000

823001

RELINQUISHMENT REPORT

EXPLORATION LICENCE 48/82

BORRADAILE PLAINS

December, 1987

N. Charchalis

Base Resources Ltd

001

CONTENTS

1. SUMMARY AND CONCLUSIONS

2. INTRODUCTION

3. FIELD EXPLORATION METHODS

4. LABORATORY FOLLOWUP METHODS

4.1 Indicator Minerals

4.2 Hardness Test

4.3 Fluorescence Test

4.4 Refractive Index and Other Tests

5. RESULTS OF PROSPECTING

APPENDIX

Appendix 1 Amdel Reports Analysis for Kimberlitic indicator minerals

1. SUMMARY AND CONCLUSIONS

1.1 This report summarises diamond exploration completed with the Borradaile Plains Exploration Licence 48/82, carried out under the supervision of Consulting Geologist Dr. B.L. Wood.

1.2 The licence closely approximates a former licence held by Shell Company of Australia, and this Company passed over to Base Resources some 600 stream sediment samples suitable for laboratory testing for kimberlitic indicator minerals.

1.3 Despite exhaustive laboratory optical and analytic tests on these samples, no kimberlitic indicator minerals or clastic diamonds were located, and the clastic assemblages within the stream sediment samples were readily correlatable with the geological units occurring within the E.L.

1.4 In view of the negative results of the survey, it was decided to relinquish the E.L.

2. INTRODUCTION

E.L. 48/82 Borrodaile Plains was granted to Base Resources Ltd. for one year, to remain in force until 29th August, 1984, and was subsequently renewed over one-yearly increments until August, 1987, when it was relinquished. The area applied for was approximately 220 sq.Km. and largely corresponded to a former E.L. 28/80 held by the Shell Company of Australia, Metals Division. The area granted to Base Resources was reduced by the Department of Mines to 190 sq.Km. by an exclusion of an area in the upper Campbell River designated as Proposed National Park Extension.

The exploration focused on the search for diamondiferous kimberlite pipes, and was carried out under the supervision of Consulting Geologist Dr. B.L. Woods.

The rationale behind the exploration programme has been summarised in prior annual reports, and is not reiterated here.

The field exploration techniques and laboratory methods which were employed in the search for diamonds and indicator minerals within the E.L. may be summarised thus;

3. FIELD EXPLORATION METHODS

The methods employed are those of classical stream sediment heavy mineral search for indicator minerals, in which both pan-concentrate and sieved -20+80 bulk sediment samples are collected at each site. The pan concentrates are subsequently re-concentrated in heavy liquid Tetrabromoethane (T.B.E.), to recover minerals of density greater than 2.9. These are washed in alcohol and dried for visual scanning under the binocular microscope.

The E.L. area comprises steep to mountainous topography, with a well developed, youthful trellised-drendritic drainage system most of which is actively eroding and loaded with abundant sediment. In parts however, upper reaches of streams drain basalt plains or dolerite plateaus, and are slowmoving and swampy with little usable sediment.

The attrition rate of the indicator minerals being sought is now well known for such high energy conditions, but maximum transit-survival distances are inferred to be less than 5 km and probably more than 3 km. At an optimum spacing of sample localities between these limits a total of approximately 500 samples should be adequate for the area.

In the present area bulk samples of between 5 and 8 kg and pan concentrates of about 200 gm, equivalent to about 10 kg weight of raw sieved sediment, were used. These are thought to be adequate because of the relatively short stream lengths involved, in contrast to the long poorly defined streams of the West Kimberley, W.A., where bulk samples of up to several tonnes are necessary, (Gregory 1984).

4. LABORATORY FOLLOWUP METHODS

The ultimate purpose of this stage is to locate and identify true indicator minerals of undoubted kimberlitic origin in the rather widely variable assemblages of species in the heavy-concentrate samples. The first step involved close examination under the binocular microscope, and systematic search through all the sample grains for the diagnostic features of the minerals being sought. In the case of voluminous samples this may take up to two hours, with additional time for various tests of individual grains. Most samples are also examined under U.V. light to check for fluorescent grains.

4.1 Indicator Minerals

The indicator species generally sought are as follows:

Mineral	Significance	Transit-Survival Distance
Picro Ilmenite	Diagnostic	Tens of km
Pyrope Garnet	"	" " "
Chrome Diopside	"	A few km
Kimberlitic Chromite	"	"
Kimberlitic Zircon	"	"
Olivine	Depends on country rocks	
Corundum	"	
Perovskite	"	
Apatite	"	(After Gregory, 1984)

In the present E.L. area the common occurrence of doleritic and basaltic rocks, and of low grade metamorphics in the Proterozoic basement results in a profusion of species in the stream sediments similar to many of those in the above list.

Thus almost all samples include doleritic-basaltic diopside, enstatite and olivine, ilmenite, black spinels - some chromitic, magnetite and zircon. Also very common are garnets of all colours (except green) mainly of metamorphic origin but possibly also igneous from unmapped porphyries or minor granite bodies. Several other minerals in the stream sediments resemble indicators under the binocular microscope, for example clasts of dark tourmaline from Proterozoic schist may often resemble perovskite, fragments of anatase resemble corundum, and dark-green epidote resemble chrome diopside.

In view of this profusion of distractors, the present search is concentrated mainly on garnet and diopside, and where other possible

indicators (e.g. perovskite) may be present (but noted in the tables as Tourmaline) the sample is designated for E.P.M.A.

4.2 Hardness Test

This was carried out on many individual grains in search for clastic diamond using a table of natural corundum. Limpid quartz fragments and zircons were rested frequently and collapsed on being firmly pressed against the test tablet. No diamond has yet been found.

4.3 Fluorescence Test

Carried out under the microscope at close range this revealed many zircons with golden fluorescence, but too many to be diagnostic of kimberlite. Fifty three blue fluorescent grains proved to be diopside, not diamond. These tests are continuing.

4.4 Refractive Index and Other Tests

After visual recognition of possible indicator grains, tests of refractive index in oils are carried out, particularly on garnet and pyroxene grains. This is to check that the sample grains fall within the specific ranges of pyrope and of diopside. Garnets with R.I. 1.67 to 1.78 are retained, as are pyroxenes with R.I. 1.65-1.70. Representative grains are then further checked by XRD either by goniometer or by powder camera photography.

At an early stage of the work further checks were made using the Scanning Electron Microscope fitted with an EDAX system, to obtain partial analyses of diagnostic elements in garnet and pyroxene, in particular Mg and Cr respectively. In the later stages this step is being omitted and most reliance is placed on the R.I. determination to screen out inappropriate compositions.

In spite of these lengthy and laborious search and screening procedures, results may still not be definite or certain, and the best that can be expected is that the most appropriate mineral samples have been obtained for the final step, which is Electron Microprobe Analysis (EPMA).

5. RESULTS OF PROSPECTING

An initial literature search and airphoto scan was carried out at Hobart, and at the Davenport office of the previous title holder, Shell Company of Australia. In addition Shell provided Base Resources some 600 suitable stream sediment samples from within the E.L. and processing and scanning of these samples was carried in Sydney, under the supervision of Dr. B. Wood.

Selected samples were then forwarded to AMDEL for microprobe analysis (refer Annual Report for year ending August, 1984).

As a result of the microprobe analysis completed by Amdel (results appended), four samples were identified as being appropriate for full-scale mineralogical assay by a diamond-search laboratory.

To this end, four samples, 057, 396, 485 and 498, were forwarded to Diamond Laboratory Services Pty. Ltd., Sydney, for further work. These

samples were washed and heavy and light fractions prepared. The heavy fraction was observed under the binocular stereo-microscope for diamonds and other kimberlitic indicator minerals.

The laboratory reports no diamonds, garnets, ilmenites, chrome-diopsides or spinels were identified in any of the samples.

The results of the extensive analytical tests completed on the stream sediment samples have proved to be negative in terms of identifying diamonds and for kimberlitic indicator minerals, and the clastic assemblages in the stream sediment samples can be correlated with the major geological units occurring in the area (Refer Annual Report for August, 1984).

In view of the negative results generated from the survey, there was little point in persisting with diamond exploration within the E.L., and the area was relinquished.

N. Charchalis

APPENDIX

Amdel Reports

Analysis for kimberlite indicator minerals

ANALYSIS OF SAND GRAINS FOR KIMBERLITE INDICATOR MINERALS

Belwood Pty Limited

3/0/0-GS 5966/84 October 1983

008 The Australian Development Laboratories

Street, Frewville,
n Australia 5063
delaide 79 1662
Telex AA 82520

ease address all
rrespondence to
x 114 Eastwood
SA 5063
In reply quote:

amdel

823009

20 October 1983

GS 3/0/0

Belwood Pty Limited
753 Kingsway
GYMEA NSW 2227

Attention: Dr B.L. Wood

REPORT GS 5966/84

YOUR REFERENCE: Letter dated 12 September 1983

MATERIAL: 44 sand grains from 11 locations

IDENTIFICATION: Nos. 009 - 498

DATE RECEIVED: 21 September 1983

WORK REQUIRED: Analysis for Kimberlite Indicator Minerals

Investigation and Report by: Michael Till

Chief - Geological Services Section: Dr Keith J. Henley
Manager, Mineral and Materials Sciences Division: Dr William G. Spencer

Keith Henley

for Brian S. Hickman
Managing Director

caw

Head Office:
on Street, Frewville
uth Australia 5063,
hone (08) 79 1662
x: Amdel AA82520
Pilot Plant:
Osman Place
Thebarton, S.A.
hone (08) 43 8053
anch Laboratories:
Melbourne, Vic.
hone (03) 645 3093
Perth, W.A.
hone (09) 325 7311
Townsville
Queensland 4814
hone (077) 75 1377

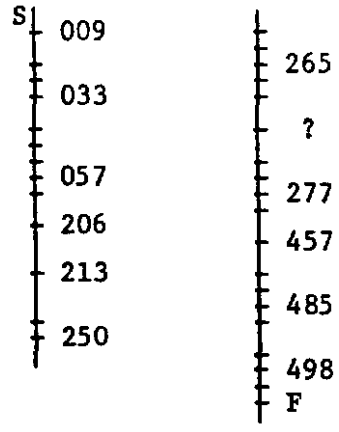
ANALYSIS OF SAND GRAINS FOR KIMBERLITE INDICATOR MINERALS

1. INTRODUCTION

Twenty three suspected diopside and twenty one suspected garnet sand grains were received from Dr B.L. Wood on behalf of Base Resources Limited, Sydney with a request for microscopic examination and microprobe analyses of suspected kimberlite indicator minerals.

2. PROCEDURE

The samples were examined microscopically in loose grain mounts. The grains were considered to be too small to be separated on the Frantz isodynamic magnetic separator (which can be used to separate almandine from pyrope, for example). Selected diopside and garnet grains were then carefully mounted in a polished section (PS 32009) in the following order.



Despite the care that was taken with mounting the grains, the diopside grain from sample 206 was plucked during polishing. One garnet grain from sample 498 could not be located in the vial. The identity of the diopside grain fragment marked '?' is not known.

The following elements/oxides were analysed. Their detection limits are as follows:

Element/Oxide	Detection Limit (wt %)
Al_2O_3	0.06
CaO	0.07
Cl	0.04
Cr_2O_3	0.12
FeO	0.14
K_2O	0.05
MgO	0.05
MnO	0.13
Na_2O	0.05
NiO	0.22
P_2O_5	0.07
SO_3	0.10
TiO	0.11

Element/Oxide	Detection Limit (wt %)
SiO_2	0.06
V_2O_3	0.11

3. RESULTS

The results of the microscopic examination of the submitted grains are as follows:

Sample No.	Inferred Mineral	No. of Grains	Refractive Index	Extinction Angle	Submitted for EPMA
009	Diopside	1	1.661	43°	✓
033	Diopside	3	1.661	33°	✓
057	Garnet	2	<1.77	-	✓
		1	<1.65	-	x
	Diopside	3	1.663	30 - 43°	✓
206	Diopside	1	1.661	43°	✓
	Garnet	3	>1.79	-	x
213	Diopside	1	1.661	33°	✓
250	Diopside	2	1.661	44°	✓
265	Garnet	2	1.775	-	✓
		1	>1.80	-	x
	Diopside	2	1.661	36 - 40°	✓
		1	1.663	0°	✓
277	Garnet	2	1.78	-	✓
		1	>1.80	-	x
	Diopside	2	1.683	30°	✓
457	Diopside	1	1.661	32°	✓
		4	<1.650	-	x
485	Diopside	2	<1.650	-	x
	Garnet	4	<1.77	-	✓
498	Garnet	1	>1.78	-	x
		5	1.775	-	✓

- = not determined.

The results of the electron probe microanalyses are as follows. (Note the FeO refers to total Fe as FeO).

Sample 009 Diopside	Wt %	Cations (O = 6)
SiO_2	52.70	1.906
TiO_2	0.32	0.008
Al_2O_3	5.90	0.251
Cr_2O_3	0.80	0.022
FeO	2.50	0.075
MgO	15.86	0.855
CaO	20.19	0.737
Na_2O	1.25	0.082
Total	99.52	

Sample 033 Diopside 1	Wt %	Cations (O = 6)
SiO_2	52.72	1.909
TiO_2	0.14	0.003
Al_2O_3	5.96	0.254
Cr_2O_3	0.76	0.021
FeO	2.63	0.079
MgO	15.14	0.817
CaO	21.22	0.823
Na_2O	1.06	0.074
Total	99.63	

Sample 033 Diopside 2	Wt %	Cations (O = 6)
SiO_2	53.66	1.988
Al_2O_3	1.17	0.051
FeO	6.71	0.207
MgO	14.26	0.787
CaO	23.66	0.939
Na_2O	0.33	0.023
Total	99.78	

Sample 033 Diopside 3	Wt %	Cations (O = 6)
SiO_2	52.66	1.929
TiO_2	0.56	0.015
Al_2O_3	2.76	0.119
Cr_2O_3	0.36	0.010
FeO	8.11	0.248
MnO	0.18	0.005
MgO	17.96	0.980
CaO	17.17	0.674
Na_2O	0.22	0.015
Total	99.98	

Sample 057 Garnet 1	Wt %	Cations (O= 24)
SiO_2	38.58	6.024
Al_2O_3	21.64	3.981
FeO	27.66	3.612
MnO	0.90	0.118
MgO	3.33	0.775
CaO	8.80	1.472
Total	100.90	

Sample 057 Garnet 2	Wt %	Cations (O= 24)
SiO_2	41.35	5.973
Al_2O_3	23.58	4.015
FeO	19.06	2.302
MnO	0.41	0.050
MgO	15.79	3.399
CaO	1.79	0.277
Total	101.98	

Sample 057 Diopside 1	Wt %	Cations (O = 6)
SiO_2	52.94	1.934
TiO_2	0.25	0.006
Al_2O_3	2.65	0.114
Cr_2O_3	0.80	0.023
FeO	7.07	0.216
MgO	18.25	0.994
CaO	17.73	0.694
Na_2O	0.21	0.014
Total	99.90	

Sample 057 Diopside 2	Wt %	Cations (O = 6)
SiO_2	52.23	1.916
TiO_2	0.60	0.016
Al_2O_3	2.83	0.122
Cr_2O_3	0.98	0.028
FeO	7.20	0.221
MgO	17.21	0.941
CaO	18.82	0.739
Na_2O	0.16	0.011
Total	100.04	

Sample 057 Diopside 3	Wt %	Cations (O = 6)
SiO_2	51.07	1.891
TiO_2	0.83	0.023
Al_2O_3	3.82	0.166
Cr_2O_3	0.70	0.020
FeO	7.22	0.223
MgO	17.47	0.964
CaO	17.56	0.696
Na_2O	0.18	0.013
Total	98.85	

Sample 206	Wt %	Cations (0 = 6)
Diopside - This grain was plucked during polishing. The analysis of another unidentified diopside found in the polished section is:		
SiO_2	52.68	1.914
TiO_2	0.20	0.005
Al_2O_3	5.47	0.234
Cr_2O_3	0.70	0.020
FeO	2.40	0.072
MgO	15.23	0.825
CaO	21.72	0.845
Na_2O	1.02	0.071
Total	99.41	

Sample 213 Diopside	Wt %	Cations (0 = 6)
SiO_2	52.32	1.915
Al_2O_3	5.19	0.223
Cr_2O_3	0.73	0.021
FeO	2.23	0.068
MgO	15.81	0.062
CaO	21.50	0.843
Na_2O	0.79	0.055
Total	98.58	

Sample 250 Diopside 1	Wt %	Cations (0 = 6)
SiO_2	52.72	1.879
Al_2O_3	6.51	0.273
Cr_2O_3	1.00	0.028
FeO	2.27	0.067
MgO	15.73	0.836
CaO	21.75	0.830
K_2O	0.06	0.002
Na_2O	0.98	0.067
SO_3	0.21	0.005
Total	101.24	

Sample 250 Diopside 2	Wt %	Cations (O = 6)
SiO_2	51.20	1.895
TiO_2	0.59	0.016
Al_2O_3	3.59	0.156
Cr_2O_3	0.77	0.022
FeO	7.03	0.217
MgO	16.81	0.927
CaO	19.06	0.755
Na_2O	0.22	0.015
Total	99.27	

Sample 265 Garnet 1	Wt %	Cations (O= 24)
SiO_2	39.63	6.010
Al_2O_3	22.06	3.943
FeO	24.26	3.077
MnO	0.53	0.068
MgO	8.43	1.905
CaO	6.24	1.013
Total	101.14	

Sample 265 Garnet 2	Wt %	Cations (O= 24)
SiO_2	38.97	6.033
Al_2O_3	21.77	3.972
FeO	23.33	3.821
MnO	0.70	0.091
MgO	3.28	0.757
CaO	12.68	2.103
Total	100.73	

Sample 265 Diopside 1	Wt %	Cations (O = 6)
SiO_2	53.50	1.993
Al_2O_3	0.71	0.031
FeO	8.00	0.249
MnO	0.33	0.010
MgO	13.93	0.773
CaO	23.37	0.933
Total	99.83	

Sample 265 Diopside 2	Wt %	Cations (0 = 6)
SiO_2	52.01	1.916
TiO_2	0.78	0.021
Al_2O_3	2.96	0.128
Cr_2O_3	0.77	0.022
FeO	4.96	0.152
MgO	16.03	0.880
CaO	21.53	0.850
Na_2O	0.42	0.029
Total	99.45	

Sample 265 Diopside 3	Wt %	Cations (0 = 6)
SiO_2	51.21	1.882
TiO_2	0.91	0.025
Al_2O_3	4.23	0.183
Cr_2O_3	0.82	0.023
FeO	4.88	0.150
MgO	16.08	0.881
CaO	20.96	0.825
Na_2O	0.47	0.033
Total	99.57	

Sample 277 Garnet 1	Wt %	Cations (0= 24)
SiO_2	37.01	5.991
$Al2O_3$	21.02	4.009
FeO	27.08	3.665
MnO	12.72	1.744
MgO	1.12	0.269
CaO	1.69	0.292
Na_2O	0.21	0.065
Total	100.84	

Sample 277 Garnet 2	Wt %	Cations (O= 24)
SiO_2	37.48	6.003
Al_2O_3	21.30	4.021
FeO	31.06	4.160
MnO	8.20	1.112
MgO	1.92	0.457
CaO	1.12	0.192
Na_2O	0.25	0.076
Cl	0.05	0.014
Total	101.39	

Sample 277 Diopside 1	Wt %	Cations (O = 6)
SiO_2	53.06	1.944
TiO_2	0.35	0.009
Al_2O_3	2.51	0.108
Cr_2O_3	0.62	0.017
FeO	7.37	0.226
MnO	0.16	0.005
MgO	18.13	0.990
CaO	17.32	0.680
Total	99.52	

Sample 277 Diopside 2	Wt %	Cations (O = 6)
SiO_2	52.24	1.926
TiO_2	0.52	0.014
Al_2O_3	2.89	0.125
Cr_2O_3	0.88	0.025
FeO	6.62	0.204
MgO	16.82	0.924
CaO	19.15	0.756
Na_2O	0.18	0.012
Total	99.32	

Sample 457 Diopside	Wt %	Cations (O = 6)
SiO_2	52.92	1.944
TiO_2	0.28	0.007
Al_2O_3	2.53	0.109
Cr_2O_3	0.70	0.020
FeO	6.88	0.211
MgO	17.91	0.981
CaO	18.00	0.708
Total	99.21	

Sample 485 Garnet 1	Wt %	Cations (O= 24)
SiO_2	40.08	5.995
Al_2O_3	22.42	3.952
FeO	24.40	3.052
MnO	0.66	0.083
MgO	9.82	2.190
CaO	4.32	0.692
SO_3	0.17	0.017
Total	101.88	

Sample 485 Garnet 2	Wt %	Cations (O= 24)
SiO_2	40.34	6.025
Al_2O_3	22.35	3.934
FeO	22.37	2.794
MnO	0.48	0.060
MgO	10.00	2.225
CaO	6.04	0.967
Total	101.58	

Sample 485 Garnet 3	Wt %	Cations (O= 24)
SiO_2	39.55	5.973
Al_2O_3	22.11	3.935
FeO	24.84	3.137
MnO	0.32	0.041
MgO	8.83	1.987
CaO	5.79	0.937
SO_3	0.13	0.014
Total	101.57	

Sample 485 Garnet 4	Wt %	Cations (O= 24)
SiO_2	40.97	5.999
Al_2O_3	22.87	3.947
FeO	18.03	2.208
MnO	0.25	0.030
MgO	12.34	2.692
CaO	7.32	1.147
Total	101.77	

Sample 498 Garnet 1	Wt %	Cations (O= 24)
SiO_2	39.55	5.962
Al_2O_3	22.74	4.039
V_2O_3	0.11	0.013
FeO	27.24	3.433
MnO	0.47	0.059
MgO	9.38	2.090
CaO	2.54	0.410
Total	101.95	

Sample 498 Garnet 2	Wt %	Cations (O= 24)
SiO_2	40.26	6.007
Al_2O_3	22.87	4.021
FeO	25.01	3.121
MnO	0.52	0.066
MgO	9.34	2.078
CaO	4.29	0.685
Total	102.30	

Sample 498 Garnet 3	Wt %	Cations (O= 24)
SiO_2	40.47	5.994
Al_2O_3	23.11	4.034
FeO	21.70	2.687
MnO	0.49	0.060
MgO	12.00	2.648
CaO	3.53	0.560
Total	101.31	

Sample 498 Garnet 4	Wt %	Cations (O= 24)
SiO_2	39.95	6.031
Al_2O_3	22.28	3.950
Cr_2O_3	0.14	0.016
FeO	26.03	3.287
MnO	0.54	0.069
MgO	9.53	2.145
CaO	3.00	0.485
Total	101.39	

A summary of the Cr_2O_3 content of the diopsides is as follows:

Sample	Cr_2O_3 (wt %)
009	0.30
033	<0.13, 0.36, 0.76
057	0.70, 0.80, 0.98
206	-
213	0.73
250	0.77, 1.00
265	<0.12, 0.77, 0.82
277	0.62, 0.88
457	0.70

A summary of the MgO content of the garnets is as follows:

Sample	MgO (wt %)
057	3.33, 15.79
265	3.28, 8.43
277	1.12, 1.92
485	8.83, 9.82, 10.00, 12.34
498	9.30, 9.34, 9.53, 12.00

Cr_2O_3 was detected only in garnet 4, sample 498 (detection limit .12%). V_2O_3 was detected in garnet 1, sample 498.

4. DISCUSSION

The values of % Cr_2O_3 in diopside in these samples are within the range of chrome diopside (0.21-2.81%), as defined by Stephens and Dawson (1977)*, but at the lower end. These values do not necessarily indicate a kimberlite source.

The values of % MgO in garnet in these samples indicate that pyrope garnet (defined as 11.5 + % MgO) is present in samples 057, 485 and 498. One garnet from sample 057 contains 15.8% MgO. While kimberlitic garnets typically have 18.0 + % MgO, some pyrope garnets in kimberlites have reported values as low as 11.75% MgO.

*STEVENS W.E. and DAWSON J.B. 1977. Statistical comparison between pyroxenes from kimberlites and their associated xenoliths. J. Geology, Vol. 85, pp. 433 - 449.

-022

823023

The Australian
Mineral Development
Laboratories

Flemington Street, Frewville,
South Australia 5063
Phone Adelaide (08) 79 1662
Telex AA82520

Please address all
correspondence to
P.O. Box 114 Eastwood
SA 5063
In reply quote:

amdel

14 February 1985

GS 3/0/0

Belwood Pty Limited
753 Kingsway
GYMEA NSW 2227

Attention: Dr B.L. Wood

REPORT G 6170/85 - PART II - FINAL

YOUR REFERENCE:	Letter dated 8 November 1984
IDENTIFICATION:	002-403, L006-L102 (not inclusive)
MATERIAL:	153 sand grains from 28 locations
DATE RECEIVED:	15 November 1984
WORK REQUIRED:	Analysis for kimberlite indicator minerals

Investigation and Report by: Michael Till

Chief - Geological Services Section: Dr Keith J. Henley

Keith Henley

for Dr William G. Spencer
Manager, Mineral and Materials Sciences Division

cap

Head Office:
Flemington Street, Frewville
South Australia 5063
Telephone (08) 79 1662
Telex: Amdel AA82520
Pilot Plant:
Osman Place
Thebarton, S.A.
Telephone (08) 43 5733
Telex: Amdel AA82725
Branch Laboratories:
Melbourne, Vic.
Telephone (03) 645 3093
Perth, W.A.
Telephone (09) 325 7311
Telex: Amdel AA94893
Sydney, N.S.W.
Telephone (02) 439 7735
Telex: Amdel AA20053
Townsville
Queensland 4814
Telephone (077) 75 1377

ANALYSIS OF SAND GRAINS FOR KIMBERLITE INDICATOR MINERALS

1. INTRODUCTION

Sand grain samples from thirty two localities were received from Dr B.L. Wood on behalf of Base Resources Limited, Sydney with a request for brief microscopic examination and microprobe analyses of suspected kimberlite indicator minerals.

2. PROCEDURE

The samples were examined microscopically in loose grain mounts, the diopside grains in an oil of refractive index of 1.66 and the garnet grains in an oil of refractive index 1.77. The diopside grains with a refractive index of not less than 1.66 and with inclined extinction or indeterminable extinction were mounted in a polished section and analysed by an electron probe microanalyser. The garnet grains with a refractive indix of not greater than 1.77 were also mounted in a polished section and analysed by an electron probe microanalyser.

Several vials with clear plastic tops were loose upon receipt of the sample container. A summary of the grains received, examined and probed is as follows:

Sample	Grains Received/Examined	Grains Submitted for Mounting in Polished Section	Grains Probed
	Diopside:Garnet	Diopside:Garnet	Diopside:Garnet
002	5:4	4:4	3:3
100	2:6	0:3	0:3
124	4:2	2:2	2:1
159	2:1	2:0	2:0
160	2:1	2:0	2:0
167	3:1	3:1	3:1
195	16:3	15:3	15:1
201	2:5	2:4	2:4
207	1:4	1:0	1:0
368	6:9	2:6	2:5
369	3:3	2:2	2:2
387	1:2	1:1	1:1
396	1:2	1:2	1:2
398	2:5	1:2	1:2
403	1:3	1:3	1:3
L006	0:4	0:0	0:0
L008	0:6	0:0	0:0
L009	0:2	0:0	0:0

Sample	Grains Received/Examined	Grains Submitted for Mounting in Polished Section	Grains Probed
	Diopside:Garnet	Diopside:Garnet	Diopside:Garnet
L024	6:8	6 :7	6:6
L028	2:0	2:0	2:0
L032	1:5	0:0	0:0
L039	1:1	1:0	1:0
L048	3:3	3:0	2:0
L065	3:0	1:0	1:0
L087	2:2	1:0	1:0
L091	1:1	1:0	1:0
L099	0:0	0:0	0:0
L102	0:0	0:0	0:0

The following elements/oxides were analysed. Their detection limits are as follows:

Element/Oxide	Detection Limit (Wt %)
Al_2O_3	0.06
CaO	0.07
Cl	0.04
Cr_2O_3	0.13
FeO	0.15
K_2O	0.05
MgO	0.05
MnO	0.13
Na_2O	0.05
NiO	0.22
P_2O_5	0.07
SO_3	0.10
TiO_2	0.11
SiO_2	0.06
V_2O_3	0.14

3. RESULTS

The results of the microscopic examination of the submitted grains are as follows:

Sample	Inferred Mineral	No. of Grains	Refractive Index	Extinction Angle	Submitted for EPMA	
002	Diopside	1	<1.66	0°	x	tourmaline
		2	>1.66	22°,27°	✓	
		2	>1.66	n.d.	✓	
	Garnet	4	<1.77	-	✓	
100	Diopside	2	<1.66	n.d.	x	
	Garnet	1	>1.77	-	x	
		3	<1.77	-	✓	
124	Diopside	2	>1.66	0°	x	
		1	>1.66	n.d.	✓	
		1	n.d.*	n.d.	✓	
159	Garnet	2	<1.77	-	✓	
	Diopside	1	>1.66	33°	✓	
		1	>1.66	n.d.	✓	
160	Garnet	1	>1.77	-	x	
	Diopside	1	>1.66	n.d.	✓	
		1	n.d.*	n.d.	✓	
167	Garnet	1	>1.77	-	x	(rutile)
	Diopside	2	>1.66	30°,45°	✓	
		1	>1.66	n.d.	✓	
195	Garnet	1	1.77	-	✓	
	Diopside	7	>1.66	12-35°	✓	
		8	>1.66	n.d.	✓	
		1	>1.66	n.d.	x	(olivine)
	Garnet	3	<1.77	-	✓	
201	Diopside	1	>1.66	40°	✓	
		1	>1.66	n.d.	✓	
	Garnet	1	>1.77	-	x	
		4	n.d.*	-	✓	
207	Diopside	1	>1.66	n.d.	✓	
		3	>1.77	-	x	
		1	>1.77	-	x	iron oxide

*Grains too large to determine refractive index.

026

Sample	Inferred Mineral	No. of Grains	Refractive Index	Extinction Angle	Submitted for EPMA
368	Diopside	3	<1.66	0°,35°,n.d.	x (one grain is tourmaline)
		1	>1.66	0°	x
		2	>1.66	40°	✓
	Garnet	3	>1.77	-	x
		6	<1.77	-	✓
369	Diopside	2	>1.66	33°,n.d.	✓
		1	<1.66	n.d.	x
	Garnet	2	1.77	-	✓
		1	>1.77	-	x
387	Diopside	1	n.d.	42°	✓
	Garnet	1	<1.77	-	✓
		1	>1.77	-	x
396	Diopside	1	>1.66	25°	✓
	Garnet	2	<1.77	-	✓
398	Diopside	1	>1.60	0°	x
		1	n.d.	n.d.	✓
	Garnet	3	>1.77	-	x
		2	<1.77	-	✓
403	Diopside	1	>1.66	45°	✓
	Garnet	3	<1.77	-	✓
L006	Garnet	4	>1.77	-	x
L008	Garnet	6	>1.77	-	x
L009	Garnet	2	>1.77	-	x
L024	Diopside	5	>1.66	n.d.	✓
		1	>1.66	11°	✓
	Garnet	7	<1.77	-	✓
		1	>1.77	-	x
L028	Diopside	2	>1.66	38°,40°	✓
L032	Diopside	1	<1.66	0°	x
	Garnet	5	>1.77	-	x
L039	Diopside	1	>1.66	44°	✓
	Garnet	1	>1.77	-	x
L048	Diopside	2	>1.66	n.d.	✓
		1	>1.66	30°	✓
	Garnet	3	>1.77	-	x
L065	Diopside	2	<1.66	n.d.	x (one is tourmaline)
		1	>1.66	n.d.	✓
L087	Diopside	1	>1.66	40°	✓
		1	1.66	0°	x
		2	>1.77	-	x

027

Sample	Inferred Mineral	No. of Grains	Refractive Index	Extinction Angle	Submitted for EPMA
L091	Diopside	1	>1.66	10°	✓
	Garnet	1	>1.77	-	x

The results of the electron probe microanalyses are as follows (note that FeO refers to total Fe as FeO.

Sample 002: PS33683

	Diopside 1		Diopside 2	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	51.5	1.93	50.3	1.88
TiO_2	0.6	0.02	0.7	0.02
Al_2O_3	2.3	0.10	4.4	0.19
Cr_2O_3	0.3	0.01	1.2	0.03
FeO	8.3	0.26	6.4	0.19
MgO	15.3	0.85	15.5	0.87
CaO	20.1	0.81	19.7	0.79
Na_2O	0.4	0.03	0.3	0.02
Total	98.8		98.5	

	Diopside 3		Garnet 1	
	Wt %	Cations (O=6)	Wt %	Cations (O=24)
SiO_2	50.5	1.90	38.7	5.95
TiO_2	0.6	0.02	-	-
Al_2O_3	3.8	0.17	22.0	3.99
Cr_2O_3	0.9	0.03	-	-
FeO	6.4	0.20	23.0	2.96
MnO	0.2	0.01	3.0	0.39
MgO	15.8	0.88	7.2	1.65
CaO	19.6	0.79	6.7	1.10
Na_2O	0.2	0.02	-	-
Total	98.0		100.6	

- = not detected at limit quoted above.

Sample 002: (Continued)

	Garnet 2		Garnet 3	
	Wt %	Cations (O=20)	Wt %	Cations (O=24)
SiO_2	38.3	6.01	38.3	5.96
Al_2O_3	21.5	3.98	22.0	4.03
FeO	27.9	3.66	31.4	4.09
MnO	1.0	0.13	0.7	0.09
MgO	7.6	1.78	6.8	1.59
CaO	2.7	0.45	1.6	0.27
Total	99.0		100.8	

Sample 100: PS33684

	Garnet 1		Garnet 2	
	Wt %	Cations (O=24)	Wt %	Cations (O=24)
SiO_2	38.5	6.00	39.1	5.91
Al_2O_3	21.4	3.93	22.1	3.98
FeO	26.4	3.44	24.3	3.10
MnO	0.5	0.06	0.7	0.08
MgO	6.6	1.53	8.4	1.91
CaO	6.1	1.02	6.1	1.00
Total	99.5		100.7	

	Garnet 3	
	Wt %	Cations (O=24)
SiO_2	38.7	5.98
Al_2O_3	22.1	4.02
FeO	31.9	4.12
MnO	0.9	0.12
MgO	6.9	1.59
CaO	1.1	0.18
Total	101.6	

- = not detected at limit quoted above.

023

Sample 124: PS33685

	Diopside 1		Diopside 2	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	51.7	1.91	51.6	1.92
TiO_2	0.6	0.02	0.5	0.01
Al_2O_3	3.3	0.15	2.7	0.12
Cr_2O_3	0.9	0.03	0.9	0.03
FeO	7.4	0.23	6.9	0.21
MgO	16.6	0.92	16.7	0.92
CaO	18.6	0.74	19.3	0.77
Total	99.1		98.6	

	Garnet 1	
	Wt %	Cations (O=24)
SiO_2	39.0	5.98
Al_2O_3	21.9	3.96
FeO	24.2	3.10
MnO	0.5	0.06
MgO	8.3	1.90
CaO	6.2	1.03
Total	100.1	

Sample 159: PS33686

	Diopside 1		Diopside 2	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	50.3	1.84	52.6	1.90
TiO_2	0.4	0.01	0.3	0.01
Al_2O_3	8.8	0.38	6.3	0.27
Cr_2O_3	0.2	0.01	0.6	0.02
FeO	7.4	0.23	2.8	0.08
MgO	16.6	0.91	15.4	0.83
CaO	13.8	0.54	20.5	0.79
Na_2O	1.4	0.10	1.3	0.09
Total	98.9		99.8	

- = not detected at limit quote above.

Sample 160: PS33687

	Diopside 1 (Orthopyroxene)		Diopside 2	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	55.3	1.90	51.4	1.92
TiO_2	-	-	0.6	0.02
Al_2O_3	4.8	0.20	2.8	0.12
Cr_2O_3	0.3	0.09	0.4	0.01
FeO	6.5	0.19	7.5	0.23
MgO	32.6	1.67	16.8	0.93
CaO	0.6	0.02	18.6	0.75
Total	100.1		98.1	

Sample 167: PS33688

	Diopside 1		Diopside 2	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	48.6	1.85	50.7	1.92
TiO_2	1.3	0.04	0.5	0.01
Al_2O_3	5.2	0.23	2.9	0.13
Cr_2O_3	0.3	0.01	0.6	0.02
FeO	8.2	0.26	7.3	0.23
MgO	13.6	0.77	16.1	0.91
CaO	20.2	0.82	19.3	0.78
Total	97.4		97.4	

	Diopside 3		Garnet 1	
	Wt %	Cations (O=6)	Wt %	Cations (O=24)
SiO_2	50.7	1.90	37.4	5.93
TiO_2	0.8	0.02	-	-
Al_2O_3	3.4	0.15	21.5	4.02
Cr_2O_3	0.7	0.02	-	-
FeO	7.5	0.23	32.2	4.27
MnO	-	-	1.5	0.20
MgO	15.9	0.88	4.9	1.16
CaO	19.5	0.78	2.6	0.43
Total	98.5		100.1	

- = not detected at limit quoted above.

031

Sample 195: PS33689

	Diopside 1		Diopside 2	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	51.3	1.92	51.2	1.91
TiO_2	0.5	0.01	0.6	0.02
Al_2O_3	3.1	0.14	3.2	0.14
Cr_2O_3	0.8	0.02	1.1	0.03
FeO	7.1	0.22	6.9	0.21
MgO	16.5	0.92	16.0	0.89
CaO	18.8	0.75	19.1	0.76
Total	98.1		98.1	

	Diopside 3		Diopside 4	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	50.7	1.91	50.2	1.89
TiO_2	0.7	0.02	0.6	0.02
Al_2O_3	3.4	0.15	3.9	0.17
Cr_2O_3	0.9	0.03	1.0	0.03
FeO	6.9	0.22	7.0	0.22
MgO	15.9	0.89	15.5	0.87
CaO	19.3	0.78	19.2	0.78
Total	97.8		97.4	

	Diopside 5		Diopside 6	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	51.1	1.90	51.5	1.90
TiO_2	0.7	0.02	0.7	0.02
Al_2O_3	3.5	0.15	3.4	0.15
Cr_2O_3	1.1	0.03	1.0	0.03
FeO	6.8	0.21	7.1	0.22
MgO	15.8	0.87	16.0	0.88
CaO	20.2	0.80	20.0	0.79
Total	99.2		99.7	

	Diopside 7 (orthopyroxene)		Diopside 8	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	54.9	1.98	52.7	1.95
TiO_2	-	-	0.4	0.01
Al_2O_3	1.2	0.05	2.3	0.10
Cr_2O_3	0.2	0.01	0.5	0.02
FeO	14.3	0.43	7.1	0.22
MgO	26.6	1.43	17.5	0.97
CaO	2.2	0.09	18.0	0.71
Total	99.4		98.5	

- = not detected at limit quoted above

032

Sample 195: (Continued)

	Diopside 9		Diopside 10	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	51.7	1.92	51.5	1.91
TiO_2	0.4	0.01	0.7	0.02
Al_2O_3	2.9	0.12	3.4	0.15
Cr_2O_3	0.7	0.02	1.1	0.03
FeO	7.1	0.21	7.0	0.22
MgO	17.1	0.94	16.0	0.88
CaO	18.6	0.74	19.6	0.78
Total	98.5		99.3	

	Diopside 11		Diopside 12	
	Wt %	Cations (O=6)	Wt %	Cations(O=6)
SiO_2	52.2	1.93	50.6	1.89
TiO_2	0.4	0.01	0.7	0.02
Al_2O_3	2.1	0.09	3.8	0.17
Cr_2O_3	0.6	0.02	0.9	0.03
FeO	7.4	0.23	7.4	0.23
MgO	17.6	0.97	16.2	0.90
CaO	18.6	0.74	18.3	0.73
Total	98.9		97.9	

	Diopside 13		Diopside 14	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	51.7	1.93	51.6	1.93
TiO_2	0.4	0.01	0.5	0.01
Al_2O_3	2.5	0.11	2.6	0.11
Cr_2O_3	0.9	0.03	0.8	0.02
FeO	6.7	0.21	6.9	0.21
MgO	17.0	0.95	16.6	0.92
CaO	18.7	0.75	18.9	0.76
Total	97.9		97.9	

- = not detected at limit quoted above.

Sample 195: (Continued)

	Diopside 15		Garnet 1	
	Wt %	Cations (O=6)	Wt %	Cations (O=24)
SiO_2	51.0	1.89	38.0	5.99
TiO_2	0.9	0.02	-	-
Al_2O_3	4.2	0.18	21.8	4.05
Cr_2O_3	0.9	0.03	-	-
FeO	7.0	0.22	30.6	4.02
MnO	-	-	1.5	0.21
MgO	15.6	0.86	5.8	1.35
CaO	18.9	0.77	2.2	0.37
Total	98.5		99.9	

Sample 201: PS33690

	Diopside 1		Diopside 2	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	49.6	1.87	49.5	1.87
TiO_2	0.8	0.02	0.7	0.02
Al_2O_3	4.8	0.21	4.9	0.22
Cr_2O_3	0.8	0.02	0.8	0.02
FeO	7.0	0.22	6.8	0.21
MgO	14.9	0.83	15.1	0.85
CaO	20.0	0.81	19.5	0.79
Total	97.9		97.3	

	Garnet 1		Garnet 2	
	Wt %	Cations (O=24)	Wt %	Cations (O=24)
SiO_2	37.2	6.00	36.9	5.93
Al_2O_3	20.9	3.98	21.2	4.02
FeO	22.5	3.03	26.6	3.58
MnO	15.0	2.05	13.0	1.76
MgO	0.6	0.15	0.8	0.18
CaO	4.5	0.78	2.8	0.48
Total	100.7		101.3	

- = not detected at limit quoted above.

034

Sample 201: (Continued)

	Garnet 3		Garnet 4	
	Wt %	Cations (O=24)	Wt %	Cations (O=24)
SiO_2	36.8	5.86	41.6	6.56
Al_2O_3	21.7	4.06	19.0	3.54
FeO	25.4	3.39	24.9	3.29
MnO	14.9	2.01	14.5	1.94
MgO	1.0	0.23	1.0	0.24
CaO	2.2	0.37	0.5	0.08
Total	102.0		101.5	

Sample 207: PS33691

	Diopside 1	
	Wt %	Cations (O=6)
SiO_2	51.7	1.91
TiO_2	0.3	0.01
Al_2O_3	5.8	0.25
Cr_2O_3	0.7	0.02
FeO	2.5	0.08
MgO	15.0	0.83
CaO	20.4	0.81
Na_2O	1.4	0.10
Total	97.8	

Sample 368: PS33692

	Diopside 1		Diopside 2	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	51.3	1.97	51.7	1.96
TiO_2	0.3	0.01	0.2	0.01
Al_2O_3	1.4	0.06	1.4	0.06
Cr_2O_3	-	-	-	-
FeO	13.3	0.43	12.3	0.39
MgO	14.3	0.82	15.1	0.86
CaO	17.0	0.70	17.4	0.71
Total	97.6		98.1	

- = not detected at limit quoted above.

Sample 368: (Continued)

	Garnet 1		Garnet 2	
	Wt %	Cations (O=24)	Wt %	Cations (O=24)
SiO_2	38.6	5.97	38.2	5.95
Al_2O_3	21.3	3.88	21.6	3.96
FeO	25.7	3.33	29.5	3.84
MnO	1.4	0.18	1.0	0.13
MgO	7.5	1.74	5.8	1.34
CaO	6.0	0.99	4.7	0.78
Total	100.5		100.8	

	Garnet 3		Garnet 4	
	Wt %	Cations (O=24)	Wt %	Cations (O=24)
SiO_2	38.4	5.97	38.7	5.95
Al_2O_3	21.8	3.99	22.3	4.05
FeO	28.0	3.64	29.4	3.78
MnO	0.8	0.10	0.3	0.04
MgO	5.7	1.32	8.6	1.98
CaO	6.1	1.01	1.3	0.22
Total	100.8		100.6	

	Garnet 5	
	Wt %	Cations (O=24)
SiO_2	37.7	5.96
Al_2O_3	21.6	4.03
FeO	33.1	4.37
MnO	1.8	0.23
MgO	5.3	1.24
CaO	1.2	0.20
Total	100.7	

Sample 369: PS33693

	Diopside 1		Diopside 2	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	51.7	1.98	51.6	1.97
TiO_2	-	-	0.1	0.01
Al_2O_3	0.8	0.04	1.1	0.05
Cr_2O_3	-	-	-	-
V_2O_3	-	-	0.2	0.01
FeO	21.7	0.69	13.6	0.43
MnO	0.4	0.01	0.3	0.01
MgO	18.0	1.03	14.2	0.81
CaO	5.9	0.24	17.3	0.71
Total	98.5		98.4	

- = not detected at limit quoted above

036

Sample 369: (Continued)

	Garnet 1		Garnet 2	
	Wt %	Cations (O=24)	Wt %	Cations (O=24)
SiO_2	38.5	5.92	39.2	5.95
Al_2O_3	22.4	4.05	22.2	3.97
FeO	29.0	3.73	26.8	3.40
MnO	0.4	0.05	1.3	0.16
MgO	9.6	2.20	9.7	2.20
CaO	0.8	0.12	2.3	0.38
Total	100.7		101.5	

Sample 387: PS33694

	Diopside 1		Garnet 1	
	Wt %	Cations (O=6)	Wt %	Cations (O=24)
SiO_2	47.7	1.81	39.7	6.00
TiO_2	1.7	0.05	-	-
Al_2O_3	6.4	0.28	21.9	3.91
Cr_2O_3	0.5	0.01	-	-
FeO	7.2	0.23	19.3	2.44
MnO	-	-	0.2	0.03
MgO	13.5	0.76	8.4	1.88
CaO	20.5	0.83	11.1	1.79
Total	97.5		100.6	

Sample 396: PS33695

	Diopside 1	
	Wt %	Cations (O=6)
SiO_2	51.5	1.94
Al_2O_3	2.1	0.09
Cr_2O_3	0.2	0.01
FeO	7.3	0.23
MgO	16.5	0.93
CaO	19.6	0.79
Total	97.2	

- = not detected at limit quoted above.

037

Sample 396: (Continued)

	Garnet 1		Garnet 2	
	Wt %	Cations (O=24)	Wt %	Cations (O=24)
SiO_2	38.6	5.92	39.7	5.98
Al_2O_3	22.3	4.03	22.5	3.99
FeO	30.6	3.92	18.7	0.03
MnO	0.2	0.02	0.4	2.36
MgO	9.0	2.04	12.2	0.05
CaO	0.7	0.12	5.5	2.72
Total	101.4		99.0	

Sample 398: PS33696

	Diopside 1	
	Wt %	Cations (O=6)
SiO_2	50.5	1.88
TiO_2	1.2	0.03
Al_2O_3	4.1	0.18
Cr_2O_3	0.3	0.01
FeO	7.2	0.22
MgO	14.9	0.83
CaO	20.5	0.82
Total	98.7	

	Garnet 1		Garnet 2	
	Wt %	Cations (O=24)	Wt %	Cations (O=24)
SiO_2	39.0	6.07	38.9	5.95
Al_2O_3	19.5	3.57	22.0	3.97
FeO	6.2	0.81	25.2	3.23
MnO	1.0	0.14	0.5	0.07
MgO	-	-	8.5	1.93
CaO	33.3	0.55	5.6	0.02
Total	99.0		100.7	

- = not detected at limit quoted above.

036

Sample 403: PS33697

	Diopside 1		Garnet 1	
	Wt %	Cations (O=6)	Wt %	Cations (O=24)
SiO_2	50.9	1.91	38.1	5.99
TiO_2	0.4	0.01	0.2	0.01
Al_2O_3	3.4	0.15	21.1	3.90
Cr_2O_3	1.0	0.03	-	-
FeO	6.4	0.20	28.2	3.70
MnO	-	-	1.1	0.15
MgO	17.0	0.95	5.1	1.19
CaO	18.3	0.74	6.5	1.09
Total	97.4		100.3	

	Garnet 2		Garnet 3	
	Wt %	Cations (O=24)	Wt %	Cations (O=24)
SiO_2	38.2	5.99	38.5	6.00
Al_2O_3	21.3	3.94	21.4	3.94
FeO	29.3	3.83	27.5	3.59
MnO	1.1	0.14	1.0	0.13
MgO	5.1	1.20	5.5	1.29
CaO	5.6	0.94	6.5	1.08
Total	100.6		100.4	

Sample L024: PS33701

	Diopside 1		Diopside 2	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	51.8	1.96	52.6	1.96
TiO_2	0.4	0.01	0.4	0.01
Al_2O_3	1.5	0.07	2.0	0.09
Cr_2O_3	0.4	0.01	0.7	0.02
FeO	8.7	0.28	8.4	0.26
MgO	17.0	0.96	17.4	0.97
CaO	16.9	0.69	16.8	0.67
Total	96.7		98.3	

- = not detected at limit quoted above.

039

Sample L024: (Continued)

	Diopside 3		Diopside 4	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	52.0	1.94	51.7	1.94
TiO_2	0.6	0.02	0.5	0.01
Al_2O_3	2.0	0.09	2.2	0.10
Cr_2O_3	0.9	0.03	0.7	0.02
FeO	8.3	0.26	8.3	0.26
MgO	16.9	0.94	16.7	0.94
CaO	17.3	0.69	17.9	0.72
Total			98.0	

	Diopside 5		Diopside 6	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	49.8	1.89	50.5	1.91
TiO_2	0.7	0.02	0.8	0.02
Al_2O_3	3.4	0.15	3.8	0.17
Cr_2O_3	1.0	0.03	0.4	0.01
FeO	8.0	0.25	8.9	0.28
MgO	14.9	0.84	15.9	0.90
CaO	19.6	0.80	16.4	0.67
Total	97.4		96.7	

	Garnet 1		Garnet 2	
	Wt %	Cations (O=24)	Wt %	Cations (O=24)
SiO_2	39.8	5.95	39.4	5.98
Al_2O_3	22.8	4.01	22.2	3.96
Cr_2O_3	0.3	0.03	0.2	0.02
FeO	20.6	2.58	26.8	3.40
MnO	0.6	0.08	0.3	0.04
MgO	10.8	2.41	10.8	2.43
CaO	6.0	0.96	1.2	0.19
Total	100.9		100.9	

	Garnet 3		Garnet 4	
	Wt %	Cations (O=24)	Wt %	Cations (O=24)
SiO_2	39.4	6.00	38.9	5.95
Al_2O_3	22.0	3.94	22.2	4.01
FeO	23.6	3.00	25.7	3.29
MnO	0.3	0.04	1.3	0.17
MgO	9.1	2.07	6.9	1.56
CaO	5.9	0.97	6.0	0.99
Total	100.3		101.0	

- = not detected at limit quoted above.

040

Sample L024: (Continued)

	Garnet 5		Garnet 6	
	Wt %	Cations (O=24)	Wt %	Cations (O=24)
SiO_2	38.9	5.94	38.5	5.97
Al_2O_3	22.3	4.02	21.9	4.00
FeO	28.5	3.64	28.7	3.72
MnO	0.6	0.08	0.9	0.12
MgO	8.6	1.95	6.6	1.51
CaO	2.1	0.34	4.0	0.67
Total	101.0		100.6	

Sample L028: PS33702

	Diopside 1		Diopside 2	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	52.2	1.95	51.7	1.94
TiO_2	0.6	0.02	0.4	0.01
Al_2O_3	2.2	0.97	2.4	0.11
Cr_2O_3	0.6	0.02	0.8	0.02
FeO	6.5	0.20	6.2	0.19
MgO	16.4	0.91	16.2	0.90
CaO	19.6	0.78	19.7	0.79
Total	98.1		97.4	

Sample L039: PS33703

	Diopside 1	
	Wt %	Cations (O=6)
SiO_2	54.4	1.99
Al_2O_3	1.6	0.07
Cr_2O_3	1.1	0.03
FeO	2.4	0.07
MgO	16.1	0.88
CaO	22.3	0.87
Na_2O	0.9	0.06
Total	98.8	

- = not detected at limit quoted above.

Sample L048: PS33704

	Diopside 1		Diopside 2	
	Wt %	Cations (O=6)	Wt %	Cations (O=6)
SiO_2	52.4	1.94	51.7	1.91
TiO_2	0.7	0.02	0.7	0.02
Al_2O_3	2.3	0.10	3.3	0.14
Cr_2O_3	0.4	0.01	1.1	0.03
FeO	7.4	0.23	6.9	0.21
MgO	17.3	0.95	15.8	0.87
CaO	18.5	0.73	20.0	0.79
Na_2O	0.2	0.02	0.3	0.02
Total	99.2		99.8	

Sample L065: PS33705

	Diopside 1 (?High Fe Chlorite)
	Wt %
SiO_2	22.1
Al_2O_3	23.2
FeO	32.2
MnO	0.4
MgO	8.5
Total	86.4

Sample L087: PS33706

	Diopside 1	
	Wt %	Cations (O=6)
SiO_2	51.9	1.89
TiO_2	0.3	0.01
Al_2O_3	7.0	0.30
Cr_2O_3	0.9	0.03
FeO	2.5	0.08
MgO	14.6	0.79
CaO	20.2	0.79
Na_2O	1.6	0.11
Total	99.0	

- = not detected at limit quoted above.

042

Sample L087: (Continued)

	Garnet 1		Garnet 2	
	Wt %	Cations (O=24)	Wt %	Cations (O=24)
SiO_2	37.3	5.93	37.4	5.93
Al_2O_3	19.3	3.61	23.3	4.35
FeO	8.9	1.19	12.1	1.60
MnO	27.3	3.68	-	-
MgO	0.6	0.14	0.2	0.04
CaO	9.3	1.58	23.2	3.94
Total	102.7		96.2	

Sample L091: PS33707

	Diopside 1 (Epidote)
	Wt %
SiO_2	37.2
Al_2O_3	21.6
FeO	13.1
CaO	23.0
Total	94.9

- = not detected at limit quoted above.

043

4. SUMMARY

A summary of the Cr_2O_3 contents of the diopsides analysed and the MgO content of the garnets analysed is as follows:

Sample	Diopside Cr_2O_3 (Wt %)	Garnet MgO (Wt %)
002	0.30, 0.86, 1.16	6.84, 7.20, 7.60
100	-	6.59, 6.92, 8.40
124	0.88, 0.94	8.29
159	0.16, 0.61	-
160	0.41	-
167	0.30, 0.55, 0.71	4.89
195	0.54, 0.56, 0.74, 0.76, 0.80, 0.84, 0.91, 0.92, 0.94, 0.99, 1.01, 1.05, 1.09, 1.14	5.77
201	0.79, 0.83	0.63, 0.66, 0.97, 1.02
207	0.72	-
368	<0.13, <0.13	5.71, 5.79, 7.54, 8.64
369	<0.13, <0.13	9.61, 9.74
387	0.45	8.36
396	0.19	8.95, 12.15
398	0.34	<0.05, 8.47
403	0.99	5.09, 5.13, 5.53
L024	0.43, 0.44, 0.68, 0.70, 0.92, 0.96	6.55, 6.85, 8.57, 9.13, 10.75, 10.83
L028	0.63, 0.82	-
L039	1.12	-
L048	0.41, 1.05	0.19, 0.58
L087	0.91	