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NASA CR 101787

STANFORD RSL TECH REPORT #68-2

"RE-EVALUATION OF THE NORMATIVE MINERALS OF
SONORA PASS ROCK STANDARDS - UNIV. OF NEV. RPTS. #7 & #12

by

I.A. Kilinc and R.J.P. Lyon

Already Issued

- 67-1 - PART I Original LMSC SG-4 Program Univac 1107 (Feb. 8, 1967)
by R.J.P. Lyon et. al.
- 67-2 - "Field Infrared Analysis of Terrain - Spectral Correlation
Program", by R.J.P. Lyon et. al. (March 30, 1967)
- 67-3 - "Statistical Analysis of IR Spectra - Stanford Programs
Applied to USGS Spectra in Tech Letter #13", by R.J.P. Lyon
et. al (Nov. 10, 1967).
- 67-4 - "Computer Reduction and Analysis of an Infrared Image", by
Keenan Lee (December 31, 1967).
- 68-1 - "Infrared Exploration for Coastal and Shoreline Springs" by
R.J.P. Lyon and Keenan Lee (November 1968).

The research described in #68-2 was performed under support from NASA
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16 November 1968

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I. INTRODUCTION

The chemical analyses and normative minerals of a number of rock samples collected from Sonora Pass NASA Test Site (Site #19) were published by the University of Nevada in their Technical Letters #7 and #12. A closer examination of the normative minerals obtained from several chemical analyses revealed that the method of calculation of normative minerals was not correct. Specifically, the weight percent sum of the normative minerals and the weight percent sum of oxides from which the norms were calculated was found to vary as much as 18 percent. Since the calculation of normative minerals involves rearrangement of the oxides in the form of pure minerals, the two sums should not deviate by more than one percent.

II. NORMATIVE MINERALS

The same chemical analyses of 34 rock samples were used to recalculate the normative minerals. These chemical analyses were obtained from Technical Letters #7 and #12. In Table 1 the description of these samples are given as they appeared in the above mentioned Technical Letters.

A normative mineral calculation program originally written by J. Holloway and modified by I.A. Kilinc was used to calculate the normative minerals and several associated petrologic values of significance. The results are presented at the end of this report in the listings of computer output.

The weight percent normative minerals of the granitic rocks are plotted on two types of triangular diagrams, commonly used in the study of granitic rocks. Figure 1 shows the compositions of these 19 granitic rocks in terms of quartz-plagioclase (Ab + An) - orthoclase. Except point 1 which represents composition of Cinko lake "granodiorite", all others occupy the central part of the diagram suggesting that they are granodiorite to quartz monzonite in composition. Figure 2 shows

the compositions of the granitic rocks in terms of normative quartz-albite-orthoclase. Again, Cinko lake "granodiorite" plots quite differently to the rest of the rocks.

III. SUMMARY AND CONCLUSIONS

It is a common practice to classify intrusive granitic rocks in terms of their modal mineralogy. Recently O'Connor (1965) proposed a classification for quartz-rich igneous rocks based on feldspar ratios. According to this classification the rock names are characterized as fields on a triangular diagram with molecular percentage of normative orthoclase, albite and anorthite as the vertices of the triangle.

The nineteen granitic rocks listed in Table 2 have been plotted on a normative Or-Ab-An diagram in Figure 3 for the purpose of reclassification. It is clear from Figure 3 that Cinko Lake granodiorite (point 1) is actually tonalite in composition. It is also clear that Dorothy Lake alaskite (points 483 and 3) is granite in composition. Furthermore Fremont Lake quartz monzonite (601 and 4), Bond Pass quartz monzonite (7), Topaz Lake quartz monzonite (9, 10) could be better classified as granodiorites. Finally Cinko Lake granodiorite plots in the tonalite field. Table 3 shows the old and the new classifications of these rocks. These modified results were considered of enough petrographic significance to justify the republication of some of the results of Technical letters #7 and #12.

IV. REFERENCES

- SJOBERG, James, Sonora Pass Standards; University of Nevada, Reno, NASA Technical Letter Number 7, 1967.
- QUADE, J.Q., Chapman, P.E., and Brennan, P.A., Surface Chemistry of Major Rock Types of Sonora Pass Test Site, California; University of Nevada, Reno, NASA Technical Letter Number 12, 1968.
- O'CONNOR, J.T., A Classification of Quartz-rich Igneous Rocks Based on Feldspar Ratios; U.S. Geological Survey Prof. Paper 525-B, pp. B79-B84, 1965.

V. FIGURE CAPTIONS

- Figure 1: Compositions of 19 "granitic" rocks in terms of weight percent normative quartz-plagioclase-orthoclase.
- Figure 2: Compositions of 19 "granitic" rocks in terms of weight percent quartz-albite-orthoclase.
- Figure 3: Compositions of 19 "granitic" rocks in terms of molecular percents of albite-orthoclase-anorthite.

TABLE 1

*N477:	Fresh Cinko lake granodiorite
*N478:	Fresh Cinko lake granodiorite
*N482	Cinko lake granodiorite (glacial pavement)
*N483:	Fresh Dorothy lake alaskite
N489:	Green phase (metamorphic rock)
N490:	Dark phase (metamorphic rock)
N493:	Dark phase (metamorphic rock)
N494:	Green phase, horizontal (metamorphic rock)
N496:	Pink phase
N466:	Iron stained, polished Fremont lake quartz monzonite
N499:	Iron stained Fremont lake quartz monzonite
*N601:	Grus on Fremont lake quartz monzonite
*N602:	Fresh pink Fremont lake quartz monzonite
*N625:	Weathered Fremont lake quartz monzonite
N606:	Agglomerate (Relief Peak andesite)
N607:	Agglomerate (Relief Peak andesite)
N612:	Fresh Topaz lake porphyritic quartz monzonite
N616:	Brown Bear basalt
N617:	Brown Bear basalt
N619:	Surface (Brown Bear basalt)
*1 (N159):	Cinko lake granodiorite
*2 (N161):	Patterson grade granodiorite
*3 (N162):	Dorothy lake alaskite
*4 (N191):	Fremont lake quartz monzonite
*5 (N192):	Bond Pass quartz monzonite
*6 (N303):	Cascade creek granodiorite
*7 (N306):	Mill creek quartz monzonite
*8 (N313):	Patterson grade granodiorite
*9 (N332):	Topaz lake quartz monzonite
*10 (N335):	Topaz lake quartz monzonite
11 (N163):	Brown Bear pass basalt
*12 (N165):	Valley Spring rhyolite
14 (N195):	Metasediment
15 (N 196):	Metasediment

*Indicates those rocks that are used in Figures 1, 2 and 3.

TABLE 2

Compositions of "granitic" rocks in terms of molecular
percents of normative albite, orthoclase and anorthite

ROCK	Ab	Or	An
N477	50.7	23.9	25.4
N478	46.7	27.7	25.6
N482	49.7	22.7	27.6
N483	51.4	48.6	0.0
N601	50.5	23.4	26.1
N602	45.7	35.9	18.4
N612	42.3	36.3	21.4
N625	45.4	35.2	19.4
1	51.7	3.00	45.3
2	48.6	30.4	21.0
3	55.4	38.8	5.8
4	48.9	27.5	23.6
5	54.0	27.4	18.6
6	47.8	24.2	28.0
7	53.5	28.2	18.3
8	47.1	27.0	25.9
9	49.3	32.7	18.0
10	52.2	31.9	15.9
12	40.8	54.7	4.5

TABLE 3

IDENTIFICATION NO.	NEW CLASSIFICATION	OLD CLASSIFICATION
N478	Granodiorite	Granodiorite
N477	Granodiorite	Granodiorite
N482	Granodiorite	Granodiorite
N483	Granite	Alaskite
N601	Granodiorite	Quartz Monzonite
N602	Quartz Monzonite	Quartz Monzonite
N612	Quartz Monzonite	Quartz Monzonite
N622	Quartz Monzonite	Quartz Monzonite
1	Diorite	Granodiorite
2	Granodiorite	Granodiorite
3	Granite	Alaskite
4	Granodiorite	Quartz Monzonite
5	Granodiorite	Quartz Monzonite
6	Granodiorite	Granodiorite
7	Granodiorite	Quartz Monzonite
8	Granodiorite	Granodiorite
9	Granodiorite	Quartz Monzonite
10	Granite	Quartz Monzonite
12	Granite (Rhyolite)	Rhyolite

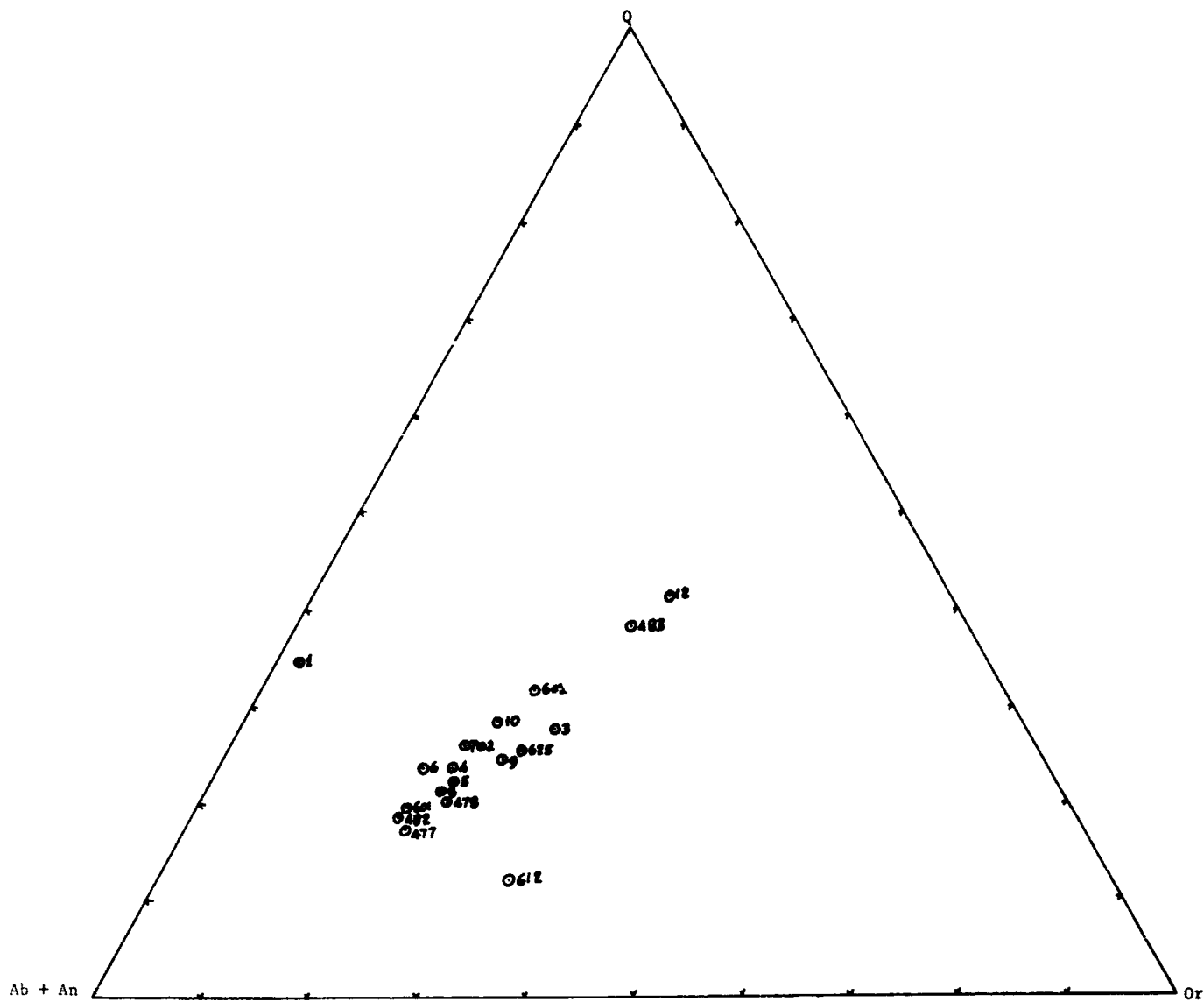


FIGURE 1

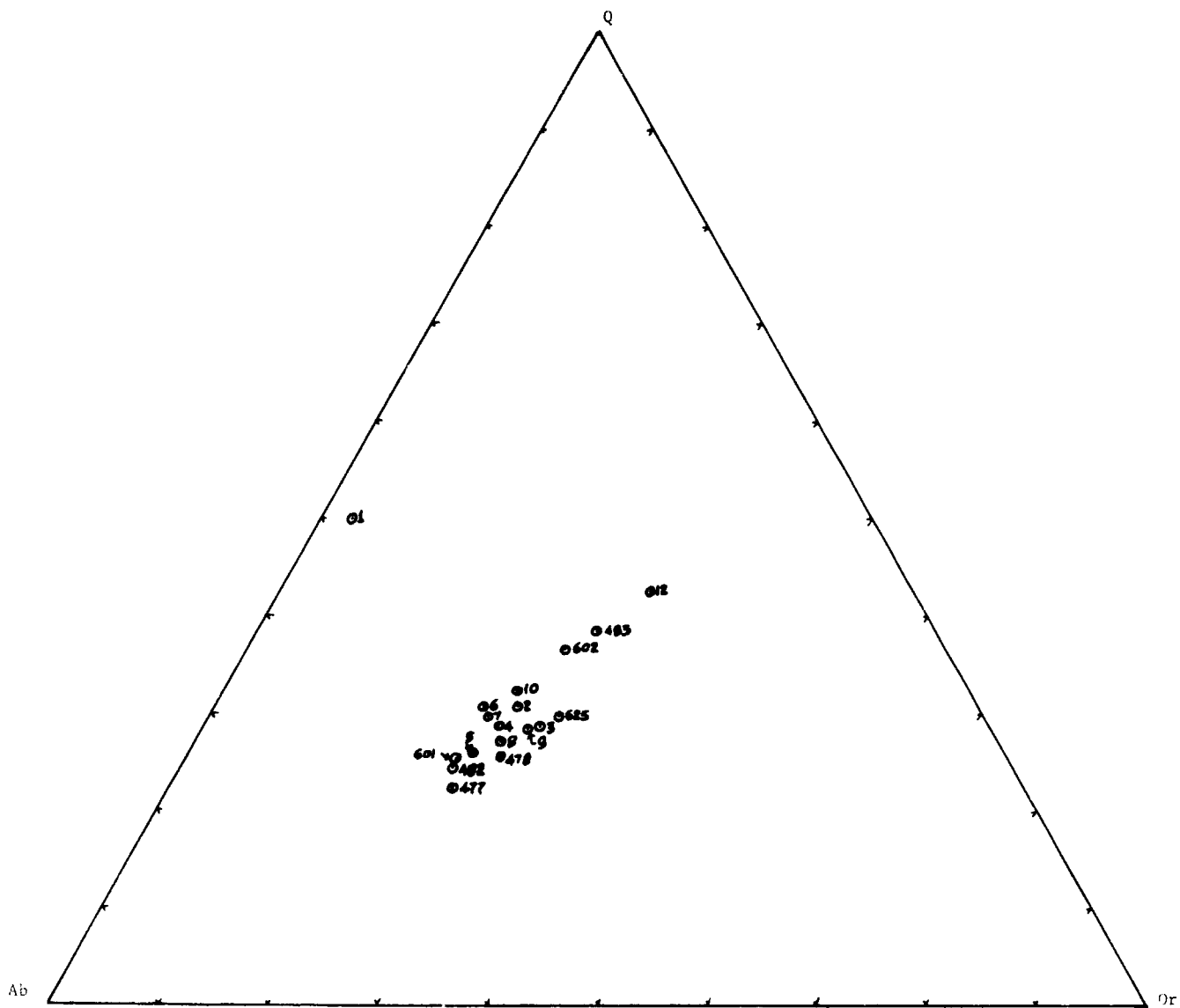


FIGURE 2

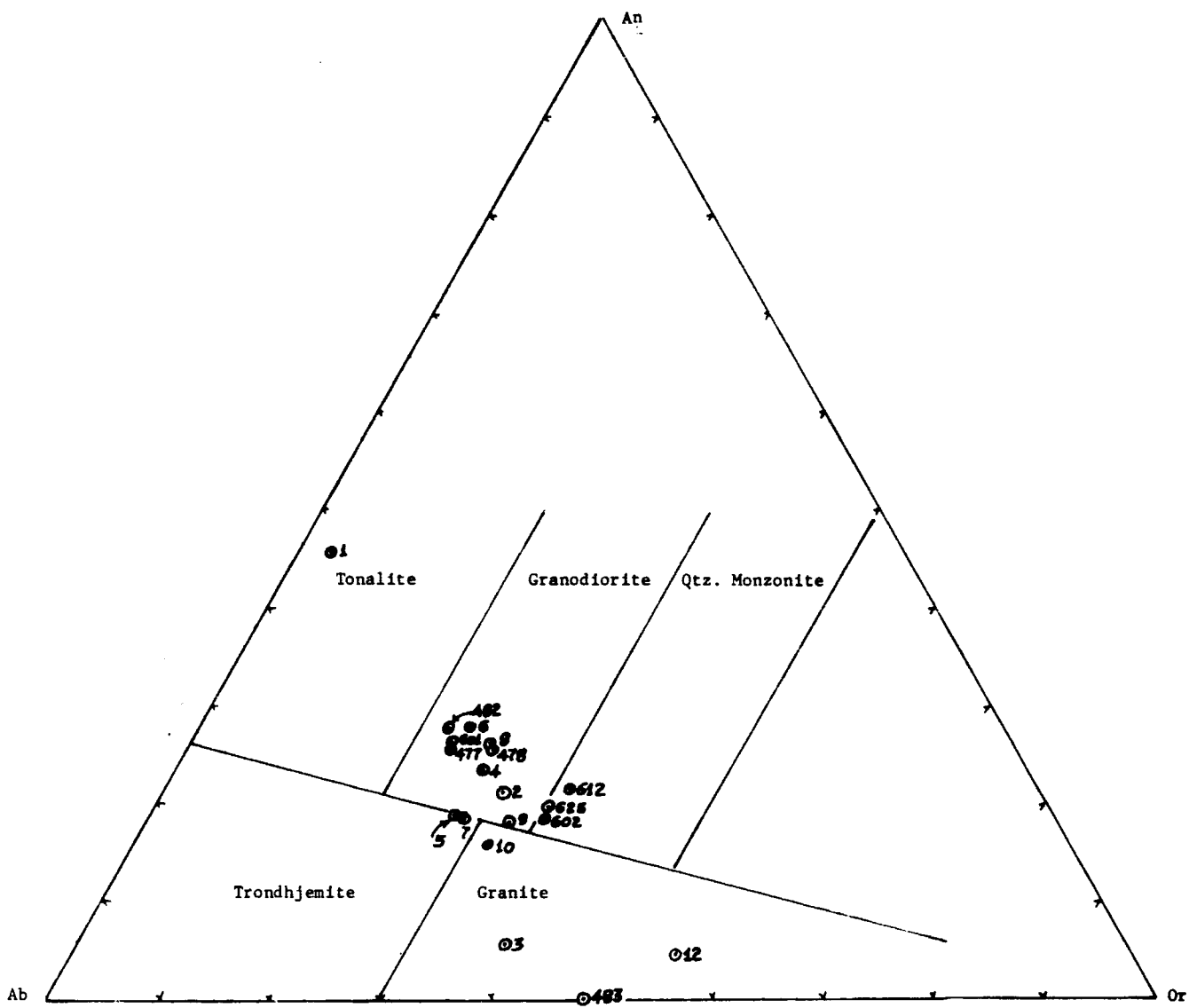


Figure 3

A1

SAMPLE NUMBER N477

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	58.41	65.97	KS	0.0	0.0
TiO2	1.13	0.96	KP	0.0	0.0
Al2O3	14.27	9.50	LC	0.0	0.0
Fe2O3	9.50	4.04	NS	0.0	0.0
FeO	0.0	0.0	DR	14.83	5.27
MnO	0.0	0.0	AR	29.70	11.19
MgO	3.27	5.50	AN	15.77	11.20
CaO	6.92	8.37	NE	0.0	0.0
Na2O	3.51	3.84	Q	12.69	41.75
K2O	2.51	1.81	OL	0.0	0.0
P2O5	0.0	0.0	FO	0.0	0.0
RAO	0.0	0.0	FA	0.0	0.0
SRO	0.0	0.0	LN	0.0	0.0
CR2O3	0.0	0.0	HY	2.86	5.64
F	0.0	0.0	EN	2.86	5.64
CL	0.0	0.0	FS	0.0	0.0
Sn3	0.0	0.0	DI	11.39	10.39
S	0.0	0.0	WM	6.11	5.20
CN2	0.0	0.0	EN	5.28	5.20
ZRO2	0.0	0.0	FS	0.0	0.0
			WO	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	2.77	2.80
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	0.0	0.0
			HEM	9.50	11.76
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

99.52

99.52

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)

RATIOS	WT PCT	MOLE PCT	UNLESS INDICATED AS WT PCT BY W	WT PCT	MOLE PCT
KUNO SI M	36.228	A	31.29	PLAG	32.09
KUNO SI	17.403	C	46.76	NE	0.0
PELDERVAART	24.090	F	22.35	OL	0.0
COOMBS	0.453	A	50.66	HY	8.08
LARSEN	9.016	F	0.0	Q	59.82
THORNTON II	2.598	M	49.34	CPX	0.0
THORNTON DI	58.211	ALK	24.18	NE	17.98
CI	21.818	AL	16.46	CL	0.0
AL2O3/SiO2	0.144	CFM	59.37	HY	9.76
FEMG	42.313	II	0.0	Q	72.26
FE2/FE3	0.0	DI	3.14	0	0.0
NA + K	5.652	CI	26.41	0.0	0.0
NA + K/A	0.595	CI	70.45	0.0	0.0
AL2/Si6	0.028	0.0	0.0	A/MG	1.03

GRANITE TETRAHEDRON-W-

OR	14.83	24.60	25.92	0.0	34.26	20.32
AB	29.70	49.25	51.90	51.07	0.0	0.0
AN	15.77	26.15	0.0	27.11	36.42	0.0
Q	12.69	0.0	22.18	21.82	29.31	17.39
PLAG	0.0	0.0	0.0	0.0	0.0	62.29

A2

SAMPLE NUMBER M479

OXIDE	WT PCT	MULE PCT	NORMATIVE MINERALS	WT PCT	MULE PCT
SiO2	58.84	66.82	KS	0.0	0.0
TiO2	1.32	1.13	KP	0.0	0.0
Al2O3	13.74	9.20	LC	0.0	0.0
Fe2O3	8.57	3.66	NS	0.0	0.0
FeO	0.0	0.0	OR	16.55	5.59
MnO	0.0	0.0	AB	26.32	9.44
MgO	3.34	5.65	AN	15.26	10.33
CaO	6.65	8.09	NE	0.0	0.0
Na2O	3.11	3.42	Q	14.63	45.83
K2O	2.80	2.03	OL	0.0	0.0
P2O5	0.0	0.0	FO	0.0	0.0
BaO	0.0	0.0	FA	0.0	0.0
SrO	0.0	0.0	LN	0.0	0.0
CR2O3	0.0	0.0	HY	3.58	6.71
F	0.0	0.0	EN	3.58	6.71
CL	0.0	0.0	FS	0.0	0.0
SO3	0.0	0.0	DI	10.22	8.88
S	0.0	0.0	WO	5.48	4.44
CO2	0.0	0.0	EM	4.74	4.44
ZrO2	0.0	0.0	FS	0.0	0.8
			WO	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	3.24	3.11
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	0.0	0.0
			HEM	8.57	10.10
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

98.37

98.37

PETROLOGIC VALUES: (IN MULE PCT UNLESS INDICATED AS WT PCT BY W)			
RATIOS			
TRIANGULAR PLOTS			
W	A	C	F
3P-280	31.69	47.03	21.28
WUMO S:	18.743	19.308	9.470
WUMO SI	19.308	9.470	0.0
POLDERVAART	0.543	0.0	0.0
COOMBS	2.221	50.90	0.0
LARSEN	60.873	23.77	14.46
THORNTON II	20.342	16.32	0.0
THORNTON DI	0.139	59.91	0.0
CI	39.314	0.0	10.92
AL2O3/SIO2	0.0	2.66	74.62
FEMC	5.452	DI	0.0
FE2/FE3	0.027	CI	0.0
NA + K			A/MC
NA + K/A			0.96
AL2/Si6			0.0

GRANITE TETRAHEDRON-W-

OR	16.55	28.47	28.78	0.0	35.63	22.74
AB	26.32	45.27	45.77	46.82	0.0	0.0
AN	15.26	26.26	0.0	27.15	32.86	0.0
Q	14.63	0.0	25.45	26.03	31.51	20.11
PLAG	0.0	0.0	0.0	0.0	0.0	57.15

A3

SAMPLE NUMBER N482

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	61.45	49.35	KS	0.0	0.0
TiO2	0.74	0.63	KP	0.0	0.0
Al2O3	16.25	10.77	LC	0.0	0.0
Fe2O3	5.85	2.49	NS	0.0	0.0
FeO	0.0	0.0	NR	15.74	5.46
MnO	0.0	0.0	AR	32.58	11.96
MgO	2.31	3.87	AN	19.17	13.27
CaO	5.63	6.79	NE	0.0	0.0
Na2O	3.85	4.20	Q	15.42	49.43
K2O	2.67	1.92	OL	0.0	0.0
P2O5	0.0	0.0	FD	0.0	0.0
RAO	0.0	0.0	FA	0.0	0.0
SR0	0.0	0.0	LN	0.0	0.0
CR2O3	0.0	0.0	HY	3.52	6.76
F	0.0	0.0	FM	3.52	6.76
CL	0.0	0.0	FS	0.0	0.0
SO3	0.0	0.0	DI	4.81	4.28
S	0.0	0.0	WD	2.58	2.14
CO2	0.0	0.0	EN	2.23	2.14
ZRO2	0.0	0.0	FS	0.0	0.0
			WD	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	1.82	1.78
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	0.0	0.0
			HEM	5.85	7.06
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

98.95

98.95

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)

RATIOS	WT PCT	MOLE PCT	TRIANGULAR PLOTS	WT PCT	MOLE PCT
KUNO SI W	31.072	A	39.77	PLAG	31.00
KUNO SI	15.736	C	44.13	NE	0.0
PLDERVAART	25.679	F	16.10	OL	0.0
COOMBS	0.502	A	61.22	HY	9.30
LARSEN	13.416	F	0.0	Q	50.70
THORNTON II	1.070	H	38.78	Q	0.0
THORNTON DI	66.850	ALK	28.53	Cpx	7.04
CI	19.862	AL	21.74	NE	0.0
AL2O3/SiO2	0.155	CFM	49.73	OL	0.0
FEMG	39.001	II	0.0	HY	11.18
FE2/FE3	0.0	II	1.22	Q	41.75
NA + K	6.115	DI	22.63	Q	0.0
NA + K/A	0.568	CI	76.16	Q	0.0
AL2/Si6	0.029	CI	0.0	A/MG	1.58

GRANITE TETRAHEDRON-W-

OR	15.78	23.37	24.74	0.0	31.32	19.02
AB	32.58	48.24	51.08	48.50	0.0	0.0
AN	19.17	28.39	0.0	28.55	38.06	0.0
Q	15.42	0.0	24.18	22.96	30.51	18.59
PLAG	0.0	0.0	0.0	0.0	0.0	62.39

A4

SAMPLE NUMBER N483

OXIDE	WT PCT	MOLE PCT	FORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	77.39	40.43	KS	0.0	0.0
TiO2	0.18	0.14	KP	0.0	0.0
Al2O3	12.34	7.56	LC	0.0	0.0
Fe2O3	1.16	0.45	NS	0.0	0.0
FeO	0.0	0.0	OR	28.31	6.43
MnO	0.0	0.0	AB	28.18	6.79
MgO	3.15	4.88	AN	0.0	0.0
CaO	0.0	0.0	NE	0.0	0.0
Na2O	3.33	3.36	O	34.98	73.61
K2O	4.70	3.18	OL	0.0	0.0
P2O5	0.0	0.0	FD	0.0	0.0
BaO	0.0	0.0	FA	0.0	0.0
SR0	0.0	0.0	LN	0.0	0.0
CR2O3	0.0	0.0	HY	7.84	9.88
F	0.0	0.0	EN	7.84	9.88
CL	0.0	0.0	FS	0.0	0.0
SO3	0.0	0.0	DI	0.0	0.0
S	0.0	0.0	MO	0.0	0.0
CO2	0.0	0.0	EM	0.0	0.0
ZRO2	0.0	0.0	FS	0.0	0.0
			WO	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	0.0	0.0
			RU	0.18	0.28
			PV	0.0	0.0
			C	1.68	2.08
			HT	0.0	0.0
			HEM	1.16	0.92
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

102.33

102.33

PETROLOGIC VALUES: (TM MOLE PCT UNLESS INDICATED AS WT PCT BY W)		BASALT TETRAHEDRON	
RATIOS		GRANITE TETRAHEDRON--W-	
TRIANGULAR PLOTS		OR	
KUNO SI W		AB	
KUNO SI		AN	
POLDERVAART		Q	
COOMBS		PLAG	
LARSEN		OR	
THORNTON II		AB	
THORNTON DI		AN	
CI		Q	
AL2O3/SIO2		PLAG	
FENG		OR	
FE2/FE3		AB	
NA + K		AN	
NA + K/A		Q	
AL2/SI6		PLAG	

41.126
 25.342
 12.813
 0.531
 23.520
 2.081
 86.837
 4.939
 0.094
 8.507
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SAMPLE NUMBR N489

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	68.34	72.46	KS	0.0	0.0
TiO2	0.53	0.50	KP	0.0	0.0
Al2O3	11.44	7.15	LC	0.0	0.0
Fe2O3	3.59	1.43	MS	0.0	0.0
FeO	0.0	0.0	DR	33.89	8.15
MnO	0.0	0.0	AB	0.0	0.0
MgO	2.53	4.00	AN	14.38	6.96
CaO	9.33	10.60	NE	0.0	0.0
Na2O	0.0	0.0	Q	29.85	66.43
K2O	5.70	3.86	OL	0.0	0.0
P2O5	0.0	0.0	FO	0.0	0.0
RAO	0.0	0.0	FA	0.0	0.0
SRO	0.0	0.0	LN	0.0	0.0
CR2O3	0.0	0.0	HY	0.0	0.0
F	0.0	0.0	EN	0.0	0.0
CL	0.0	0.0	FS	0.0	0.0
SO3	0.0	0.0	DI	13.59	8.45
S	0.0	0.0	WO	4.22	4.22
CO2	0.0	0.0	EN	6.30	4.22
ZRO2	0.0	0.0	FS	0.0	0.0
			WO	5.12	5.93
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	1.55	1.06
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			NT	0.0	0.0
			HEM	3.59	3.03
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			MC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

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PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)									
RATIOS	TRIANGULAR PLOTS		BASALT TETRAHEDRON		GRANITE TETRAHEDRON-W-				
KUNO SI M	43.056	A	24.27	PLAG	33.69	70.08	53.19	0.0	43.34
KUNO SI	21.404	C	66.72	NE	0.0	0.0	0.0	0.0	0.0
POLDERVAART	0.0	F	0.01	OL	0.0	0.0	0.0	0.0	0.0
COOMBS	0.456	A	49.04	HY	14.38	29.92	0.0	32.66	18.50
LARSEN	11.484	F	0.0	Q	29.65	0.0	46.81	67.34	38.15
MORNTON II	2.112	M	50.91	Q	0.0	0.0	0.0	0.0	18.50
MORNTON DI	74.576	ALK	17.73	Cpx	0.0	0.0	0.0	0.0	0.0
CI	13.295	AL	15.14	NE	0.0	0.0	0.0	0.0	0.0
AL2O3/SIO2	0.099	C=M	67.13	OL	0.0	0.0	0.0	0.0	0.0
FEMG	26.376		0.0	HY	0.0	0.0	0.0	0.0	0.0
FE2/FE3	0.0	II	2.35	Q	88.72	0.0	0.0	0.0	0.0
NA + K	3.855	DI	14.77		0.0	0.0	0.0	0.0	0.0
NA + K/A	0.539	CI	0.0	A/MG	0.0	0.0	0.0	0.0	0.0
AL2/SIO	0.018		0.0						

AL

SAMPLE NUMBER N400

OXIDE	WT PCT	MOLE PCT	ACCOMMODATIVE MINERALS	WT PCT	MOLE PCT
SiO2	66.02	71.33	KS	0.0	0.0
TiO2	0.76	0.51	KP	0.0	0.0
Al2O3	10.43	6.90	LC	0.0	0.0
Fe2O3	5.56	2.25	NS	0.0	0.0
FeO	0.0	0.0	OR	39.60	10.23
MnO	0.0	0.0	AB	0.0	0.0
MgO	5.39	8.64	AN	9.90	5.12
CaO	5.17	5.95	NE	0.0	0.0
Na2O	0.0	0.0	Q	24.67	59.05
K2O	6.70	4.60	PL	0.0	0.0
P2O5	0.0	0.0	FO	0.0	0.0
BaO	0.0	0.0	FA	0.0	0.0
SrO	0.0	0.0	LN	0.0	0.0
Cr2O3	0.0	0.0	HY	8.69	12.45
F	0.0	0.0	EN	8.69	12.45
CL	0.0	0.0	FS	0.0	0.0
SO3	0.0	0.0	DI	10.20	6.77
S	0.0	0.0	MO	5.47	3.39
CO2	0.0	0.0	EN	4.73	3.39
ZnO2	0.0	0.0	FS	0.0	0.0
			WD	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	1.86	1.37
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	0.0	0.0
			HEM	5.36	5.01
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TM	0.0	0.0
			PR	0.0	0.0
			MC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

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PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)		TRIANGULAR PLOTS		BASALT TETRAEDRON	
RATIOS		A	35.90	PLAG	6.68
KUNO SI W	55.788	C	46.53	NE	0.0
KUNO SI	30.538	F	17.57	OL	0.0
POLDERVAART	-17.029	A	34.73	HY	16.26
COMBSS	0.508	F	0.0	Q	77.06
LARSEN	11.374	M	65.27		0.0
THORNTON TI	1.694	ALK	21.39	CPR	8.65
THORNTON DI	69.276	AL	10.70	NE	0.0
CI	16.427	CFM	67.91	OL	0.0
AL2O3/SIO2	0.097		0.0	HY	15.91
FENG	20.667	II	1.94	Q	75.43
FE2.FE3	0.0	DI	18.60		0.0
NA + K	4.508	CI	79.27		0.0
NA + K/A	0.667		0.0	A/MG	0.53
AL2/Si6	0.22				

GRANITE TETRAEDRON-W-		TETRAEDRON-W-	
OR	39.60	80.00	61.62
AB	0.0	0.0	0.0
AN	9.90	20.00	0.0
Q	24.67	0.0	38.38
PLAG	0.0	0.0	0.0

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OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	54.54	68.89	KS	0.0	0.0
TiO2	0.75	0.60	KP	0.0	0.0
Al2O3	12.35	7.77	LC	0.0	0.0
Fe2O3	6.74	2.71	NS	0.0	0.0
FeO	0.0	0.0	OR	18.67	4.68
MnO	0.0	0.0	AB	7.70	2.05
MgO	3.91	6.22	AN	20.28	10.16
CaO	9.37	10.72	NE	0.0	0.0
Na2O	0.91	0.44	Q	26.90	62.41
K2O	3.16	2.15	OL	0.0	0.0
P2O5	0.0	0.0	FO	0.0	0.0
BaO	0.0	0.0	FA	0.0	0.0
SrO	0.0	0.0	LN	0.0	0.0
CR2O3	0.0	0.0	HY	1.22	1.70
F	0.0	0.0	EN	1.22	1.70
CL	0.0	0.0	FS	0.0	0.0
SO3	0.0	0.0	DT	18.37	11.82
S	0.0	0.0	WO	9.95	5.91
CO2	0.0	0.0	EN	8.51	5.91
ZnO2	0.0	0.0	FS	0.0	0.0
			WD	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	1.84	1.31
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	0.0	0.0
			HEM	6.74	5.88
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			MC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

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PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)

RATIOS	WT PCT	MOLE PCT	TRIANGULAR PLOTS	WT PCT	MOLE PCT
KUNO SI M	51.746	68.89	A	18.73	16.00
KUNO SI	26.562	68.89	C	6.74	16.00
POLDERVAART	5.305	68.89	F	16.39	0.0
COOMBS	0.444	68.89	A	33.21	0.0
LARSEN	7.103	68.89	F	0.0	0.0
THORNTON II	2.955	68.89	M	6.79	0.0
THORNTON DI	69.131	68.89	ALK	12.52	15.57
CI	19.875	68.89	AL	18.93	0.0
AL2O3/SiO2	0.113	68.89	CFM	48.55	0.0
FENG	30.324	68.89	II	0.0	2.24
FE2/FE3	0.0	68.89	DI	3.21	92.20
NA + K	3.093	68.89	CI	21.61	0.0
NA + K/A	0.398	68.89	CI	75.17	0.0
AL2/Si6	0.015	68.89	A/MG	0.50	0.50

GRANITE TETRAMEDRON-W-

OR	18.67	40.03	35.55	0.0	28.35	25.39
AB	7.70	16.50	14.45	14.03	0.0	0.0
AN	20.28	43.47	0.0	36.95	30.79	0.0
Q	26.90	0.0	50.50	49.02	40.85	36.57
PLAG	0.0	0.0	0.0	0.0	0.0	38.04

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SAMPLE NUMBER M494

OXIDE	WT PCT	WTL PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	71.74	77.74	KS	0.0	0.0
TiO2	0.74	0.50	KP	0.0	0.0
Al2O3	12.94	8.20	IC	0.0	0.0
Fe2O3	2.74	0.97	NS	0.0	0.0
FeO	0.0	0.0	OR	34.22	7.56
MnO	0.0	0.0	AR	0.0	0.0
MgO	1.38	2.23	AN	17.94	7.93
CaO	5.44	6.32	NE	0.0	0.0
Na2O	0.0	0.0	Q	77.82	77.44
K2O	5.79	4.00	QL	0.0	0.0
P2O5	0.0	0.0	FO	0.0	0.0
Rb2O	0.0	0.0	FA	0.0	0.0
SrO	0.0	0.0	LN	0.0	0.0
Cr2O3	0.0	0.0	HY	1.09	1.33
F	0.0	0.0	EN	1.09	1.33
Cl	0.0	0.0	FS	0.0	0.0
Sn3	0.0	0.0	NI	5.07	2.88
S	0.0	0.0	WO	2.72	1.44
Cu2	0.0	0.0	EN	2.35	1.44
ZnO2	0.0	0.0	FS	0.0	0.0
			MO	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	1.79	1.12
			RJ	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	0.0	0.0
			HEM	2.25	1.73
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

100.17

100.17

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)		TRIANGULAR PLOTS		RASHLY TETRAHEDRON	
RATIO	W	A	35.62	PLAG	9.15
KUMD SI	31.177	C	56.22	NE	0.0
KUMD SI	16.650	F	8.16	OL	0.0
POLDERVAAT	-2.129	A	64.23	HY	1.54
COOMBS	0.491	F	0.0	Q	89.32
LARSEN	18.369	W	35.77	Cpx	3.53
THORNTON II	0.720	ALK	23.90	NE	0.0
THORNTON DI	85.000	AL	25.07	OL	0.0
CI	10.757	CFM	51.03	HY	1.63
AL2O3/SIO2	0.105	II	0.75	Q	94.84
FE2O3	25.160	NI	11.15	CI	0.0
FE2O3	0.0	CI	88.10	A/MG	1.80
MA + K	4.002		0.0		
MA + R/A	0.488		0.0		
AL2/SI6	0.017		0.0		

GRANITE TETRAHEDRON-W-
 OR 34.22 65.61
 AB 0.0 0.0
 AN 17.94 34.39
 Q 37.82 0.0
 PLAG 0.0 0.0

47.50 0.0
 0.0 0.0
 0.0 32.17
 0.0 67.83
 52.50 0.0
 0.0 19.93

38.03 0.0
 0.0 0.0
 19.93 0.0
 42.03 0.0
 0.0 19.93

A9

SAMPLE NUMBER N466

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	49.42	75.38	MS	0.0	0.0
TiO2	0.62	0.51	KP	0.0	0.0
Al2O3	13.44	0.61	LC	0.0	0.0
Fe2O3	2.24	0.01	NS	0.0	0.0
FeO	0.0	0.0	OP	46.45	12.54
MnO	0.0	0.0	AB	0.0	0.0
MgO	1.60	2.59	AN	13.57	7.33
CaO	5.45	6.56	NF	0.0	0.0
Na2O	0.0	0.0	Q	28.07	70.21
K2O	7.84	5.44	PL	0.0	0.0
P2O5	0.0	0.0	FD	0.0	0.0
SiO2	0.0	0.0	FA	0.0	0.0
SiO2	0.0	0.0	LN	0.0	0.0
SiO2	0.0	0.0	HY	0.0	0.0
SiO2	0.0	0.0	EN	0.0	0.0
SiO2	0.0	0.0	FS	0.0	0.0
SiO2	0.0	0.0	DI	8.59	5.96
SiO2	0.0	0.0	MO	4.61	2.98
SiO2	0.0	0.0	EN	3.98	2.98
SiO2	0.0	0.0	FS	0.53	0.68
SiO2	0.0	0.0	AC	0.0	0.0
SiO2	0.0	0.0	AP	0.0	0.0
SiO2	0.0	0.0	IL	0.0	0.0
SiO2	0.0	0.0	SP	1.52	1.17
SiO2	0.0	0.0	RU	0.0	0.0
SiO2	0.0	0.0	PV	0.0	0.0
SiO2	0.0	0.0	C	0.0	0.0
SiO2	0.0	0.0	MT	0.0	0.0
SiO2	0.0	0.0	MEM	2.24	2.11
SiO2	0.0	0.0	CH	0.0	0.0
SiO2	0.0	0.0	HL	0.0	0.0
SiO2	0.0	0.0	FR	0.0	0.0
SiO2	0.0	0.0	TH	0.0	0.0
SiO2	0.0	0.0	PR	0.0	0.0
SiO2	0.0	0.0	NC	0.0	0.0
SiO2	0.0	0.0	CC	0.0	0.0
SiO2	0.0	0.0	Z	0.0	0.0

100.97

100.97

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY M)

RATIOS	WT PCT	MOLE PCT	TRIANGULAR PLOTS	WT PCT	MOLE PCT
KUNO SI W	28.934	42.10	PLAG	9.45	9.45
KUNO SI	13.675	50.83	NE	0.0	0.0
POLDERVAART	0.0	7.04	OL	0.0	0.0
CRONAS	0.470	67.77	HY	0.0	0.0
LARSEN	18.695	0.0	Q	90.55	90.55
THORNTON II	1.491	32.23	Cpx	7.83	7.83
THORNTON DI	82.749	30.60	NE	0.0	0.0
CI	11.804	17.89	OL	0.0	0.0
AL2O3/SIO2	0.114	51.51	HY	0.0	0.0
FENG	26.115	0.0	O	92.17	92.17
FE2/FE3	0.0	1.55		0.0	0.0
NA + K	5.437	12.29		0.0	0.0
NA + K/A	0.631	96.16	A/MG	2.10	2.10
AL2/Si4	0.024	0.0			

GRANITE TETRAEDRON-W-

OR	43.45	77.39	62.33	0.0	52.71	52.73
AN	0.0	0.0	0.0	0.0	0.0	0.0
AM	13.57	22.61	0.0	32.59	15.40	0.0
O	29.07	0.0	37.67	67.41	31.96	31.86
PLAG	0.0	0.0	0.0	0.0	0.0	15.40

A10

GEORGE HUNTER 1966

OXIDE	WT PCT	MOLE PCT	FORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	60.00	70.01	KS	0.0	0.0
TiO2	0.71	0.62	KP	0.0	0.0
Al2O3	15.10	10.38	LC	0.0	0.0
Fe2O3	7.67	3.32	NS	0.0	0.0
FeO	0.0	0.0	OR	17.79	5.62
MnO	0.0	0.0	AR	25.22	8.45
MgO	2.31	4.02	AN	18.94	11.97
CaO	4.82	6.03	NE	0.0	0.0
Na2O	2.98	3.37	Q	18.45	53.99
K2O	3.01	2.24	OL	0.0	0.0
P2O5	0.0	0.0	FN	0.0	0.0
RAO	0.0	0.0	FA	0.0	0.0
SR0	0.0	0.0	LN	0.0	0.0
CR2O3	0.0	0.0	HY	4.85	8.49
F	0.0	0.0	FN	4.85	8.49
CL	0.0	0.0	FS	0.0	0.0
Sn3	0.0	0.0	DI	1.95	1.58
S	0.0	0.0	MO	1.05	0.79
CO2	0.0	0.0	EN	0.90	0.79
ZnO2	0.0	0.0	FS	0.0	0.0
			MO	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	1.74	1.56
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			HT	0.0	0.0
			HEM	7.57	8.34
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

96.50		96.50	
PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY WJ)			
RATIOS		TRIANGULAR PLOTS	
KUNO SI W	31.015	A	37.51
KUNO SI	14.556	C	40.28
POLDERVAART	15.718	F	27.21
FOOMRS	0.526	A	58.28
LARSEN	14.414	F	0.0
THORNTON II	0.396	M	41.72
THORNTON DI	68.059	ALK	27.47
CI	17.402	AI	23.36
AL2O3/SIO2	0.148	CFM	49.17
FFMG	45.277		0.0
FE2/FE3	0.0	II	0.46
NA + K	5.612	CI	20.27
NA + K/A	0.540	CI	79.27
AL2/SI6	0.027	A/MG	0.0
			1.40
GRANITE TETRAHEDRON-W-			
OR	17.79	28.72	22.13
AB	25.22	40.71	0.0
AN	18.94	30.57	0.0
Q	18.45	0.0	33.44
PLAG	0.0	0.0	0.0
			54.92
BASALT TETRAHEDRON			
PLAG	24.64		
NE	0.0		
OL	0.0		
HY	10.24		
Q	65.12		
CPX	2.47		
NE	0.0		
OL	0.0		
HY	13.26		
Q	44.27		
	0.0		

A11

SAMPLE NUMREP N403

OXIDE	WT PCT	MOLE PCT	NEFMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	71.65	79.94	KS	0.0	0.0
TiO2	0.10	0.08	KP	0.0	0.0
Al2O3	11.63	7.65	LC	0.0	0.0
Fe2O3	8.70	3.65	NS	0.0	0.0
FeO	0.0	0.0	OR	17.91	4.06
MNO	0.0	0.0	AR	26.99	6.49
MGO	0.21	0.35	AN	8.47	3.84
CAO	2.28	2.73	NE	0.0	0.0
NA2O	3.19	3.45	Q	36.91	77.46
K2O	3.03	2.16	OL	0.0	0.0
P2O5	0.0	0.0	FD	0.0	0.0
BAO	0.0	0.0	FA	0.0	0.0
SRO	0.0	0.0	LN	0.0	0.0
CR2O3	0.0	0.0	HY	0.0	0.0
F	0.0	0.0	EN	0.0	0.0
CL	0.0	0.0	FS	0.0	0.0
SO3	0.0	0.0	DI	1.13	0.66
S	0.0	0.0	WO	0.61	0.33
CO2	0.0	0.0	EN	0.52	0.33
ZRO2	0.0	0.0	FS	0.0	0.0
			MO	0.44	0.47
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	0.25	0.16
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	0.0	0.0
			HEM	8.70	6.87
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PQ	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			7	0.0	0.0

100.79

100.79

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)

RATIOS		TRIANGULAR PLOTS		BASALT TETRANEDRON	
KUNO SI W	3.634	A	46.78	PLAG	11.76
KUNO SI	1.388	C	22.74	NE	0.0
POLDERVAART	26.993	F	30.47	OL	0.0
COOMBS	0.497	A	94.14	HY	0.0
LARSEN	24.649	e	0.0	Q	88.24
THORNTON II	0.164	M	5.86		0.0
THORNTON DI	88.004	ALK	52.29	CPX	0.84
CI	4.330	A1	19.03	NE	0.0
AL2O3/SIO2	0.096	CFM	28.68	OL	0.0
FLMG	91.274		0.0	HY	0.0
FE2/FE3	0.0	II	0.14	Q	98.16
NA + K	5.607	DI	4.68		0.0
NA + K/A	0.733	CI	95.14		0.0
AL2/SI4	0.023		0.0	A/MG	16.06

GRANITE TETRANEDRON-W-

OR	17.91	33.55	21.89	0.0	28.29	19.83
AB	26.99	50.58	32.99	37.30	0.0	0.0
AN	8.47	15.87	0.0	11.70	13.38	0.0
Q	36.91	0.0	45.12	51.00	58.33	40.89
PLAG	0.0	0.0	0.0	0.0	0.0	39.28

SAMPLE NUMBER N602

A13

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	69.78	78.07	KS	0.0	0.0
TiO2	0.46	0.39	KP	0.0	0.0
Al2O3	15.40	10.15	LC	0.0	0.0
Fe2O3	2.20	0.93	NS	0.0	0.0
FeO	0.0	0.0	NR	23.34	6.22
MnO	0.0	0.0	AB	28.01	7.92
MgO	0.70	1.17	AN	11.96	6.38
CaO	2.41	2.89	NE	0.0	0.0
Na2O	3.31	3.59	Q	29.20	72.11
K2O	3.95	2.82	OL	0.0	0.0
P2O5	0.0	0.0	FD	0.0	0.0
BaO	0.0	0.0	FA	0.0	0.0
SrO	0.0	0.0	LN	0.0	0.0
CR2O3	0.0	0.0	HY	1.74	0.0
F	0.0	0.0	EN	1.74	2.58
CL	0.0	0.0	FS	0.0	0.0
SO3	0.0	0.0	DI	0.0	0.0
S	0.0	0.0	WO	0.0	0.0
CO2	0.0	0.0	FN	0.0	0.0
ZrO2	0.0	0.0	FS	0.0	0.0
			WO	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	0.0	0.0
			RV	0.46	0.85
			PV	0.0	0.0
			C	1.30	1.89
			MT	0.0	0.0
			HEM	2.20	2.04
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

98.21

98.21

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)									
RATIOS									
TRIANGULAR PLOTS									
KUNO SI W	13.727	A	62.69	PLAG	16.07	GRANITE	TETRAHEDRON-W-		
KUNO SI	6.890	C	28.26	NE	0.0	OR	23.34	36.87	25.23
POLDERVAART	2.594	F	9.06	OL	0.0	AB	28.01	44.24	0.0
COOMBS	0.509	A	84.59	HY	2.90	AN	11.96	18.89	0.0
LARSEN	23.376	F	0.0	Q	81.03	Q	29.20	0.0	31.56
THORNTON II	1.889	W	15.41		0.0	PLAG	0.0	0.0	43.20
THORNTON DI	86.259	ALK	45.10	CPX	0.0				
CI	7.665	AL	26.35	NE	0.0				
AL2O3/SiO2	C.130	CFM	28.54	OL	0.0				
FEMG	44.243		0.0	HY	3.45				
FE2/FE3	0.0	II	1.97	Q	96.55				
NA + K	6.409	DI	8.00		0.0				
NA + K/A	0.631	CI	90.03		0.0				
AL2/Si6	0.027		0.0	A/MG	5.49				

SAMPLE NUMBER 1525

OXIDE	WT PCT	MOLE PCT	NOMINATIVE MINERALS	WT PCT	MOLE PCT
SiO2	68.51	76.21	KS	0.0	0.0
TiO2	0.25	0.21	KP	0.0	0.0
Al2O3	15.62	10.24	LC	0.0	0.0
Fe2O3	2.57	1.08	NS	0.0	0.0
FeO	0.0	0.0	OR	25.12	7.73
MnO	0.0	0.0	AR	30.55	9.98
MgO	0.84	1.39	AM	13.87	8.54
CaO	3.38	3.97	NE	0.0	0.0
Na2O	3.61	3.89	Q	23.45	6.88
X2O	4.25	3.01	OL	0.0	0.0
P2O5	0.0	0.0	FO	0.0	0.0
BaO	0.0	0.0	FA	0.0	0.0
SiO	0.0	0.0	LM	0.0	0.0
K2O3	0.0	0.0	MY	1.45	2.47
F	0.0	0.0	EM	1.45	2.47
CL	0.0	0.0	FS	0.0	0.0
SiO3	0.0	0.0	DI	1.39	1.10
S	0.0	0.0	WN	0.74	0.55
CO2	0.0	0.0	EM	0.44	0.55
ZnO2	0.0	0.0	FS	0.0	0.0
			WD	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	0.61	0.54
			BU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	0.0	0.0
			HEM	2.57	2.76
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	3.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

99.00

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)
 TRIANGULAR PLOTS BASALT/TETRAHEDRON RATIOS

[illegible]

99.00

A15

SAMPLE NUMBER NAGS

OXIDE	WT PCT	VOL PCT	NORMATIVE MINERALS	WT PCT	MOL PCT
SiO2	61.55	72.57	KC	0.0	0.0
TiO2	0.65	0.59	KP	0.0	0.0
Al2O3	16.14	11.22	IC	0.0	0.0
Fe2O3	4.73	7.10	NS	0.0	0.0
FeO	0.0	0.0	OR	19.52	6.57
MnO	0.0	0.0	AH	28.94	10.29
MgO	1.07	1.88	AN	18.88	12.66
CaO	4.15	5.24	NE	0.0	0.0
Na2O	3.42	3.91	Q	18.83	58.45
K2O	3.32	2.50	QL	0.0	0.0
P2O5	0.0	0.0	FO	0.0	0.0
BaO	0.0	0.0	FA	0.0	0.0
SRD	0.0	0.0	LN	0.0	0.0
CR2O3	0.0	0.0	HV	2.66	4.95
F	0.0	0.0	EN	2.66	4.95
CL	0.0	0.0	FS	0.0	0.0
SO3	0.0	0.0	OT	0.0	0.0
S	0.0	0.0	WO	0.0	0.0
CO2	0.0	0.0	EN	0.0	0.0
ZrO2	0.0	0.0	FS	0.0	0.0
			WO	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			Sp	1.20	1.14
			RU	0.17	0.40
			PV	0.0	0.0
			C	0.0	0.0
			MT	0.0	0.0
			HEM	0.0	0.0
			CH	4.73	5.53
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			MC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

95.04

95.04

PETROLOGIC VALUES: (IN MOL PCT UNLESS INDICATED AS WT PCT BY W)

RATIOS	WT PCT	VOL PCT	TRANGULAR PLOTS	WT PCT	MOL PCT
KUNO SI M	18.105	0.0	A	46.60	26.58
KUNO SI	8.533	0.0	C	38.14	0.0
POLDERVAART	23.720	0.0	F	15.26	0.0
CDOMBS	0.520	0.0	A	77.31	5.73
LARSEN	18.316	0.0	F	0.0	67.69
THORNTON II	0.0	0.0	M	22.69	0.0
THORNTON DI	75.322	0.0	ALK	34.93	0.0
CI	15.137	0.0	AL	26.22	0.0
AL2O3/SIO2	0.155	0.0	CFM	38.84	0.0
FEMG	52.743	0.0	U.C	0.0	7.81
FE2/FE3	0.0	0.0	IT	0.0	92.19
NA + K	6.406	0.0	DI	16.73	0.0
NA + K/A	9.571	0.0	CI	83.27	0.0
AL2/SI6	0.029	0.0	A:RG	3.41	0.0

GRANITE TETRAHEDRON-W-
OR 19.62 29.09
AB 28.94 42.91
AN 18.88 28.00
Q 18.83 0.0
PLAG 0.0 0.0

29.12 22.74
42.94 0.0
28.33 0.0
28.25 21.83
0.0 55.43

34.22 0.0
0.0 43.42
32.94 0.0
32.84 28.25
0.0 0.0

A16

SAMPLE NUMBER N4C7

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	61.71	72.01	KS	0.0	0.0
TiO2	0.41	0.53	KP	0.0	0.0
Al2O3	15.88	10.75	IC	0.0	0.0
Fe2O3	5.32	2.30	NS	0.0	0.0
FeO	0.0	0.0	OR	20.98	7.44
MnO	0.0	0.0	AR	29.02	10.92
MgO	1.44	2.47	AN	17.45	12.38
CaO	5.38	6.62	NE	0.0	0.0
Na2O	3.43	3.82	Q	16.49	54.15
K2O	3.55	2.60	OL	0.0	0.0
P2O5	0.0	0.0	FO	0.0	0.0
BaO	0.0	0.0	FA	0.0	0.0
SrO	0.0	0.0	LN	0.0	0.0
Cr2O3	0.0	0.0	HY	1.02	2.00
F	0.0	0.0	EN	1.02	2.00
CL	0.0	0.0	FS	5.54	5.05
SrO3	0.0	0.0	NI	2.97	2.52
S	0.0	0.0	WO	2.57	2.52
CO2	0.0	0.0	FW	0.0	0.0
ZrO2	0.0	0.0	FS	0.0	0.0
			MO	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	1.50	1.51
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			WT	0.0	0.0
			HEM	5.32	6.57
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

97.32

97.32

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY WJ)		TRIANGULAR PLOTS		BASALT TETRAHEDRON	
RATIOS					
KUNO SI	W	22.039	A	41.85	PLAG
KUNO SI	M	10.480	C	43.16	NE
POLDERVAART		27.030	F	14.99	OL
COHRS		0.476	A	72.26	HY
LARSEN		15.847	F	0.0	Q
THORNTON II		1.262	M	27.74	0.0
THORNTON DI		72.500	ALK	32.37	Cpx
CI		17.160	AL	21.82	NE
AL2O3/SiO2		0.152	CFM	45.81	OL
FEMG		48.260		0.0	HY
FE2/FE3		0.0	II	1.39	Q
NA + K		6.423	DI	18.87	0.0
NA + K/A		0.597	CI	79.74	0.0
AL2/Si6		0.030		0.0	A/MG

GRANITE TETRAHEDRON-W-
OR 20.98 31.10
AB 29.02 43.03
AN 17.45 25.87
Q 16.49 0.0
PLAG 0.0 0.0

31.55 38.20 24.99
43.65 0.0 0.0
0.0 0.0 0.0
27.71 31.77 0.0
26.19 30.03 19.65
0.0 0.0 55.36

SAMPLE NUM:FB N612

OXIDE	WT PCT	WOLF PCT	NORMATIVE MINERALS	WT PCT	WOLF PCT
SiO2	59.68	67.22	KFS	0.0	0.0
TiO2	0.84	0.71	KP	0.0	0.0
Al2O3	15.95	10.59	LC	0.0	0.0
Fe2O3	7.13	3.02	NS	0.0	0.0
FeO	0.0	0.0	OR	26.00	10.50
MnO	0.0	0.0	AB	29.60	12.26
MgO	2.99	5.02	AN	15.36	12.41
CaO	5.46	6.59	NF	0.0	0.0
Na2O	3.38	3.69	Q	9.56	35.75
K2O	4.40	3.16	OL	0.0	0.0
P2O5	0.0	0.0	FN	0.0	0.0
FeO	0.0	0.0	FA	0.0	0.0
FeO	0.0	0.0	LN	0.0	0.0
Cr2O3	0.0	0.0	HY	4.27	9.56
F	0.0	0.0	EN	4.27	9.56
Cl	0.0	0.0	FS	0.0	0.0
SO3	0.0	0.0	DI	6.86	7.12
S	0.0	0.0	WO	3.68	3.56
CO2	0.0	0.0	EN	3.18	3.56
FeO2	0.0	0.0	FS	0.0	0.0
			WO	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			TL	0.0	0.0
			SP	2.06	2.36
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	0.0	0.0
			HEM	7.13	10.04
			CH	0.0	0.0
			HL	0.0	0.0
			ER	0.0	0.0
			TH	0.0	0.0
			Pr	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

99.93

PETROLOGIC VALUES: (IN MOLF PCT UNLESS INDICATED AS WT PCT BY MI
 RATIOS TRIANGULAR PLOTS BASALT TETRAHEDRON

RATIOS		TRIANGULAR PLOTS		RASALT TETRAHEDRON		GRANITE TETRAHEDRON-H-			
33.701	A	41.62	PLAG	3.25	OR	26.00	37.17	40.53	51.07
16.704	C	40.03	NE	0.0	AB	28.60	40.88	44.58	0.0
20.242	F	18.35	OL	0.0	AN	15.36	21.95	0.0	30.16
0.494	A	57.72	HY	13.66	Q	9.56	0.0	14.99	18.77
12.374	F	0.0	Q	51.09	PLAG	0.0	0.0	0.0	0.0
1.779	M	42.24		0.0					
58.516	ALK	30.87	CPX	13.54					
22.525	AL	16.83	NE	0.0					
0.154	CFM	52.30	OL	0.0					
37.540	AL2O3/SIO2	0.0	HY	14.23					
0.0	FEMG		Q	44.20					
FE2/FE3	II	2.15		0.0					
6.852	DI	27.20		0.0					
0.647	NA + K	70.65		0.0					
0.034	AL2/Si6	0.0	A/MG	1.37					

A18

SAMPLE RUNOFF N416

OXIDE	WT PCT	VOL PCT	MPHATIVE MINERALS	WT PCT	MGLE PCT
SiO2	50.81	59.24	MS	0.0	0.0
TiO2	1.14	1.02	KD	0.0	0.0
AL2O3	15.52	10.48	LC	0.0	0.0
FE2O3	10.58	4.56	NS	0.0	0.0
FeO	0.0	0.0	NR	12.82	5.68
MNO	0.0	0.0	AR	24.79	11.66
MGO	9.52	9.16	AN	22.79	20.21
CAO	2.17	1.59	NE	0.0	0.0
NA2O	0.0	0.0	O	2.35	9.65
K2O	0.0	0.0	CI	0.0	0.0
PAO	0.0	0.0	FO	0.0	0.0
SR0	0.0	0.0	FA	0.0	0.0
CR2O3	0.0	0.0	LN	0.0	0.0
F	0.0	0.0	HY	6.01	14.77
CL	0.0	0.0	EN	6.01	14.77
SN3	0.0	0.0	FS	0.0	0.0
S	0.0	0.0	MO	15.83	18.03
CO2	0.0	0.0	EM	8.49	9.02
PR02	0.0	0.0	FS	7.34	9.02
			VJ	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	2.90	3.64
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	0.0	0.0
			HEM	10.58	16.35
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

98.07

98.07

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)		TRIANGULAR PLOTS		BASALT TETRAHEDRON	
RATIOS					
KUNO SI W	49.328	A	22.95	PLAG	56.62
KUNO SI	25.475	C	55.42	NE	0.0
POLDERVAART	13.021	E	21.63	OL	0.0
COOMBS	0.400	A	34.59	HY	26.24
LARSEN	-0.642	F	0.0	Q	17.14
THORNTON II	4.508	M	65.41		0.0
THORNTON DI	26.999	ALK	15.46	CPX	42.48
CI	41.118	AL	18.01	NE	0.0
AL2O3/SIO2	0.180	CFM	66.54	OL	0.0
FEMG	33.260		0.0	HY	34.79
FE2/FE3	0.0	II	6.21	O	22.73
NA + K	4.843	DI	56.62		0.0
NA + K/A	0.462	CI	37.18		0.0
AL2/SI6	0.028		0.0	A/MG	0.53

GRANITE TETRAHEDRON-W-

OR	12.82	21.23	32.09	0.0	33.78	20.43
AB	24.79	41.04	62.03	49.65	0.0	0.0
AN	22.79	37.73	0.0	45.64	60.03	0.0
Q	2.35	0.0	5.88	4.71	6.10	3.75
PLAG	0.0	0.0	0.0	0.0	0.0	75.82

A19

SAMPLE NUMBER NA17

OXIDE	WT PCT	MOL PCT	FORMATIVE MINERALS	WT PCT	MOL PCT
SiO2	51.01	58.37	KS	0.0	0.0
TiO2	2.19	1.98	KP	0.0	0.0
Al2O3	15.33	10.34	LC	0.0	0.0
Fe2O3	10.84	4.67	NS	0.0	0.0
FeO	0.0	0.0	OR	14.83	6.42
MnO	0.0	0.0	AR	25.13	11.54
MgO	5.20	8.57	AN	21.09	18.25
CaO	8.76	10.74	NE	0.0	0.0
Na2O	2.97	3.29	O	2.44	9.77
K2O	2.51	1.83	OL	0.0	0.0
P2O5	0.0	0.0	FG	0.0	0.0
RAO	0.0	0.0	FA	0.0	0.0
SRN	0.0	0.0	LN	0.0	0.0
CR2O3	0.0	0.0	HY	7.63	18.29
F	0.0	0.0	EN	7.63	18.29
CL	0.0	0.0	FS	0.0	0.0
SO3	0.0	0.0	WD	11.48	12.77
S	0.0	0.0	WJ	6.16	6.38
CO2	0.0	0.0	EN	5.32	6.38
ZRO2	0.0	0.0	ES	0.0	0.0
			MD	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	9.0	0.0
			SP	5.37	6.60
			PV	0.0	0.0
			C	0.0	0.0
			MT	0.0	0.0
			HEM	10.85	16.36
			CH	0.0	0.0
			HL	0.0	0.0
			ER	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

98.82

PETROLOGIC VALUES: (IN MOL PCT UNLESS INDICATED AS WT PCT BY M)

RATIOS	WT PCT	MOL PCT	MINERAL	WT PCT	MOL PCT
KUNO SI M	47.507	24.96	FLAG	51.50	51.50
KUNO SI	24.152	52.29	NE	0.0	0.0
POLDERVAART	10.192	22.74	OL	0.0	0.0
COOMBS	0.493	36.63	HY	31.62	31.62
LARSEN	0.764	0.0	Q	16.88	16.88
THORNTON II	3.191	43.37	CPX	31.27	31.27
THORNTON DI	27.724	17.12	NE	0.0	0.0
CI	36.974	17.40	OL	0.0	0.0
AL2O3/SIO2	0.177	65.48	HY	44.81	44.81
FENG	34.503	0.0	Q	23.92	23.92
FE2/FE1	0.0	4.70	Q	0.0	0.0
NA + K	5.127	54.44	Q	0.0	0.0
NA + K/A	0.496	40.84	Q	0.0	0.0
AL2/SIO6	0.029	0.0	A/MG	0.58	0.58

GRANITE TETRAHEDRON-M-

OR	14.83	24.30
AB	25.13	41.16
AN	21.09	34.54
Q	2.44	0.0
PLAG	0.0	0.0

34.98	0.0	38.67	23.36
59.27	51.65	0.0	0.0
0.0	43.34	54.97	0.0
5.75	6.35	6.35	3.84
3.0	0.0	0.0	72.80

A20

CAMPF NIST-100 MAJO

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	58.09	48.37	KS	0.0	0.0
TiO2	2.07	1.84	KP	0.0	0.0
Al2O3	15.77	10.00	LC	0.0	0.0
Fe2O3	5.63	4.24	NS	0.0	0.0
FeO	0.0	0.0	OR	14.54	4.08
MnO	0.0	0.0	AB	20.65	6.14
MgO	1.92	3.38	AN	24.21	13.58
CaO	4.88	6.14	NE	0.0	0.0
Na2O	2.44	2.80	Q	21.16	54.97
K2O	2.46	1.96	HL	0.0	0.0
P2O5	0.0	0.0	FO	0.0	0.0
BaO	0.0	0.0	FA	0.0	0.0
SrO	0.0	0.0	LN	0.0	0.0
Cr2O3	0.0	0.0	HY	4.78	7.43
F	0.0	0.0	FM	4.78	7.43
CL	0.0	0.0	FS	0.0	0.0
Si3	0.0	0.0	DI	0.0	0.0
S	0.0	0.0	WO	0.0	0.0
CO2	0.0	0.0	EM	0.0	0.0
ZRO2	0.0	0.0	FS	0.0	0.0
			WN	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	0.0	0.0
			SP	0.0	0.0
			RU	2.07	4.04
			PV	0.0	0.0
			C	0.22	0.14
			MT	0.0	0.0
			HEM	9.63	9.41
			CH	0.0	0.0
			ML	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

97.76

97.26

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)									
RATIOS		TRIANGULAR PLOTS		BASALT TETRAMEDRON		PLAG		TETRAMEDRON-W	
KUNO SI	M	A	30.77	PLAG	24.02	NE	0.0	OR	14.54
KUNO SI		C	40.89	NE	0.0	OL	0.0	AB	20.65
POLDERVAART		F	78.34	OL	0.0	HY	9.05	AN	24.21
COOMBS		F	57.90	HY	9.05	Q	46.93	Q	21.16
LARSEN		F	0.0	Q	46.93			PLAG	0.0
THORNTON II		M	42.10						
THORNTON II		ALK	22.63	CPK	0.0				
CI		AL	30.83	NE	0.0				
AL2O3/SIO2		CFM	44.54	OL	0.0				
FENG			55.875	HY	11.91				
FE2/FE3		II	0.41	Q	94.09				
NA + K		DI	4.652		0.0				
NA + K/A		CI	0.423	A/MG	1.39				
AL2/SI6			0.023						

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)									
RATIOS		TRIANGULAR PLOTS		BASALT TETRAMEDRON		PLAG		TETRAMEDRON-W	
KUNO SI	M	A	30.77	PLAG	24.02	NE	0.0	OR	14.54
KUNO SI		C	40.89	NE	0.0	OL	0.0	AB	20.65
POLDERVAART		F	78.34	OL	0.0	HY	9.05	AN	24.21
COOMBS		F	57.90	HY	9.05	Q	46.93	Q	21.16
LARSEN		F	0.0	Q	46.93			PLAG	0.0
THORNTON II		M	42.10						
THORNTON II		ALK	22.63	CPK	0.0				
CI		AL	30.83	NE	0.0				
AL2O3/SIO2		CFM	44.54	OL	0.0				
FENG			55.875	HY	11.91				
FE2/FE3		II	0.41	Q	94.09				
NA + K		DI	4.652		0.0				
NA + K/A		CI	0.423	A/MG	1.39				
AL2/SI6			0.023						

A21

SAMPLE NUMBER 1

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	58.50	68.28	KS	0.0	0.0
TiO2	1.13	0.99	KP	0.0	0.0
Al2O3	15.70	10.80	LC	0.0	0.0
Fe2O3	2.52	1.11	NS	0.0	0.0
FeO	5.04	4.92	NR	1.48	0.37
MnO	0.04	0.04	AR	23.69	6.34
MgO	2.85	4.94	AN	22.03	11.12
CaO	4.44	5.55	NE	0.0	0.0
Na2O	2.80	3.17	Q	25.04	58.52
K2O	0.25	0.19	OL	0.0	0.0
P2O5	0.0	0.0	FO	0.0	0.0
RaO	0.0	0.0	FA	0.0	0.0
SrO	0.0	0.0	LN	0.0	0.0
Cr2O3	0.0	0.0	HY	12.48	15.65
F	0.0	0.0	EM	7.10	9.93
CL	0.0	0.0	FS	5.38	5.73
Sn3	0.0	0.0	DI	0.0	0.0
S	0.0	0.0	WO	0.0	0.0
CO2	0.0	0.0	EN	0.0	0.0
ZrO2	0.0	0.0	FS	0.0	0.0
			WO	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	2.15	1.99
			SP	0.0	0.0
			RU	0.0	0.0
			PV	0.0	0.0
			C	2.75	3.79
			MT	3.65	2.22
			HEM	0.0	0.0
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

93.27

93.27

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)

RATIOS	WT PCT	MOLE PCT	TRIANGULAR PLOTS	WT PCT	MOLE PCT
KUMD SI H	34.575	A	22.46	PLAG	19.05
KUMD SI	21.174	C	37.18	NE	0.0
POLDERVAART	1.770	F	40.35	OL	0.0
COOMBS	0.539	A	25.35	HY	17.08
LARSEN	12.342	F	37.18	O	63.86
THORNTON II	11.732	M	37.47		
THORNTON DI	65.238	ALK	12.79	CPX	0.0
AL2O3/SiO2	16.081	AL	26.38	NE	0.0
FE/FE1	0.158	CFM	58.83	DL	0.0
NA + K	54.866	II	0.0	HY	21.10
NA + K/A	3.354	DI	12.61	Q	78.90
AL2/Si6	0.311	CI	70.11		0.0
	0.016		0.0	A/MG	0.68

GRANITE TETRAHEDRON-M-

OR	1.48	3.13
AB	23.69	50.20
AN	22.03	46.67
Q	25.04	0.0
PLAG	0.0	0.0

2.94	0.0	3.04	2.05
47.19	33.46	0.0	0.0
0.0	31.13	45.37	0.0
49.87	35.39	51.58	34.67
0.0	0.0	0.0	63.29

A22

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	67.92	74.46	MS	0.0	0.0
TiO2	0.59	0.49	KO	0.0	0.0
AL2O3	15.16	5.78	LC	0.0	0.0
FE2O3	1.10	0.44	NS	0.0	0.0
FeO	2.38	2.18	OR	20.80	6.16
MNO	0.10	0.09	AR	31.31	9.84
MGO	1.47	2.40	AN	14.36	8.51
CaO	3.23	3.79	NE	0.0	0.0
Na2O	3.70	3.93	O	23.18	63.62
K2O	1.52	2.44	UL	0.0	0.0
P2O5	0.14	0.06	FN	0.0	0.0
RAO	0.0	0.0	FA	0.0	0.0
SRO	0.0	0.0	LM	0.0	0.0
CR2O3	0.0	0.0	HY	5.96	8.81
F	0.0	0.0	EN	3.48	5.72
CL	0.0	0.0	FS	2.47	3.09
SO3	0.0	0.0	DI	0.62	0.45
S	0.0	0.0	MO	0.32	0.22
CO2	0.0	0.0	FN	0.18	0.15
ZRO2	0.0	0.0	FS	0.13	0.08
			MO	0.0	0.0
			AC	0.0	0.0
			AP	0.33	0.16
			TL	1.12	1.22
			SP	0.0	0.0
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			NT	1.73	1.23
			HEM	0.0	0.0
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

99.40		99.40	
PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)			
RATIOS		TRIANGULAR PLOTS	
KUNO S1 M	20.941	A	49.72
KUNO S1	11.990	C	29.50
POLDERVAART	20.799	F	20.78
COOMBS	0.520	A	58.24
LARSEN	19.823	F	19.68
THORNTON II	4.673	M	21.88
THORNTON DI	79.620	ALK	35.18
CI	11.130	AL	18.71
AL2O3/SIO2	0.132	CFM	46.10
FENG	52.673	O	0.0
FE2/FE3	81.636	II	4.87
NA + K	0.653	DI	12.12
AL2/SIO6	0.029	CI	83.00
		A/MG	2.66

GRANITE TETRAEDRON-W-			
OR	20.80	31.29	27.63
AB	31.31	47.10	45.47
AN	14.36	21.61	0.0
Q	23.18	0.0	20.86
PLAG	0.0	0.0	33.67
			0.0
			35.65
			23.20

A23

SAMPLE NUMBER 3

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	74.02	70.35	KS	0.0	0.0
TiO2	0.33	0.27	KD	0.0	0.0
Al2O3	14.88	9.40	LC	0.0	0.0
Fe2O3	0.71	0.29	NS	0.0	0.0
FeO	1.42	1.27	DR	28.25	8.20
MnO	0.06	0.05	AR	37.99	11.71
MgO	0.27	0.43	AN	4.01	2.33
CaO	0.86	0.99	NE	0.0	0.0
Na2O	4.49	4.67	Q	26.75	71.95
K2O	4.78	3.27	DL	0.0	0.0
P2O5	0.04	0.02	FO	0.0	0.0
SiO2	0.0	0.0	FA	0.0	0.0
SiO2	0.0	0.0	LN	0.0	0.0
SiO2	0.0	0.0	HY	2.26	3.03
SiO2	0.0	0.0	EN	0.67	1.08
SiO2	0.0	0.0	FS	1.59	1.94
SiO2	0.0	0.0	DT	0.0	0.0
SiO2	0.0	0.0	WO	0.0	0.0
SiO2	0.0	0.0	FM	0.0	0.0
SiO2	0.0	0.0	FS	0.0	0.0
SiO2	0.0	0.0	WN	0.0	0.0
SiO2	0.0	0.0	AC	0.0	0.0
SiO2	0.0	0.0	AP	0.09	0.05
SiO2	0.0	0.0	IL	0.63	0.67
SiO2	0.0	0.0	SP	0.0	0.0
SiO2	0.0	0.0	RU	0.0	0.0
SiO2	0.0	0.0	PV	0.0	0.0
SiO2	0.0	0.0	C	0.85	1.35
SiO2	0.0	0.0	MT	1.03	0.72
SiO2	0.0	0.0	HEM	0.0	0.0
SiO2	0.0	0.0	CH	0.0	0.0
SiO2	0.0	0.0	HL	0.0	0.0
SiO2	0.0	0.0	FR	0.0	0.0
SiO2	0.0	0.0	TH	0.0	0.0
SiO2	0.0	0.0	PR	0.0	0.0
SiO2	0.0	0.0	NC	0.0	0.0
SiO2	0.0	0.0	CC	0.0	0.0
SiO2	0.0	0.0	Z	0.0	0.0

101.86

101.86

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY WJ)		TRIANGULAR PLOTS		BASALT TETRAHEDRON	
KUNO S1	4.34	A	75.70	PLAG	15.77
KUNO S1	2.314	C	9.42	NE	0.0
PCLOERVAART	34.310	F	14.88	DL	0.0
COOMBS	0.504	A	82.32	HY	3.40
LARSEN	26.664	F	13.21	Q	80.83
THORNTON II	4.059	M	4.47	Q	0.0
THORNTON DI	91.863	ALK	65.62	CPX	0.0
CI	2.869	AL	12.12	NE	0.0
AL2O3/SiO2	0.118	CFM	22.24	DL	0.0
FEMG	78.333	II	0.0	HY	4.04
FE2/FE3	81.636	II	4.11	Q	95.96
NA + K	7.935	DI	2.90	0.0	0.0
NA + K/A	0.844	CI	92.99	0.0	0.0
AL2/Si6	0.033	0.0	0.0	A/MG	18.40

GRANITE TETRAHEDRON-W-

OR	28.25	40.21	30.38	47.87	29.12
AB	37.99	54.08	40.86	0.0	0.0
AN	4.01	5.71	0.0	0.0	0.0
Q	26.75	0.0	28.77	45.33	27.58
PLAG	0.0	0.0	0.0	0.0	43.30

A24

SAMPLE NUMBER 4

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	64.64	73.60	KS	0.0	0.0
TiO2	0.66	0.56	KP	0.0	0.0
Al2O3	15.95	10.60	LC	0.0	0.0
Fe2O3	1.44	0.71	NS	0.0	0.0
FeO	3.32	3.15	OR	19.27	6.26
MnO	0.01	0.01	AB	32.24	11.11
MgO	0.14	0.00	AN	16.52	10.73
CaO	3.70	0.00	NE	0.0	0.0
Na2O	3.81	4.00	O	20.91	62.89
K2O	3.26	2.00	OL	0.0	0.0
P2O5	0.0	0.0	ED	0.0	0.0
BAC	0.0	0.0	FA	0.0	0.0
SMO	0.0	0.0	LN	0.0	0.0
CR2O3	0.0	0.0	HY	3.15	4.44
F	0.0	0.0	EM	0.27	0.49
CL	0.0	0.0	ES	2.88	3.95
Sn3	0.0	0.0	DI	1.61	1.19
S	0.0	0.0	WO	0.77	0.60
CO2	0.0	0.0	EN	0.07	0.07
FM02	0.0	0.0	FS	0.77	0.53
			WO	0.0	0.0
			AC	0.0	0.0
			AP	0.0	0.0
			IL	1.25	1.49
			SP	0.0	0.0
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	2.41	1.88
			HEM	0.0	0.0
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

97.36

97.36

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)

RATIOS	W	W	W	W	W
KUNO SI	2.224	A	43.94	PLAG	24.50
KUNO SI	1.148	C	30.17	NE	0.0
PCLDERVAAT	27.408	F	25.89	OL	0.0
COOMBS	0.499	A	65.92	HY	4.98
LARSEN	21.007	F	31.70	O	70.52
THORNTON II	6.654	M	2.38	CPX	0.0
THORNTON DI	80.260	ALK	35.44	NE	1.74
CI	11.346	AL	21.90	OL	0.0
AL2O3/SIO2	0.144	CFW	42.66	HY	6.48
FFMG	94.220	II	0.0	O	91.78
FE2/FE3	81.636	DI	11.55	A/MG	27.67
NA + K	6.550	CI	81.68		
NA + K/A	0.618				
AL2/SI6	0.030				

GRANITE TETRAHEDRON-W-

OR	19.27	28.32	26.61	0.0	33.98	21.66
AB	32.24	47.39	44.52	46.28	0.0	0.0
AN	16.52	24.28	0.0	23.71	29.14	0.0
O	20.91	0.0	28.87	30.01	36.88	23.51
PLAG	0.0	0.0	0.0	0.0	0.0	54.83

A25

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	66.42	74.24	KS	0.0	0.0
TiO2	0.56	0.47	KP	0.0	0.0
Al2O3	16.39	10.80	IC	0.0	0.0
Fe2O3	1.01	0.43	NS	0.0	0.0
FeO	2.03	1.90	OR	20.09	6.62
MnO	0.06	0.06	AB	37.32	13.06
MgO	0.90	1.50	AN	12.80	8.45
CaO	2.75	3.30	NE	0.0	0.0
Na2O	4.41	4.78	Q	19.94	60.89
K2O	3.40	2.43	DL	0.0	0.0
P2O5	0.13	0.06	FO	0.0	0.0
BaO	0.0	0.0	FA	0.0	0.0
SrO	0.0	0.0	LN	0.0	0.0
CR2O3	0.0	0.0	HY	4.32	6.99
F	0.0	0.0	FN	2.24	4.10
CL	0.0	0.0	FS	2.08	2.89
SO3	0.0	0.0	DI	0.0	0.0
S	0.0	0.0	MO	0.0	0.0
CO2	0.0	0.0	EN	0.0	0.0
ZrO2	0.0	0.0	FS	0.0	0.0
			WD	0.0	0.0
			AC	0.0	0.0
			AP	0.30	0.17
			IL	1.06	1.29
			SP	0.0	0.0
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.76	1.37
			MT	1.46	1.16
			HEM	0.0	0.0
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

98.06

98.06

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)		TRIANGULAR QTS		BASALT TETRAHEDRON	
RATIOS		A	56.19	PLAG	24.06
KUNO SI W	13.599	C	25.69	NE	0.0
KUNO SI	7.660	F	16.12	OL	0.0
POLDERVAART	29.826	A	67.95	HY	7.82
COOMBS	0.516	F	17.90	Q	68.12
LARSEN	21.178	M	14.14		0.0
THORNTON II	5.597	ALK	41.19	Cpx	0.0
THORNTON DI	80.574	AL	20.55	NE	0.0
CI	10.494	CFM	38.26	OL	0.0
AL2O3/SIO2	0.145			HY	10.30
FEMG	60.770	II	5.79	Q	89.70
FE2/FE3	81.710	DI	7.207		0.0
NA + K	0.667	CI	83.35		0.0
NA + R/A				A/MG	4.80
AL2/SI6	0.032				

GRANITE TETRAHEDRON-W-
OR 20.09 28.62
AB 37.32 53.15
AN 12.80 18.23
Q 19.94 0.0
PLAG 0.0 0.0

25.98 0.0
40.25 53.27
0.0 18.27
25.77 28.46
0.0 0.0

38.03 0.0
24.23 0.0
37.73 0.0

22.29 0.0
0.0 0.0
22.11 55.60

A26

SAMPLE NUMBER 5

OXIDE	WT PCT	W/LT PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	63.49	71.13	MS	0.0	0.0
TiO2	0.71	0.60	KP	0.0	0.0
Al2O3	15.35	10.14	LC	0.0	0.0
Fe2O3	1.69	0.71	MS	0.0	0.0
FeO	3.38	3.17	DR	15.84	4.89
MnO	0.09	0.09	AA	29.53	9.67
MgO	1.97	3.29	AN	18.30	11.30
CaO	4.24	5.09	NE	0.0	0.0
Na2O	3.49	3.79	Q	20.02	57.23
K2O	2.68	1.92	OL	0.0	0.0
P2O5	0.18	0.09	FA	0.0	0.0
BaO	0.0	0.0	LN	0.0	0.0
SrO	0.0	0.0	HY	0.0	0.0
Cr2O3	0.0	0.0	EN	4.55	12.38
F	0.0	0.0	FS	3.53	7.79
CL	0.0	0.0	DI	1.29	4.60
SO3	0.0	0.0	MO	0.65	0.97
S	0.0	0.0	EM	0.36	0.48
CO2	0.0	0.0	FS	0.28	0.30
ZrO2	0.0	0.0	WO	0.0	0.18
			AC	0.0	0.0
			AP	0.42	0.0
			IL	1.35	0.22
			SP	0.0	1.53
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	2.45	0.0
			HEM	0.0	1.82
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PS	0.0	0.0
			MC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

97.27

97.27

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)		TRIANGULAR PLOTS		BASALT TETRAHEDRON	
RATIOS		A	38.88	PLAG	23.16
KUNO SI W	25.549	C	34.68	NE	0.0
KUNO SI	14.913	F	26.43	OL	0.0
POLDERVAART	15.357	A	46.92	HY	13.67
CDOMBS	0.527	F	26.04	Q	63.18
LARSEN	16.289	M	27.05		0.0
THORNTON II	7.053	ALK	26.32	Cpx	1.37
THORNTON DI	71.787	AL	20.43	NE	0.0
CI	15.741	CF ⁴	53.25	OL	0.0
AL2O3/SiO2	0.142			HY	17.54
FENG	54.116	II	7.46	Q	81.09
FE2/FE3	81.636	DI	16.64		0.0
NA + K	5.706	CI	75.90		0.0
NA + K/A	0.563			A/MG	1.73
AL2/Si6	0.027				

GRANITE	TETRAHEDRON-W-
DR	15.84 24.87
AB	29.53 46.38
AN	18.30 28.75
Q	20.02 0.0
PLAG	0.0 0.0

24.22	0.0	29.24	18.92
43.16	43.52	0.0	0.0
0.0	26.98	33.80	0.0
30.61	29.50	36.96	23.32
0.0	0.0	0.0	57.16

A27

SAMPLE NUMBER 7

OXIDE	WT PCT	WOLF PCT	MORBATIC MINERALS	WT PCT	WOLF PCT
SiO2	67.58	75.16	KS	0.0	0.0
TiO2	0.54	0.45	KD	0.0	0.0
AL2O3	15.13	9.55	LC	0.0	0.0
FE2O3	1.23	0.51	NS	0.0	0.0
FE3	2.46	2.20	DR	19.50	5.88
MNO	0.07	0.07	AR	34.86	11.16
MGO	1.02	1.69	AN	11.70	7.05
CAN	2.54	3.03	NF	0.0	0.0
NA2O	4.12	4.44	N	23.16	64.69
K2O	3.30	2.34	OL	0.0	0.0
P2O5	0.14	0.07	FO	0.0	0.0
RAO	0.0	0.0	FA	0.0	0.0
CR2O3	0.0	0.0	LN	0.0	0.0
F	0.0	0.0	HY	5.28	7.73
CL	0.0	0.0	FN	2.54	4.25
SO3	0.0	0.0	FS	2.74	3.48
S	0.0	0.0	DT	0.0	0.0
CO2	0.0	0.0	MO	0.0	0.0
ZRO2	0.0	0.0	FN	0.0	0.0
			FS	0.0	0.0
			WQ	0.0	0.0
			AC	0.0	0.0
			AP	0.33	0.17
			IL	1.03	1.13
			Sp	0.0	0.0
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.54	0.90
			MT	1.78	1.29
			HEM	0.0	0.0
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

98.18

98.18

PETROLOGIC VALUES: (IN WOLF PCT UNLESS INDICATED AS WT PCT BY W)

RATIOS	WT PCT	WOLF PCT	TRIANGULAR PLOTS	WT PCT	WOLF PCT
KUNO SI W	14.992	14.992	A	53.78	20.09
KUNO SI	9.409	9.409	C	24.00	0.0
POLDERVAART	25.904	25.904	E	27.22	0.0
CDOWS	0.515	0.515	A	63.23	6.53
LARSEN	21.507	21.507	E	21.26	0.0
THORNTON II	4.839	4.839	M	15.71	0.0
THORNTON DI	81.727	81.727	AIK	40.01	0.0
CI	9.177	9.177	AL	18.67	0.0
AL2O3/SIO2	0.112	0.112	CFM	41.32	0.0
FEWQ	62.376	62.376	II	0.04	0.0
FE2/FE3	0.136	0.136	II	0.04	0.0
NA + K	4.734	4.734	Q	0.0	0.0
NA + K/A	0.002	0.002	Q	0.0	0.0
AL2/SIO2	0.003	0.003	Q	0.0	0.0

GRANITE TETRAHEDRON-W-

DR	19.50	20.52	25.15	0.0	35.87	21.86
AR	34.86	52.77	44.97	50.00	0.0	0.0
AN	11.70	17.70	0.0	16.77	21.51	0.0
Q	23.16	0.0	24.88	33.22	42.61	25.94
PLAG	0.0	0.0	0.0	0.0	0.0	52.14

A28

SAMPLE NUMBER 9

CRIST	WT PCT	MOLE PCT	COGNITIVE MINERALS	WT PCT	MOLE PCT
SiO ₂	52.24	70.76	KS	0.0	0.0
TiO ₂	0.74	0.64	KP	0.0	0.0
Al ₂ O ₃	15.67	10.32	LC	0.0	0.0
Fe ₂ O ₃	1.42	2.63	NS	0.0	0.0
FeO	3.24	3.03	NR	19.38	6.00
MnO	0.68	0.63	AR	30.12	10.43
MgO	2.64	3.40	AN	17.59	11.49
CaO	4.20	5.03	NE	0.0	0.0
Na ₂ O	3.56	3.86	O	17.95	54.25
K ₂ O	3.11	2.72	OL	0.0	0.0
P ₂ O ₅	0.0	0.07	FO	0.0	0.0
BaO	0.0	0.0	FA	0.0	0.0
SrO	0.0	0.0	LN	0.0	0.0
CR ₂ O ₃	0.0	0.0	HV	7.78	12.70
F	0.0	0.0	EN	4.60	8.33
CL	0.0	0.0	FS	3.18	4.37
SnO ₃	0.0	0.0	DI	1.65	1.31
S	0.0	0.0	MO	0.84	0.66
Cr ₂	0.0	0.0	FN	0.48	0.43
ZrO ₂	0.0	0.0	FS	0.33	0.23
			MO	0.0	0.0
			AC	0.0	0.0
			AP	0.44	0.24
			IL	1.44	1.73
			Sp	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	2.35	1.84
			HEM	0.0	0.0
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

97.70

97.70

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)

RATIOS	WT PCT	MOLE PCT	TRIANGULAR PLOTS	WT PCT	MOLE PCT
KUNO SI W	25.777	A	41.01	PLAG	24.66
KUNO SI	15.033	C	33.95	NE	0.0
POLDERVAART	16.373	E	25.04	OL	0.0
COOMBS	0.529	A	48.59	HV	14.29
LARSEN	16.236	F	24.23	Q	61.05
THORNTON II	7.014	M	27.18		0.0
THORNTON DI	70.684	ALK	27.89	Cpx	1.93
CT	14.411	AL	19.50	NE	0.0
AL ₂ O ₃ /SiO ₂	0.146	CFM	52.61	OL	0.0
FEMC	52.193			HV	18.60
FE ₂ /FF ₃	81.636	II	7.45	Q	79.47
NA + K	6.074	DI	17.44		0.0
NA + K/A	0.589	CI	75.11		0.0
AL ₂ /Si ₂	0.029		0.0	A/MG	1.79

GRANITE TETRAHEDRON-W-

OR	18.38	27.81	27.66	0.0	34.09	21.87
AB	30.12	45.58	45.33	45.88	0.0	0.0
AN	17.59	26.62	0.0	26.79	32.63	0.0
Q	17.95	0.0	27.01	27.33	33.28	21.35
PLAG	0.0	0.0	0.0	0.0	0.0	56.78

A29

SAMPLE NUMBER 9

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO ₂	67.69	75.52	KS	0.0	0.0
TiO ₂	0.50	0.42	KP	0.0	0.0
Al ₂ O ₃	15.44	10.28	LC	0.0	0.0
Fe ₂ O ₃	0.44	0.37	NS	0.0	0.0
FeO	1.76	1.64	OR	23.40	7.31
MnO	0.06	0.06	AB	33.26	11.02
MgO	0.87	1.45	AN	11.80	7.37
CaO	2.60	3.11	NE	0.0	0.0
Na ₂ O	3.93	4.25	Q	22.46	64.98
K ₂ O	3.96	2.82	OL	0.0	0.0
P ₂ O ₅	0.17	0.08	FD	0.0	0.0
HAO	0.0	0.0	FA	0.0	0.0
SR0	0.0	0.0	LN	0.0	0.0
CR ₂ O ₃	0.0	0.0	HY	3.96	6.11
F	0.0	0.0	EN	2.17	3.75
CL	0.0	0.0	FS	1.79	2.36
S03	0.0	0.0	DI	0.0	0.0
S	0.0	0.0	HO	0.0	0.0
C02	0.0	0.0	EN	0.0	0.0
ZR02	0.0	0.0	FS	0.0	0.0
			WO	0.0	0.0
			AC	0.0	0.0
			AP	0.40	0.21
			TL	0.95	1.09
			SP	0.0	0.0
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.56	0.96
			MT	1.28	0.96
			HEM	0.0	0.0
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			MC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

98.06

98.06

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY H)			
RATIOS	TRIANGULAR PLOTS		
KUNO SI W	13.741	A	58.00
KUNO SI	7.632	C	25.50
POLDERVAART	26.342	F	16.50
COOMBS	0.514	A	69.59
LARSEN	22.029	F	16.17
THORNTON II	4.488	M	14.24
THORNTON DI	83.303	ALK	42.89
CI	9.246	AL	19.51
AL ₂ O ₃ /SiO ₂	0.136	CFM	37.60
FFMG	58.170	II	0.0
FE ₂ /FE ₃	81.636	DI	9.53
NA + K	7.069	CI	85.85
NA + K/A	0.687		A/MG
AL ₂ /SiO ₂	0.031		0.0

GRANITE TETRAHEDRON-W-
 OR 23.40 34.19
 AB 33.26 48.58
 AN 11.80 17.24
 Q 22.46 0.0
 PLAG 0.0 0.0

29.58 0.0 40.58 25.74
 2.03 49.25 0.0 0.0
 0.0 17.48 20.46 0.0
 28.39 33.27 38.96 24.71
 0.0 0.0 0.0 49.55

Journal of Democracy

98.79

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)		BASALT TETRAHEDRON	
RATIOS	Y TRIANGULAR PLOTS	PLAG	
KUNO SI W	11.633	A 59.12	18.01
KUNO SI	6.425	C	0.0
PLCLDERVAART	27.353	F	0.0
COOMRS	0.510	A 71.13	0.0
LARSEN	23.159	D 16.79	5.69
THORNTON II	3.483	M 12.07	76.30
THURNTON DI	86.700	ALK 45.78	0.0
CI	7.621	AL 17.23	0.0
AL2O3/SiO2	0.122	CFM 36.09	0.0
FE/FE	63.018	O 122	0.0
FE2/FE1	81.636	HY 6.94	93.06
NA + K	6.863	O	0.0
NA + K/A	0.727		0.0
AL2/Si6	2.030		5.89
		A/MG	

GRANITE	21.93	32.99	26.76	0.0	37.20	23.65
OR	33.76	50.80	41.21	47.70	0.0	0.0
AN	10.77	16.20	0.0	15.21	18.27	0.0
	26.24	0.0	32.03	37.08	44.53	28.31
PLAG	0.0	0.0	0.0	0.0	0.0	48.04

A31

SAMPLE NUMBER 11

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	51.92	55.51	KS	0.0	0.0
TiO2	1.85	1.49	Kp	0.0	0.0
Al2O3	15.46	10.91	LC	0.0	0.0
Fe2O3	2.15	0.37	NS	0.0	0.0
FeO	8.40	7.70	QR	11.35	4.66
MnO	0.15	0.14	AR	26.74	11.65
MgO	7.24	11.56	AN	23.42	19.23
CaO	6.96	7.87	NE	0.0	0.0
Na2O	3.16	3.28	Q	0.0	0.0
K2O	1.92	1.31	OL	3.76	5.34
P2O5	0.59	0.27	FO	2.23	3.62
SiO	0.0	0.0	FA	1.53	1.72
SrO	0.0	0.0	LN	0.0	0.0
Cr2O3	0.0	0.0	HY	21.40	44.23
F	0.0	0.0	EN	13.18	30.00
CL	0.0	0.0	FS	8.22	14.23
SO3	0.0	0.0	DI	5.54	5.58
S	0.0	0.0	MO	2.84	2.79
CO2	0.0	0.0	EN	1.66	1.89
ZrO2	0.0	0.0	FS	1.04	0.98
			WD	0.0	0.0
			AC	0.0	0.0
			AP	1.37	0.95
			IL	3.51	5.29
			SP	0.0	0.0
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	3.12	3.08
			HEM	0.0	0.0
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

100.20

100.21

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)

RATIOS	WT PCT	MOLE PCT	TRIANGULAR PLOTS	WT PCT	MOLE PCT
KUNO SI W	46.751	21.83	PLAG	38.39	38.39
KUNO SI	31.383	C	NE	0.0	0.0
POLDERVAART	-11.336	F	OL	6.64	6.64
COOMBS	0.820	A	HY	54.98	54.98
LARSEN	-0.273	F	O	0.0	0.0
THORNTON II	22.268	M	CPX	10.12	10.12
THORNTON DI	16.304	ALK	NE	0.0	0.0
CI	41.140	AL	HY	80.20	80.20
AL2O3/SIO2	0.180	CFM	O	0.0	0.0
FENG	42.580	II	A/MG	0.40	0.40
FE2/FE3	80.890	DI			
NA + K	4.593	CI			
NA + K/A	0.459				
AL2/SIO2	0.028				

GRANITE TETRAMEDRON-W-

OR	11.35	18.45	29.79	0.0	32.63	18.45
AB	26.74	43.47	70.21	53.31	0.0	0.0
AN	23.42	38.08	0.0	46.69	67.37	0.0
Q	0.0	0.0	0.0	0.0	0.0	0.0
PLAG	0.0	0.0	0.0	0.0	0.0	81.55

A32

SAMPLE NUMBER 12

OXIDE	WT PCT	MOLE PCT	MINORATIVE MINERALS	WT PCT	MOLE PCT
SiO2	55.55	44.60	KC	0.0	0.0
TiO2	0.18	0.15	KD	0.0	0.0
Al2O3	11.43	7.44	LC	0.0	0.0
Fe2O3	0.20	0.08	NS	0.0	0.0
FeO	0.48	0.44	OR	31.44	7.24
MnO	0.08	0.07	AB	22.09	5.40
MgO	0.10	0.16	AN	2.52	1.16
CaO	0.52	0.61	NE	0.0	0.0
Na2O	2.61	2.79	Q	39.51	84.30
K2O	0.32	3.75	OL	0.0	0.0
FeO	0.01	0.00	FO	0.0	0.0
FeO	0.0	0.0	FA	0.0	0.0
FeO	0.0	0.0	LN	0.0	0.0
FeO	0.0	0.0	HY	0.82	0.87
FeO	0.0	0.0	EN	0.25	0.32
FeO	0.0	0.0	FS	0.57	0.55
FeO	0.0	0.0	DI	0.0	0.0
FeO	0.0	0.0	WO	0.0	0.0
FeO	0.0	0.0	EN	0.0	0.0
FeO	0.0	0.0	FS	0.0	0.0
FeO	0.0	0.0	WO	0.0	0.0
FeO	0.0	0.0	AC	0.0	0.0
FeO	0.0	0.0	AP	0.02	0.01
FeO	0.0	0.0	IL	0.34	0.29
FeO	0.0	0.0	SP	0.0	0.0
FeO	0.0	0.0	RU	0.0	0.0
FeO	0.0	0.0	PV	0.0	0.0
FeO	0.0	0.0	C	0.46	0.57
FeO	0.0	0.0	MT	0.29	0.16
FeO	0.0	0.0	HEM	0.0	0.0
FeO	0.0	0.0	CH	0.0	0.0
FeO	0.0	0.0	ML	0.0	0.0
FeO	0.0	0.0	FR	0.0	0.0
FeO	0.0	0.0	TH	0.0	0.0
FeO	0.0	0.0	PS	0.0	0.0
FeO	0.0	0.0	MC	0.0	0.0
FeO	0.0	0.0	CC	0.0	0.0
FeO	0.0	0.0	F	0.0	0.0

97.48

97.48

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)

RATIOS	WT PCT	MOLE PCT	MINORATIVE MINERALS	WT PCT	MOLE PCT
KUMD SI W	2.275	85.14	PLAC	7.15	0.0
KUMD SI	1.148	8.01	NE	0.0	0.0
POLDERVAART	20.751	6.85	GL	0.0	0.0
COOMBS	0.501	91.50	HY	0.95	0.0
LARSEN	29.257	6.20	Q	91.90	0.0
THORNTON II	1.295	2.30	Cpx	0.0	0.0
THORNTON DI	96.939	75.52	NE	0.0	0.0
CI	1.319	10.36	OL	0.0	0.0
AL2O3/SIO2	0.088	14.12	HY	1.02	0.0
FEH	76.182	0.0	Q	98.98	0.0
FE2/FE3	84.213	1.30	Q	0.0	0.0
NA + K	6.539	1.32	Q	0.0	0.0
NA + K/A	0.879	97.37	A/MG	0.0	0.0
AL2/SI6	0.026	0.0	A/MG	0.0	0.0

GRANITE TETRAMEOROM-W-

OP	31.44	56.10	33.79	0.0	42.79	32.90
AB	22.09	39.41	23.74	36.45	0.0	0.0
AN	2.52	4.49	0.0	3.92	3.42	0.0
Q	39.51	0.0	42.47	61.63	53.78	41.35
PLAG	0.0	0.0	0.0	0.0	0.0	25.75

A33

SAMPLE NUMBER 14

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	51.76	61.76	KS	0.0	0.0
TiO2	1.42	1.27	KP	0.0	0.0
Al2O3	21.18	14.90	LC	0.0	0.0
Fe2O3	2.56	1.15	NS	0.0	0.0
FeO	9.00	8.98	OR	21.10	5.19
MnO	0.10	0.10	AR	9.98	2.64
MgO	3.66	6.15	AN	4.59	2.26
CaO	1.16	1.48	ME	0.0	0.0
Na2O	1.18	1.37	Q	18.51	42.23
K2O	3.57	2.72	OL	0.0	0.0
P2O5	0.18	0.09	FO	0.0	0.0
BaO	0.0	0.0	FA	0.0	0.0
SrO	0.0	0.0	LN	0.0	0.0
Cr2O3	0.0	0.0	HY	20.87	24.49
F	0.0	0.0	EN	8.62	11.76
Cl	0.0	0.0	FS	12.25	12.73
Sn3	0.0	0.0	DI	0.0	0.0
S	0.0	0.0	MO	0.0	0.0
CO2	0.0	0.0	EM	0.0	0.0
ZrO2	0.0	0.0	FS	0.0	0.0
			WD	0.0	0.0
			AC	0.0	0.0
			AP	0.42	0.17
			IL	2.70	2.44
			SP	0.0	0.0
			RU	0.0	0.0
			PV	0.0	0.0
			C	13.69	18.41
			MT	3.71	2.20
			MEM	0.0	0.0
			CH	0.0	0.0
			HL	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			P	0.0	0.0

95.57

95.57

PETROLOGIC VALUES: 1 IN MOLE PCT UNLESS INDICATED AS WT PCT BY W1
 RATIOS

	W	M	30.212	A	26.01	PLAG	6.80
KUNO SI	17.501	C	9.45	NE	0.0	0.0	0.0
POLDERVAART	-25.157	F	64.54	OL	0.0	0.0	0.0
CROMBS	0.561	A	21.24	HY	34.21	0.0	0.0
LARSEN	14.314	E	46.74	Q	58.99	0.0	0.0
THORNTON II	33.53R	M	72.02	Cpx	0.0	0.0	0.0
THORNTON DI	50.032	ALK	12.96	NE	0.0	0.0	0.0
CI	8.143	AL	34.31	OL	0.0	0.0	0.0
AL2O3/SiO2	0.241	CFM	52.73	HY	36.71	0.0	0.0
FEMG	62.214	II	36.55	D	63.29	0.0	0.0
FE2/FE3	88.655	DI	9.88	CI	54.57	0.0	0.0
NA + K	0.244	CI	54.57	A/MG	0.66	0.0	0.0
NA + K/A	0.244						
AL2/Si6	0.022						

GRANITE TETRAHEDRON-W-

DR	21.10	59.14	42.34	0.0	47.73	38.94
AB	9.98	27.99	20.13	30.18	0.0	0.0
AN	4.59	12.87	0.0	13.27	10.39	0.0
Q	18.51	0.0	37.33	55.95	41.98	34.16
PLAG	0.0	0.0	0.0	0.0	0.0	26.90

A34

SAMPLE NUMBER 15

OXIDE	WT PCT	MOLE PCT	NORMATIVE MINERALS	WT PCT	MOLE PCT
SiO2	56.07	53.15	KS	0.0	0.0
YtO2	0.42	0.30	KP	0.0	0.0
Al2O3	6.27	3.50	LC	0.0	0.0
Fe2O3	1.00	0.34	NS	0.0	0.0
FeO	4.97	3.85	OR	1.36	0.43
MnO	0.43	0.35	AR	7.45	0.83
MgO	12.20	17.23	AN	15.13	9.66
CaO	20.32	20.64	NE	0.0	0.0
Na2O	0.29	0.27	Q	7.28	21.52
K2O	0.23	0.14	OL	0.0	0.0
P2O5	0.53	0.21	FC	0.0	0.0
BaO	0.0	0.0	FA	0.0	0.0
SnO	0.0	0.0	LM	0.0	0.0
Cr2O3	0.0	0.0	HY	0.0	0.0
F	0.0	0.0	EN	7.33	12.88
CL	0.0	0.0	FS	5.77	10.21
SO3	0.0	0.0	DI	1.56	2.10
S	0.0	0.0		65.62	52.54
CO2	0.0	0.0	MD	34.34	26.27
ZnO2	0.0	0.0	EM	25.82	21.78
			FS	6.66	4.49
			WD	0.0	0.0
			AC	0.0	0.0
			AP	1.23	0.66
			IL	0.80	0.93
			SP	0.0	0.0
			RU	0.0	0.0
			PV	0.0	0.0
			C	0.0	0.0
			MT	1.45	1.11
			HEM	0.0	0.0
			CH	0.0	0.0
			ML	0.0	0.0
			FR	0.0	0.0
			TH	0.0	0.0
			PR	0.0	0.0
			NC	0.0	0.0
			CC	0.0	0.0
			Z	0.0	0.0

102.63

102.65

PETROLOGIC VALUES: (IN MOLE PCT UNLESS INDICATED AS WT PCT BY W)			
RATIOS		TRIANGULAR PLOTS	
KUNO SI W	78.95	A	1.61
KUNO SI	65.627	C	81.70
POLDERVART	-11.167	F	16.69
CHORAS	0.238	A	1.89
LARSEN	-20.087	F	17.95
THORNTON II	21.499	M	80.16
THORNTON DI	22.782	ALK	0.90
CI	49.682	AL	6.85
AL2O3/SIO2	0.066	CFM	92.24
FEMG	13.659		0.0
FE2/FE3	91.543	II	22.88
NA + K	0.406	JI	52.87
NA + K/A	0.116	CI	24.25
AL2/Si6	7.003		0.0
		PLAG	23.68
		NE	0.0
		CL	0.0
		HY	27.77
		Q	48.55
		CPX	60.83
		NE	0.0
		OL	0.0
		HY	17.75
		Q	24.91
			0.0
			0.0
			0.02
			8/MG
GRANITE TETRAHEDRON-W			
OR	1.36	7.12	5.18
AR	2.45	12.96	0.0
AN	15.13	79.87	0.0
Q	7.28	0.0	27.75
PLAG	0.0	0.0	0.0
			5.72
			0.0
			63.66
			30.62
			57.06