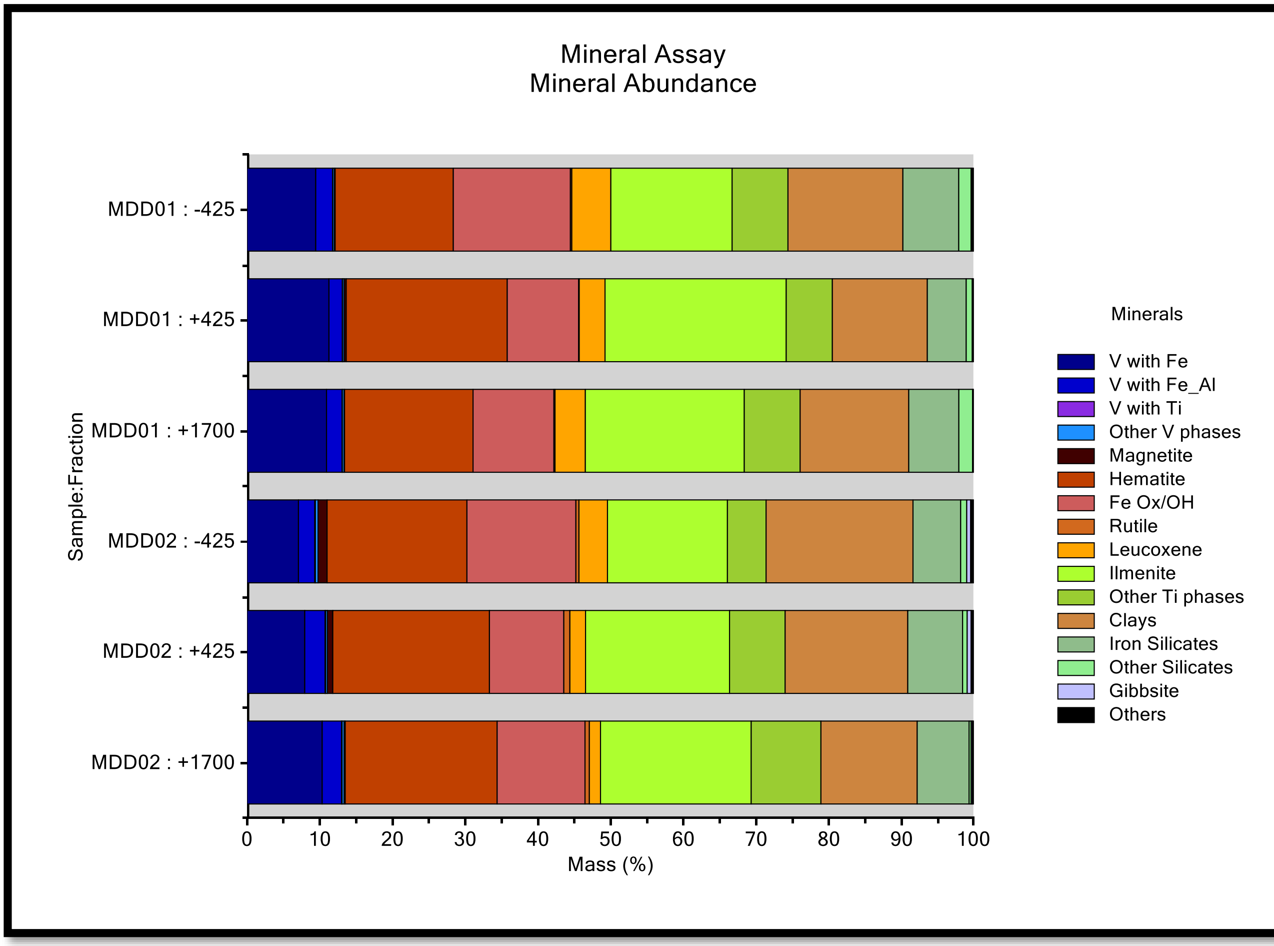

Figure 16. QEMSCAN mineral assay abundance data for 6 metallurgical composite core samples (Whittington 2013)

Minerals	Composition	MDD01-								MDD02-							
		006	011	016	029	042	045	051	056	007	010	018	027	038	044	056	066
Quartz	SiO_2	<1	<1	<1		<1	7	<1	<1	1	<1	<1				<1	28
Magnetite[1]	Fe_3O_4						<1		3		<1					5	9
Hematite	Fe_2O_3	18	26	41	60	36	<1	7	12	12	9	15	11	53	68	19	4
Goethite	FeO(OH)	7	14			7	29	75	56	37	6	4	2	6		15	44
Rutile[2]	TiO_2		1	2						3	1						<1
Anatase[2]	TiO_2	1			1					2	2						
Gibbsite	$Al(OH)_3$													11	15		<1
Diaspore	AlO(OH)				2												
Kaolin	$Al_2Si_2O_5(OH)_4$	73	56	57	38	52	58	15	26	46	82	81	87	30	13	59	14
Mica Group[3]	$X_2Y_{4-6}Z_8O_{20}(OH,F)_4$						3										
Ilmenite	$FeTiO_3$	2	2			5	<1	2	2					1	4	2	
Total		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 2. Results of quantitative mineralogy XRD from 16 samples (BV, 2013)

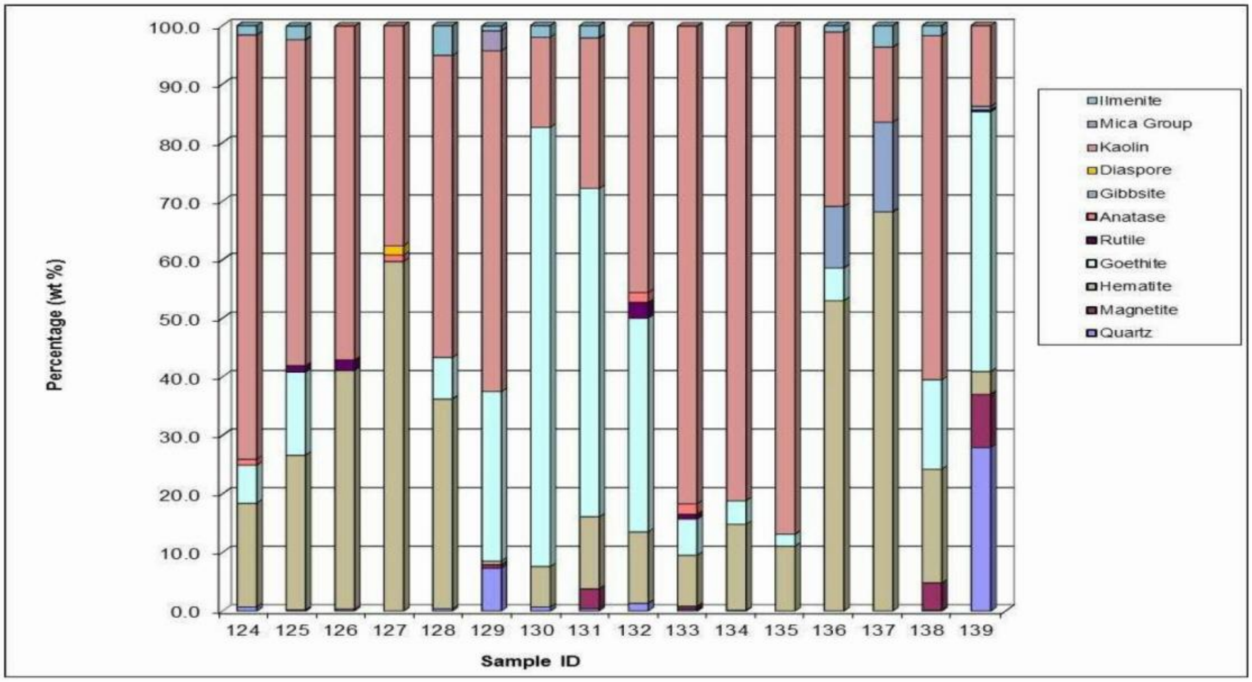

Figure 17. Graph of quantitative mineralogy by XRD, (BV, 2013)