Mineral Observation Results of Four Loam/Alluvial Samples From SEL 26939, Northern Territory

by

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Distribution list:

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Executive Summary

Four loam and alluvial samples collected from tenement SEL26939 in the Northern Territory were processed for their heavy mineral content and observed under a binocular stereoscopic microscope to test their diamond and/or kimberlite prospectivity. No diamonds or minerals suggestive of kimberlite were recorded.

The four samples are dominated by limonite and Fe-Ti oxide phases (mainly ilmenite and Ti-bearing magnetite), with minor amounts of minerals such as leucoxene, haematite, monazite, carbonate, tourmaline, rutile and zircon. There is a progressive decrease in the proportion of the Fe-Ti oxides from samples BUT 1 through BUT 2 to NR 1 and NR 3.

The morphology and surface textures of the Fe-Ti oxides indicate they are "ordinary" crustal phases, probably derived from nearby basalt or dolerite.

Introduction and Processing

Four loam and alluvial samples were collected along a prominent linear magnetic feature by David Jones and Ron Roberts in order to test if it could be kimberlite, or related rock. The rationale was to examine the heavy mineral fractions of the samples for diamond and kimberlitic indicator minerals (KIMs).

The samples were submitted to Diamond Recovery Services in Welshpool in November 2009 for processing, involving Wet Tabling and Heavy Liquid Separation (TBE). The details of the original sample sizes and heavy mineral concentration weights are shown in the following Table.

Sample Number	Weight (kg)			Weight (g)	
	Initial	Table Concentrate		TBE Sinks	
		+1mm	-1mm	+0.3mm	-0.3mm
BUT 1	26.9	0.924	1.146	42.2	35.8
BUT 2	24.3	1.179	2.179	17.5	17.5
NR 1	11.0	0.212	0.276	6.8	36.2
NR 3	22.9	1.031	0.771	10.6	2.4

An examination of the 0.3-1.0 mm heavy mineral concentrates (HMC) indicated significant amounts of highly magnetic minerals and particles and the decision was made to remove ("scalp") these materials. The weights of the scalped fractions, which were discarded, are:

BUT 1	10.7 g
BUT 2	0.96 g
NR 1	3.95 g
NR 3	1.12 g

By percentage, the biggest reductions were for samples NR 1 (58 %) and BUT 1 (25 %). It is assumed that the scalped material is largely magnetite, much of it variably coated by iron oxides/hydroxides (i.e. "limonite").

Mineral Observation

Mineral observation was limited to the 0.3-1.0 mm fraction. Normally, the +1 mm fraction rarely contains discrete mineral particles and the -0.3 mm fraction is very time-consuming to observe (this fraction is usually fused in sodium peroxide in order to reduce the number of grains to observe).

To facilitate better observing results, the 0.3-1.0 mm fraction was further sieved at 0.8 mm, 0.5 mm, 0.4 mm and 0.3 mm, producing splits of +0.8 mm, +0.5 mm, +0.4 mm and +0.3 mm. The various splits were observed under a binocular stereoscopic microscope.

Observation Results

Observation results are presented in the attached "observation sheets" (see end of this report; note that observation sheets have data on their back page as well). Mineral proportion codes used in the sheets are:

P	Prevalent	>=50 %
A	Abundant	20-50 %
C	Common	10-20 %
S	Some	1-10 %
O	Often	0.1-1 %
F	Few	>5 grains
R	Rare	2-5 grains
T	Trace	1 grain

No diamond or kimberlitic indicator minerals were recovered.

Each sample is dominated by "limonite" (various Fe-oxides/hydroxides) and Fe-Ti oxides (mainly ilmenite, but also Ti-magnetite and magnetite in various stages of "martitisation"), with a very strong inverse proportional relationship between the two with grain size. For example, the +0.8 mm splits may or may not contain Fe-Ti oxides (e.g. ilmenite) whereas the +0.3 mm splits may contain up to 50 % ilmenite.

Minor phases in the HMCs include leucoxene (ex-ilmenite and Ti-magnetite), haematite, monazite, carbonate, tourmaline, rutile, zircon, epidote (±clinozoisite), ?kyanite, garnet (one almandine grain in NR 1) and amphibole. Quartz and rust flakes (up to 10 % in some +0.8 mm splits) are present in all samples as contaminants.

Ilmenite and the other Fe-Ti oxide minerals are mostly euhedral in form and display surface textures and structures consistent with growth directly from magma.

Discussion and Conclusions

As mentioned above, no diamond or kimberlitic indicator minerals (KIMs) were recovered in the 0.3-1.0 mm size-range. This fact greatly reduces the likelihood of kimberlite or lamproites being present in the area. However, it is still possible that such minerals are present in the -0.3 mm fraction, but kimberlites and lamproites typically contain large KIMs that are well-represented in the +0.3 mm fraction.

The ilmenite and other Fe-Ti oxide minerals show features consistent with high-level, upper crustal crystallisation, probably in a basic magma. There are no textural features to suggest that any of the ilmenite was derived from the upper mantle.

The exceptional "freshness" of the Fe-Ti oxide minerals indicates that the source of these minerals is very close by.

Anthony L. Ahmat
B.Sc.(Hons), PhD, FGAA

MACRO (+0.3mm)

SANDFIRE RESOURCES NL
HEAVY MINERALS & DIAMOND INDICATOR MINERALS DATA SHEET

SAMPLE:	BUT 1
DATE:	11-1-2010
SIGNATURE:	Anthony Hall

STATE: NT			
D.P.O:			
E.L. NUMBER: SEL 23939	PROJECT:		
TOTAL WEIGHT: 26.9kg	WEIGHT AFTER THE (Pre-SCALPING)	12.2g	
OBSERVER 1: Tony	DATE: 6.7.8 11-1-2010	TIME TAKEN (MINS):	616
OBSERVER 2:	DATE:	TIME TAKEN (MINS):	
MINERALOGIST:	DATE:	TIME TAKEN (MINS):	

INDICATORS						
SCREEN SIZE:	+0.8	+0.5	+0.4	+0.3	-0.3	TOTAL
DIAMOND						
PYROPE						
CHROME DIOPSIDE						
CHROMITE						
PICROILMENITE						
ZIRCON KIMB						
PHLOGOPITE						
OLIVINE KIMB						
BRONZITE KIMB						
TITANATE						

COMMENTS (Please print clearly): NEGATIVE FOR DIAMOND & INDICATOR MINERALS

POSITIVE:
NEGATIVE: ✓

The TBE 'sinks' were scalped, removing 10.7g of highly magnetic material (e.g. magnetite). The mineralogy of the remaining material is listed below. "Limonite" includes various earthy Fe-oxides/hydroxides, ranging from yellow to brown to red-brown and to variably coated magnetite. Ilmenite is mostly subrotund and fresh-looking.

1. ALMANDINE	2. AMPHIBOLE	3. ANATASE	4. ANDALUSITE	5. APATITE
6. AXINITE	7. BARITE	8. BIOTITE	9. BRONZITE	10. CASSITERITE
11. CLINOPYROXENE	12. CORUNDUM	13. CR-SPINEL	14. CU-MINERALS	15. DIASPORE
16. DIOPSIDE	17. ENSTATITE	18. EPIDOTE	19. FLORENCITE	20. FLUORITE
21. GARNET	22. GOLD	23. HAEMATITE ✓S	24. ILMENITE ✓A	25. KYANITE
26. LIMONITE ✓P	27. MAGNIOPHORITE	28. MICA	29. MONAZITE ✓D	30. MUSCOVITE
31. OLIVINE	32. ORTHOPYROXENE	33. PLATINUM	34. PREHNITE	35. PRIDERITE
36. PYRITE	37. PYROCLORE	38. ROCK FRAGMENT	39. RUTILE	40. SCHEELITE
41. SILLIMANITE	42. SPHENE	43. SPINEL	44. STAUROLITE	45. SULPHIDES
46. TANTALITE	47. TOPAZ	48. TOURMALINE ✓F	49. WOLFRAMITE	50. ZOISITE ?F
51. ZIRCON ✓F	52. ANDRADITE	53. GALENA	54. CHRYSOBERYL	55. XENOTIME
56. PHOSPHATE	57. MOLYBDENITE	58. CROCOITE	59. CARBONATE	60. UVAROVITE
61. VERMICULITE	62. CORDIERITE	63. CHLORITE	64. LEUCOXENE ✓S	65. QUARTZ ✓D

RUST = 5 (<1%)

PTO

BUT 1 (continued)

Notes:

① Weights observed:

+0.8 mm	1.681 g
+0.5 mm	5.519 g
+0.4 mm	4.306 g
+0.3 mm	12.477 g
	24.983 g

② When the 'scalped' +0.3 mm fraction was sieved, 6.507 g reported to the -0.3 mm fraction. This fraction was not observed.

③ "Ilmenite" = Fe-Ti oxides, comprising ilmenite, magnetite-bearing ilmenite and titan-ferromagnetite.

④ Magnetite is largely 'locked' / 'set' and is a significant component of the 'scalped' HMC.

⑤ The Fe-Ti oxides (i.e. ilmenite) are mostly euhedral and very fresh-looking, generally with delicate impingement textures.

⑥ Fe-Ti oxides are more abundant in the finer grained fractions. For example, Fe-Ti oxides make up <1% of the +0.8 mm fraction, but ~55% of the +0.3 mm fraction.

⑦ The mineralogy of the sample and the freshness of the Fe-Ti oxides suggest a mafic source (e.g. dolerite, basalt) that is very close-by (i.e. proximal).

MACRO (+0.3 mm)

SANDFIRE RESOURCES NL
HEAVY MINERALS & DIAMOND INDICATOR MINERALS DATA SHEET

STATE: NT			
H.P.O:			
E.L. NUMBER: SEL 28939	PROJECT:		
TOTAL WEIGHT: 24.2 kg	WEIGHT AFTER TBE (PRE-LOADING): 17.59		
OBSERVER 1: Tony	DATE: 11/03-4-2010	TIME TAKEN (MINS): 358	
OBSERVER 2:	DATE:	TIME TAKEN (MINS):	
MINERALOGIST:	DATE:	TIME TAKEN (MINS):	

SAMPLE: BUT 2	
DATE: 13-1-2010	
SIGNATURE: [signature]	
POSITIVE:	
NEGATIVE:	✓

COMMENTS (Please print clearly)

NEGATIVE FOR DIAMOND & INDICATOR MINERALS

Magnet. "scalping" removed 0.95g (5.6%) from the TBE sinks

The HMC is very similar to BUT 1, except the ilmenite is paler, the Fe-Ti oxides (ilmenite, titaniferous magnetite) are less abundant (and vitreous) and carbonate is more abundant.

INDICATORS

SCREEN SIZE	+0.8	+0.5	+0.3	+0.2	-0.2	TOTAL
DIAMOND						
PYROPE						
CHROME DIOPSIDE						
CHROMITE						
PICROILMENITE						
ZIRCON KIMB						
PHLOGOPITE						
OLIVINE KIMB						
BRONZITE KIMB						
TITANATE						

1. ALMANDINE	2. AMPHIBOLE	3. ANATASE	4. ANDALUSITE	5. APATITE
6. AXINITE	7. BARITE	8. BIOTITE	9. BRONZITE	10. CASSITERITE
11. CLINOPYROXENE	12. CORUNDUM	13. CR-SPINEL	14. Cu-MINERALS	15. DIASPORE
16. DIOPSIDE	17. ENSTATITE	18. EPIDOTE ✓R	19. FLORENCITE	20. FLUORITE
21. GARNET	22. GOLD	23. HAEMATITE	24. ILMENITE ✓A	25. KYANITE ?R
26. LIMONITE ✓P	27. MAGNOPHORITE	28. MICA	29. MONAZITE ✓O	30. MUSCOVITE
31. OLIVINE	32. ORTHOPYROXENE	33. PLATINUM	34. PREHNITE	35. PRIDERITE
36. PYRITE	37. PYROCLORE	38. ROCK FRAGMENT ✓F	39. RUTILE ✓F	40. SCHEELITE
41. SILLIMANITE	42. SPHENE	43. SPINEL	44. STAUROLITE	45. SULPHIDES
46. TANTALITE	47. TOPAZ	48. TOURMALINE ✓F	49. WOLFRAMITE	50. ZOISITE
51. ZIRCON ✓F	52. ANDRADITE	53. GALENA	54. CHRYSOBERYL	55. MONOTIME
56. PHOSPHATE	57. MOLYBDENITE	58. CROCOITE	59. CARBONATE ✓S	60. UVAROVITE
61. VERMICULITE	62. COCHERITE	63. CHLORITE	64. LEUCOXENE ✓O-S	65. QUARTZ ✓O

BUST = S

MC

BUT 2 (continued)

Notes:

① Weights observed:

+0.8 mm :	1.635 g
+0.5 mm :	5.053 g
+0.4 mm :	1.968 g
+0.3 mm :	5.157 g
	13.793 g

② When the "scalped" +0.3 mm fraction was sieved, 2.735 g reported to the −0.3 mm fraction. This fraction was not observed.

③ Fe-Ti oxides are, on average, less vitreous than those in BUT 1.

④ Fe-Ti oxides are more abundant in the finer grained fractions, similar to BUT 1.

⑤ Like BUT 1, the Fe-Ti oxides are mostly euhedral, very fresh-looking and commonly have delicate impingement textures.

⑥ Like BUT 1, the mineralogy and grain morphologies suggest a proximal mafic source.

Macro (0.3-1.0mm)

SANDFIRE RESOURCES NL
HEAVY MINERALS & DIAMOND INDICATOR MINERALS DATA SHEET

SAMPLE:	MC1
DATE:	15-1-10
SIGNATURE:	

STATE: NT		
D.P.D.D:		
E.L. NUMBER: SEC 24939	PROJECT:	
TOTAL WEIGHT: 11.0 kg	WEIGHT AFTER TBE: (PRE-SCALPING) 6.8g	
OBSERVER 1: Tony	DATE: 14-15-1-2010	TIME TAKEN (MINS): 131
OBSERVER 2:	DATE:	TIME TAKEN (MINS):
MINERALOGIST:	DATE:	TIME TAKEN (MINS):

COMMENTS (Please print clearly)

NEGATIVE FOR DIAMONDS & INDICATOR MINERALS.

POSITIVE:

NEGATIVE: ✓

Magnetic "scalping" removed 3.74g (58.0%) from the TBE "sinks".

The remaining material is dominated by "limonite" mostly brown and red-brown, commonly equant or spherical, commonly well-rounded and commonly strongly magnetic (widespread encapsulated magnetite).

Fe-Ti oxides (e.g. ilmenite) comprise ~5% of the HMC.

INDICATORS						
SCREEN SIZE	+0.8	+0.5	+0.4	+0.3	-0.3	TOTAL
DIAMOND						
PYROPE						
CHROME DIOPSIDE						
CHROMITE						
PICROILMENITE						
ZIRCON KIMB						
PHLOGOPITE						
OLIVINE KIMB						
BRONZITE KIMB						
TITANATE						

1. ALMANDINE	2. AMPHIBOLE	3. ANATASE	4. ANDALUSITE	5. APATITE
6. AXINITE	7. BARITE	8. BIOTITE	9. BRONZITE	10. CASSITERITE
11. CLINOPYROXENE	12. CORUNDUM	13. CR-SPINEL	14. CU-MINERALS	15. DIASPORE
16. DIOPSIDE	17. ENSTATITE	18. EPIDOTE	19. FLUORITE	20. FLUORITE
21. GARNET ✓T	22. GOLD	23. HAEMATITE	24. ILMENITE ✓S	25. KYANITE
26. LIMONITE ✓P	27. MAGNOPHORITE	28. MICA	29. MONAZITE	30. MUSCOVITE
31. OLIVINE	32. ORTHOPYROXENE	33. PLATINUM	34. PREHNITE	35. PRIDERITE
36. PYRITE	37. PYROCLORE	38. ROCK FRAGMENT	39. RUTILE ✓T	40. SCHEELITE
41. SILLIMANITE	42. SPHENE	43. SPINEL	44. STAURSLITE	45. SULPHIDES
46. TANTALITE	47. TOPAZ	48. TOURMALINE ✓F	49. WOLFRAMITE	50. ZOISITE
51. ZIRCON	52. AMDRADITE	53. GALENA	54. CHRYSOBERYL	55. XENOTIME
56. PHOSPHATE	57. MOLYBDENITE	58. CHROMITE	59. CARBONATE	60. UVAROVITE
61. VERMICULITE	62. CORDIERITE	63. CHLORITE	64. LEUCOXENE ✓F-O	65. QUARTZ ✓F

REST = ~8%

PTO

NR. 1 (continued)

NOTES:

① Weights observed:

+ 0.8 mm	0.258 g	} 2.200 g
+ 0.5 mm	0.785 g	
+ 0.4 mm	0.245 g	
+ 0.3 mm	0.912 g	

② When the "scalped" + 0.3 mm fraction was sieved, 0.651 g reported to the + 0.3 mm fraction. This fraction was not observed.

③ The Fe-Ti oxides are similar to those in BUT 1 and BUT 2, but in much smaller amounts.

④ A signif.cant proportion of the 'limonite' grains have relict forms (± euhedral) after magnetite and pyrite (pyritohedrons, cubes and combination forms).

Micro (0.3-1.0 mm)

SANDFIRE RESOURCES NL
HEAVY MINERALS & DIAMOND INDICATOR MINERALS DATA SHEET

SAMPLE:	NR 3
DATE:	18-1-10
SIGNATURE:	
POSITIVE:	
NEGATIVE:	✓

STATE: NT			
D.P.O:			
E.L. NUMBER: EL 25939	PROJECT:		
TOTAL WEIGHT: 22.9 kg		WEIGHT AFTER TBE: (Pre-scalping) 10.6 g	
OBSERVER 1: Tony	DATE: 15,16,18-1-10	TIME TAKEN(MINS): 199	
OBSERVER 2:	DATE:	TIME TAKEN(MINS):	
MINERALOGIST:	DATE:	TIME TAKEN(MINS):	

COMMENTS (Please print clearly)

NEGATIVE FOR DIAMOND & INDICATOR MINERALS

Magnetic "scalping" removed 1.118 g (10.5%) from the TBE "sinks"

"Limonite" comprises 2-5% of the HMC. Fe-Ti oxides comprise ~1% of the HMC. Very fine-grained haematite pseudomorphs and altered magnetite octahedrons make up 3-5% of the HMC.

A few grains of specular haematite are present

INDICATORS						
SCREEN SIZE	+0.8	+0.5	+0.4	+0.1	-0.1	TOTAL
DIAMOND						
PYROPE						
CHROME PYROPE						
CHROMITE						
PICROILMENITE						
ZIRCON KIMB						
PHLOGOPITE						
OLIVINE KIMB						
BRONZITE KIMB						
UTANATE						

1. ALMANDINE	2. AMPHIBOLE ✓T	3. ANATASE	4. ANDALUSITE	5. APATITE
6. AXINITE	7. BARITE	8. BIOTITE	9. BRONZITE	10. CASSITERITE
11. CLINOPYROXENE	12. CORUNDUM	13. CR-SPINEL	14. CU-MINERALS	15. DIASPORE
16. DROPSIDE	17. ENSTATITE	18. EPIDOTE	19. FLUORENCITE	20. FLUORITE
21. GARNET	22. GOLD	23. HAEMATITE ✓S	24. ILMENITE ✓C-S	25. KYANITE
26. LIMONITE ✓F	27. MAGNOPHORITE	28. MICA	29. MONAZITE ✓R	30. MUSCOVITE
31. OLIVINE	32. ORTHOPYROXENE	33. PLATINUM	34. PREHNITE	35. PHLOGITE
36. PYRITE	37. PYROCLORE	38. ROCK FRAGMENT	39. RUTILE	40. SCHEELITE
41. SILLIMANITE	42. SPHENE	43. SPINEL	44. STAUROLITE	45. SULPHIDES
46. TANTALITE	47. TOPAZ	48. TOURMALINE ✓F	49. WOLFRAMITE	50. ZOISITE
51. ZIRCON	52. ANDRADITE	53. GALENA	54. CHRYSOBERYL	55. XENOTIME
56. PHOSPHATE	57. MOLYBDENITE	58. CHROMITE	59. CARBONATE ✓F	60. UVAROVITE
61. VERMICULITE	62. CORDIERITE	63. CHLORITE	64. LEUCOXENE ✓F	65. QUARTZ ✓Q

QUART ~ 2%

NR 3 (continued)

NOTES

① Weights observed:

+0.8 mm:	1.258 g
+0.5 mm:	4.242 g
+0.4 mm:	1.179 g
+0.3 mm:	2.127 g
	8.806 g

② When the "scalped" -0.3 mm fraction was sieved, 0.467 g reported to the -0.3 mm fraction. This fraction was not observed.

③ Very fine-grained (cryptic, amorphous), steel-blue hematite is a significant component of the HMC.

④ Ilmenite/Fe-Ti oxides are a comparatively minor component of this sample, however the grains are typically euhedral and very fresh- to fresh-looking, just like those in EUT1, EUT2 and NR1.