in deeper portions. In other sections, there is no tendency such as this. In relation to other elements, Mn decreases in portions where Fe increases.

7. Strontium

Each sections shows average contents from 3,651 to 6,329 ppm of Sr. Central beforsite shows an average content of 6,329 ppm. Northeast beforsite shows an average content of 6,249 ppm. The content of Sr in central beforsite is same as that in northeast beforsite.

MJNO-1 in central beforsite and MJNO-8 of northeast beforsite shows wide variations of contents. But the other sections have small variations of contents. Sr has no tendency to increase in the depth.

8. Phosphorus

Sections MJNO-3 and 4 show average contents of less than 1,000 ppm of P. The other sections show average contents of 1,000 ppm and more of P. In particular, sections of MJNO-1, 7 and 8 exceed the average content of 1%. An maximum content of 7.7% is attained in sections of MJNO-1. Portions with high content are not continuous.

The central beforsite shows an average content of 2,602 ppm. The northeast beforsite shows an average content of 12,224 ppm. P is concentrated in the northeast beforsite, compared with the central beforsite.

Sections MJNO-1, 2 and 5 show wide variations in contents. Sections of MJNO-3 and 4 do not have high content. Sections of MJNO-6, 7 and 8 have continuous high contents at depth. and relatively low content near surface.

9. Iron

Each sections shows an average content of from 3.63 to 6.77 % of Fe. The central beforsite shows an average content of 4.49 % of Fe. The northeast beforsite shows an average content of 3.35 %. Fe is concentrated in the central beforsite, compared with the northeast beforsite.

Sections in the central beforsite have low variation in content, but the contents does not increase with depth. Sections in the northeast beforsite tend to have an increase in content with depth.

2-3 Considerations

A drilling survey was performed in the two beforsites. The beforsites are mainly composed of dolomite. Based on the contents of accessory minerals, The beforsites are subdivided into ankeritic, suphide-rich, Fe oxide-rich phlogopite-rich, apatite-rich, weathered, and normal beforsite.

The shallow zone of the central beforsite consists mainly of weathered or ankeritic beforsite. The deep zone consists mainly of Fe oxide-rich or sulphide-rich beforsite. Magnetite is dominant as the

Fe oxide. Pyrite, marcasite, pyrrhotite are dominant, and sphalerite and galena are subordinate as sulphides.

The shallow zone of the northeast beforsite consists mainly of weathered beforsite, which is not thick. The deep zone consists mainly of phlogopite-rich or apatite-rich beforsite, which is accompanied with alkali amphibole, alkali feldspar, pyrite, pyrrhotite, or magnetite. This beforsite is weakly weathered compared with the central beforsite.

The central beforsite is rich in normative magnetite and forsterite and poor in apatite compared with the northeast beforsite. This difference in composition between the two beforsites corresponds to the field observations of drill cores.

According to the geochemical analyses, the central beforsite is rich in Sc, U, Ta and Fe. The northeast beforsite is rich in Y and P. Contents of rare earth oxides, Th, Nb, Zr, Mn and Sr are the same in the two beforsites. This corresponds to the geochemical analyses in that the central beforsite is rich in magnetite, and the northeast beforsite is rich in apatite.

Pyrochlore form the central beforsite has the same composition, $(Na,Ca)_2(Nb)_2O_6(F)$, as that of the northeast beforsite. The atomic ratio of Na : Ca is approximately 1 : 1. Pyrochlore from underground has the same composition as that on the surface.

Content of rare-earth oxides reached 2.7 % in MJNO-1, but the high values are not continuous at depth. MJNO-1 has an average values of 3,000 ppm of rare earth oxides, but the others have averages less than 1,000 ppm. REEs contents in the central beforsite are the same as those of the northeast beforsite. But middle to heavy REEs (Eu, Tb, Yb and Lu) are concentrated in the north beforsite, compared with the central beforsite.

According to the distribution pattern of REEs (see figure in back pocket), the distribution mode of carbonatite dyke is highest, followed in descending order by the sovite, the northeast beforsite, and the central beforsite. But the patterns of the two beforsites are distributed in the high content area. Therefore, the average content in the carbonatite dyke is highest, followed in descending order by the two beforsites and the sovite.

Nb is contained in the two beforsites at average values of from 1,042 to 2,039 ppm. Sr is contained in the two beforsites at average values of from 5,993 to 6,209 ppm. P is contained in the two beforsites at average values of from 6,257 to 11,803 ppm. Nb and Sr contents of the central beforsite are the same as that of the northeast beforsite. P content of the northeast beforsite is grater than that of the central beforsite.

$\delta^{13}C$ values in dolomite and calcite of the central beforsite increase, while $\delta^{18}O$ values decrease with depth. $\delta^{13}C$ and ^{18}O values of the central beforsite are higher than those of the northeast beforsite. This tendency corresponds with the results at the surface.

There is a possibility that $\delta^{13}C$ and $\delta^{18}O$ values of the outer zone of the central beforsite are higher than those of the inner zone, and that values of the boundary zone are lower than those of the outer zone.

According to the Th / Yb versus Y / Yb diagram in Fig.II–1–9, the sovite, the two beforsites and the carbonatite dyke have particular composition fields. Y has a similar chemical behavior to heavy REEs, such as Yb, and is concentrated in the solid phase. Th has a tendency to be concentrated into a liquid phase, though Th contents are variable in the central beforsite, Th content is highest in the carbonatite dyke, followed in order of abundance by those of the two beforsites, and the sovite. The intrusion order of these rock facies corresponds to the order of Th content.

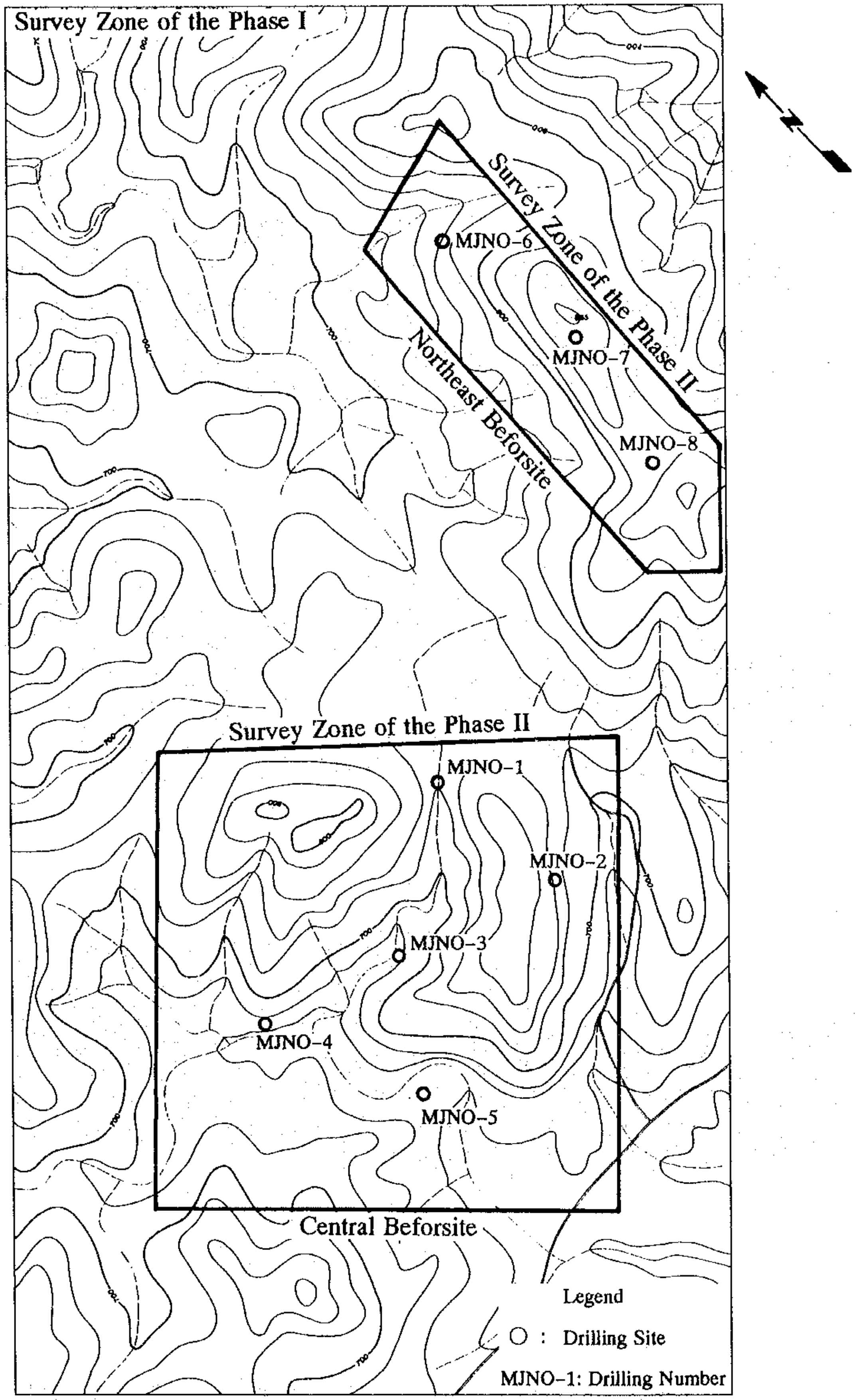

Fig. II-2-1 Drilling Sites in the Orange Area

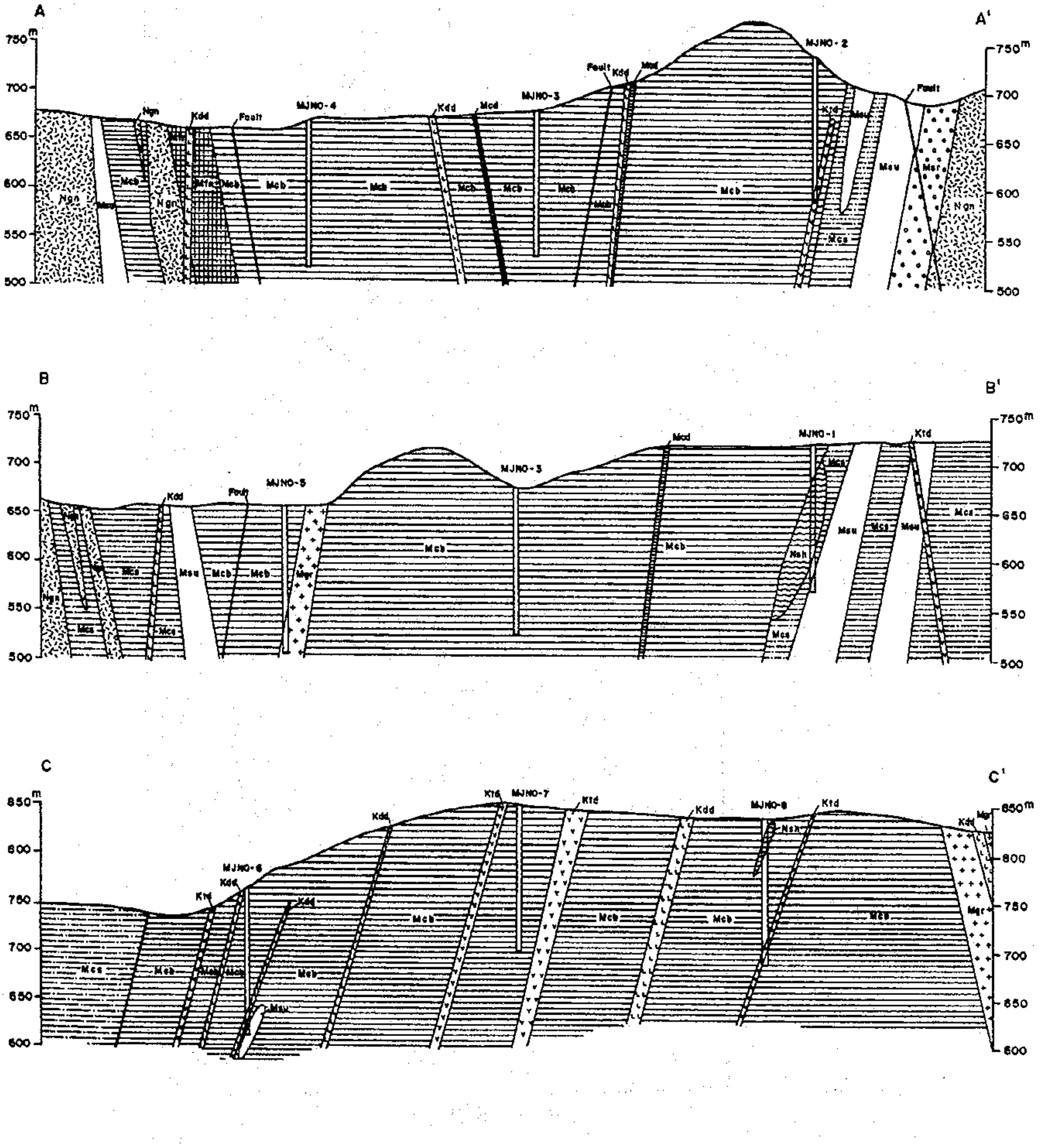

Fig. II-2-2 Geological Section from Drilling Logs of the Orange Area

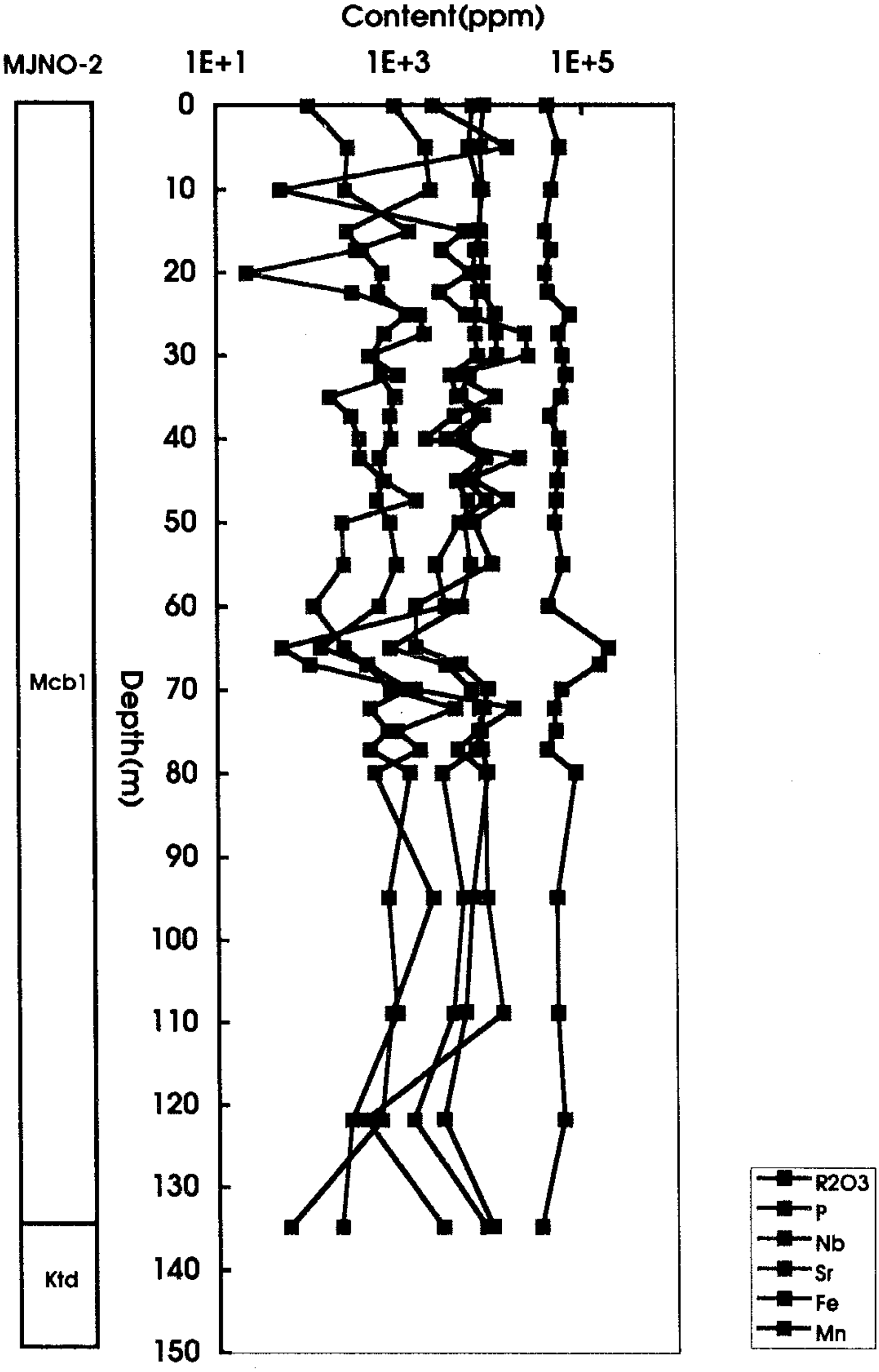

Fig. II-2-3 Geochemical Distribution along Drilling Cores from the Orange Area (2)

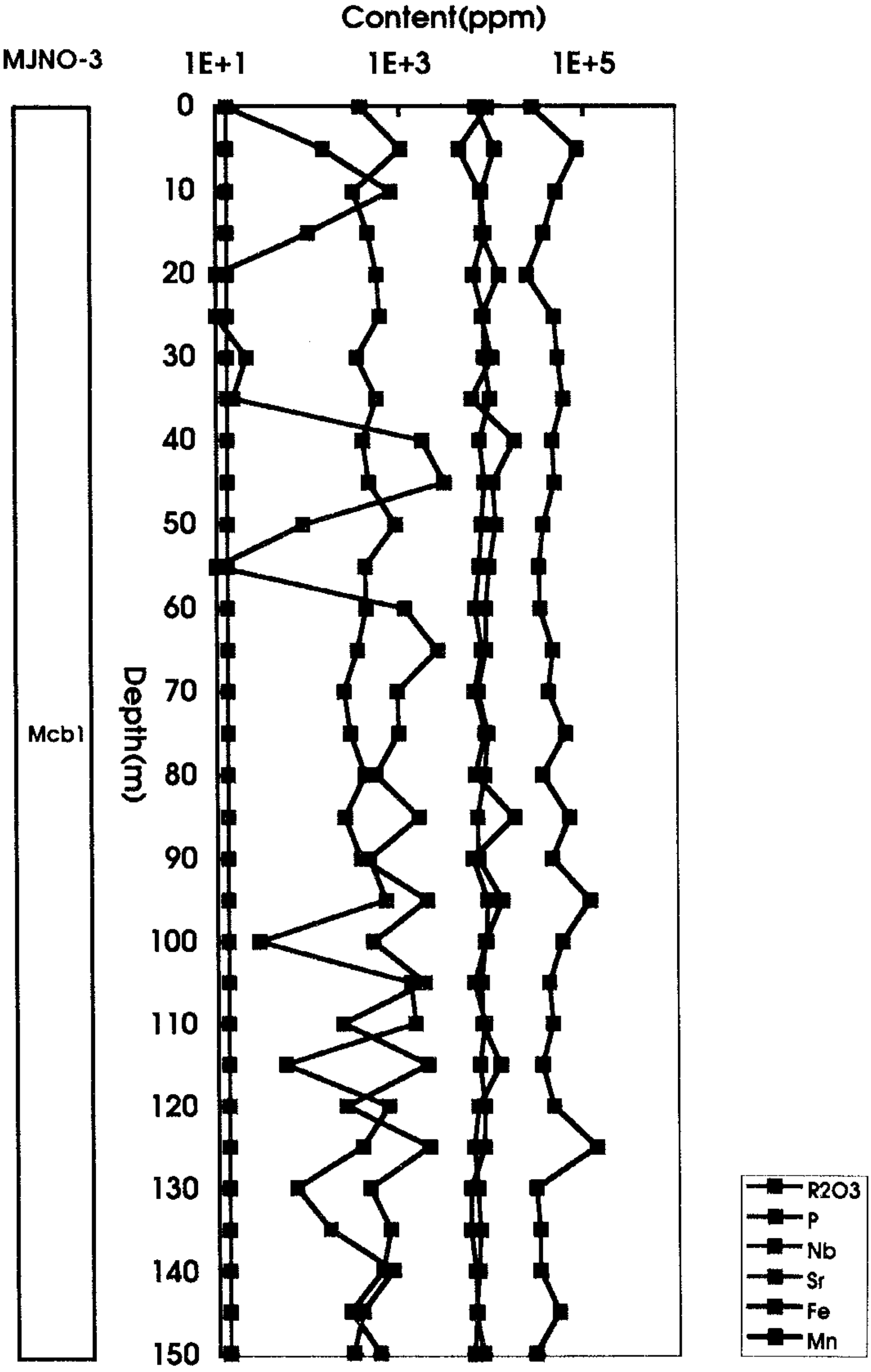

Fig. II-2-3 Geochemical Distribution along Drilling Cores from the Orange Area (3)

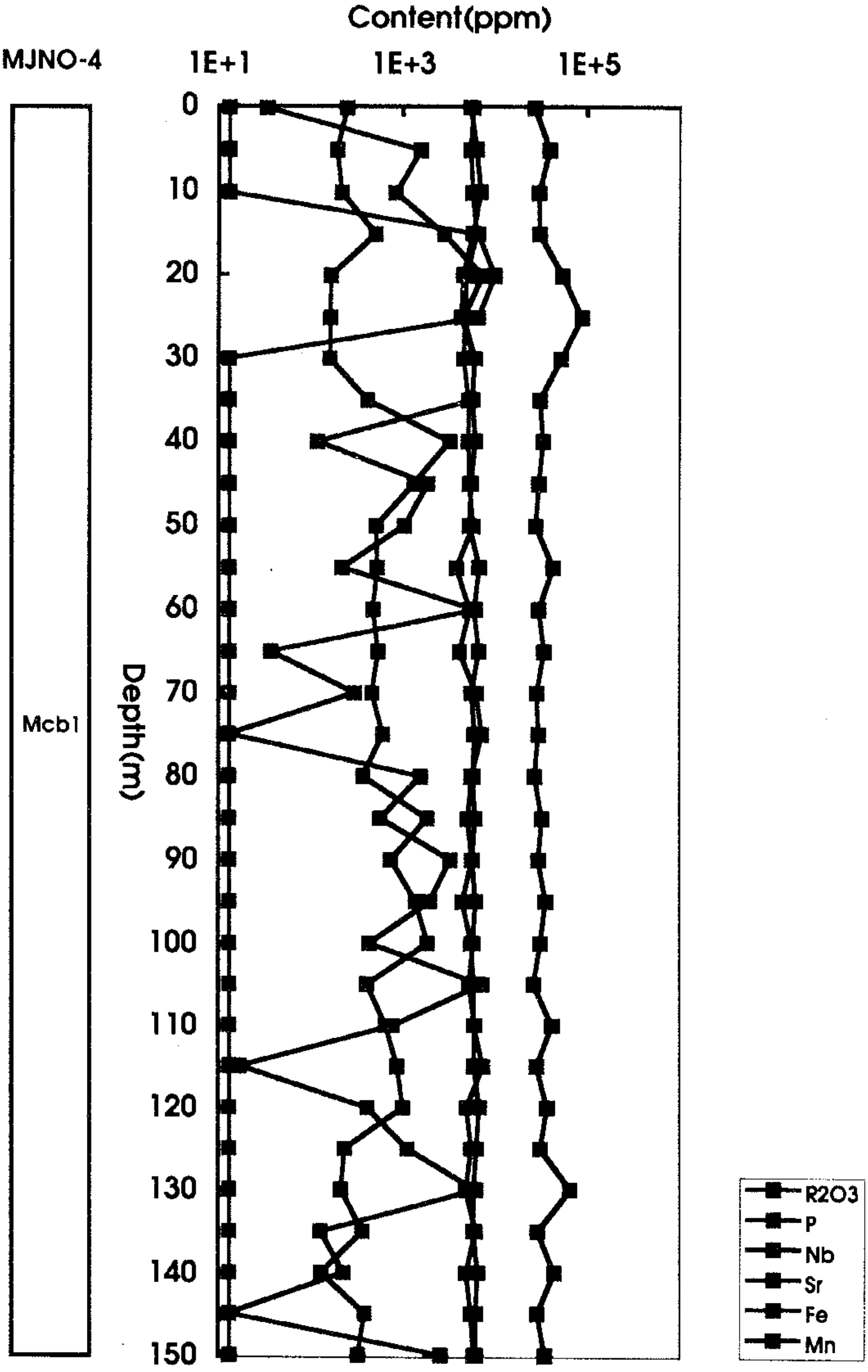

Fig. II-2-3 Geochemical Distribution along Drilling Cores from the Orange Area (4)

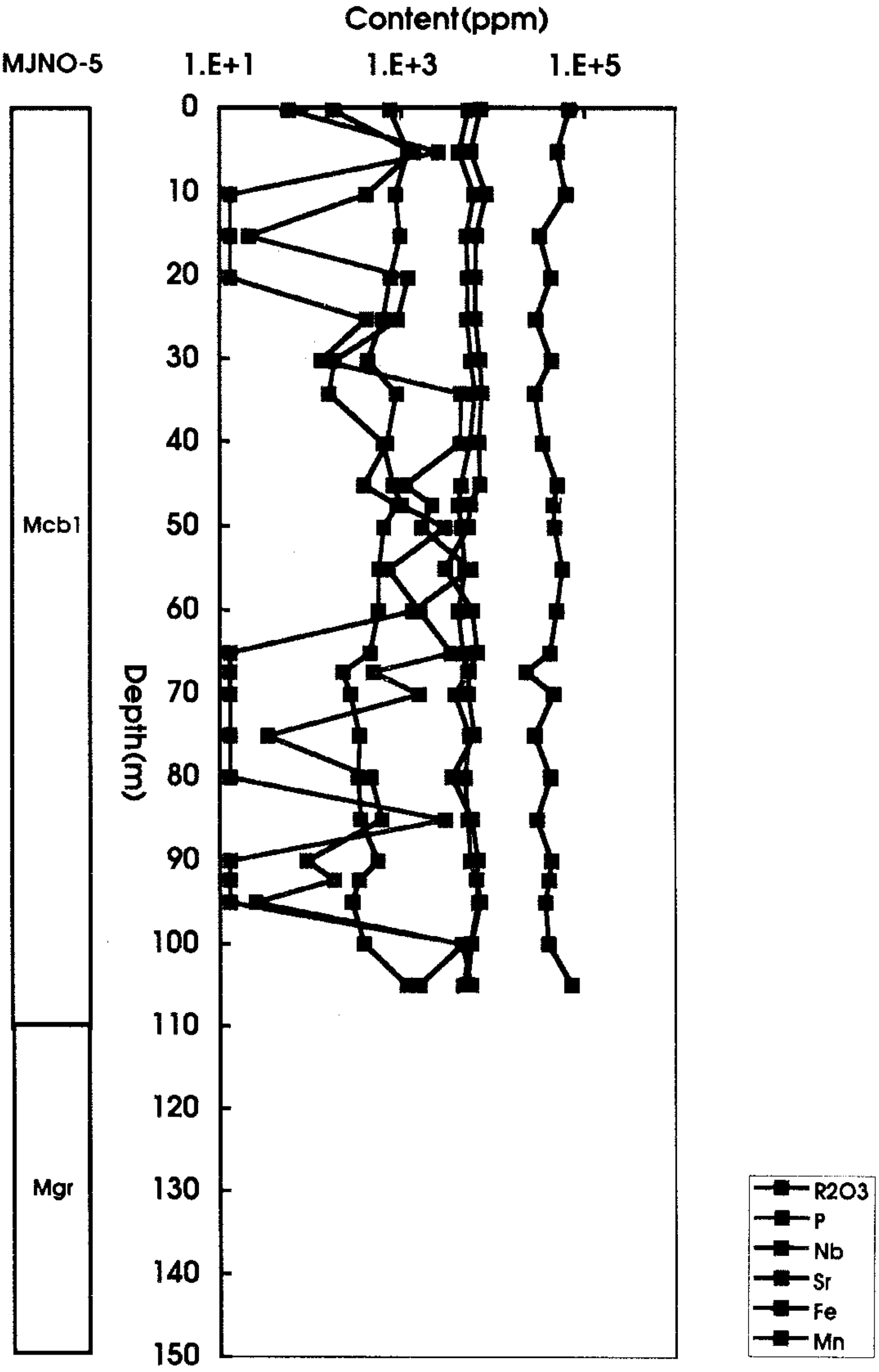

Fig. II-2-3 Geochemical Distribution along Drilling Cores from the Orange Area (5)

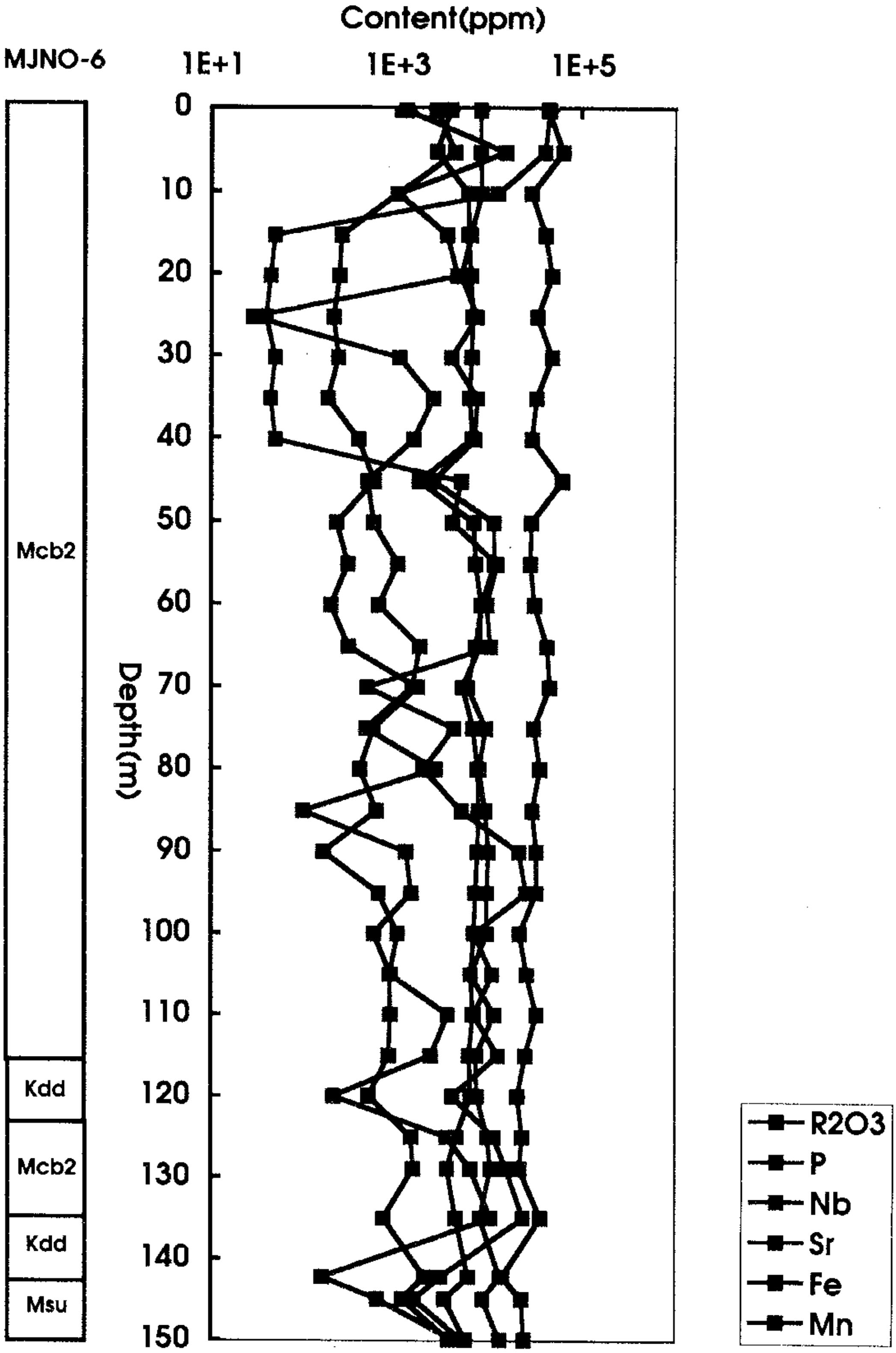

Fig. II-2-3 Geochemical Distribution along Drilling Cores from the Orange Area (6)

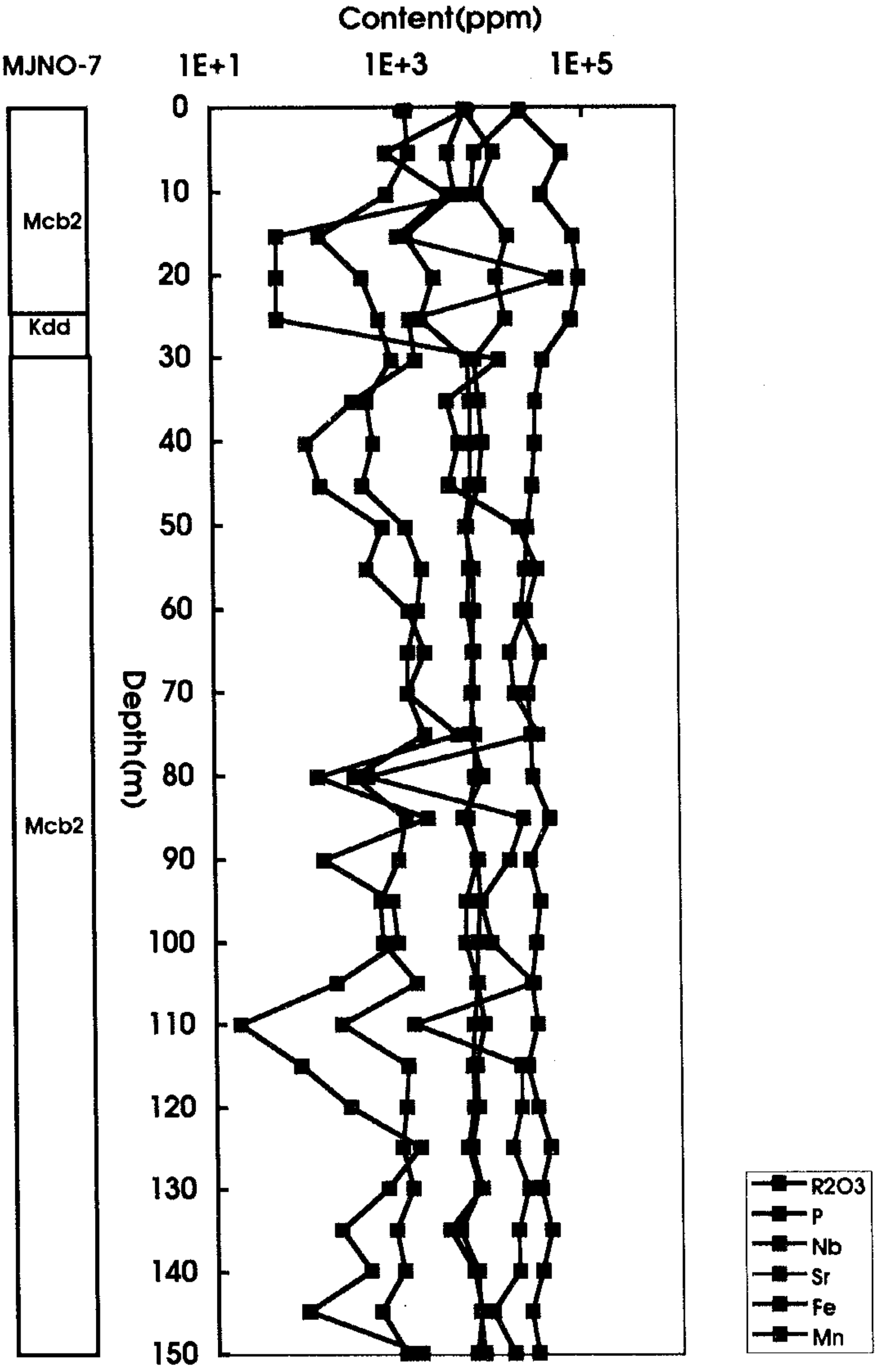

Fig. II-2-3 Geochemical Distribution along Drilling Cores from the Orange Area (7)

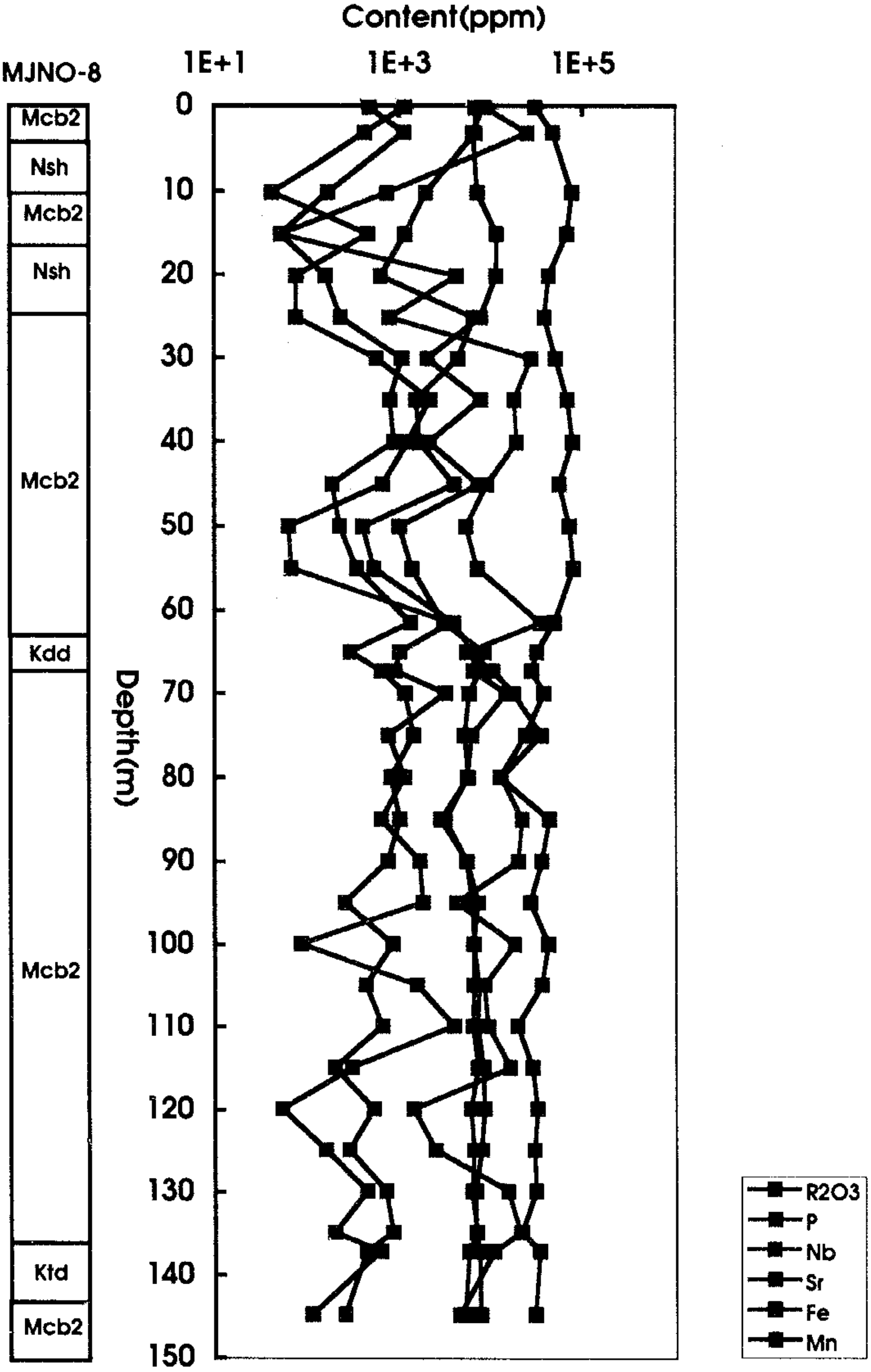

Fig. II-2-3 Geochemical Distribution along Drilling Cores from the Orange Area (8)

Table II-2-1 Drilling Equipment

ITEM	MODEL	SPECIFICATION	QUANTITY
DRILL MACHINE	L-38 (LONGYEAR)	DRILL CAPACITY : BQ-WL 725m TRANSMISSION : 8 FORWARD , 2 REVERSE PRIME MOVER: DETROIT DIESEL 50HP @2200RPM	2
	BOYLES 25 (BOYLES)	DRILL CAPACITY : BQ-WL 1000m TRANSMISSION : 8 FORWARD PRIME MOVER: FORD, GAS 120HP @33000RPM	1
	BOYLES 17 (BOYLES)	DRILL CAPACITY : BQ-WL 600m TRANSMISSION : 8 FORWARD PRIME MOVER: DETROIT DIESEL 50HP @2200RPM	1
PUMPING UNIT	RQ535 (LONGYEAR)	TYPE : TRIPLEX, SINGLE ACTING, PISTON MAXIMUM PRESSURE : 56kg/cm2 DISPLACEMENT : 140LPM PRIME MOVER : DIESEL, AIR-COOLED 16HP @2200RPM	4
WIRELINE HOIST	WLH-S (LONGYEAR)	DRUM CAPACITY : 350m LINE SPEED(BARE DRUM) : 57m/min PRIME MOVER : DIESEL, AIR-COOLED 4HP	2

Table II-2-2 Drilling Materials Consumed

ITEM	SPECIFICATION	UNIT	MJNO-1	MJNO-2	MJNO-3	MJNO-4	MJNO-5	MJNO-6	MJNO-7	MJNO-8	TOTAL
DRILL RODS	NQ×3.0m	PCS	-	-	-	-	-	-	-	-	0
DRILL RODS	BQ×3.0m	PCS	-	-	-	-	-	-	-	-	0
CORE BARREL (NQ)	60.3mm×73.0mm×3.2m	PCS	-	-	-	1	1	-	-	1	3
CORE BARREL (BQ)	46.0mm×57.2mm×3.2m	PCS	-	1	-	1	1	-	1	-	4
INNER TUBE(NQ)	NQ×3.0m	PCS	-	-	-	2	2	-	-	-	4
INNER TUBE(BQ)	BQ×3.0m	PCS	2	2	-	4	3	1	-	1	13
INNER TUBE HEAD(NQ)	NQ	SET	-	-	-	2	2	-	-	-	4
INNER TUBE HEAD(BQ)	BQ	SET	-	-	-	2	2	-	-	-	4
OVERSHOT(NQ)	NQ	PCS	-	-	-	1	1	-	-	-	2
OVERSHOT(BQ)	BQ	PCS	-	-	-	1	1	-	-	-	2
WIRE ROPE	6mm×300m	ROLL	-	-	-	-	-	-	-	-	0
CASING(BW)	60.3mm×73.0mm×3.0m	PCS	-	-	-	1	1	-	-	-	2
CASING SHOE	56.2mm×75.3mm	PCS	1	1	1	1	1	1	1	1	8
CORE LIFTER	NQ	PCS	3	4	2	3	4	1	1	2	20
CORE LIFTER	BQ	PCS	5	3	6	4	7	6	5	4	40
CORE LIFTER CASE	NQ	PCS	2	2	2	2	2	2	2	2	16
CORE LIFTER CASE	BQ	PCS	3	4	2	2	2	3	3	2	21
DIESEL		Litres	200	450	420	160	270	260	210	160	2,130
HYDRAULIC OIL		Litres	20	10	30	40	-	20	20	-	140
CEMENT		kg	480	560	1,080	-	-	320	240	200	2,880
BENTONITE		kg	-	3,600	-	-	-	-	-	-	3,600
C.M.C.		kg	-	110	-	-	-	-	-	-	110

Table II-2-3 Drilling Bits and Reamers Consumed

ITEM	DESCRIPTION	SPECIFICATION	MJNO-1	MJNO-2	MJNO-3	MJNO-4	MJNO-5	MJNO-6	MJNO-7	MJNO-8	TOTAL
DIAMOND BIT											
	NXC	101. 00mm×77. 00mm	1	1	1	1	1	1	1	1	8
	NQ	47. 63mm×75. 31mm	1	2	1	1	1	1	1	1	9
	BQ	36. 40mm×59. 56mm	1	2	1	2	2	1	2	1	12
REAMING SHELL											
	NXC	101. 70mm	1	1	1	1	1	1	1	1	8
	NQ	75. 69mm	1	1	1	1	1	1	1	1	8
	BQ	59. 94mm	1	1	1	1	1	1	1	1	8
CASING SHOE	(METAL)										
	BX	56. 2mm×75. 3mm	1	1	1	1	1	1	1	1	8

Table II-2-4 Progress of Drilling Work

	1994 AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	1995 JANUARY	FEBRUARY	TOTAL DEPTH	CORE RECOVERY	PERIOD
PLANNING & PREPARATION	13 15									
MJNO−1			2 12					150.40m	99.93%	1994.10. 2 ~ 1994.10.12
MJNO−2		22	8					150.40m	51.60%	1994. 9.22 ~ 1994.10. 8
MJNO−3		16	1					150.30m	99.60%	1994. 9.16 ~ 1994.10. 1
MJNO−4		14 22						150.20m	99.80%	1994. 9.14 ~ 1994. 9.22
MJNO−5	16	15						150.30m	95.81%	1994. 8.16 ~ 1994. 9.15
MJNO−6			18 30					150.50m	99.27%	1994.10.18 ~ 1994.10.30
MJNO−7			13 25					150.50m	99.80%	1994.10.13 ~ 1994.10.25
MJNO−8			8 18					150.40m	99.73%	1994.10. 8 ~ 1994.10.18
DEMOBILIZATION			31	2						
REPORT MAKING				10			20			

Table II-2-5 Drilling Summary (1)

PERIOD OF DRILLING

ITEM	PERIOD			DETAILS			
				NO. OF DAYS	WORKING DAY	DAY OFF	NO. OF WORKER
RIG UP	2. 10.1994	～	3. 10.1994	2.5	2.5	0	21.0
DRILLING	4. 10.1994	～	10. 10.1994	6.5	6.5	0	58.0
TEAR DOWN	11. 10.1994	～	10. 12.1994	2	2	0	20.0
TOTAL	2. 10.1994	～	10. 12.1994	11	11	0	99.0

TOTAL DEPTH

PROPSED DEPTH	150.00 m	OVERBURDEN	0.00 m
EXCESS DEPTH	- m	CORE LENGTH	150.30 m
INSPECTED DEPTH	150.40 m	CORE REC.(%)	99.93 %

TIME ANALYSIS

DRILLING	45.0 h	63.4 %	38.5 %
TRIP	4.0 h	5.6 %	3.4 %
CORE RECOVERY	11.0 h	15.5 %	9.4 %
RUN CASING, ETC.	11.0 h	15.5 %	9.4 %
FISHING	0.0 h	0.0 %	0.0 %
OTHERS	0.0 h	0.0 %	0.0 %
SUB-TOTAL	71.0 h	100.0 %	60.7 %

PREPARATION

RIG UP	26.0 h		22.2 %
TEAR DOWN	20.0 h		17.1 %
TOTAL	117.0 h		100.0 %

CASING

CASING SET DEPTH AND SIZE	(m)	B/A×100 (%)	CASING RECOVERY (%)
BW	51.1	34.0	100.0

CORE RECOVERY/100m

DEPTH (m)	CORE LENGTH	CORE RECOVERY	TOTAL
0.00 ～ 98.10	98.00 m	99.90 %	99.90 %
98.10 ～ 150.40	52.30 m	100.00 %	99.93 %

PENETRATION RATE

TOTAL DEPTH(m)／TOTAL DAYS	13.67	m/day
TOTAL DEPTH(m)／WORKING DAYS	13.67	m/day
TOTAL DEPTH(m)／DRILLING DAYS	23.14	m/day
TOTAL DEPTH(m)／ ACTUAL DRILLING DAYS	23.14	m/day
TOTAL DEPTH(m)／TOTAL WORKERS	1.52	m/man
ACTUAL DRILLING WORKERS／TOTAL	0.39	man/m

HELICOPTER FLYING TIME: 3.0 HOURS

REMARKS
A : TOTAL DEPTH
B : CASING SET DEPTH

Table II-2-5 Drilling Summary (2)

PERIOD OF DRILLING

ITEM	PERIOD			DETAILS			
				NO. OF DAYS	WORKING DAY	DAY OFF	NO. OF WORKER
RIG UP	22. 9.1994	~	24. 9.1994	3	3	0	17.5
DRILLING	25. 9.1994	~	7. 10.1994	13.5	13.5	0	93.0
TEAR DOWN	7. 10.1994	~	8. 10.1994	1.5	1.5	0	12.5
TOTAL	22. 9.1994	~	8. 10.1994	18	18	0	123.0

TOTAL DEPTH

PROPSED DEPTH	150.00 m	OVERBURDEN	0.00 m
EXCESS DEPTH	- m	CORE LENGTH	77.60 m
INSPECTED DEPTH	150.40 m	CORE REC. (%)	51.60 %

TIME ANALYSIS

DRILLING	70.0 h	49.0 %	38.3 %
TRIP	22.0 h	15.4 %	12.0 %
CORE RECOVERY	13.0 h	9.1 %	7.1 %
RUN CASING, ETC.	34.0 h	23.8 %	18.6 %
FISHING	4.0 h	2.8 %	2.2 %
OTHERS	0.0 h	0.0 %	0.0 %
SUB-TOTAL	143.0 h	100.0 %	78.1 %

PREPARATION

RIG UP	30.0 h		16.4 %
TEAR DOWN	10.0 h		5.5 %
TOTAL	183.0 h		100.0 %

CASING SET DEPTH AND SIZE	(m)	B/A×100 (%)	CASING RECOVERY (%)
BW	78.00	51.9	100.0

CORE RECOVERY/100m

DEPTH (m)	CORE LENGTH CORE RECOVERY		TOTAL
0.00 ~ 100.80	69.30 m	68.75 %	68.75 %
100.80 ~ 150.40	8.30 m	16.73 %	51.60 %

PENETRATION RATE

TOTAL DEPTH(m)/TOTAL DAYS	8.36	m/day
TOTAL DEPTH(m)/WORKING DAYS	8.36	m/day
TOTAL DEPTH(m)/DRILLING DAYS	11.14	m/day
TOTAL DEPTH(m)/ ACTUAL DRILLING DAYS	11.14	m/day
TOTAL DEPTH(m)/TOTAL WORKERS	1.22	m/man
ACTUAL DRILLING WORKERS/TOTAL	0.62	man/m

HELICOPTER FLYING TIME: 7.5 HOURS

REMARKS
A : TOTAL DEPTH
B : CASING SET DEPTH

Table II-2-5 Drilling Summary (3)

PERIOD OF DRILLING

ITEM	PERIOD			NO. OF DAYS	WORKING DAY	DAY OFF	NO. OF WORKER
RIG UP	16. 9.1994	~	17. 9.1994	2	2	0	19.0
DRILLING	18. 9.1994	~	29. 9.1994	12	12	0	116.5
TEAR DOWN	30. 9.1994	~	1. 10.1994	2	2	0	20.0
TOTAL	16. 9.1994	~	1. 10.1994	16	16	0	155.5

TOTAL DEPTH

PROPSED DEPTH	150.00 m	OVERBURDEN	0.00 m
EXCESS DEPTH	- m	CORE LENGTH	149.70 m
INSPECTED DEPTH	150.37 m	CORE REC.(%)	99.55 %

CORE RECOVERY/100m

DEPTH (m)	CORE LENGTH CORE RECOVERY		TOTAL
0.00 ~ 95.00	94.50 m	99.47 %	99.47 %
95.00 ~ 150.37	55.20 m	99.69 %	99.55 %

TIME ANALYSIS

DRILLING	55.0 h	40.4 %	32.0 %
TRIP	14.0 h	10.3 %	8.1 %
CORE RECOVERY	18.0 h	13.2 %	10.5 %
RUN CASING, ETC.	30.0 h	22.1 %	17.4 %
FISHING	19.0 h	14.0 %	11.0 %
OTHERS	0.0 h	0.0 %	0.0 %
SUB-TOTAL	136.0 h	100.0 %	79.1 %

PREPARATION

RIG UP	20.0 h		11.6 %
TEAR DOWN	16.0 h		9.3 %
TOTAL	172.0 h		100.0 %

PENETRATION RATE

TOTAL DEPTH(m)/TOTAL DAYS	9.40	m/day
TOTAL DEPTH(m)/WORKING DAYS	9.40	m/day
TOTAL DEPTH(m)/DRILLING DAYS	12.53	m/day
TOTAL DEPTH(m)/ ACTUAL DRILLING DAYS	12.53	m/day
TOTAL DEPTH(m)/TOTAL WORKERS	0.97	m/man
ACTUAL DRILLING WORKERS/TOTAL	0.77	man/m

CASING SET DEPTH AND SIZE	(m)	B/A×100 (%)	CASING RECOVERY (%)
BW	35.40	23.5	100.0

HELICOPTER FLYING TIME: 4.0 HOURS

REMARKS
A : TOTAL DEPTH
B : CASING SET DEPTH

Table II-2-5 Drilling Summary (4)

PERIOD OF DRILLING

ITEM	PERIOD	DETAILS NO. OF DAYS	WORKING DAY	DAY OFF	NO. OF WORKER
RIG UP	14. 9.1994 ～ 15. 9.1994	2	2	0	13.0
DRILLING	16. 9.1994 ～ 20. 9.1994	5	5	0	33.5
TEAR DOWN	21. 9.1994 ～ 22. 9.1994	2	2	0	13.5
TOTAL	14. 9.1994 ～ 22. 9.1994	9	9	0	60.0

TOTAL DEPTH

PROPOSED DEPTH	150.00 m	OVERBURDEN	0.00 m
EXCESS DEPTH	- m	CORE LENGTH	149.90 m
INSPECTED DEPTH	150.23 m	CORE REC. (%)	99.78 %

CORE RECOVERY/100m

DEPTH (m)	CORE LENGTH CORE RECOVERY		TOTAL
0.00 ～ 101.00	100.70 m	99.70 %	99.70 %
101.00 ～ 150.23	49.20 m	99.94 %	99.78 %

TIME ANALYSIS

DRILLING	39.0 h	63.9 %	41.1 %
TRIP	5.0 h	8.2 %	5.3 %
CORE RECOVERY	9.0 h	14.8 %	9.5 %
RUN CASING, ETC.	8.0 h	13.1 %	8.4 %
FISHING	0.0 h	0.0 %	0.0 %
OTHERS	0.0 h	0.0 %	0.0 %
SUB-TOTAL	61.0 h	100.0 %	64.2 %

PREPARATION

RIG UP	20.0 h		21.1 %
TEAR DOWN	14.0 h		14.7 %
TOTAL	95.0 h		100.0 %

PENETRATION RATE

TOTAL DEPTH(m)／TOTAL DAYS	16.69	m/day
TOTAL DEPTH(m)／WORKING DAYS	16.69	m/day
TOTAL DEPTH(m)／DRILLING DAYS	30.05	m/day
TOTAL DEPTH(m)／ACTUAL DRILLING DAYS	30.05	m/day
TOTAL DEPTH(m)／TOTAL WORKERS	2.50	m/man
ACTUAL DRILLING WORKERS／TOTAL	0.22	man/m

CASING

CASING SET DEPTH AND SIZE	(m)	B/A×100 (%)	CASING RECOVERY (%)
BW	50.30	33.5	100.0

HELICOPTER FLYING TIME: 7.0 HOURS

REMARKS
A : TOTAL DEPTH
B : CASING SET DEPTH

Table II-2-5 Drilling Summary (5)

PERIOD OF DRILLING

ITEM	PERIOD			NO. OF DAYS	WORKING DAY	DAY OFF	NO. OF WORKER
				DETAILS			
RIG UP	13. 8.1994	~	4. 9.1994	23	23	0	248
DRILLING	5. 9.1994	~	13. 9.1994	9	9	0	126
TEAR DOWN	14. 9.1994	~	15. 9.1994	2	2	0	19
TOTAL	13. 8.1994	~	15. 9.1994	34	34	0	393

TOTAL DEPTH

PROPOSED DEPTH	150.00 m	OVERBURDEN	0.00 m
EXCESS DEPTH	- m	CORE LENGTH	144.00 m
INSPECTED DEPTH	150.37 m	CORE REC.(%)	95.76 %

TIME ANALYSIS

DRILLING	84.0 h	71.8 %	33.6 %
TRIP	8.0 h	6.8 %	3.2 %
CORE RECOVERY	9.0 h	7.7 %	3.6 %
RUN CASING, ETC.	16.0 h	13.7 %	6.4 %
FISHING	0.0 h	0.0 %	0.0 %
OTHERS	0.0 h	0.0 %	0.0 %
SUB-TOTAL	117.0 h	100.0 %	46.8 %

PREPARATION

RIG UP	120.0 h		48.0 %
TEAR DOWN	13.0 h		5.2 %
TOTAL	250.0 h		100.0 %

CASING

CASING SET DEPTH AND SIZE	(m)	B/A×100 (%)	CASING RECOVERY (%)
BW	51.30	34.1	100.0

CORE RECOVERY/100m

DEPTH (m)	CORE LENGTH	CORE RECOVERY	TOTAL
0.00 ~ 92.10	86.30 m	93.70 %	93.70 %
92.10 ~ 150.37	58.27 m	100.00 %	96.14 %

PENETRATION RATE

TOTAL DEPTH(m)/TOTAL DAYS	4.42	m/day
TOTAL DEPTH(m)/WORKING DAYS	4.42	m/day
TOTAL DEPTH(m)/DRILLING DAYS	16.71	m/day
TOTAL DEPTH(m)/ ACTUAL DRILLING DAYS	16.71	m/day
TOTAL DEPTH(m)/TOTAL WORKERS	0.38	m/man
ACTUAL DRILLING WORKERS/TOTAL	0.84	man/m

HELICOPTER FLYING TIME: 2.5 HOURS

REMARKS
A : TOTAL DEPTH
B : CASING SET DEPTH

Table II-2-5 Drilling Summary (6)

PERIOD OF DRILLING

ITEM	PERIOD			NO. OF DAYS	WORKING DAY	DAY OFF	NO. OF WORKER
RIG UP	18. 10.1994	~	19. 10.1994	2	2	0	19.5
DRILLING	20. 10.1994	~	23. 10.1994	4	4	0	40.0
TEAR DOWN	24. 10.1994	~	2. 11.1994	10	10	0	74.0
TOTAL	18. 10.1994	~	2. 11.1994	16	16	0	133.5

TOTAL DEPTH

PROPOSED DEPTH	150.00 m	OVERBURDEN	0.00 m
EXCESS DEPTH	- m	CORE LENGTH	149.40 m
INSPECTED DEPTH	150.50 m	CORE REC.(%)	99.27 %

CORE RECOVERY/100m

DEPTH (m)	CORE LENGTH	CORE RECOVERY	TOTAL
0.00 ~ 101.00	100.70 m	99.70 %	99.70 %
101.00 ~ 150.50	48.70 m	98.38 %	99.27 %

TIME ANALYSIS

DRILLING	62.0 h	73.8 %	50.0 %
TRIP	5.0 h	6.0 %	4.0 %
CORE RECOVERY	13.0 h	15.5 %	10.5 %
RUN CASING, ETC.	4.0 h	4.8 %	3.2 %
FISHING	0.0 h	0.0 %	0.0 %
OTHERS	0.0 h	0.0 %	0.0 %
SUB-TOTAL	84.0 h	100.0 %	67.7 %

PREPARATION

RIG UP	20.0 h		16.1 %
TEAR DOWN	20.0 h		16.1 %
TOTAL	124.0 h		100.0 %

PENETRATION RATE

TOTAL DEPTH(m)/TOTAL DAYS	9.41	m/day
TOTAL DEPTH(m)/WORKING DAYS	9.41	m/day
TOTAL DEPTH(m)/DRILLING DAYS	11.15	m/day
TOTAL DEPTH(m)/ ACTUAL DRILLING DAYS	11.15	m/day
TOTAL DEPTH(m)/TOTAL WORKERS	1.13	m/man
ACTUAL DRILLING WORKERS/TOTAL	0.27	man/m

CASING SET DEPTH AND SIZE	(m)	B/A×100 (%)	CASING RECOVERY (%)
BW	18.00	12.0	100.0

HELICOPTER FLYING TIME: 7.0 HOURS

REMARKS
A : TOTAL DEPTH
B : CASING SET DEPTH

Table II-2-5 Drilling Summary (7)

PERIOD OF DRILLING

ITEM	PERIOD			DETAILS			
				NO. OF DAYS	WORKING DAY	DAY OFF	NO. OF WORKER
RIG UP	13. 10.1994	~	14. 10.1994	2	2	0	20
DRILLING	15. 10.1994	~	23. 10.1994	9	9	0	63
TEAR DOWN	24. 10.1994	~	25. 10.1994	2	2	0	15
TOTAL	13. 10.1994	~	25. 10.1994	13	13	0	98

TOTAL DEPTH

PROPOSED DEPTH	150.00 m	OVERBURDEN	0.00 m
EXCESS DEPTH	- m	CORE LENGTH	150.20 m
INSPECTED DEPTH	150.50 m	CORE REC.(%)	99.80 %

TIME ANALYSIS

DRILLING	57.0 h	57.6 %	41.0 %
TRIP	10.0 h	10.1 %	7.2 %
CORE RECOVERY	17.0 h	17.2 %	12.2 %
RUN CASING, ETC.	15.0 h	15.2 %	10.8 %
FISHING	0.0 h	0.0 %	0.0 %
OTHERS	0.0 h	0.0 %	0.0 %
SUB-TOTAL	99.0 h	100.0 %	71.2 %

PREPARATION

RIG UP	20.0 h		14.4 %
TEAR DOWN	20.0 h		14.4 %
TOTAL	139.0 h		100.0 %

CASING SET DEPTH AND SIZE	(m)	B/A×100 (%)	CASING RECOVERY (%)
BW	21.00	14.0	100.0

CORE RECOVERY/100m

DEPTH (m)	CORE LENGTH	CORE RECOVERY	TOTAL
0.00 ~ 89.00	88.70 m	99.66 %	99.66 %
89.00 ~ 150.50	61.50 m	100.00 %	99.80 %

PENETRATION RATE

TOTAL DEPTH(m)/TOTAL DAYS	11.58	m/day
TOTAL DEPTH(m)/WORKING DAYS	11.58	m/day
TOTAL DEPTH(m)/DRILLING DAYS	11.15	m/day
TOTAL DEPTH(m)/ ACTUAL DRILLING DAYS	11.15	m/day
TOTAL DEPTH(m)/TOTAL WORKERS	1.54	m/man
ACTUAL DRILLING WORKERS/TOTAL	0.42	man/m

HELICOPTER FLYING TIME: 5.0 HOURS

REMARKS
A : TOTAL DEPTH
B : CASING SET DEPTH

Table II-2-5 Drilling Summary (8)

PERIOD OF DRILLING

ITEM	PERIOD			DETAILS			
				NO. OF DAYS	WORKING DAY	DAY OFF	NO. OF WORKER
RIG UP	8. 10.1994	~	10. 10.1994	3	3	0	17.5
DRILLING	11. 10.1994	~	16. 10.1994	6	6	0	41.0
TEAR DOWN	17. 10.1994	~	18. 10.1994	2	2	0	13.5
TOTAL	8. 10.1994	~	18. 10.1994	11	11	0	72.0

TOTAL DEPTH

PROPOSED DEPTH	150.00 m	OVERBURDEN	0.00 m
EXCESS DEPTH	- m	CORE LENGTH	150.00 m
INSPECTED DEPTH	150.40 m	CORE REC. (%)	99.73 %

CORE RECOVERY/100m

DEPTH (m)	CORE LENGTH CORE RECOVERY		TOTAL
0.00 ~ 100.80	100.40 m	99.60 %	99.60 %
100.80 ~ 150.40	49.60 m	100.00 %	99.73 %

TIME ANALYSIS

DRILLING	41.0 h	62.1 %	35.3 %
TRIP	4.0 h	6.1 %	3.4 %
CORE RECOVERY	13.0 h	19.7 %	11.2 %
RUN CASING, ETC.	8.0 h	12.1 %	6.9 %
FISHING	0.0 h	0.0 %	0.0 %
OTHERS	0.0 h	0.0 %	0.0 %
SUB-TOTAL	66.0 h	100.0 %	56.9 %

PREPARATION

RIG UP	30.0 h		25.9 %
TEAR DOWN	20.0 h		17.2 %
TOTAL	116.0 h		100.0 %

PENETRATION RATE

TOTAL DEPTH(m)／TOTAL DAYS	13.67	m/day
TOTAL DEPTH(m)／WORKING DAYS	13.67	m/day
TOTAL DEPTH(m)／DRILLING DAYS	11.14	m/day
TOTAL DEPTH(m)／ ACTUAL DRILLING DAYS	11.14	m/day
TOTAL DEPTH(m)／TOTAL WORKERS	2.09	m/man
ACTUAL DRILLING WORKERS／TOTAL	0.27	man/m

CASING SET DEPTH AND SIZE	(m)	B/A×100 (%)	CASING RECOVERY (%)
BW	20.00	13.3	100.0

HELICOPTER FLYING TIME: 3.0 HOURS

REMARKS
A : TOTAL DEPTH
B : CASING SET DEPTH

Table II-2-6 Microscopic Observations of Polished Thin Sections of Drilling Cores

No.	Sample No.	Rock Name	Rock Code	Silica and silicate minerals													Carbonates				Oxides				Sulfides			Phosphates			Alteration minerals						
				Qtz	Pl	Ab	Kfs	Mel	Anl	Ol	Grt	Spn	Rbk	Bt	Phl	Ms	Cal	Dol	Sd	Bst	Mag	Hem	Prv	Pyro	Py	Mc	Po	Ap			Ep	Bt	Ser	Chl	Srp	Tlc	Goe
1	1T- 1	Beforsite	Mcb1				△								◎			◎			△				△								△				
2	1T- 3	Arenite	Nsh	◎			○							△		△																		△			
3	1T- 4	Syenite, carbonated	Msu				○									△	◎																	△			
4	1T- 5	Syenite, Ol bearing, carbonated	Msu				○					△	△				◎				△							△						△	◎	○	
5	2T- 1	Beforsite, Ank	Mcb1												△	△		◎			△				△			△									△
6	2T- 2	Beforsite, Ank	Mcb1												△			◎			△				△			○									△
7	3T- 1	Beforsite, sulfide rich	Mcb1					△	△			△			△			◎	◎		○				○								△	△			◎
8	3T- 2	Beforsite, sulfide rich	Mcb1								△				○	△	○	◎			△				△								△				◎
9	3T- 4	Beforsite, sulfide rich	Mcb1				△				△	△			△		○	◎				△		△	△												
10	3T- 5	Beforsite, sulfide rich	Mcb1								△	△				△		◎			△				△		△										△
11	4T- 1	Beforsite, Fe oxide-rich	Mcb1												◎			◎			◎				○			○									
12	4T- 2	Beforsite, Fe oxide-rich	Mcb1												○			◎	○						△												
13	4T- 3	Beforsite, sulfide rich	Mcb1												○	○		◎			△				○			△						△			
14	4T- 4	Beforsite, sulfide rich	Mcb1								△				◎		○	◎					△		△			○									
15	5T- 1	Beforsite, Ap-Phl rich	Mcb1												◎			△			△				△			◎						○			
16	5T- 2	Beforsite, sulfide rich	Mcb1															◎	△		△		△		○									△			
17	6T- 1	Beforsite, sulfide rich	Mcb2												△			◎			○			△	△		○										
18	6T- 2	Beforsite, Ap rich	Mcb2	△			△				○		○		△		◎	○						△	△		○	△						△			
19	6T- 3	Beforsite, Ap rich	Mcb2			△					△	△	△		○			◎										○									
20	6T- 4	Syenite, Bre. & carbonated	Msu			◎									◎		○	△							△									△			
21	7T- 2	Beforsite, Fe oxide rich	Mcb2	△							○							◎						△	△			○									
22	7T- 3	Beforsite, sulfide rich	Mcb2												◎				○						◎			○									
23	7T- 4	Beforsite, Ap rich	Mcb2												○			◎						△				○									
24	8T- 2	Beforsite, Phl-Rbk rich	Mcb2									△	◎		◎													△									
25	8T- 3	Beforsite, Ap rich	Mcb2	△							△	△	△					◎							△			△									
26	8T- 4	Beforsite, Ap rich	Mcb2	△														◎				△			△			○									
27	8T- 5	Syenite, Phl	Msu	△		◎									○		○								△									?			

◎:abundant ○:common △:rare

Abbreviation

Qtz:quartz Pl:plagioclase Ab:albite Kfs:potassium feldspar Mel:melilite Anl:analcime Ol:olivine Grt:garnet Spn:sphene Rbk:riebeckite Bt:biotite Phl:phlogopite Ms:muscovite

Cal:calcite Dol:dolomite Sd:siderite Bst:bastnaesite

Mag:Magnetite Hem:hematite Prv:pervskite Pyr:pyrochore

Py:pyrite Mc:marcasite Po:pyrrhotite

Ap:apatite

Ep:Epidote Ser:Sericite Chl:chlorite Srp:serpentine Tlc:talc Goe:goethite

The rock codes are same as in the appendices of B－1.

Table II-2-7 XRD Analyses of Drilling Cores

No.	Sample No.	Rock Name	Rock code	Silica and silicate minerals							Carbonates						Oxides		Sulfides			Phosphates			Alteration minerals				
				Qtz	Pl	Ab	Kfs	Rbk	Phl	Ms	Cal	Mcc	Dol	Ank	Sd	Mgs	Mag	Hem	Py	Mc	Po	Ap			Chl	Mnt	Atg	Tlc	Goe
1	1X- 1	Beforsite	Mcb						●		△		●												△				
2	1X- 2	Arkorse, Bre., cut by beforsite	Nsh			○			●		△		◎						△						◎				
3	1X- 3	Syenite, carbonated	Msu				●		○													○			○				
4	1X- 4	Syenite, carbonated	Msu				○			△	●			△								△			○				
5	2X- 1	Beforsite	Mcbl						●						△														△
6	2X- 2	Beforsite	Mcbl						●				●																
7	2X- 3	Beforsite	Mcbl						◎													△				◎			
8	2X- 4	Beforsite	Mcbl						●		△											△				○			
9	3X- 1	Beforsite	Mcbl											●															△
10	3X- 2	Beforsite, sulfide rich	Mcbl						○					●		●	○											△	
11	3X- 3	Beforsite, sulfide rich	Mcbl										●																△
12	4X- 1	Beforsite, Fe oxide rich	Mcbl						◎				●		○		○					△							
13	4X- 2	Beforsite, sulfide rich	Mcbl						◎				●						○			○				○			
14	5X- 1	Dolerite	Kdd		○					△	△														○				
15	5X- 2	Beforsite, Phl rich	Mcbl						●		○		◎		△		○										○		
16	6X- 1a	Beforsite, Phl rich	Mcb2				◎			○										△					○				
17	6X- 1b	Beforsite, Phl rich	Mcb2				○		●		△			○											△				
18	6X- 2	Beforsite, Ap rich	Mcb2	○		△			●					○								△				△			
19	7X- 1a	Beforsite, Ap rich	Mcb2						●													○				△			
20	7X- 1b	Beforsite, Ap rich	Mcb2			○	○		●		△		○									△				○			
21	7X- 2	Beforsite, Ap rich	Mcb2						○				●								△	○				△			
22	7X- 3	Beforsite, Ap rich	Mcb2			○	●	△	●		△											○				△			
23	8X- 1	Beforsite, Phl rich	Mcb2					△	●													○							
24	8X- 2	Beforsite, Ap rich	Mcb2					●	●																				

●:abundant ◎:common ○:poor △:detectable

Abbreviation

Qtz:quartz Pl:plagioclase Ab:albite Kfs:potassium feldspar Rbk:riebeckite Phl:phlogopite Ms:muscovite

Cal:calcite Mcc:manganese calcite Dol:dolomite Ank:ankerite Sd:siderite Mgs:magnesite

Mag:Magnetite Hem:hematite

Py:pyrite Mc:marcasite Po:pyrrhotite

Ap:apatite

Chl:chlorite Mnt:montmorillonite Atg:antigorite Tlc:talc Goe:goethite

The rock codes are same as in the appendices of B－1.

Table II-2-8 Chemical Compositions of Pyroclore Analysed by EPMA from Drilling Cores

Sample No.	3T-4				6T2-1				7T-2			
mineral	pyrochlore				Pyrochlore				pyrochlore			
Point No.	1-core	1-rim	2-core	2-rim	1-core	1-rim	2-core	2-rim	1-core	1-rim	2-core	2-rim
	Weight percentage				Weight percentage							
Si	0.000	0.045	0.002	0.008	0.049	0.037	0.025	0.032	0.316	0.217	0.017	0.064
Ti	0.315	0.526	0.233	0.399	1.015	0.945	1.308	0.964	0.848	0.839	0.863	1.066
Zr	0.011	0.000	0.121	0.000	0.000	0.000	0.006	0.000	0.000	0.011	0.007	0.020
Ta	0.002	0.000	0.000	0.015	0.023	0.000	0.000	0.000	0.045	0.004	0.018	0.000
Nb	51.645	51.479	50.673	51.895	50.218	49.381	49.408	48.183	49.929	49.621	48.979	49.263
Ce	0.474	0.839	0.535	0.551	0.398	0.414	0.409	0.395	0.306	0.267	0.393	0.328
Nd	0.110	0.151	0.123	0.094	0.060	0.091	0.053	0.041	0.033	0.057	0.092	0.070
Ca	10.428	10.645	10.056	10.449	10.209	10.456	10.622	10.457	9.966	10.133	10.041	10.076
Sr	0.932	0.850	1.276	0.831	1.909	1.954	1.772	1.937	2.355	2.639	2.970	2.771
Na	5.965	5.978	5.893	6.108	5.706	5.630	5.650	5.336	5.706	5.592	5.703	5.723
F	7.850	7.098	7.770	7.795	7.593	7.949	7.825	7.725	7.465	7.995	7.798	7.959
O(calc.)	25.652	26.231	25.155	25.897	25.650	25.162	25.490	24.631	25.741	25.337	25.023	25.237
Total	103.384	103.842	101.837	104.042	102.830	102.019	102.568	99.701	102.710	102.712	101.904	102.577
	Atom numbers(Si+Ti+Zr+Ta+Nb=2.000)											
Si	0.000	0.006	0.000	0.001	0.006	0.005	0.003	0.004	0.040	0.028	0.002	0.008
Ti	0.023	0.039	0.018	0.029	0.075	0.071	0.098	0.075	0.063	0.063	0.066	0.080
Zr	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Ta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Nb	1.976	1.956	1.977	1.969	1.918	1.924	1.899	1.921	1.897	1.909	1.931	1.911
B site	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Ce	0.012	0.021	0.014	0.014	0.010	0.011	0.010	0.010	0.008	0.007	0.010	0.008
Nd	0.003	0.004	0.003	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.002	0.002
Ca	0.925	0.937	0.910	0.919	0.904	0.944	0.946	0.967	0.878	0.904	0.918	0.906
Sr	0.038	0.034	0.053	0.033	0.077	0.081	0.072	0.082	0.095	0.108	0.124	0.114
Na	0.922	0.918	0.929	0.937	0.881	0.886	0.878	0.860	0.876	0.870	0.909	0.897
A site	1.900	1.914	1.909	1.905	1.874	1.924	1.908	1.920	1.857	1.889	1.963	1.927
F	1.469	1.319	1.483	1.447	1.418	1.514	1.471	1.506	1.387	1.504	1.504	1.510
O(calc.)	5.700	5.786	5.700	5.707	5.689	5.692	5.689	5.703	5.679	5.661	5.729	5.684

Composition of pyrochlore, assuming A2B2O6F as the formula.
The rock codes are same as in the appendices of B－1.

Table II-2-9 Oxygen and Carbon Isotopic Compositions of Carbonatites from Drilling Cores

Sp.No.	Rock Name	Rock Code	δ^{13}CPDB (‰)		δ^{18}OSMOW (‰)	
			Calcite	Dolomite	Calcite	Dolomite
1R-1	Beforsite	Mcb1	-4.6	-4.7	8.0	8.5
3R-1	Beforsite, sulfide rich	Mcb1	-4.6	-4.5	8.5	8.5
3R-3	Beforsite, sulfide rich	Mcb1	-4.0	-4.0	8.5	8.5
3R-5	Beforsite, sulfide rich	Mcb1	-4.0	-4.0	8.2	8.2
4R-1	Beforsite, sulfide rich	Mcb1	-3.7	-3.7	8.8	8.8
6R-1	Beforsite, apatite rich	Mcb2	-4.9	-4.9	8.3	8.3
7R-1	Beforsite, apatite rich	Mcb2	-4.7	-4.8	8.2	8.2
8R-1	Beforsite, apatite rich	Mcb2	-4.7	-4.7	8.2	8.4

The rock codes are same as in the Appendices of B-1.

Table II-2-10 Results of Geochemical Analyses of Drilling Cores

Rock code	Nos.	La ppm	Ce ppm	Nd ppm	Sm ppm	Eu ppm	Tb ppm	Yb ppm	Lu ppm	Sc ppm	Y ppm	U ppm	Th ppm	Nb ppm	Ta ppm	Zr ppm	Mn ppm	Sr ppm	P ppm	Fe %	TR2O3 ppm
Maximum contents																					
Mcb1	129	10930	10023	1556	270.1	39.7	7.4	2.7	0.4	14.8	41	60	216	7391	113	848	16630	17174	25660	18.81	27662
Mcb2	90	926	1302	852	160.9	36.4	10.3	10.5	1.1	26.5	185	53	330	52200	5	273	15122	14024	45520	9.03	4259
Msu	15	995	1882	692	185.1	46.9	15.8	10.5	1.2	5.9	190	175	87	4065	98	643	5572	13214	77380	11.84	4953
Nsh	8	4105	4485	1222	271.8	80.3	37.3	36.5	4.3	22.4	710	42	657	1617	87	303	10974	6270	67040	10.62	12428
Minimum contents																					
Mcb1	129	23	35	17	2.0	0.6	0.4	0.4 <	0.1 <	0.5	4 <	1 <	1	3 <	2 <	3	1488	788	100	2.34	127
Mcb2	90	5	12	6	2.0 <	0.5	0.6	0.5 <	0.1 <	0.5	6 <	1 <	1	18 <	2 <	3	1005	401	100	1.21	50
Msu	15	102	206	74	14.7	4.0	1.5	1.6	0.2 <	0.5	26 <	1	5	164 <	2 <	3	456	411	5064	2.25	522
Nsh	8	34	54	18	4.6	2.0	0.7	0.9 <	0.1	0.7	13 <	1 <	1	73 <	2 <	3	191	260	779	2.89	154
Arithetic average																					
Mcb1	129	257	360	95	15.1	3.00	1.14	0.77	0.12	5.92	10.2	5.89	24.5	1111	8.07	20.4	6971	6329	2602	4.86	912
Mcb2	90	165	289	132	31.6	8.04	3.15	1.92	0.23	4.22	34.8	2.66	16.6	2068	2.11	14.0	6295	6241	12221	3.63	822
Msu	15	504	884	318	70.4	17.94	6.79	5.75	0.72	2.13	98.9	59.87	41.4	815	40.67	225.5	2541	3925	29930	6.28	2327
Nsh	8	991	1291	447	81.7	21.76	9.39	12.51	1.64	9.36	184.9	18.75	149.4	494	22.75	95.9	5236	3599	20172	6.77	3650
Geometric average																					
Mcb1	129	130.4	223.7	66.0	10.6	2.22	1.01	0.69	0.11	5.54	9.0	3.57	14.0	387.8	4.26	6.6	6670	5893	423	4.49	556
Mcb2	90	130.9	219.3	93.8	22.6	5.69	2.39	1.51	0.19	2.63	26.8	1.55	5.9	732.0	2.07	4.5	5864	5509	6101	3.35	631
Msu	15	416.7	749.2	275.6	58.2	14.99	5.83	5.20	0.65	1.53	88.6	32.69	31.4	560.4	30.61	124.4	1964	3131	21589	5.27	1988
Nsh	8	334.2	517.6	184.3	35.0	10.24	4.29	5.50	0.71	6.07	75.1	11.22	36.2	277.4	11.36	46.9	2587	2490	9941	6.08	1436

Beforsite (Mcb) is subdivided into the Central beforsite (Mcb1) and the Northeast beforsite (Mcb2). Other rock codes are same as in the appendices of B-1.

Part III Conclusions and Recommendations

Part III Conclusions and Recommendations

Chapter 1 Conclusions

The Marinkas Quelle Carbonatite Complex (MQC) intrudes the Namaqua Metamorphic Complex and the Nama Sequence of Cambrian age. MQC is located along the Kuboos–Bremen tectonic line, which trends NE–SW direction, and is also found at the intersection of the this tectonic line and post–Karoo faults.

Carbonatites are divided by the intrusive forms into diatremes, cone sheets, plutonic plugs and ring dykes. The carbonatite of the Orange area is a manifest as a plutonic plug form. The exposure of the complex is about 2 km^2.

On the other hand, carbonatites are divided by erosion level into volcanic cones, volcanic necks, shallow plutonic, and deep plutonic types. The volcanic cone is regarded to be the original form of the carbonatite being least affected by erosion. The deep plutonic shape reflects strong or prolonged exposure to erosion, through which the core of the carbonatite is visible on the surface. The carbonatite of the Orange area is considered to be the shallow plutonic type. The top of the carbonatite may have eroded out.

The carbonatite complex is composed of syenites, sovite, two beforsites and carbonatite dykes, which intruded in this order. The geochemical survey indicated concentrations of REEs and Nb in the later stage intrusives i.e. the two beforsites and the carbonatite dyke. The MQC, especially the northeast beforsite (Mcb1), is enriched in apatite and pyrochlore. This mineralogy corresponds to the geochemical concentrations of P and Nb. The beforsite is rich in Nb and P compared with that of the Kalkfeld area.

The main minerals of the two beforsites are dolomite and ankerite. Subordinate minerals are quartz, albite, potassium feldspar, melilite, analcime, olivine, garnet, sphene, riebeckite, phlogopite, muscovite, calcite, siderite, manganocalcite, magnesite, strontianite, apatite, barite, magnetite, hematite, pyrite, marcasite, pyrrhotite, sphalerite, galena, bastnaesite, monazite, synchysite and pyrochlore. The latter four minerals contains La, Ce, Nd and Nb.

REEs, Nb and P have a tendency to be concentrated in the central beforsite, the northeast beforsite, and in the carbonatite dyke which emplaced in the later stage of carbonatite complex activity.

REEs, Nb, Mn, Sr and P are concentrated more in the two beforsites than in other rock facies. REEs are concentrated in the outer zone of the two beforsites and reduced in the inner zone. On the other hand, Nb is concentrated in the inner zone of the two beforsites. The distribution of Nb is in distinct contrast with that of REEs. P is concentrated in the outer zone of the central beforsite, and in the northeast beforsite and its vicinity, but not concentrated in the inner zone of the central beforsite.

REEs, Nb, Mn, Sr, and P are concentrated in the sovite. Concentration of all of these contents except Sr are lower than those of the two beforsites. These elements are less concentrated in the syenites than in the two beforsites and the sovite.

These elements are most concentrated in the two beforsites. The concentration zones of those elements are changeable on the surface, and not successive to underground. At drilling sites MJNO-1 and 2, which are situated in the outer zone of the central beforsite, the section has zone of high concentration of REEs and P at both shallow and deep sites, but these zones are not continuous.

At drilling sites of MJNO-3, 4 and 5, which are situated in the inner zone of the central beforsite, the sections have zones of high concentration of Nb at both shallow and deep sites, but the contents are not variable.

At the drilling sites, MJNO-6, 7 and 8, which are situated in the inner zone of the northeast beforsite, the sections have zones of high concentration of P and Nb at both shallow and deep sites, and the contents are not variable. There is no tendency for concentration to increase with depth. The results of the drilling survey shows no indication of distinct increase or decrease in REEs, Nb and P with depth.

The two beforsites contain rare-earth oxides with maximum values of from 2.7 to 3.2%, average contents of from 0.12 to 0.16 % at the surface, and with maximum values of from 0.4 to 2.7 %, average contents of less than 0.1 % underground. Total average contents are 0.11 to 0.15 %.

The two beforsites contain Nb with maximum values of from 0.5 to 0.6 %, average contents of from 0.08 to 0.12 % at the surface, and with maximum values of from 0.7 to 5.2 %, average contents of from 0.1 to 0.2 % underground. Total average contents are 0.09 to 0.15 %.

The northeast beforsite contains P with maximum values of 3.4 %, average contents of 0.8 % at the surface, and with maximum values of from 4.5%, average contents of from 1.2 % underground. Total average content is 1.00 %.

The MQC is composed of syenites, sovite, beforsite and carbonatite dyke, which intrude in this order. The Th / Yb versus Y / Yb diagram indicates that Th is the lowest in the sovite followed, in order of content by the two beforsites and the carbonatite dyke. Th is concentrated in the liquid phase. Y has a similar chemical behavior to Yb of the heavy REEs and is concentrated in the solid phase. Th concentration corresponds to the intrusion order.

Chapter 2 Recommendations for the Future

This project is the first fundamental and systematic attempt to study to carbonatites by geochemical and drilling surveys in Namibia. This survey revealed the outline of the distribution of such valuable elements as lanthanides.

Based on the survey results of the Orange area, recommendations for the future are summarized as follows.

The Orange area is underlain by carbonatite complexes which contain REEs, Nb, and P as valuable elements. In particular, the beforsite of the carbonatite complex, which consists of dolomitic carbonatite, concentrates these elements. Therefore, the beforsite has a significance for exploration.

The central and northeast beforistes in the Orange area contain 0.12 % and 0.15 % of rare-earth oxides, 0.09 % and 0.15 % of Nb, respectively. The northeast beforsite contains 1.00 % of P.

On the other hand, current carbonatite mines, such as Baiyun Obo, China, and Mountain Pass, USA, have rare-earth oxides of 5 to 13 % (Kamitani, 1988). Compared with these, the MQC and the OC have relatively low contents of rare-earth oxides.

The Ondurakorume carbonatite, contains 0.28 % of total rare-earth oxides, 0.24 % of Nb_2O_5, and 7 % of P_2O_5 (Verwoerd, 1967). This carbonatite is manifest as a plutonic plug and has an intermediate exposed area. The erosion level is intermediate, since erosion indicates a shallow plutonic body. The MQC in the Orange area has an intermediate exposed area, which is a characteristic of mid-level erosion of a shallow plutonic plug. The underground concentration of the REEs is similar to the Kalkfeld carbonatite, based on the above-mentioned formation form and the drilling survey, and shows no indication of sufficient enrichment in REEs elements at depth.

Therefore, further exploration in the Orange area should be done, following an increase in economic demand for these elements, to evaluate the ore reserves by more a detailed drilling survey.

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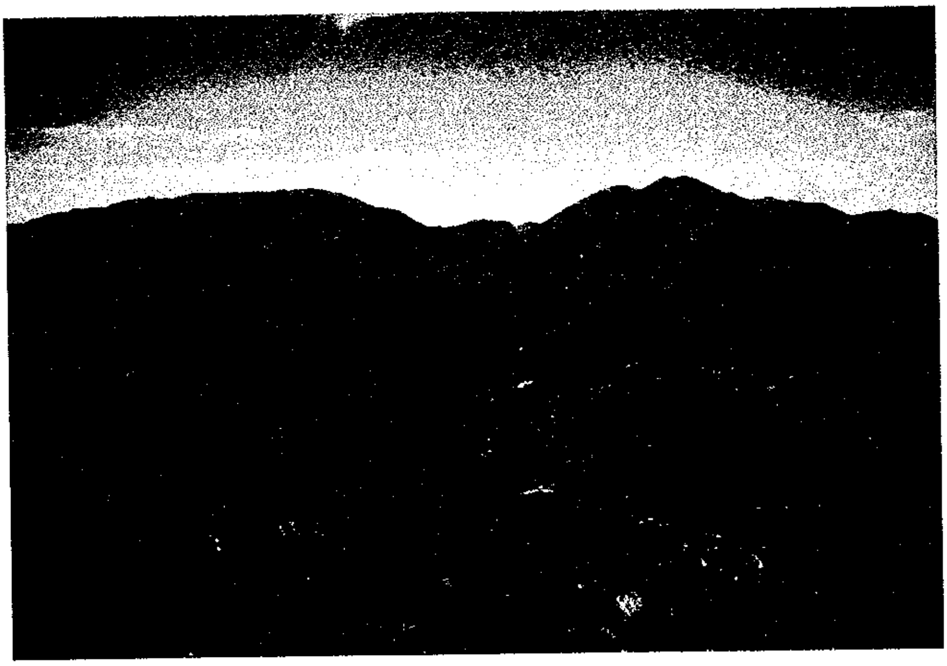
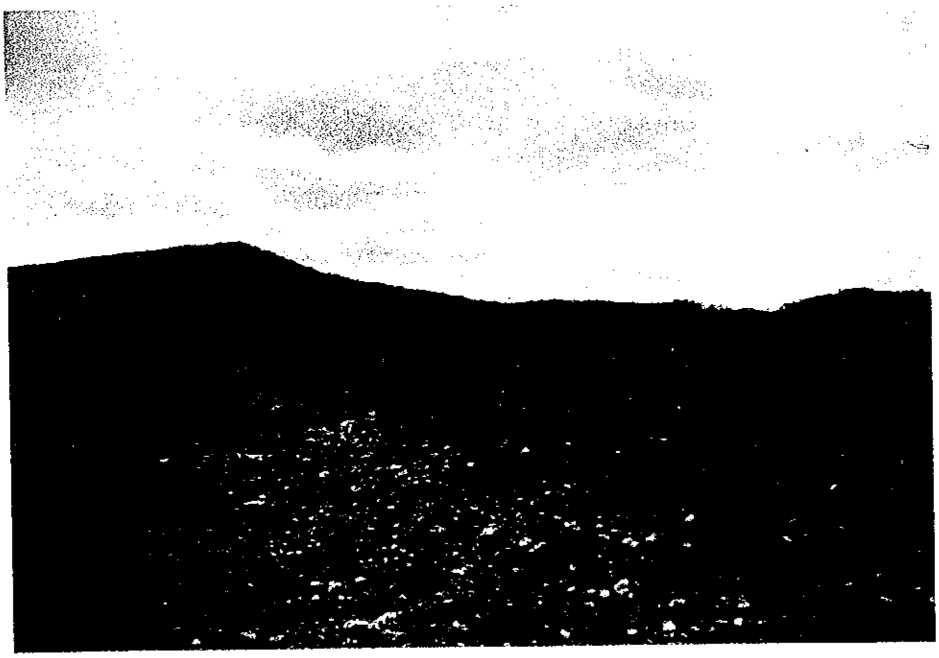
Appendices

A-1 Photographs of Survey Area

A-1 Photographs of the Survey Area



Overlooking of the Orange Area



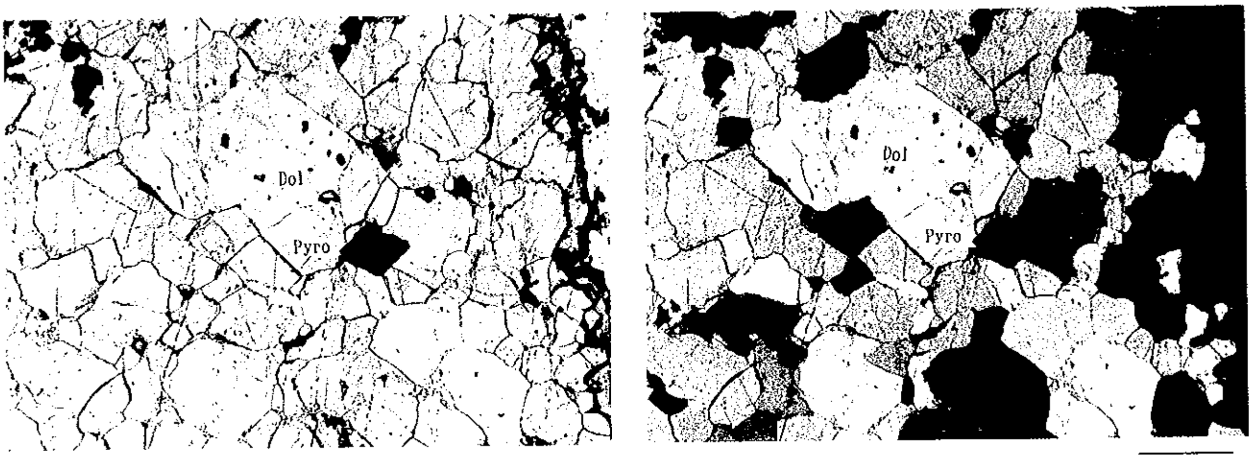
Overlooking of the Kalkfeld Area

A-1 Photograps of Survey Area

A–2 Photomicrographs

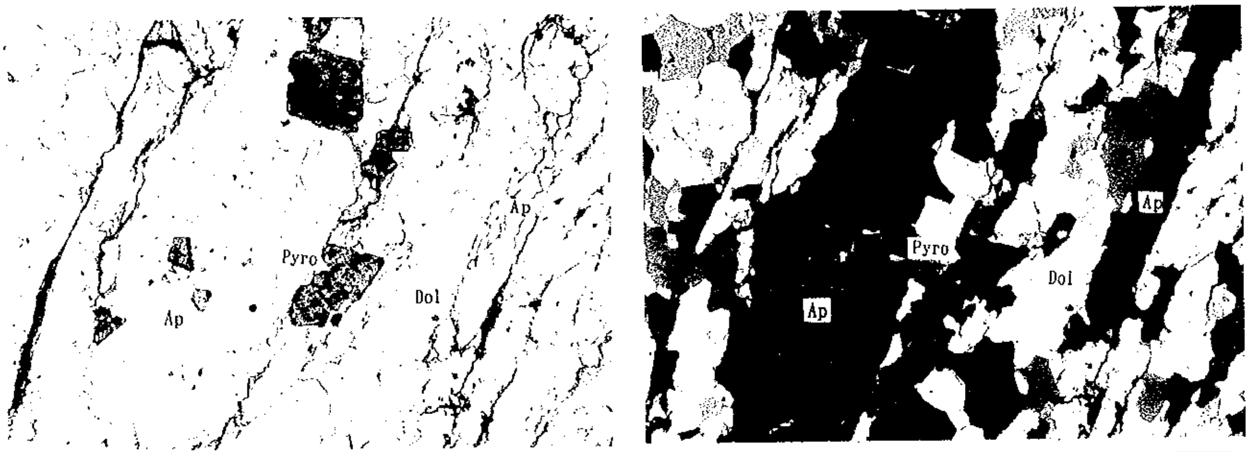
Abbreviation

Minerals
Qtz: quartz
Pl: plagioclase
Kfs: orthoclase
Spn: sphene
Agt: aegirine
Cpx: clinopyroxene
Bt: biotite
Phl: phlogopite
Rbk: riebeckite
Cal: calcite
Dol: dolomite
Ap: apatite
Pyro: pyrochlore
Po: pyrrhotite



Open nicol 0.7mm Cross nicol 0.7mm

Sample No. Da415
Formation Central beforsite body of the Marinkas Quelle Carbomatite Complex
Rock name pyroclore bearing beforsite
Locality The Orange Area



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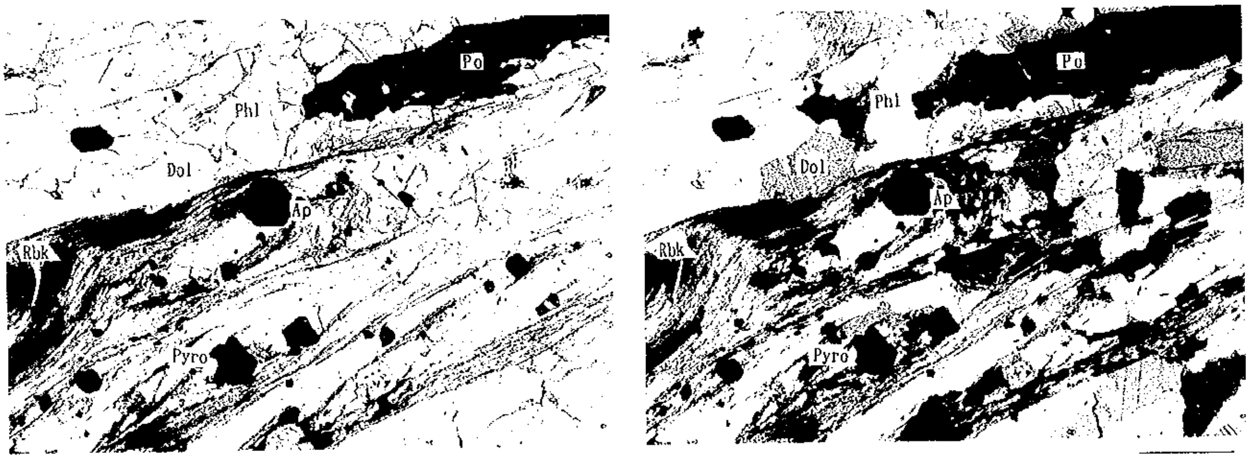
Sample No. Lc415
Formation Northeast beforsite body of the Marinkas Quelle Carbonatite Complex
Rock name pyroclore bearing beforsite
Locality The Orange Area

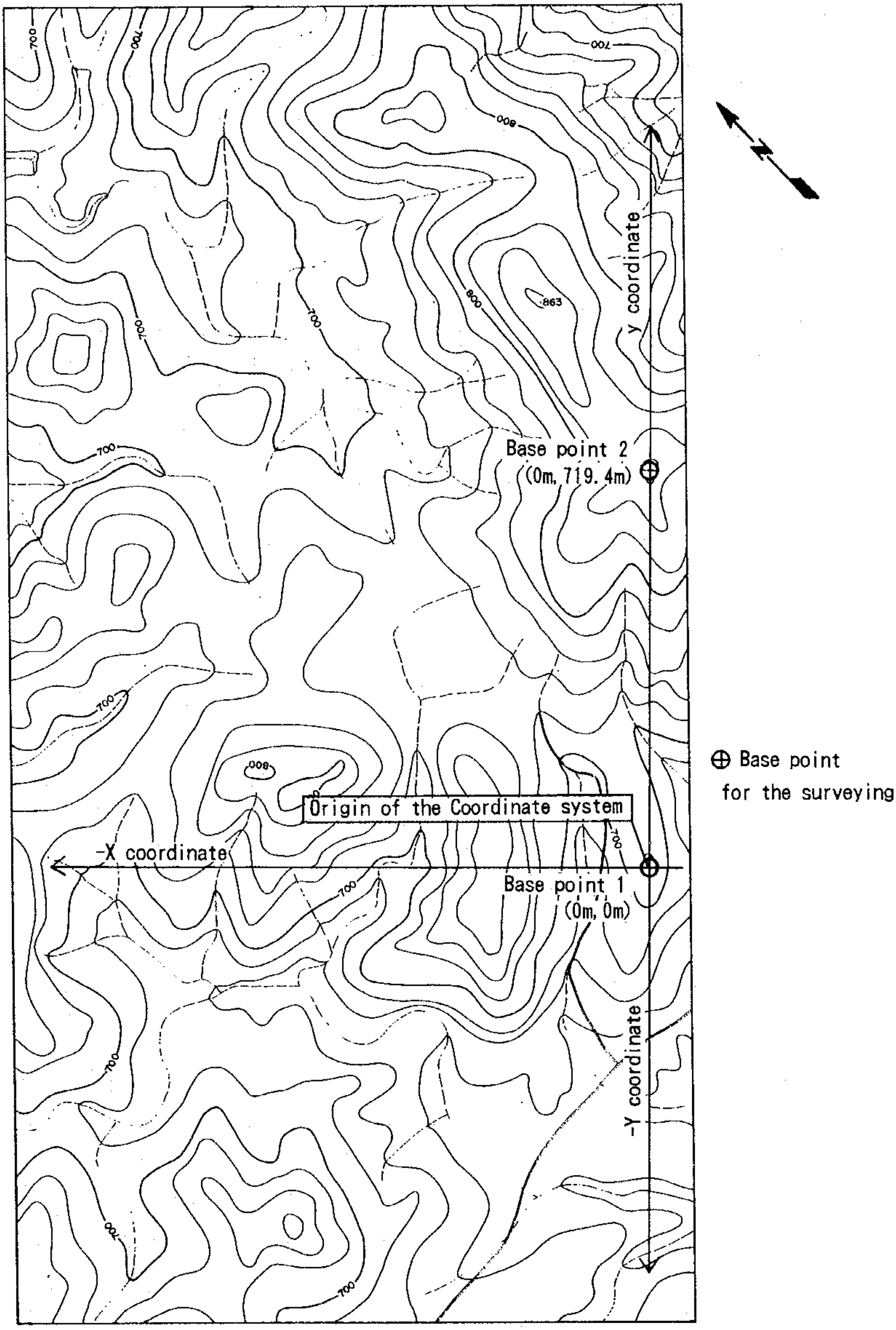


Open nicol 0.7mm Cross nicol 0.7mm

Sample No. GT-2 (MJNO-2 117.0m)
Formation Northeast beforsite body of the Marinkas Quelle Carbonatite Complex
Rock name pyroclore bearing beforsite
Locality The Orange Area

A-2 Photomicrographs

B–1 Index Map and List of Samples from the Orange Area



B-1 Index Map of Base Point for Geochemical Survey

Abbreviation in the list

Minerals

Qtz: quartz
Fd: feldspar
Ne: nepheline
Hbl: Hornbende
Agt: aegirine
Aug: augite
Px: pyroxene group mineral
Phl: phlogopite
Bt: biotite
Cal: calcite / calcitic
Dol: dolomite / dolomitic
Ank: ankerite / ankeritic
Ap: apatite
Mag: magnetite
Hem: hematite
Gln: galena

Structure

Bre.: Brecciated / breccia

Rock code

Ktd: trachyte dyke (Post- to Syn- Karoo sequence)
Kdd: dolerite dyke (Post- to Syn- Karoo sequence)
Mgr: granophyre and micro granite (MQC)
Mcd: carbonatite dyke (MQC)
Mfn: massive fenite (MQC)
Mcb: beforsite (MQC)
Mcb1: Central beforsite (MQC)
Mcb2: Northeast beforsite (MQC)
Msu: syenite (undifferentiated) (MQC)
Msr: reddish porphyritic nepheline syenite (MQC)
Msm: micro nepheline syenite sill (MQC)
Mcs: sovite (MQC)
Msp: porphyritic nepheline syenite (REE bearing) (MQC)
Msw: grey-white porphyritic syenite (MQC)
Nsh: shale, quartzite, and grit (Nama group)
Ngn: quartz-feldspar gneiss (Namaqua metamorphic complex)

B-1 List of Samples from the Orange Area (1)

No.	Sample	X	Y	Depth	Rock Name	Rock	Analytical methods									
	No.	m	m	m		Code	Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
	Surface															
1	A 100	-1162.5	-750.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
2	A 300	-900.0	-750.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
3	A 500	-600.0	-750.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
4	A 700	-300.0	-750.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
5	A 900	0.0	-750.0	-	Gneiss, Qtz-Fd	Ngn	93	○		○			○			
6	B 200	-1050.0	-600.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
7	B 400	-750.0	-600.0	-	Beforsite, Ank	Mcd	93	○					○			
8	B 500	-600.0	-600.0	-	Beforsite vein, Hbl?	Mcd	93	○								
9	B 600	-450.0	-625.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
10	B 700	-309.0	-600.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
11	B 800	-152.0	-600.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
12	Ba310	-850.0	-525.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
13	Ba320	-800.0	-525.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
14	Ba400	-750.0	-525.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
15	Ba410	-700.0	-525.0	-	Syenite-albitite?	Mfn	93	○								
16	Ba420	-650.0	-525.0	-	Syenite-albitite?	Mfn	93	○								
17	Ba500	-600.0	-525.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
18	Ba510	-560.0	-525.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
19	Ba520	-510.0	-525.0	-	Sovite, Hbl	Mcs	93	○								
20	Ba600	-450.0	-525.0	-	Sovite	Mcs	93	○								
21	Ba610	-400.0	-525.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
22	Ba620	-350.0	-525.0	-	Sovite, Hbl-Agt	Mcs	93	○								
23	Bb400	-749.5	-487.5	-	Beforsite	Mcbl	94	○	○							
24	Bb410	-699.7	-487.5	-	Syenite, fenitised	Msu	94	○								
25	Bb420	-650.0	-487.5	-	Beforsite	Mcbl	94	○								
26	Bb500	-598.5	-487.5	-	Beforsite	Mcbl	94	○	○							
27	Bb510	-562.0	-487.5	-	Beforsite	Mcbl	94	○								
28	Bb515	-537.3	-487.5	-	Beforsite, Ank	Mcbl	94	○	○							
29	Bb520	-512.6	-487.5	-	Beforsite	Mcbl	94	○								
30	Bb525	-487.6	-487.5	-	Beforsite, Ank	Mcbl	94	○								
31	Bb600	-462.6	-487.5	-	Beforsite, Ank	Mcbl	94	○	○							
32	Bb605	-437.6	-487.5	-	Syenite	Msu	94	○								
33	C 100	-1162.5	-450.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
34	C 300	-900.0	-450.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
35	C 310	-850.0	-450.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
36	C 320	-800.0	-450.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
37	C 325	-775.0	-450.0	-	Beforsite, Ank	Mcbl	94	○								
38	C 400	-750.0	-450.0	-	Beforsite	Mcbl	93	○								
39	C 405	-725.0	-450.0	-	Beforsite, Ank	Mcbl	94	○								
40	C 410	-700.0	-450.0	-	Beforsite	Mcbl	93	○								
41	C 415	-675.0	-450.0	-	Syenite	Msu	94	○								
42	C 420	-650.0	-450.0	-	Dolerite	Kdd	94	○	○							
43	C 425	-625.0	-450.0	-	Beforsite	Mcbl	94	○								
44	C 500	-600.0	-450.0	-	Syenite, porphyritic	Mfn	93	○								
45	C 505	-575.0	-450.0	-	Beforsite	Mcbl	94	○								
46	C 510	-550.0	-450.0	-	Beforsite, Phl	Mcbl	93	○								
47	C 515	-525.0	-450.0	-	Beforsite	Mcbl	94	○								
48	C 520	-500.0	-450.0	-	Beforsite	Mcbl	93	○								
49	C 525	-475.0	-450.0	-	Beforsite	Mcbl	94	○								
50	C 600	-450.0	-450.0	-	Sovite, Hbl-Agt	Mcs	93	○								
51	C 605	-425.0	-450.0	-	Sovite, Px-Phl	Mcs	94	○								
52	C 610	-400.0	-450.0	-	Sovite, Hbl-Agt	Mcs	93	○								
53	C 620	-350.0	-450.0	-	Sovite, Hbl-Agt	Mcs	93	○								
54	C 700	-300.0	-450.0	-	Sovite, Hbl-Agt	Mcs	93	○								
55	C 800	-150.0	-450.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
56	C 900	0.0	-450.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
57	Ca300	-900.0	-375.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
58	Ca310	-850.0	-375.0	-	Beforsite	Mcbl	93	○								
59	Ca315	-825.0	-375.0	-	Beforsite, Hbl-Agt-Phl-Ank	Mcbl	94	○								
60	Ca320	-800.0	-375.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
61	Ca325	-775.0	-375.0	-	Beforsite, Hbl-Agt-Phl-Ank	Mcbl	94	○								
62	Ca400	-750.0	-375.0	-	Syenite, porphyritic, banded	Mfn	93	○		○			○			
63	Ca405	-725.0	-375.0	-	Beforsite, Hbl-Phl	Mcbl	94	○								
64	Ca410	-700.0	-375.0	-	Beforsite, Phl-Agt-Hbl-Dol, vei	Mcbl	93	○		○			○			
65	Ca415	-675.0	-375.0	-	Beforsite	Mcbl	94	○								
66	Ca420	-650.0	-375.0	-	Beforsite	Mcbl	93	○								
67	Ca425	-625.0	-375.0	-	Beforsite	Mcbl	94	○								
68	Ca500	-600.0	-375.0	-	Beforsite	Mcbl	93	○					○			
69	Ca505	-576.6	-376.0	-	Beforsite	Mcbl	94	○								
70	Ca510	-550.0	-376.0	-	Beforsite	Mcbl	93	○								
71	Ca515	-526.6	-375.0	-	Beforsite	Mcbl	94	○								
72	Ca520	-499.7	-376.5	-	Beforsite	Mcbl	93	○								
73	Ca525	-476.4	-375.0	-	Beforsite	Mcbl	94	○								
74	Ca600	-448.0	-375.0	-	Beforsite	Mcbl	93	○								
75	Ca605	-400.0	-375.0	-	Beforsite	Mcbl	94	○								
76	Ca620	-350.0	-375.0	-	Syenite, porphyritic	Msu	93	○		○			○			
77	Ca700	-300.0	-375.0	-	Syenite - albitite ?	Msu	93	○								
78	Ca710	-250.0	-375.0	-	Sovite, Agt-Phl-Hbl	Mcs	93	○								

B-1 List of Samples from the Orange Area (2)

No.	Sample No.	X m	Y m	Depth m	Rock Name	Rock Code	Analytical methods								
							Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
79	Ca720	-210.0	-375.0	-	Sovite, Agt-Phl-Hbl	Mcs	93	○								
80	Cb310	-850.0	-337.5	-	Beforsite	Mcbl	94	○								
81	Cb315	-825.0	-337.5	-	Beforsite, Phl-Px	Mcbl	94	○	○							
82	Cb325	-775.0	-337.5	-	Beforsite, Ank	Mcbl	94	○								
83	Cb400	-747.0	-335.5	-	Fenite, Agt-Phl	Mfn	94	○								
84	Cb405	-725.0	-337.5	-	Beforsite, Phl-Px	Mcbl	94	○								
85	Cb410	-698.0	-337.5	-	Beforsite	Mcbl	94	○								
86	Cb415	-678.0	-337.5	-	Beforsite	Mcbl	94	○	○							
87	Cb420	-650.0	-337.5	-	Beforsite	Mcbl	94	○								
88	Cb425	-625.0	-332.5	-	Beforsite	Mcbl	94	○								
89	Cb500	-600.0	-337.5	-	Beforsite	Mcbl	94	○	○							
90	Cb510	-550.0	-337.5	-	Beforsite	Mcbl	94	○								
91	Cb515	-525.0	-337.5	-	Beforsite, Phl-Agt	Mcbl	94	○	○							
92	Cb520	-500.0	-337.5	-	Beforsite	Mcbl	94	○								
93	Cb525	-475.0	-337.5	-	Beforsite	Mcbl	94	○								
94	Cb600	-450.0	-342.5	-	Beforsite	Mcbl	94	○	○							
95	Cb605	-425.0	-337.5	-	Beforsite, Ank	Mcbl	94	○								
96	Cb610	-400.0	-337.5	-	Beforsite	Mcbl	94	○								
97	Cb615	-375.0	-337.5	-	Beforsite, Ank	Mcbl	94	○	○							
98	Cb620	-350.0	-337.5	-	Syenite, Agt-Hbl,fenitised	Msu	94	○								
99	Cc310	-850.0	-412.5	-	Gneiss, Qtz-Fd, fenitised	Ngn	94	○								
100	Cc315	-825.0	-412.5	-	Beforsite, Px-Hbl	Mcbl	94	○	○							
101	Cc320	-800.0	-413.5	-	Beforsite	Mcbl	94	○								
102	Cc325	-775.0	-412.5	-	Beforsite, Ank	Mcbl	94	○								
103	Cc400	-746.0	-412.5	-	Beforsite	Mcbl	94	○	○							
104	Cc405	-725.0	-412.5	-	Beforsite, Hbl-Agt-Phl	Mcbl	94	○								
105	Cc410	-700.0	-412.5	-	Fenite	Mfn	94	○								
106	Cc415	-675.0	-412.5	-	Beforsite	Mcbl	94	○	○							
107	Cc420	-650.0	-412.5	-	Beforsite, Ap	Mcbl	94	○								
108	Cc425	-627.0	-415.5	-	Beforsite, Phl	Mcbl	94	○								
109	Cc500	-601.0	-409.5	-	Beforsite	Mcbl	94	○	○							
110	Cc505	-575.0	-412.5	-	Beforsite, Agt-Phl	Mcbl	94	○								
111	Cc510	-550.0	-412.5	-	Beforsite	Mcbl	94	○			○		○			
112	Cc515	-525.0	-412.5	-	Beforsite	Mcbl	94	○	○							
113	Cc520	-500.0	-412.5	-	Beforsite	Mcbl	94	○								
114	Cc525	-475.0	-412.5	-	Syenite, Agt-phl	Msu	94	○								
115	Cc600	-448.0	-394.5	-	Beforsite	Mcbl	94	○	○							
116	Cc605	-425.0	-412.5	-	Beforsite, Ank	Mcbl	94	○								
117	Cc610	-400.0	-412.5	-	Beforsite	Mcbl	94	○								
118	D 100	-1162.5	-300.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
119	D 200	-1067.7	-300.0	-	Beforsite vein, Phl-Agt-Hbl	Mcd	93	○		○			○			
120	D 220	-950.0	-300.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
121	D 300	-909.0	-300.0	-	Syenite - albitite	Msu	93	○								
122	D 305	-875.0	-300.0	-	Beforsite	Mcbl	94	○								
123	D 310	-850.0	-300.0	-	Beforsite	Mcd	93	○					○			
124	D 400	-747.0	-300.0	-	Beforsite	Mcbl	93	○								
125	D 405	-725.0	-300.0	-	Beforsite	Mcbl	94	○								
126	D 410	-700.0	-300.0	-	Beforsite	Mcbl	93	○								
127	D 415	-675.0	-300.0	-	Beforsite	Mcbl	94	○								
128	D 420	-650.0	-300.0	-	Beforsite	Mcbl	93	○								
129	D 500	-600.0	-300.0	-	Beforsite	Mcbl	93	○								
130	D 505	-525.0	-300.0	-	Beforsite	Mcbl	94	○								
131	D 510	-550.0	-300.0	-	Beforsite	Mcbl	93	○								
132	D 515	-525.0	-300.0	-	Beforsite, Ank	Mcbl	94	○								
133	D 520	-500.0	-300.0	-	Beforsite	Mcbl	93	○								
134	D 525	-475.0	-300.0	-	Beforsite, Ank	Mcbl	94	○								
135	D 600	-450.0	-300.0	-	Beforsite	Mcbl	93	○								
136	D 605	-425.0	-300.0	-	Beforsite, Ank	Mcbl	94	○								
137	D 610	-400.0	-300.0	-	Beforsite	Mcbl	93	○								
138	D 615	-375.0	-300.0	-	Beforsite, Ank	Mcbl	94	○								
139	D 620	-350.0	-300.0	-	Beforsite	Mcbl	93	○								
140	D 700	-300.0	-300.0	-	Beforsite	Mcbl	93	○								
141	D 705	-275.0	-300.0	-	Beforsite, Ank	Mcbl	94	○								
142	D 710	-250.0	-300.0	-	Sovite, Phl-Hbl,banded	Mcs	93	○								
143	D 720	-200.0	-300.0	-	Sovite, Px-Hbl	Mcs	93	○								
144	D 800	-150.0	-300.0	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○								
145	Da220	-950.0	-225.0	-	Syenite - albitite	Msu	93	○								
146	Da300	-900.0	-225.0	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○	○	○			○			
147	Da305	-878.0	-225.0	-	Fenite, Agt	Mfn	94	○								
148	Da310	-850.0	-225.0	-	Syenite, bre.	Msu	93	○								
149	Da320	-800.0	-205.0	-	Beforsite, banded	Mcbl	93	○	○	○			○			
150	Da400	-750.0	-225.0	-	Beforsite, Agt	Mcbl	93	○								
151	Da405	-724.9	-225.0	-	Beforsite	Mcbl	94	○								
152	Da410	-702.1	-227.2	-	Beforsite	Mcbl	93	○								
153	Da415	-675.0	-227.0	-	Beforsite, Ap	Mcbl	94	○			○		○	○	○	
154	Da420	-649.5	-226.7	-	Beforsite	Mcbl	93	○								
155	Da425	-625.0	-230.0	-	Beforsite	Mcbl	94	○								
156	Da500	-600.0	-225.0	-	Beforsite	Mcbl	93	○				○				
157	Da505	-575.0	-225.0	-	Beforsite, Ank	Mcbl	94	○								

B-1 List of Samples from the Orange Area (3)

No.	Sample No.	X m	Y m	Depth m	Rock Name	Rock Code	Analytical methods									
							Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
158	Da510	-550.0	-225.0	-	Beforsite	Mcbl	93	○				○				
159	Da515	-525.0	-225.0	-	Beforsite, Ank	Mcbl	94	○								
160	Da520	-500.0	-225.0	-	Beforsite	Mcbl	93	○				○	○			
161	Da525	-475.0	-225.0	-	Beforsite, Ank	Mcbl	94	○								
162	Da600	-450.0	-225.0	-	Beforsite	Mcbl	93	○								
163	Da610	-423.0	-225.0	-	Beforsite	Mcbl	93	○								
164	Da700	-300.0	-225.0	-	Beforsite	Mcbl	93	○								
165	Da705	-275.0	-225.0	-	Beforsite, Ank	Mcbl	94	○								
166	Da710	-250.0	-225.0	-	Beforsite	Mcbl	93	○				○				
167	Da715	-225.0	-225.0	-	Beforsite, Ank	Mcbl	94	○								
168	Da720	-200.0	-225.0	-	Syenite, bre.	Mfn	93	○								
169	Da800	-150.0	-225.0	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○								
170	Da810	-100.0	-225.0	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○		○			○			
171	Db305	-872.0	-187.6	-	Syenite, Agt-Hbl	Msu	94	○								
172	Db310	-850.1	-187.6	-	Syenite, Agt-Hbl	Msu	94	○								
173	Db315	-825.1	-187.6	-	Fenite	Mfn	94	○								
174	Db320	-800.1	-187.6	-	Beforsite	Mcbl	94	○								
175	Db325	-774.0	-187.6	-	Beforsite	Mcbl	94	○								
176	Db400	-750.1	-184.6	-	Beforsite	Mcbl	94	○	○							
177	Db405	-726.8	-187.6	-	Beforsite	Mcbl	94	○								
178	Db410	-699.4	-187.6	-	Beforsite	Mcbl	94	○								
179	Db415	-674.4	-188.6	-	Beforsite	Mcbl	94	○	○							
180	Db420	-648.9	-187.6	-	Beforsite, Ap	Mcbl	94	○								
181	Db425	-624.9	-187.5	-	Beforsite	Mcbl	94	○								
182	Db505	-574.9	-187.5	-	Beforsite	Mcbl	94	○			○		○			
183	Db510	-550.0	-185.7	-	Beforsite	Mcbl	94	○								
184	Db515	-524.0	-185.7	-	Beforsite	Mcbl	94	○	○		○		○			
185	Db520	-497.9	-185.7	-	Beforsite, Ap	Mcbl	94	○								
186	Db600	-456.8	-185.7	-	Beforsite	Mcbl	94	○	○							
187	Db610	-422.0	-185.7	-	Beforsite	Mcbl	94	○								
188	Db620	-350.8	-187.5	-	Beforsite	Mcbl	94	○								
189	Db700	-300.0	-187.5	-	Beforsite	Mcbl	94	○	○							
190	Db705	-275.0	-187.5	-	Beforsite, Ank	Mcbl	94	○								
191	Db710	-250.0	-187.5	-	Beforsite	Mcbl	94	○								
192	Db715	-225.0	-187.5	-	Beforsite, Ank	Mcbl	94	○	○							
193	Db720	-200.0	-187.5	-	Fenite	Mfn	94	○								
194	Dc320	-799.4	-262.5	-	Fenite, Agt-Phl	Mfn	94	○	○							
195	Dc405	-724.4	-262.5	-	Beforsite	Mcbl	94	○	○							
196	Dc410	-699.8	-262.5	-	Beforsite	Mcbl	94	○								
197	Dc415	-674.3	-262.5	-	Beforsite	Mcbl	94	○	○							
198	Dc420	-649.6	-262.5	-	Beforsite	Mcbl	94	○								
199	Dc425	-624.9	-262.5	-	Beforsite	Mcbl	94	○								
200	Dc500	-600.0	-262.5	-	Beforsite	Mcbl	94	○	○							
201	Dc505	-575.0	-262.5	-	Beforsite	Mcbl	94	○								
202	Dc510	-550.0	-262.5	-	Beforsite	Mcbl	94	○								
203	Dc515	-525.0	-262.5	-	Beforsite, Ank	Mcbl	94	○	○							
204	Dc520	-500.0	-262.5	-	Beforsite	Mcbl	94	○								
205	Dc525	-475.0	-262.5	-	Beforsite, Ank	Mcbl	94	○								
206	Dc600	-450.0	-262.5	-	Granophyre	Mgr	94	○	○							
207	Dc605	-425.0	-262.5	-	Beforsite, Ank	Mcbl	94	○								
208	Dc610	-395.0	-262.5	-	Beforsite	Mcbl	94	○								
209	Dc615	-375.0	-262.5	-	Beforsite, Ank	Mcbl	94	○	○							
210	Dc620	-350.0	-262.5	-	Beforsite	Mcbl	94	○								
211	Dc625	-325.0	-262.5	-	Beforsite, Ank	Mcbl	94	○								
212	Dc700	-300.0	-262.5	-	Beforsite	Mcbl	94	○	○							
213	Dc705	-275.0	-262.5	-	Beforsite, Ank	Mcbl	94	○								
214	Dc710	-249.0	-262.5	-	Beforsite	Mcbl	94	○								
215	Dc715	-225.0	-262.5	-	Sovite, Px-Phl	Mcs	94	○								
216	E 100	-1162.5	-147.8	-	Gneiss, Qtz-Fd	Ngn	93	○								
217	E 220	-950.0	-147.8	-	Syenite, banded	Msu	93	○								
218	E 300	-900.0	-147.8	-	Beforsite, Ank	Mcbl	93,94	○								
219	E 305	-876.1	-147.8	-	Syenite	Msu	94	○								
220	E 310	-850.0	-147.8	-	Syenite, banded	Msu	93	○		○			○			
221	E 315	-825.5	-147.8	-	Fenite	Mfn	94	○								
222	E 320	-800.0	-147.8	-	Beforsite, Phl-Hbl	Mcbl	93	○								
223	E 325	-774.3	-147.8	-	Beforsite	Mcbl	94	○								
224	E 400	-750.0	-147.8	-	Beforsite	Mcbl	93	○								
225	E 405	-725.6	-147.8	-	Beforsite	Mcbl	94	○								
226	E 410	-700.0	-147.3	-	Beforsite	Mcbl	93	○								
227	E 415	-676.5	-147.8	-	Beforsite, Ap	Mcbl	94	○								
228	E 420	-650.0	-147.8	-	Beforsite	Mcbl	93	○								
229	E 425	-624.7	-148.8	-	Beforsite	Mcbl	94	○								
230	E 500	-600.0	-147.8	-	Beforsite	Mcbl	93	○		○		○	○			
231	E 505	-574.7	-147.8	-	Beforsite	Mcbl	94	○								
232	E 510	-549.7	-147.8	-	Beforsite	Mcd	94	○			○		○		○	
233	E 515	-525.0	-147.8	-	Beforsite	Mcbl	94	○								
234	E 520	-500.0	-147.8	-	Beforsite	Mcbl	93	○								
235	E 600	-450.0	-147.8	-	Beforsite	Mcbl	93	○								
236	E 610	-400.0	-147.8	-	Beforsite	Mcbl	93	○								

B-1 List of Samples from the Orange Area (4)

No.	Sample No.	X m	Y m	Depth m	Rock Name	Rock Code	Analytical methods									
							Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
237	E 620	-350.0	-147.8	-	Beforsite	Mcbl	93	○								
238	E 700	-300.0	-147.8	-	Beforsite	Mcbl	93	○								
239	E 705	-275.0	-147.8	-	Beforsite	Mcbl	94	○								
240	E 710	-250.0	-147.8	-	Beforsite	Mcbl	93	○								
241	E 715	-225.0	-147.8	-	Beforsite, Ank	Mcbl	94	○								
242	E 720	-196.0	-138.8	-	Beforsite	Mcbl	93	○								
243	E 800	-133.0	-147.8	-	Syenite, brc.	Msu	93	○								
244	E 810	-100.0	-147.8	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○								
245	E 900	0.0	-147.8	-	Gneiss, Qtz-Fd	Ngn	93	○								
246	Ea420A	-654.4	-74.7	-	White mineral vein in beforsite	Vein	94						○			
247	Ea510A	-550.7	-77.7	-	Beforsite, Ca bearing	Mcd	93					○				
248	Ea220	-950.0	-74.7	-	Syenite	Msu	93	○		○		○	○			
249	Ea300	-898.6	-74.7	-	Beforsite, Agt agregation	Mcbl	93	○	○	○			○			
250	Ea305	-873.5	-74.7	-	Beforsite	Mcbl	94	○								
251	Ea310	-855.2	-73.2	-	Beforsite, Fd bearing	Mcd	93	○								
252	Ea313	-830.1	-74.7	-	Syenite, Agt-Hbl	Msu	94	○								
253	Ea317	-815.1	-74.7	-	Beforsite	Mcbl	94	○								
254	Ea320	-808.4	-73.3	-	Sovite, Ap	Msu	93	○	○	○			○			
255	Ea325	-775.3	-74.7	-	Beforsite	Mcbl	94	○								
256	Ea400	-744.9	-74.3	-	Beforsite	Mcbl	93	○								
257	Ea405	-727.2	-74.7	-	Beforsite	Mcbl	94	○								
258	Ea410	-706.1	-74.7	-	Beforsite	Mcbl	93	○	○	○		○	○			
259	Ea415	-676.4	-74.7	-	Beforsite	Mcbl	94	○								
260	Ea420	-654.4	-74.7	-	Beforsite	Mcbl	93	○								
261	Ea425	-627.6	-74.7	-	Beforsite	Mcbl	94	○								
262	Ea500	-597.5	-74.7	-	Beforsite	Mcbl	93	○								
263	Ea505	-572.1	-74.7	-	Beforsite	Mcbl	94	○								
264	Ea510	-547.7	-74.7	-	Beforsite with Dol mega-crystal	Mcbl	93	○				○				
265	Ea515	-521.1	-74.7	-	Beforsite	Mcbl	94	○								
266	Ea520	-497.7	-74.7	-	Beforsite	Mcbl	93	○								
267	Ea525	-477.3	-74.7	-	Beforsite	Mcbl	94	○								
268	Ea600	-446.0	-74.7	-	Beforsite	Mcbl	93	○	○	○			○			
269	Ea605	-428.0	-74.7	-	Beforsite	Mcbl	94	○								
270	Ea610	-392.6	-74.7	-	Beforsite with Dol mega-crystal	Mcbl	93	○					○			
271	Ea620	-341.6	-74.7	-	Beforsite	Mcbl	93	○								
272	Ea700	-298.0	-70.2	-	Beforsite	Mcbl	93	○								
273	Ea705	-273.0	-70.2	-	Beforsite, Ank	Mcbl	94	○								
274	Ea710	-248.0	-70.2	-	Beforsite	Mcbl	93	○	○	○			○			
275	Ea715	-222.6	-70.2	-	Beforsite, Ank	Mcbl	94	○								
276	Ea720	-197.2	-70.2	-	Beforsite	Mcbl	93	○								
277	Ea800	-154.4	-70.2	-	Sovite	Mcs	93	○		○			○			
278	Ea810	-100.0	-70.2	-	Syenite, leuco-	Msu	93	○								
279	Eb300	-904.8	-33.7	-	Syenite, Agt, fenitized	Msu	94	○								
280	Eb305	-880.1	-33.7	-	Beforsite	Mcbl	94	○								
281	Eb310	-855.2	-33.7	-	Beforsite	Mcbl	94	○								
282	Eb315	-830.2	-33.7	-	Beforsite, Gn bearing	Mcbl	94	○	○							○
283	Eb320	-803.6	-34.7	-	Syenite, Agt, fenitized	Msu	94	○								
284	Eb325	-779.6	-33.7	-	Beforsite, Agt segregate	Mcbl	94	○								
285	Eb400	-754.7	-33.7	-	Beforsite	Mcbl	94	○	○							
286	Eb405	-729.9	-33.7	-	Beforsite	Mcbl	94	○								
287	Eb410	-705.2	-33.7	-	Beforsite	Mcbl	94	○								
288	Eb415	-680.1	-33.7	-	Beforsite	Mcbl	94	○	○							
289	Eb420	-655.1	-33.7	-	Beforsite	Mcbl	94	○								
290	Eb425	-629.7	-33.7	-	Beforsite	Mcbl	94	○								
291	Eb500	-604.5	-33.7	-	Beforsite	Mcbl	94	○	○							
292	Eb505	-579.5	-33.7	-	Beforsite	Mcbl	94	○								
293	Eb510	-554.5	-33.7	-	Beforsite	Mcbl	94	○								
294	Eb515	-529.4	-33.7	-	Beforsite, Agt?	Mcbl	94	○	○							
295	Eb520	-504.3	-33.7	-	Beforsite, Agt?	Mcbl	94	○								
296	Eb523	-516.8	-33.7	-	Beforsite	Mcbl	94								○	
297	Eb525	-479.3	-33.7	-	Beforsite	Mcbl	94	○								
298	Eb600	-454.4	-33.7	-	Beforsite	Mcbl	94	○								
299	Eb605	-429.5	-33.7	-	Beforsite	Mcbl	94	○								
300	Eb610	-404.9	-33.7	-	Beforsite	Mcbl	94	○	○							
301	Eb620	-354.7	-33.7	-	Beforsite	Mcbl	94	○								
302	Eb700	-298.0	-33.7	-	Beforsite	Mcbl	94	○	○							
303	Eb705	-272.8	-32.2	-	Beforsite, Ank	Mcbl	94	○								
304	Eb710	-247.5	-32.2	-	Beforsite	Mcbl	94	○								
305	Eb715	-222.4	-32.2	-	Beforsite, Ank	Mcbl	94	○	○							
306	Eb720	-197.2	-32.2	-	Beforsite	Mcbl	94	○								
307	Ec300	-899.6	-109.8	-	Beforsite	Mcbl	94	○	○							
308	Ec305	-876.1	-113.8	-	Syenite, cut by Ank vein	Msu	94	○								
309	Ec310	-849.9	-113.8	-	Syenite	Msu	94	○	○							
310	Ec315	-824.7	-113.8	-	Fenite, carbonatised	Mfn	94	○								
311	Ec320	-798.8	-109.8	-	Beforsite, Agt-Phl	Mcbl	94	○								
312	Ec325	-774.9	-110.8	-	Beforsite	Mcbl	94	○								
313	Ec400	-750.3	-112.8	-	Beforsite	Mcbl	94	○	○							
314	Ec405	-724.9	-112.8	-	Beforsite	Mcbl	94	○								
315	Ec410	-699.6	-112.8	-	Beforsite	Mcbl	94	○								

B-1 List of Samples from the Orange Area (5)

No.	Sample	X	Y	Depth	Rock Name	Rock	Analytical methods									
	No.	m	m	m		Code	Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
316	Ec415	-675.6	-112.3	-	Beforsite, Agt	Mcbl	94	○	○							
317	Ec420	-649.7	-112.8	-	Beforsite	Mcbl	94	○								
318	Ec425	-624.5	-112.8	-	Beforsite	Mcbl	94	○								
319	Ec500	-601.0	-112.8	-	Beforsite	Mcbl	94	○	○							
320	Ec505	-570.9	-112.8	-	Beforsite	Mcbl	94	○								
321	Ec510	-549.4	-112.8	-	Beforsite	Mcbl	94	○								
322	Ec515	-524.6	-112.8	-	Beforsite	Mcbl	94	○								
323	Ec520	-500.0	-120.8	-	Beforsite	Mcbl	94	○								
324	Ec525	-474.3	-115.0	-	Beforsite	Mcbl	94	○								
325	Ec600	-448.8	-115.0	-	Beforsite, Agt	Mcbl	94	○	○							
326	Ec605	-423.0	-115.0	-	Beforsite	Mcbl	94	○								
327	Ec610	-397.8	-115.0	-	Beforsite	Mcbl	94	○								
328	Ec620	-350.4	-115.0	-	Beforsite	Mcbl	94	○	○							
329	Ec700	-321.9	-115.0	-	Beforsite	Mcbl	94	○	○							
330	Ec705	-272.5	-108.7	-	Beforsite	Mcbl	94	○								
331	Ec710	-247.5	-102.3	-	Beforsite	Mcbl	94	○								
332	Ec715	-225.1	-102.3	-	Beforsite, Ank	Mcbl	94	○	○							
333	Ec720	-202.7	-102.3	-	Beforsite	Mcbl	94	○								
334	F 200	-1050.0	0.0	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○								
335	F 300	-900.0	0.0	-	Syenite, porphyritic	Msu	93	○								
336	F 310	-850.0	0.0	-	Beforsite, Hbl	Mcbl	93	○								
337	F 320	-800.0	0.0	-	Beforsite with Mag layers	Mcbl	93	○								
338	F 400	-750.0	0.0	-	Beforsite	Mcbl	93	○								
339	F 410	-700.0	0.0	-	Beforsite	Mcbl	93	○								
340	F 415	-674.8	0.0	-	Beforsite	Mcbl	94	○								
341	F 420	-650.0	0.0	-	Beforsite	Mcbl	93	○								
342	F 425	-624.3	0.0	-	Beforsite	Mcbl	94	○								
343	F 500	-600.0	0.0	-	Beforsite	Mcbl	93	○								
344	F 505	-574.5	0.0	-	Beforsite	Mcbl	94	○								
345	F 510	-550.0	0.0	-	Beforsite	Mcbl	93	○								
346	F 515	-526.6	0.0	-	Beforsite	Mcbl	94	○								
347	F 520	-500.0	0.0	-	Beforsite	Mcbl	93	○				○				
348	F 525	-474.9	0.0	-	Beforsite	Mcbl	94	○								
349	F 600	-450.0	0.0	-	Beforsite	Mcbl	93	○								
350	F 605	-425.0	0.0	-	Beforsite	Mcbl	94	○								
351	F 610	-400.0	0.0	-	Beforsite	Mcbl	93	○								
352	F 615	-374.6	0.0	-	Beforsite	Mcbl	94	○								
353	F 620	-354.4	0.0	-	Beforsite	Mcbl	93	○				○				
354	F 625	-324.9	0.0	-	Beforsite	Mcbl	94	○								
355	F 700	-305.2	-4.4	-	Beforsite	Mcbl	93	○	○	○		○	○			
356	F 705	-280.3	-4.4	-	Beforsite	Mcbl	94	○								
357	F 710	-250.0	0.0	-	Beforsite	Mcbl	93	○		○			○			
358	F 715	-228.7	0.0	-	Beforsite, Ap	Mcbl	94	○								
359	F 720	-200.0	0.0	-	Beforsite, Phl	Mcbl	93	○								
360	F 800	-150.0	0.0	-	Syenite, Ne with Cal matrix	Msu	93	○								
361	F 810	-100.0	0.0	-	Syenite, Ne with Cal matrix	Msu	93	○	○	○			○			
362	F 900	0.0	0.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
363	Fa310	-842.5	70.0	-	Beforsite	Mcbl	93	○								
364	Fa320	-792.5	70.0	-	Beforsite	Mcbl	93	○								
365	Fa400	-750.0	70.0	-	Beforsite, Bt	Mcbl	93	○								
366	Fa410	-700.0	70.0	-	Beforsite	Mcbl	93	○								
367	Fa415	-675.0	70.0	-	Beforsite	Mcbl	94	○								
368	Fa420	-650.0	70.0	-	Beforsite	Mcbl	93	○								
369	Fa425	-625.2	68.0	-	Beforsite	Mcbl	94	○								
370	Fa500	-600.0	70.0	-	Beforsite	Mcbl	93	○								
371	Fa505	-576.6	70.0	-	Beforsite	Mcbl	94	○								
372	Fa510	-548.6	67.4	-	Beforsite	Mcbl	93	○								
373	Fa515	-526.6	70.0	-	Beforsite	Mcbl	94	○								
374	Fa520	-500.0	70.0	-	Beforsite	Mcbl	93	○								
375	Fa525	-480.7	73.6	-	Beforsite	Mcbl	94	○								
376	Fa600	-450.0	70.0	-	Beforsite	Mcbl	93	○					○			
377	Fa605	-429.2	70.6	-	Beforsite	Mcbl	94	○								
378	Fa610	-400.0	70.0	-	Beforsite	Mcbl	93	○								
379	Fa615	-379.7	70.6	-	Beforsite	Mcbl	94	○								
380	Fa620	-360.1	64.2	-	Beforsite	Mcbl	93	○								
381	Fa625	-330.2	64.6	-	Beforsite	Mcbl	94	○								
382	Fa700	-308.1	66.1	-	Beforsite	Mcbl	93	○								
383	Fa705	-280.2	64.6	-	Beforsite	Mcbl	94	○								
384	Fa710	-259.5	62.6	-	Beforsite	Mcbl	93	○								
385	Fa715	-230.2	64.6	-	Beforsite	Mcbl	94	○								
386	Fa720	-204.2	61.1	-	Beforsite	Mcbl	93	○								
387	Fa800	-150.0	70.0	-	Syenite, Ne with Cal matrix	Msu	93	○								
388	Fa810	-100.0	70.0	-	Syenite, Ne with Cal matrix	Msu	93	○								
389	Fb320	-784.7	98.6	-	Beforsite	Mcbl	94	○								
390	Fb400	-759.7	98.6	-	Beforsite	Mcbl	94	○	○							
391	Fb410	-709.7	98.6	-	Beforsite	Mcbl	94	○								
392	Fb415	-684.7	98.6	-	Beforsite	Mcbl	94	○	○							
393	Fb420	-659.7	98.6	-	Beforsite	Mcbl	94	○								
394	Fb425	-634.7	98.6	-	Beforsite	Mcbl	94	○								

B-1 List of Samples from the Orange Area (6)

No.	Sample No.	X m	Y m	Depth m	Rock Name	Rock Code	Analytical methods Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
395	Fb500	-609.7	98.6	-	Beforsite	Mcbl	94	○	○							
396	Fb505	-584.7	98.6	-	Beforsite	Mcbl	94	○								
397	Fb510	-559.7	98.6	-	Beforsite	Mcbl	94	○								
398	Fb515	-534.7	98.6	-	Beforsite	Mcbl	94	○	○							
399	Fb520	-509.7	98.6	-	Beforsite	Mcbl		○								
400	Fb525	-484.7	98.6	-	Beforsite	Mcbl	94	○								
401	Fb600	-459.7	98.6	-	Beforsite	Mcbl	94	○	○							
402	Fb605	-435.1	98.6	-	Beforsite	Mcbl	94	○								
403	Fb610	-413.7	98.6	-	Beforsite	Mcbl	94	○								
404	Fb615	-386.7	98.6	-	Beforsite	Mcbl	94	○	○							
405	Fb620	-361.5	98.6	-	Beforsite	Mcbl	94	○								
406	Fb625	-336.9	98.6	-	Beforsite	Mcbl	94	○								
407	Fb700	-312.0	98.6	-	Beforsite	Mcbl	94	○	○							
408	Fb705	-284.2	98.6	-	Beforsite	Mcbl	94	○								
409	Fb710	-258.7	98.6	-	Beforsite	Mcbl	94	○								
410	Fb715	-233.1	98.6	-	Beforsite	Mcbl	94	○	○							
411	Fb720	-208.2	98.6	-	Fenite, Agt-Phl	Mfn	94	○								
412	Fc310	-851.9	33.1	-	Beforsite	Mcbl	94	○								
413	Fc320	-802.0	33.1	-	Beforsite	Mcbl	94	○								
414	Fc400	-751.4	33.1	-	Beforsite	Mcbl	94	○	○							
415	Fc410	-704.2	33.1	-	Beforsite	Mcbl	94	○								
416	Fc415	-677.5	34.1	-	Beforsite	Mcbl	94	○	○							
417	Fc420	-653.5	33.1	-	Beforsite	Mcbl	94	○								
418	Fc425	-628.4	30.1	-	Beforsite	Mcbl	94	○								
419	Fc500	-604.2	33.1	-	Beforsite	Mcbl	94	○	○							
420	Fc505	-578.9	31.1	-	Beforsite	Mcbl	94	○								
421	Fc510	-554.3	33.1	-	Beforsite	Mcbl	94	○								
422	Fc515	-529.3	33.1	-	Beforsite	Mcbl	94	○	○							
423	Fc520	-504.5	33.1	-	Beforsite	Mcbl	94	○								
424	Fc525	-479.5	33.1	-	Beforsite	Mcbl	94	○								
425	Fc600	-454.3	33.1	-	Beforsite	Mcbl	94	○	○							
426	Fc605	-429.2	33.1	-	Beforsite	Mcbl	94	○								
427	Fc610	-404.2	33.1	-	Beforsite	Mcbl	94	○								
428	Fc615	-379.3	33.1	-	Beforsite	Mcbl	94	○	○							
429	Fc620	-354.4	33.1	-	Beforsite	Mcbl	94	○								
430	Fc625	-330.0	33.1	-	Beforsite	Mcbl	94	○								
431	Fc700	-305.2	33.1	-	Beforsite	Mcbl	94	○								
432	Fc705	-274.4	37.9	-	Beforsite	Mcbl	94	○								
433	Fc710	-249.8	37.9	-	Beforsite	Mcbl	94	○							○	
434	Fc715	-225.0	37.9	-	Beforsite	Mcbl	94	○	○							
435	Fc720	-200.0	37.9	-	Beforsite	Mcbl	94	○								
436	G 200	-1060.0	122.1	-	Fenite (no quartz)	Ngn	93	○								
437	G 300	-910.0	122.1	-	Syenite, Ne with Cal matrix	Msu	93	○								
438	G 310	-860.0	122.1	-	Syenite, Ne	Msu	93	○								
439	G 320	-810.0	122.1	-	Syenite(1), beforsite vein(2)	Msu	93	○								
440	G 400	-760.0	122.1	-	Beforsite, Phl	Mcbl	93	○					○			
441	G 410	-710.0	122.1	-	Beforsite, Phl	Mcbl	93	○								
442	G 415	-685.0	122.1	-	Beforsite	Mcbl	94	○								
443	G 420	-660.0	122.1	-	Beforsite	Mcbl	93	○								
444	G 425	-635.0	122.1	-	Beforsite	Mcbl	94	○								
445	G 500	-610.0	122.1	-	Beforsite	Mcbl	93	○								
446	G 505	-585.0	122.1	-	Beforsite	Mcbl	94	○								
447	G 510	-560.0	122.1	-	Beforsite	Mcbl	93	○								
448	G 515	-535.0	122.1	-	Beforsite	Mcbl	94	○								
449	G 520	-510.0	122.1	-	Beforsite	Mcbl	93	○								
450	G 525	-485.0	122.1	-	Beforsite	Mcbl	94	○								
451	G 600	-460.0	122.1	-	Beforsite	Mcbl	93	○								
452	G 605	-444.3	128.3	-	Beforsite	Mcbl	94	○								
453	G 610	-410.0	122.1	-	Beforsite, Phl	Mcbl	93	○								
454	G 615	-385.1	122.1	-	Beforsite	Mcbl	94	○								
455	G 620	-360.0	122.4	-	Beforsite	Mcbl	93	○								
456	G 625	-335.6	122.1	-	Beforsite	Mcbl	94	○								
457	G 700	-311.7	125.1	-	Beforsite	Mcbl	93	○								
458	G 705	-286.5	122.1	-	Beforsite	Mcbl	94	○								
459	G 710	-267.6	128.6	-	Beforsite, Phl	Mcbl	93	○								
460	G 715	-235.3	122.1	-	Syenite, Agt	Msu	94	○								
461	G 720	-210.0	122.1	-	Sovite-beforsite, Phl	Mcs	93	○					○			
462	G 800	-160.0	122.1	-	Syenite	Msu	93	○								
463	G 900	-10.0	122.1	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○								
464	Ga310	-877.2	214.5	-	Syenite, Ne	Msu	93	○								
465	Ga320	-827.2	214.5	-	Syenite, Ne	Msu	93	○								
466	Ga400	-777.2	214.5	-	Beforsite dyke with Phl	Mcd	93	○								
467	Ga410	-727.2	214.5	-	Syenite	Msu	93	○								
468	Ga415	-702.2	214.5	-	Syenite, fenitised	Msu	94	○								
469	Ga420	-677.6	212.9	-	Beforsite, Phl	Mcbl	93	○								
470	Ga425	-655.1	214.5	-	Beforsite	Mcbl	94	○								
471	Ga500	-630.1	210.5	-	Beforsite	Mcbl	93	○								
472	Ga505	-605.1	214.5	-	Beforsite	Mcbl	94	○								
473	Ga510	-573.0	213.0	-	Beforsite	Mcbl	93	○								

B-1 List of Samples from the Orange Area (7)

No.	Sample No.	X m	Y m	Depth m	Rock Name	Rock Code	Analytical methods									
							Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
474	Ga515	-548.0	213.0	-	Beforsite	Mcbl	94	○								
475	Ga520	-522.7	210.2	-	Beforsite	Mcbl	93	○								
476	Ga525	-498.1	213.0	-	Beforsite	Mcbl	94	○								
477	Ga600	-474.0	210.2	-	Beforsite	Mcbl	93	○								
478	Ga605	-447.8	213.0	-	Beforsite	Mcbl	94	○								
479	Ga610	-422.7	212.5	-	Beforsite	Mcbl	93	○								
480	Ga615	-397.4	213.0	-	Beforsite	Mcbl	94	○								
481	Ga620	-371.8	211.0	-	Sovite, Phl-Px	Mcs	93	○					○			
482	Ga625	-347.5	213.0	-	Syenite, Agt-Ne	Msu	94	○								
483	Ga700	-322.5	213.0	-	Syenite, Ne with Cal matrix	Msu	93	○								
484	Ga710	-297.5	213.0	-	Sovite, Agt-Phl rich	Mcs	93	○					○			
485	Ga720	-272.5	213.0	-	Sovite	Mcs	93	○					○			
486	Gb500	-615.5	239.9	-	Beforsite	Mcbl	94	○	○							
487	Gb505	-590.6	239.9	-	Beforsite	Mcbl	94	○								
488	Gb510	-558.4	239.9	-	Beforsite	Mcbl	94	○								
489	Gb515	-533.4	239.9	-	Beforsite, Gn bearing	Mcbl	94	○	○		○		○			
490	Gb520	-508.5	239.9	-	Beforsite	Mcbl	94	○								
491	Gb525	-483.6	239.9	-	Beforsite	Mcbl	94	○								
492	Gb600	-458.5	239.9	-	Beforsite	Mcbl	94	○	○							
493	Gb605	-433.2	239.9	-	Beforsite	Mcbl	94	○								
494	Gb610	-408.0	239.9	-	Beforsite	Mcbl	94	○								
495	Gc400	-769.5	166.2	-	Beforsite	Mcbl	94	○	○							
496	Gc410	-719.5	166.2	-	Beforsite	Mcbl	94	○								
497	Gc415	-694.7	166.2	-	Beforsite	Mcbl	94	○	○							
498	Gc420	-669.7	166.2	-	Beforsite	Mcbl	94	○								
499	Gc425	-643.8	166.2	-	Beforsite	Mcbl	94	○								
500	Gc500	-619.7	166.2	-	Beforsite	Mcbl	94	○	○							
501	Gc505	-594.6	166.2	-	Beforsite	Mcbl	94	○								
502	Gc510	-569.8	166.2	-	Beforsite	Mcbl	94	○								
503	Gc515	-545.2	166.2	-	Beforsite	Mcbl	94	○	○							
504	Gc520	-519.7	163.2	-	Beforsite	Mcbl	94	○								
505	Gc525	-495.1	166.2	-	Beforsite	Mcbl	94	○								
506	Gc600	-470.0	166.2	-	Beforsite	Mcbl	94	○	○							
507	Gc605	-444.3	166.2	-	Beforsite	Mcbl	94	○								
508	Gc610	-419.6	166.2	-	Beforsite	Mcbl	94	○								
509	Gc615	-385.1	166.2	-	Beforsite	Mcbl	94	○	○							
510	Gc620	-366.6	166.2	-	Beforsite	Mcbl	94	○								
511	Gc625	-342.3	166.2	-	Beforsite	Mcbl	94	○								
512	Gc700	-317.3	166.2	-	Beforsite	Mcbl	94	○	○							
513	Gc705	-292.4	166.2	-	Beforsite	Mcbl	94	○								
514	Gc710	-267.6	166.2	-	Granule conglomerate	Oth	94	○								
515	H 200	-1063.3	278.3	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○								
516	H 300	-913.3	278.3	-	Sovite, Px-Phl-Ne	Mcs	93	○								
517	H 400	-763.3	278.3	-	Syenite, Ne	Msu	93	○								
518	H 500	-613.3	278.3	-	Sovite, Px-Ne-Phl	Mcs	93	○								
519	H 600	-463.3	278.3	-	Sovite, Phl-Agt	Mcs	93	○								
520	H 700	-313.3	278.3	-	Sovite, Px-Ne-Phl	Mcs	93	○	○	○			○			
521	H 800	-163.3	278.3	-	Px-Fd rock, coarse grained	Msu	93	○								
522	I 100	-1186.8	413.5	-	Gneiss, Qtz-Fd, bre.	Ngn	93	○								
523	I 300	-929.3	413.5	-	Gneiss, Qtz-Fd	Ngn	93	○								
524	I 500	-629.3	413.5	-	Syenite, porphyritic	Msu	93	○	○	○			○			
525	I 600	-496.8	413.5	-	Sovite, banded	Mcs	93	○								
526	I 700	-329.3	413.5	-	Syenite - albitite	Msu	93	○								
527	I 800	-179.3	413.5	-	Syenite, porphyritic	Msr	93	○	○	○			○			
528	I 900	-29.3	413.5	-	Gneiss, Qtz-Fd	Ngn	93	○								
529	Ia710	-266.3	501.4	-	Syenite, Hbl-Ne	Msu	93	○								
530	Ia720	-196.4	501.4	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○								
531	Ia800	-166.2	501.4	-	Gneiss, Qtz-Fd	Ngn	93	○								
532	Ia810	-116.0	501.4	-	Gneiss, Qtz-Fd	Ngn	93	○								
533	Ia820	-65.6	501.4	-	Gneiss, Qtz-Fd	Ngn	93	○								
534	Ia900	-28.2	508.5	-	Beforsite	Mcb2	93	○								
535	J 400A	-345.6	592.7	-	Iron ore, Mag-Hem	Mcs	93					○	○			
536	J 200	-1025.2	590.2	-	Gneiss, Qtz-Fd	Ngn	93	○								
537	J 400	-726.0	592.5	-	Sovite	Mcs	93	○								
538	J 500	-571.0	593.8	-	Sovite, Hbl	Mcs	93	○								
539	J 600	-426.2	594.7	-	Sovite, Phl	Mcs	93	○								
540	J 700	-270.6	596.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
541	J 710	-224.6	596.4	-	Sovite-beforsite	Mcs	93	○								
542	J 720	-168.4	597.8	-	Gneiss, Qtz-Fd	Ngn	93	○								
543	J 800	-121.5	602.2	-	Gneiss, Qtz-Fd	Ngn	93	○								
544	J 820	-18.9	599.6	-	Granitic rock, leuco-	Mgr	93	○					○			
545	J 900	-26.8	587.6	-	Granitic rock	Mgr	93	○	○	○		○	○			
546	Ja800A	-111.1	658.0	-	Trachyte-dacite, siliceous dyke	Ktd	93			○		○	○			
547	Ja710	-265.2	653.5	-	Gneiss, Qtz-Fd	Ngn	93	○								
548	Ja715	-238.4	653.5	-	Granophyre	Mgr	94	○	○							
549	Ja720	-216.4	653.5	-	Sovite, Phl-Hbl	Mcs	93	○								
550	Ja725	-188.6	653.5	-	Granophyre	Mgr	94	○								
551	Ja800	-165.1	652.0	-	Beforsite	Mcb2	93	○								
552	Ja805	-138.3	653.5	-	Syenite, cut by green network	Msu	94	○								

B-1 List of Samples from the Orange Area (8)

No.	Sample No.	X m	Y m	Depth m	Rock Name	Rock Code	Analytical methods									
							Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
553	Ja810	-113.6	653.5	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○								
554	Ja815	-88.5	653.5	-	Beforsite, Ap	Mcb2	94	○								
555	Ja820	-63.5	653.5	-	Beforsite, Agt-Dol	Mcb2	93	○								
556	Ja825	-39.0	653.5	-	Beforsite, Ap	Mcb2	94	○								
557	Ja900	-14.0	653.5	-	Beforsite, Ank	Mcb2	93	○								
558	Ja905	10.6	653.5	-	Beforsite, Ap	Mcb2	94	○								
559	Jb720	-215.1	686.8	-	Sovite, Ap-Agt	Mcs	94	○								
560	Jb725	-190.5	686.8	-	Beforsite, Ap	Mcb2	94	○								
561	Jb800	-165.9	686.8	-	Beforsite, Agt	Mcb2	94	○	○							
562	Jb805	-141.3	686.8	-	Beforsite, Ap	Mcb2	94	○								
563	Jb810	-115.9	686.8	-	Beforsite, Ap	Mcb2	94	○								
564	Jb815	-90.8	686.8	-	Beforsite	Mcb2	94	○	○							
565	Jb820	-65.4	686.8	-	Beforsite	Mcb2	94	○								
566	Jb825	-40.8	686.8	-	Quartzite	Nsh	94	○								
567	Jb900	-16.0	686.8	-	Beforsite	Mcb2	94	○								
568	Jb910	33.5	686.8	-	Beforsite, Ap	Mcb2	94	○								
569	K 400A	-612.8	876.5	-	Sovite, Bt	Mcs	93	○	○	○			○			
570	K 800A	-23.0	722.1	-	Andesite-Fine granophyre?	Ktd	93			○			○			
571	K 800B	-55.0	719.9	-	Dolerite	Kdd	93			○			○			
572	K 100	-1172.8	727.6	-	Gneiss, Qtz-Fd	Ngn	93	○								
573	K 200	-1023.5	728.3	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○								
574	K 300	-874.5	697.8	-	Sovite, Phl	Mcs	93	○								
575	K 500	-598.2	725.6	-	Syenite, Agt-Phl-Ne	Msu	93	○	○	○			○			
576	K 600	-454.8	724.3	-	Sovite, Agt?	Mcs	93	○								
577	K 700	-287.9	724.1	-	Sovite-beforsite	Mcs	93	○								
578	K 710	-261.0	724.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
579	K 720	-205.7	723.8	-	Gneiss, Qtz-Fd	Ngn	93	○								
580	K 725	-182.7	719.4	-	Gneiss, Qtz-Fd, fenitised	Ngn	94	○								
581	K 800	-156.3	721.2	-	Beforsite, Ap	Mcb2	93	○								
582	K 805	-131.3	719.4	-	Beforsite, Ap	Mcb2	94	○								
583	K 810	-100.0	720.3	-	Beforsite, Dol	Mcb2	93	○								
584	K 815	-74.1	716.4	-	Beforsite	Mcb2	94	○								
585	K 820	-50.5	719.8	-	Beforsite, Dol	Mcb2	93	○								
586	K 825	-24.5	719.4	-	Trachyte	Ktd	94	○	○							
587	K 900	0.0	719.4	-	Beforsite,cut by Carbonate vein	Mcb2	93	○	○	○			○			
588	Ka600A	-394.0	831.1	-	Syenite, Px	Msu	93					○				
589	Ka110	-1133.8	807.5	-	Syenite-albitite, bre.	Msw	93	○								
590	Ka120	-1083.8	807.5	-	Syenite-albitite, bre.	Msw	93	○								
591	Ka200	-1033.8	807.5	-	Syenite, porphyritic	Msp	93	○								
592	Ka210	-991.8	807.5	-	Syenite, porphyritic	Msp	93	○								
593	Ka220	-938.8	817.5	-	Syenite, porphyritic	Msw	93	○								
594	Ka610	-394.0	806.7	-	Syenite, Phl-Px	Msu	93	○								
595	Ka620	-341.4	806.7	-	Sovite, Phl-Px	Mcs	93	○								
596	Ka700	-290.7	806.7	-	Sovite, Phl, banded	Mcs	93	○								
597	Ka710	-240.8	806.6	-	Beforsite-sovite(?), Phl	Mcb2	93	○								
598	Ka715	-221.9	803.3	-	Fenite, gneiss origin?	Mfn	94	○								
599	Ka720	-190.4	806.6	-	Beforsite, Phl-Ap-Dol	Mcb2	93	○								
600	Ka725	-171.3	803.3	-	Beforsite	Mcb2	94	○								
601	Ka800	-140.6	806.5	-	Beforsite, Ap-Dol	Mcb2	93	○								
602	Ka805	-121.7	803.3	-	Beforsite	Mcb2	94	○								
603	Ka810	-96.8	803.3	-	Beforsite, Cal bearing Phl	Mcb2	93	○								
604	Ka815	-74.9	797.3	-	Beforsite, Ap	Mcb2	94	○								
605	Ka820	-50.0	797.3	-	Beforsite, Phl	Mcb2	93	○								
606	Ka825	-25.2	797.3	-	Beforsite, Ap	Mcb2	94	○								
607	Ka900	1.2	797.3	-	Beforsite	Mcb2	93	○				○	○			
608	Kb610	-391.0	837.8	-	Syenite, Agt	Msu	94	○								
609	Kb620	-338.3	836.8	-	Beforsite, Cal bearing	Mcb2	94	○	○							
610	Kb700	-290.3	837.8	-	Shale, black hard	Nsh	94	○								
611	Kb710	-237.5	834.8	-	Fenite, gneiss origin?	Mfn	94	○								
612	Kb715	-212.5	835.8	-	Beforsite	Mcb2	94	○	○							
613	Kb720	-189.6	837.8	-	Beforsite	Mcb2	94	○								
614	Kb725	-161.4	840.8	-	Beforsite	Mcb2	94	○								
615	Kb800	-139.6	837.8	-	Beforsite	Mcb2	94	○								
616	Kb805	-115.1	837.8	-	Beforsite	Mcb2	94	○								
617	Kb810	-93.0	834.8	-	Beforsite	Mcb2	94	○								
618	Kb815	-65.6	837.8	-	Beforsite	Mcb2	94	○	○							
619	Kb820	-40.7	836.8	-	Beforsite	Mcb2	94	○								
620	Kc720	-208.7	763.1	-	Beforsite	Mcb2	94	○								
621	Kc725	-180.5	763.1	-	Beforsite	Mcb2	94	○							○	
622	Kc800	-157.8	765.1	-	Beforsite	Mcb2	94	○	○							
623	Kc805	-130.6	762.1	-	Beforsite	Mcb2	94	○								
624	Kc810	-105.8	762.6	-	Beforsite	Mcb2	94	○								
625	Kc815	-80.1	762.1	-	Beforsite	Mcb2	94	○	○							
626	Kc820	-55.4	765.1	-	Beforsite	Mcb2	94	○								
627	Kc825	-31.4	762.1	-	Beforsite	Mcb2	94	○								
628	Kc900	-5.5	762.1	-	Beforsite	Mcb2	94	○								
629	L 800A	-146.2	874.6	-	Hbl, green network	Nsh	93						○			
630	L 100	-1179.5	884.2	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○								
631	L 110	-1129.5	884.2	-	Syenite, porphyritic	Msw	93	○	○	○			○			

B-1 List of Samples from the Orange Area (9)

No.	Sample No.	X m	Y m	Depth m	Rock Name	Rock Code	Analytical methods									
							Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
632	L 120	-1079.5	884.2	-	Syenite, porphyritic	Msw	93	○								
633	L 200	-1029.5	884.2	-	Syenite, porphyritic	Msp	93	○					○			
634	L 210	-979.5	884.2	-	Syenite, porphyritic	Msp	93	○								
635	L 220	-922.5	876.5	-	Syenite - albitite	Msp	93	○								
636	L 600	-419.4	883.1	-	Sovite, Px	Mcs	93	○								
637	L 610	-386.7	883.0	-	Syenite ?	Msu	93	○								
638	L 615	-368.0	874.6	-	Sovite	Mcs	94	○								
639	L 620	-345.2	890.0	-	Beforsite-sovite	Mcb2	93	○					○			
640	L 625	-314.7	874.6	-	Dolerite	Kdd	94	○	○							
641	L 700	-290.7	875.0	-	Gneiss, Qtz-Fd	Ngn	93	○								
642	L 705	-267.7	874.6	-	Beforsite/sovite	Mcb2	94	○								
643	L 710	-241.8	869.9	-	Beforsite	Mcb2	93	○								
644	L 715	-222.7	874.6	-	Beforsite, Ap	Mcb2	94	○							○	
645	L 720	-193.6	874.8	-	Beforsite	Mcb2	93	○								
646	L 725	-173.3	874.6	-	Beforsite	Mcb2	94	○								
647	L 800	-147.9	874.6	-	Beforsite	Mcb2	93	○	○	○			○			
648	L 805	-122.9	874.5	-	Beforsite	Mcb2	94	○								
649	L 810	-98.1	874.5	-	Beforsite	Mcb2	93	○								
650	L 820	-48.2	874.5	-	Beforsite, Dol	Mcb2	93	○								
651	L 900	-0.1	874.5	-	Shale, black hard	Nsh	93	○				○				
652	La200A	-1006.8	965.5	-	Beforsite/sovite	Mcd	94								○	
653	La120	-1083.8	951.5	-	Syenite, porphyritic	Msp	93	○								
654	La200	-1033.8	951.5	-	Syenite, porphyritic	Msp	93	○	○	○		○	○			
655	La210	-983.8	951.5	-	Syenite, porphyritic	Msp	93	○								
656	La220	-933.8	951.5	-	Sovite	Mcs	93	○								
657	La610	-390.0	950.0	-	Sovite-beforsite, Px-Phl	Mcs	93	○								
658	La615	-368.8	950.1	-	Beforsite	Mcb2	94	○								
659	La620	-343.6	950.2	-	Sovite-beforsite, Px-Phl	Mcs	93	○					○			
660	La625	-317.4	950.2	-	Beforsite	Mcb2	94	○								
661	La700	-291.1	950.2	-	Beforsite, Ap	Mcb2	93	○								
662	La710	-243.4	953.3	-	Beforsite	Mcb2	93	○								
663	La715	-219.3	950.3	-	Beforsite	Mcb2	94	○								
664	La720	-195.2	950.3	-	Beforsite	Mcb2	93	○								
665	La725	-170.4	950.3	-	Beforsite	Mcb2	94	○								
666	La800	-145.5	950.4	-	Beforsite, Ap	Mcb2	93	○								
667	La805	-121.0	950.4	-	Beforsite	Mcb2	94	○								
668	La810	-96.4	950.4	-	Quartzite, bre.	Nsh	93	○								
669	La900	2.4	950.4	-	Shale, black hard	Nsh	93	○								
670	Lb605	-419.5	992.0	-	Beforsite	Mcb2	94	○	○							
671	Lb610	-394.5	997.0	-	Beforsite	Mcb2	94	○								
672	Lb615	-371.2	993.5	-	Beforsite	Mcb2	94	○	○							
673	Lb620	-344.9	992.0	-	Beforsite	Mcb2	94	○								
674	Lb625	-319.3	992.0	-	Beforsite, Ap-Agt	Mcb2	94	○			○		○	○		
675	Lb700	-291.3	993.0	-	Beforsite	Mcb2	94	○	○							
676	Lb705	-269.6	992.0	-	Beforsite	Mcb2	94	○								
677	Lb710	-244.6	997.0	-	Beforsite	Mcb2	94	○								
678	Lb715	-217.0	994.0	-	Beforsite	Mcb2	94	○	○							
679	Lb720	-194.5	994.0	-	Beforsite	Mcb2	94	○								
680	Lb725	-168.7	992.0	-	Beforsite	Mcb2	94	○								
681	Lb800	-144.8	992.0	-	Beforsite	Mcb2	94	○	○							
682	Lb805	-120.1	990.0	-	Beforsite	Mcb2	94	○								
683	Lc610	-394.5	912.5	-	Sovite	Mcs	94	○								
684	Lc615	-369.5	912.5	-	Sovite	Mcs	94	○	○							
685	Lc620	-344.5	912.5	-	Beforsite	Mcb2	94	○								
686	Lc625	-319.5	912.5	-	Beforsite	Mcb2	94	○			○		○	○		
687	Lc700	-294.5	912.5	-	Beforsite	Mcb2	94	○	○							
688	Lc705	-269.5	912.5	-	Beforsite	Mcb2	94	○								
689	Lc710	-244.5	912.5	-	Beforsite	Mcb2	94	○								
690	Lc715	-219.5	912.5	-	Beforsite	Mcb2	94	○	○							
691	Lc720	-194.5	912.5	-	Beforsite	Mcb2	94	○								
692	Lc725	-169.5	912.5	-	Beforsite	Mcb2	94	○								
693	Lc800	-144.5	912.5	-	Beforsite	Mcb2	94	○	○							
694	Lc805	-119.5	912.5	-	Beforsite	Mcb2	94	○								
695	M 100	-1179.8	1026.5	-	Syenite-albitite, bre.	Msw	93	○								
696	M 110	-1133.8	1026.5	-	Syenite-albitite, bre.	Msw	93	○								
697	M 120	-1083.8	1026.5	-	Syenite, porphyritic, bre.	Msw	93	○								
698	M 200	-1033.8	1026.5	-	Syenite	Msp	93	○								
699	M 210	-983.8	1026.5	-	Syenite	Msp	93	○					○			
700	M 220	-933.8	1026.5	-	Sovite, Hbl	Mcd	93	○	○	○			○			
701	M 300	-883.8	1027.4	-	Sovite	Mcs	93	○								
702	M 400	-732.4	1031.7	-	Sovite-beforsite, Px-Phl	Mcs	93	○								
703	M 500	-579.4	1027.9	-	Sovite	Mcs	93	○								
704	M 600	-422.3	1028.2	-	Sovite	Mcs	93	○								
705	M 605	-402.0	1028.2	-	Beforsite	Mcb2	94	○								
706	M 610	-375.8	1028.3	-	Beforsite	Mcb2	93	○								
707	M 615	-350.8	1038.2	-	Beforsite	Mcb2	94	○								
708	M 620	-325.9	1028.5	-	Beforsite, Ap-Ank	Mcb2	93	○								
709	M 625	-305.3	1028.2	-	Beforsite	Mcb2	94	○								
710	M 700	-288.2	1028.6	-	Beforsite, Hbl	Mcb2	93	○								

B-1 List of Samples from the Orange Area (10)

No.	Sample No.	X m	Y m	Depth m	Rock Name	Rock Code	Analytical methods									
							Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
711	M 705	-261.9	1028.9	-	Beforsite	Mcb2	94	○								
712	M 710	-239.2	1028.7	-	Beforsite, Phl-Ank	Mcb2	93	○	○	○			○			
713	M 715	-213.7	1027.9	-	Beforsite	Mcb2	94	○								
714	M 720	-194.5	1028.9	-	Beforsite, Ank	Mcb2	93	○								
715	M 725	-174.6	1028.9	-	Beforsite	Mcb2	94	○								
716	M 800	-159.5	1028.9	-	Beforsite	Mcb2	93	○								
717	M 805	-130.0	1028.9	-	Beforsite, Cal bearing	Mcb2	94	○								
718	M 810	-98.0	1028.9	-	Shale, black hard	Nsh	93	○								
719	M 900	3.2	1028.9	-	Quartzite-grit	Nsh	93	○								
720	Ma600A	-415.9	1110.5	-	Apatite ?	Mcb2	93						○			
721	Ma120	-1075.8	1101.5	-	Syenite, porphyritic	Msw	93	○								
722	Ma200	-1033.8	1101.5	-	Syenite, porphyritic	Msp	93	○								
723	Ma210	-983.8	1101.5	-	Syenite, porphyritic	Msp	93	○								
724	Ma220	-933.8	1101.5	-	Syenite, porphyritic	Msp	93	○								
725	Ma225	-908.0	1101.5	-	Sovite	Mcs	94								○	
726	Ma510	-544.3	1111.1	-	Sovite	Mcs	93	○					○			
727	Ma520	-493.2	1110.9	-	Sovite, Hbl	Mcs	93	○								
728	Ma525	-457.6	1109.6	-	Beforsite, Cal bearing	Mcb2	94	○								
729	Ma600	-433.9	1110.6	-	Beforsite, Cal bearing	Mcb2	93	○								
730	Ma605	-408.3	1109.6	-	Beforsite	Mcb2	94	○								
731	Ma610	-384.2	1110.3	-	Beforsite, Cal bearing	Mcb2	93	○								
732	Ma615	-357.7	1109.6	-	Beforsite	Mcb2	94	○								
733	Ma620	-333.4	1110.1	-	Beforsite, Dol	Mcb2	93	○								
734	Ma625	-309.2	1109.6	-	Beforsite	Mcb2	94	○								
735	Ma700	-282.2	1109.6	-	Beforsite, Dol-Ank	Mcb2	93	○								
736	Ma710	-252.2	1112.8	-	Beforsite-sovite, Dol	Mcb2	93	○					○			
737	Ma715	-216.4	1112.8	-	Beforsite, Ap-Cal bearing	Mcb2	94	○								
738	Ma720	-195.6	1112.8	-	Shale, siliceous-calcareous	Nsh	93	○								
739	Ma800	-147.0	1112.8	-	Gneiss, Qtz-Fd	Ngn	93	○								
740	Ma820	-47.5	1112.8	-	Quartzite-chert	Nsh	93	○								
741	Mb525	-475.4	1148.4	-	Beforsite	Mcb2	94	○								
742	Mb600	-450.4	1148.4	-	Beforsite	Mcb2	94	○	○							
743	Mb605	-425.4	1148.4	-	Beforsite	Mcb2	94	○								
744	Mb610	-400.4	1148.4	-	Beforsite, Ap?	Mcb2	94	○								
745	Mb615	-375.4	1148.4	-	Beforsite	Mcb2	94	○	○							
746	Mb620	-350.4	1148.4	-	Beforsite	Mcb2	94	○								
747	Mb625	-325.4	1148.4	-	Beforsite	Mcb2	94	○								
748	Mb700	-300.4	1148.4	-	Beforsite	Mcb2	94	○	○							
749	Mb705	-275.4	1148.4	-	Beforsite	Mcb2	94	○								
750	Mc525	-505.5	1069.3	-	Sovite	Mcs	94	○								
751	Mc600	-480.5	1069.3	-	Beforsite	Mcb2	94	○	○							
752	Mc605	-455.5	1069.3	-	Beforsite/sovite	Mcb2	94	○								
753	Mc610	-430.5	1069.3	-	Beforsite	Mcb2	94	○								
754	Mc615	-405.5	1069.3	-	Beforsite	Mcb2	94	○	○							
755	Mc620	-380.5	1069.3	-	Beforsite	Mcb2	94	○								
756	Mc625	-355.5	1069.3	-	Beforsite	Mcb2	94	○								
757	Mc700	-330.5	1069.3	-	Beforsite	Mcb2	94	○	○							
758	Mc705	-305.5	1069.3	-	Beforsite	Mcb2	94	○								
759	Mc710	-280.5	1069.3	-	Beforsite	Mcb2	94	○								
760	Mc715	-255.5	1069.3	-	Beforsite	Mcb2	94	○	○							
761	Mc720	-230.5	1069.3	-	Beforsite	Mcb2	94	○								
762	Mc725	-205.5	1069.3	-	Beforsite	Mcb2	94	○								
763	Mc800	-180.5	1069.3	-	Beforsite	Mcb2	94	○	○							
764	Mc805	-155.5	1069.3	-	Sovite	Mcs	94	○								
765	N 10-1	-1184.5	1186.5	-	An-Ca network	Mcd	93						○			
766	N 190A	-1184.5	1246.5	-	Hbl, greenish	Msw	93						○			
767	N 820A	-884.6	1190.6	-	Sovite	Mcs	93					○				
768	N 100	-1184.5	1186.5	-	Syenite/gneiss, bre.	Ngn	93						○			
769	N 110	-1159.5	1186.5	-	Syenite, Ne?	Msp	93			○			○			
770	N 120	-1109.8	1186.5	-	Syenite, leuco-	Msw	93					○				
771	N 200	-1059.1	1186.5	-	Syenite, porphyritic	Msw	93	○								
772	N 210	-1007.5	1186.5	-	Syenite	Msp	93	○								
773	N 220	-959.4	1186.5	-	Syenite	Msp	93	○	○	○		○	○			
774	N 400	-756.6	1185.5	-	Sovite, Hbl	Mcs	93	○					○			
775	N 520	-500.6	1183.1	-	Beforsite, Dol	Mcb2	93			○			○			
776	N 525	-475.4	1182.9	-	Beforsite, Py bearing	Mcb2	94	○								
777	N 600	-450.1	1182.6	-	Beforsite, Dol	Mcb2	93,94	○								
778	N 605	-426.2	1182.4	-	Beforsite	Mcb2	94	○								
779	N 610	-410.2	1185.1	-	Beforsite	Mcb2	93	○								
780	N 615	-377.2	1181.6	-	Beforsite	Mcb2	94	○								
781	N 620	-352.1	1181.1	-	Beforsite	Mcb2	93,94	○								
782	N 625	-327.1	1180.9	-	Beforsite	Mcb2	94	○								
783	N 700	-302.1	1180.6	-	Beforsite	Mcb2	93	○		○			○			
784	N 705	-274.7	1183.6	-	Syenite, bre., carbonatised	Msu	94	○								
785	N 710	-284.7	1183.6	-	Syenite, bre., carbonatised	Msu	94	○								
786	N 720	-204.3	1187.6	-	Beforsite, Phl	Mcb2	93	○					○			
787	N 800	-147.4	1189.8	-	Sovite-beforsite	Mcs	93			○		○	○			
788	N 820	-47.5	1187.8	-	Bre. rock with Cal network	Nsh	93	○					○			
789	N 900	4.5	1187.8	-	Gneiss, Qtz-Fd	Ngn	93	○								

B-1 List of Samples from the Orange Area (11)

No.	Sample No.	X m	Y m	Depth m	Rock Name	Rock Code	Analytical methods									
							Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
790	Na 20A	-1038.1	1261.2	-	Feldspar, mega-crystal	Msw	93						○			
791	Na110	-1141.9	1261.2	-	Syenite, leuco-	Msw	93	○								
792	Na120	-1087.9	1261.2	-	Syenite, with Fd mega-crystal	Msw	93	○		○		○	○			
793	Na200	-1038.1	1261.2	-	Syenite, Hbl	Msw	93	○								
794	Na210	-988.0	1261.2	-	Syenite cut by Cal network	Msw	93	○								
795	Na220	-936.4	1261.2	-	Syenite, Bt-(Ne?)	Msp	93	○								
796	Na510	-544.3	1261.2	-	Syenite ?	Msw	93	○					○			
797	Na520	-492.0	1261.7	-	Beforsite, Cal bearing	Mcb2	93	○					○			
798	Na600	-437.9	1262.2	-	Bre. rock cut by Cal veins	Msw	93	○								
799	Na610	-386.5	1262.7	-	Beforsite cut by Ank network	Mcb2	93	○								
800	Na620	-335.5	1263.0	-	Syenite, leuco-	Msw	93	○								
801	Na700	-302.6	1263.2	-	Syenite, porphyritic	Msw	93	○	○	○			○			
802	Na710	-252.7	1268.5	-	Green Hbl-Agt rock	Nsh	93	○								
803	Na720	-202.7	1263.7	-	Syenite,leuco-,cut by Ank vien	Nsh	93	○								
804	Na800	-148.6	1264.3	-	Hbl-Agt rock cut by An network	Nsh	93	○					○			
805	Na820	-47.5	1265.0	-	Hbl-Agt rock cut by An network	Ngn	93	○								
806	Nc520	-492.0	1224.4	-	Beforsite, Cal bearing	Mcb2	94	○								
807	Nc600	-437.9	1224.4	-	Beforsite, Cal bearing	Mcb2	94	○	○		○		○			
808	Nc610	-386.5	1224.4	-	Syenite	Msu	94	○								
809	Nc620	-335.5	1224.4	-	Beforsite, Cal bearing Bt	Mcb2	94	○	○							
810	Nc700	-302.6	1224.4	-	Syenite	Msu	94	○								
811	O 400A	-675.4	1320.2	-	Syenite, Agt	Msw	93			○			○			
812	O 100	-1184.5	1337.6	-	Syenite, Ne porphyritic	Msw	93	○								
813	O 200	-1038.1	1337.6	-	Syenite, Ne porphyritic	Msw	93	○								
814	O 300	-907.6	1336.7	-	Syenite, Ne?-Bt-Aug	Msw	93	○		○			○			
815	O 400	-735.4	1320.3	-	Syenite, Bt, porphyritic	Msw	93	○		○			○			
816	O 500	-571.6	1319.9	-	Syenite, leuco-	Msw	93	○								
817	O 600	-417.5	1319.7	-	Syenite, leuco-	Msw	93	○	○	○			○			
818	O 610	-366.3	1319.6	-	Hbl-Agt rock cut by An network	Ngn	93	○					○			
819	O 620	-335.5	1335.0	-	Beforsite cut by Ank veins	Mcb2	93	○								
820	O 700	-285.4	1334.9	-	Gneiss, Qtz-Fd	Ngn	93	○								
821	O 800	-129.0	1334.6	-	Gneiss, Qtz-(Fd)	Ngn	93	○								
822	P 600A	-921.2	1477.7	-	Beforsite, Ank	Mcd	93						○			
823	P 100	-1184.5	1486.8	-	Syenite, Ne	Msw	93	○	○	○			○			
824	P 200	-1061.1	1486.3	-	Syenite,leuco-,cut by Cal veins	Msw	93	○					○			
825	P 400	-735.4	1476.4	-	Gneiss, cut by brown Cal veins	Ngn	93	○								
826	P 600	-438.9	1477.2	-	Gneiss, Qtz-Fd,cut by Cal veins	Ngn	93	○								
827	P 800	-129.0	1478.2	-	Gneiss, Bt-Qtz-Fd	Ngn	93	○								
828	T 1A	-172.5	-605.0	-	Beforsite, Ank	Mcd	93,94	○			○		○	○	○	
829	T 2A	-377.5	-458.0	-	Sovite	Mcs	93	○					○			
830	T 4A	-587.5	-180.0	-	Beforsite, Ank	Mcb1	93	○					○			
831	T 5A	-525.7	-92.2	-	Beforsite, Ank	Mcb1	93	○	○				○			
832	T 6A	-765.8	835.5	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○					○			
833	T 7A	-1044.8	943.5	-	Syenite, Ne, porphyritic	Msp	93	○	○				○			
834	T 8A	-1016.8	972.5	-	Beforsite, Ank	Mcd	93	○					○			
835	T 9A	-693.8	959.7	-	Sovite, Hbl	Mcs	93,94	○	○				○		○	
836	T 10A	-89.0	-697.5	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○					○			
837	T 11A	-369.3	311.3	-	Syenite	Msu	93	○	○				○			
838	T 12A	-203.3	548.4	-	Gneiss, Qtz-Fd, fenitised	Ngn	93	○					○			
839	T 13A	-218.3	521.4	-	Sovite-beforsite	Mcs	93	○	○				○			
	MJNO−1															
840	1- 0	-	-	0.0	Beforsite, weathered	Mcb1	94	○								
841	1- 5	-	-	5.0	Beforsite, weathered	Mcb1	94	○								
842	1- 10	-	-	10.0	Beforsite	Mcb1	94	○								
843	1- 15	-	-	15.0	Beforsite	Mcb1	94	○								
844	1- 20	-	-	20.0	Beforsite	Mcb1	94	○	○							
845	1- 25	-	-	25.0	Beforsite	Mcb1	94	○								
	1T- 1										○					
846	1X- 1	-	-	26.0	Beforsite	Mcb1	94						○			
847	1- 30	-	-	30.0	Beforsite	Mcb1	94	○	○							
848	1- 35	-	-	35.0	Beforsite, weathered	Mcb1	94	○								
849	1- 40	-	-	40.0	Beforsite	Mcb1	94	○								
850	1- 45	-	-	45.0	Beforsite	Mcb1	94	○	○							
	1R- 1														○	
851	1- 50	-	-	50.0	Beforsite	Mcb1	94	○								
852	1- 55	-	-	55.0	Arkose, Bre. & carbonated	Nsh	94	○								
853	1- 60	-	-	60.0	Arkose, Bre., cut by beforsite	Nsh	94	○	○							
	1X- 2												○			
854	1- 65	-	-	65.0	Arkose, Bre. & carbonated	Nsh	94	○								
855	1- 70	-	-	70.0	Arkose, Bre. & carbonated	Nsh	94	○								
856	1- 75	-	-	75.0	Arkose, Bre. & carbonated	Nsh	94	○								
857	1- 80	-	-	80.0	Arkose, Bre. & carbonated	Nsh	94	○								
858	1T- 3	-	-	85.0	Beforsite, Py bearing	Mcb1	94				○					
859	1-110	-	-	110.0	Syenite, carbonated	Msu	94	○								
860	1-115	-	-	115.0	Syenite, carbonated	Msu	94	○								
861	1-117	-	-	117.3	Syenite, carbonated	Msu	94	○								
862	1-120	-	-	120.0	Syenite, carbonated	Msu	94	○	○							
863	1-122	-	-	122.3	Syenite, carbonated	Msu	94	○								
864	1-125	-	-	125.0	Syenite, carbonated	Msu	94	○								

B-1 List of Samples from the Orange Area (12)

No.	Sample No.	X m	Y m	Depth m	Rock Name	Rock Code	Analytical methods									
							Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
865	1X- 3	-	-	126.0	Syenite, carbonated	Msu	94						○			
866	1-130	-	-	130.0	Syenite, carbonated	Msu	94	○	○							
867	1T- 4	-	-	131.5	Syenite, carbonated	Msu	94				○					
868	1-132	-	-	132.3	Syenite, carbonated	Msu	94	○								
869	1-135	-	-	135.0	Syenite, carbonated	Msu	94	○								
870	1-137	-	-	137.3	Syenite, carbonated	Msu	94	○								
871	1-140	-	-	140.0	Syenite, carbonated	Msu	94	○	○							
872	1-145	-	-	145.0	Syenite, carbonated	Msu	94	○								
873	1-147	-	-	147.3	Syenite, carbonated	Msu	94	○								
874	1T- 5	-	-	148.4	Syenite, carbonated	Msu	94				○					
	1X- 4												○			
875	1-150	-	-	150.0	Syenite, carbonated	Msu	94	○	○							
MJNO-2																
876	2- 0	-	-	0.0	Beforsite, An	Mcbl	94	○								
877	2- 5	-	-	5.0	Beforsite, An	Mcbl	94	○								
878	2- 10	-	-	10.0	Beforsite, An	Mcbl	94	○								
879	2- 15	-	-	15.0	Beforsite, An	Mcbl	94	○								
	2T- 1										○					
880	2- 17	-	-	17.3	Beforsite, An	Mcbl	94	○								
881	2- 20	-	-	20.0	Beforsite, An	Mcbl	94	○	○							
882	2- 22	-	-	22.3	Beforsite, An	Mcbl	94	○								
883	2- 25	-	-	25.0	Beforsite, An	Mcbl	94	○								
884	2- 27	-	-	27.3	Beforsite, An	Mcbl	94	○								
885	2- 30	-	-	30.0	Beforsite, An	Mcbl	94	○	○							
886	2X- 1	-	-	32.2	Beforsite	Mcbl	94						○			
887	2- 32	-	-	32.3	Beforsite, weathered	Mcbl	94	○								
888	2- 35	-	-	35.0	Beforsite, weathered	Mcbl	94	○								
889	2- 37	-	-	37.3	Beforsite, weathered	Mcbl	94	○								
890	2- 40	-	-	40.0	Beforsite, weathered	Mcbl	94	○	○							
891	2- 42	-	-	42.3	Beforsite, weathered	Mcbl	94	○								
892	2- 45	-	-	45.0	Beforsite, weathered	Mcbl	94	○								
893	2- 47	-	-	47.3	Beforsite, weathered	Mcbl	94	○								
894	2- 50	-	-	50.0	Beforsite, weathered	Mcbl	94	○	○							
895	2- 55	-	-	55.0	Beforsite, weathered	Mcbl	94	○								
896	2- 60	-	-	60.0	Beforsite, weathered	Mcbl	94	○	○							
897	2- 65	-	-	65.0	Beforsite, weathered	Mcbl	94	○	○							
898	2- 67	-	-	67.0	Beforsite, weathered	Mcbl	94	○								
899	2- 70	-	-	70.0	Beforsite, weathered	Mcbl	94	○	○							
900	2- 72	-	-	72.3	Beforsite, An	Mcbl	94	○								
901	2- 75	-	-	75.0	Beforsite, An	Mcbl	94	○	○							
	2T- 2										○					
902	2- 77	-	-	77.3	Beforsite, fractured	Mcbl	94	○								
903	2- 80	-	-	80.0	Beforsite, fractured	Mcbl	94	○								
904	2- 95	-	-	95.0	Beforsite, fractured	Mcbl	94	○								
905	2-109	-	-	109.0	Beforsite, fractured	Mcbl	94	○								
906	2X- 2	-	-	118.0	Beforsite	Mcbl	94						○			
907	2-122	-	-	122.0	Beforsite, fractured	Mcbl	94	○								
908	2X- 3	-	-	127.0	Beforsite	Mcbl	94						○			
909	2-135	-	-	135.0	Beforsite, fractured	Mcbl	94	○								
	2X- 4												○			
MJNO-3																
910	3- 0	-	-	0.0	Beforsite, weathered	Mcbl	94	○								
911	3- 5	-	-	5.0	Beforsite, An	Mcbl	94	○								
912	3X- 1	-	-	5.7	Beforsite	Mcbl	94						○			
913	3- 10	-	-	10.0	Beforsite, sulfide rich	Mcbl	94	○								
914	3- 15	-	-	15.0	Beforsite, sulfide rich	Mcbl	94	○								
915	3- 20	-	-	20.0	Beforsite, sulfide rich	Mcbl	94	○	○							
916	3R- 1	-	-	23.2	Beforsite, sulfide rich	Mcbl	94								○	
	3X- 2												○			
917	3T- 1	-	-	23.4	Beforsite, sulfide rich	Mcbl	94				○					
918	3- 25	-	-	25.0	Beforsite, weathered	Mcbl	94	○								
919	3- 30	-	-	30.0	Beforsite, sulfide rich	Mcbl	94	○	○							
920	3- 35	-	-	35.0	Beforsite, weathered	Mcbl	94	○								
921	3- 40	-	-	40.0	Beforsite, weathered	Mcbl	94	○	○							
922	3- 45	-	-	45.0	Beforsite, weathered	Mcbl	94	○								
923	3- 50	-	-	50.0	Beforsite, sulfide rich	Mcbl	94	○								
924	3R- 2	-	-	53.7	Beforsite, weathered	Mcbl	94								○	
925	3- 55	-	-	55.0	Beforsite, sulfide rich	Mcbl	94	○								
926	3- 60	-	-	60.0	Beforsite, weathered	Mcbl	94	○	○							
927	3T- 2	-	-	61.1	Beforsite, sulfide rich	Mcbl	94				○					
928	3- 65	-	-	65.0	Beforsite, weathered	Mcbl	94	○								
929	3- 70	-	-	70.0	Beforsite, sulfide rich	Mcbl	94	○								
930	3- 75	-	-	75.0	Beforsite, sulfide rich	Mcbl	94	○								
931	3T- 4	-	-	77.0	Beforsite, sulfide rich	Mcbl	94				○			○		
932	3- 80	-	-	80.0	Beforsite, sulfide rich	Mcbl	94	○	○							
933	3- 85	-	-	85.0	Beforsite, weathered	Mcbl	94	○								
934	3R- 3	-	-	89.1	Beforsite, sulfide rich	Mcbl	94								○	
935	3- 90	-	-	90.0	Beforsite, weathered	Mcbl	94	○								
936	3- 95	-	-	95.0	Beforsite, weathered	Mcbl	94	○								

B-1 List of Samples from the Orange Area (13)

No.	Sample No.	X m	Y m	Depth m	Rock Name	Rock Code	Analytical methods									
							Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
937	3-100	-	-	100.0	Beforsite, Fe oxide rich	Mcbl	94	○	○							
938	3-105	-	-	105.0	Beforsite, Fe oxide rich	Mcbl	94	○								
939	3-110	-	-	110.0	Beforsite, An	Mcbl	94	○								
940	3-115	-	-	115.0	Beforsite, weathered	Mcbl	94	○								
941	3-120	-	-	120.0	Beforsite, weathered	Mcbl	94	○	○							
942	3-125	-	-	125.0	Beforsite, sulfide rich	Mcbl	94	○								
943	3-130	-	-	130.0	Beforsite, sulfide rich	Mcbl	94	○								
944	3-135	-	-	135.0	Beforsite, sulfide rich	Mcbl	94	○								
945	3X- 3	-	-	135.0	Beforsite, sulfide rich	Mcbl	94						○			
946	3-140	-	-	140.0	Beforsite, sulfide rich	Mcbl	94	○	○							
947	3-145	-	-	145.0	Beforsite, sulfide rich	Mcbl	94	○								
948	3T- 5	-	-	146.7	Beforsite, sulfide rich	Mcbl	94				○					
949	3-150	-	-	150.0	Beforsite, sulfide rich	Mcbl	94	○								
	MJNO-4															
950	4- 0	-	-	0.0	Beforsite, weathered	Mcbl	94	○								
951	4- 5	-	-	5.0	Beforsite, weathered	Mcbl	94	○								
952	4- 10	-	-	10.0	Beforsite, weathered	Mcbl	94	○								
953	4- 15	-	-	15.0	Beforsite, sulfide rich	Mcbl	94	○								
	4T- 4										○					
954	4- 20	-	-	20.0	Beforsite, sulfide rich	Mcbl	94	○	○							
955	4T- 1	-	-	20.6	Beforsite, Fe oxide-rich	Mcbl	94				○					
	4X- 1												○			
956	4- 25	-	-	25.0	Beforsite, Fe oxide rich	Mcbl	94	○								
957	4- 30	-	-	30.0	Beforsite, Fe oxide rich	Mcbl	94	○	○							
958	4T- 2	-	-	30.0	Beforsite, Fe oxide-rich	Mcbl	94				○					
959	4- 35	-	-	35.0	Beforsite, sulfide rich	Mcbl	94	○								
	4R- 1														○	
960	4- 40	-	-	40.0	Beforsite, Fe oxide rich	Mcbl	94	○	○							
961	4- 45	-	-	45.0	Beforsite, weathered	Mcbl	94	○								
962	4- 50	-	-	50.0	Beforsite, weathered	Mcbl	94	○								
963	4- 55	-	-	55.0	Beforsite, weathered	Mcbl	94	○								
964	4- 60	-	-	60.0	Beforsite, weathered	Mcbl	94	○	○							
965	4- 65	-	-	65.0	Beforsite	Mcbl	94	○								
966	4- 70	-	-	70.0	Beforsite	Mcbl	94	○								
967	4- 75	-	-	75.0	Beforsite, weathered	Mcbl	94	○								
968	4- 80	-	-	80.0	Beforsite	Mcbl	94	○	○							
969	4- 85	-	-	85.0	Beforsite	Mcbl	94	○								
970	4- 90	-	-	90.0	Beforsite	Mcbl	94	○								
971	4- 95	-	-	95.0	Beforsite, weathered	Mcbl	94	○								
972	4-100	-	-	100.0	Beforsite, weathered	Mcbl	94	○	○							
973	4-105	-	-	105.0	Beforsite	Mcbl	94	○								
974	4-110	-	-	110.0	Beforsite, weathered	Mcbl	94	○								
975	4-115	-	-	115.0	Beforsite, weathered	Mcbl	94	○								
976	4-120	-	-	120.0	Beforsite, weathered	Mcbl	94	○	○							
977	4-125	-	-	125.0	Beforsite	Mcbl	94	○								
978	4-130	-	-	130.0	Beforsite, weathered	Mcbl	94	○								
979	4-135	-	-	135.0	Beforsite	Mcbl	94	○								
980	4-140	-	-	140.0	Beforsite, weathered	Mcbl	94	○	○							
981	4-145	-	-	145.0	Beforsite, sulfide rich	Mcbl	94	○								
982	4T- 3	-	-	146.9	Beforsite, sulfide rich	Mcbl	94				○					
983	4X- 2	-	-	148.7	Beforsite, sulfide rich	Mcbl	94						○			
984	4-150	-	-	150.0	Beforsite, sulfide rich	Mcbl	94	○								
	MJNO-5															
985	5- 0	-	-	0.0	Beforsite, weathered	Mcbl	94	○								
986	5- 5	-	-	5.0	Beforsite, weathered	Mcbl	94	○								
987	5- 10	-	-	10.0	Beforsite, weathered	Mcbl	94	○								
988	5- 15	-	-	15.0	Beforsite, weathered	Mcbl	94	○								
989	5- 20	-	-	20.0	Beforsite, weathered	Mcbl	94	○								
990	5- 25	-	-	25.0	Beforsite, Phl rich	Mcbl	94	○								
991	5- 30	-	-	30.0	Beforsite, Phl rich	Mcbl	94	○	○							
992	5- 34	-	-	34.0	Beforsite, Phl rich	Mcbl	94	○								
993	5X- 1	-	-	35.0	Dolerite	Kdd	94						○			
994	5- 40	-	-	40.0	Beforsite, Phl rich	Mcbl	94	○	○							
995	5- 45	-	-	45.0	Beforsite, Phl rich	Mcbl	94	○								
996	5- 47	-	-	47.3	Beforsite, Phl rich	Mcbl	94	○								
997	5- 50	-	-	50.0	Beforsite, Phl rich	Mcbl	94	○	○							
998	5- 55	-	-	55.0	Beforsite, Phl rich	Mcbl	94	○								
	5X- 2												○			
999	5- 60	-	-	60.0	Beforsite, Phl rich	Mcbl	94	○	○							
1000	5- 65	-	-	65.0	Beforsite, Fe oxide rich	Mcbl	94	○								
1001	5- 67	-	-	67.3	Beforsite, Fe oxide rich	Mcbl	94	○								
1002	5- 70	-	-	70.0	Beforsite, Fe oxide rich	Mcbl	94	○	○							
1003	5- 75	-	-	75.0	Beforsite, Fe oxide rich	Mcbl	94	○								
1004	5- 80	-	-	80.0	Beforsite, Fe oxide rich	Mcbl	94	○	○							
1005	5T- 1	-	-	84.7	Beforsite, sulfide rich	Mcbl	94				○					
1006	5- 85	-	-	85.0	Beforsite, sulfide rich	Mcbl	94	○								
1007	5- 90	-	-	90.0	Beforsite, sulfide rich	Mcbl	94	○	○							
1008	5T- 2	-	-	92.2	Beforsite, sulfide rich	Mcbl	94				○					
1009	5- 92	-	-	92.3	Beforsite, sulfide rich	Mcbl	94	○								

B-1 List of Samples from the Orange Area (14)

No.	Sample No.	X m	Y m	Depth m	Rock Name	Rock Code	Analytical methods									
							Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
1010	5- 95	-	-	95.0	Beforsite, sulfide rich	Mcb1	94	○								
1011	5-100	-	-	100.0	Beforsite, sulfide rich	Mcb1	94	○	○							
1012	5-105	-	-	105.0	Beforsite, sulfide rich	Mcb1	94	○								
	MJNO－6															
1013	6- 0	-	-	0.0	Beforsite, weathered	Mcb2	94	○								
1014	6- 5	-	-	5.0	Beforsite, sulfide rich	Mcb2	94	○								
1015	6- 10	-	-	10.0	Beforsite, sulfide rich	Mcb2	94	○	○							
1016	6- 15	-	-	15.0	Beforsite, sulfide rich	Mcb2	94	○								
1017	6T- 1	-	-	17.5	Beforsite, sulfide rich	Mcb2	94				○					
1018	6- 20	-	-	20.0	Beforsite, sulfide rich	Mcb2	94	○								
1019	6- 25	-	-	25.0	Beforsite, sulfide rich	Mcb2	94	○								
1020	6- 30	-	-	30.0	Beforsite, sulfide rich	Mcb2	94	○	○							
1021	6- 35	-	-	35.0	Beforsite, sulfide rich	Mcb2	94	○								
1022	6- 40	-	-	40.0	Beforsite, sulfide rich	Mcb2	94	○								
1023	6X- 1a	-	-	42.2	Beforsite, Phl rich	Mcb2	94						○			
1024	6X- 1b	-	-	42.3	Beforsite, Phl rich	Mcb2	94						○			
1025	6- 45	-	-	45.0	Beforsite, Phl rich	Mcb2	94	○								
1026	6- 50	-	-	50.0	Beforsite, Phl rich	Mcb2	94	○	○							
1027	6- 55	-	-	55.0	Beforsite, sulfide rich	Mcb2	94	○								
1028	6- 60	-	-	60.0	Beforsite, sulfide rich	Mcb2	94	○								
1029	6- 65	-	-	65.0	Beforsite, sulfide rich	Mcb2	94	○								
1030	6- 70	-	-	70.0	Beforsite, sulfide rich	Mcb2	94	○	○							
1031	6- 75	-	-	75.0	Beforsite, Phl rich	Mcb2	94	○								
1032	6- 80	-	-	80.0	Beforsite	Mcb2	94	○								
1033	6- 85	-	-	85.0	Beforsite	Mcb2	94	○								
1034	6- 90	-	-	90.0	Beforsite, sulfide rich	Mcb2	94	○	○							
1035	6- 95	-	-	95.0	Beforsite, sulfide rich	Mcb2	94	○								
1036	6-100	-	-	100.0	Beforsite, sulfide rich	Mcb2	94	○								
1037	6-105	-	-	105.0	Beforsite, sulfide rich	Mcb2	94	○								
1038	6X- 2	-	-	105.5	Beforsite, Ap rich	Mcb2	94						○			
1039	6-110	-	-	110.0	Beforsite, Ap rich	Mcb2	94	○	○							
1040	6-115	-	-	115.0	Beforsite, Ap rich	Mcb2	94	○								
	6R- 1														○	
1041	6T- 2	-	-	117.0	Beforsite, Ap rich	Mcb2	94				○			○		
1042	6-120	-	-	120.0	Beforsite, Ap rich	Mcb2	94	○								
1043	6T- 3	-	-	121.3	Beforsite, Ap rich	Mcb2	94				○					
1044	6-125	-	-	125.0	Beforsite, Ap rich	Mcb2	94	○								
1045	6-130	-	-	129.0	Beforsite, Ap rich	Mcb2	94	○	○							
1046	6-135	-	-	135.0	Beforsite, Ap rich	Mcb2	94	○								
1047	6-142	-	-	142.3	Beforsite, Phl rich	Mcb2	94	○								
1048	6-145	-	-	145.0	Beforsite, Phl rich	Mcb2	94	○								
1049	6T- 4	-	-	148.7	Slate, Bre. & carbonated	Msu	94				○					
1050	6-150	-	-	150.0	Syenite	Msu	94	○	○							
	MJNO－7															
1051	7- 0	-	-	0.0	Beforsite, weathered	Mcb2	94	○								
1052	7- 5	-	-	5.0	Beforsite, Ap rich	Mcb2	94	○								
1053	7- 10	-	-	10.0	Beforsite, Ap rich	Mcb2	94	○	○							
1054	7- 15	-	-	15.0	Beforsite, Ap rich	Mcb2	94	○								
1055	7- 20	-	-	20.0	Beforsite, Ap rich	Mcb2	94	○								
1056	7- 25	-	-	25.0	Dolerite	Kdd	94	○								
1057	7- 30	-	-	30.0	Beforsite	Mcb2	94	○	○							
1058	7- 35	-	-	35.0	Beforsite, Fe oxide rich	Mcb2	94	○								
1059	7- 40	-	-	40.0	Beforsite, Fe oxide rich	Mcb2	94	○								
1060	7- 45	-	-	45.0	Beforsite, Fe oxide rich	Mcb2	94	○								
1061	7T- 2	-	-	46.0	Beforsite, Fe oxide rich	Mcb2	94				○			○		
1062	7- 50	-	-	50.0	Beforsite, Ap rich	Mcb2	94	○	○							
1063	7- 55	-	-	55.0	Beforsite, Ap rich	Mcb2	94	○								
1064	7- 60	-	-	60.0	Beforsite, Ap rich	Mcb2	94	○								
1065	7- 65	-	-	65.0	Beforsite, Ap rich	Mcb2	94	○								
1066	7- 70	-	-	70.0	Beforsite, Ap rich	Mcb2	94	○	○							
1067	7- 75	-	-	75.0	Beforsite, Ap rich	Mcb2	94	○								
1068	7- 80	-	-	80.0	Beforsite, Ap rich	Mcb2	94	○								
1069	7- 85	-	-	85.0	Beforsite, Ap rich	Mcb2	94	○								
	7X- 3												○			
1070	7- 90	-	-	90.0	Beforsite, Ap rich	Mcb2	94	○	○							
1071	7T- 3	-	-	93.0	Beforsite, sulfide rich	Mcb2	94				○					
1072	7- 95	-	-	95.0	Beforsite, Ap rich	Mcb2	94	○								
1073	7-100	-	-	100.0	Beforsite, Ap rich	Mcb2	94	○								
1074	7-105	-	-	105.0	Beforsite, Ap rich	Mcb2	94	○								
1075	7-110	-	-	110.0	Beforsite, Ap rich	Mcb2	94	○	○							
1076	7-115	-	-	115.0	Beforsite, Ap rich	Mcb2	94	○								
1077	7-120	-	-	120.0	Beforsite, Ap rich	Mcb2	94	○								
1078	7-125	-	-	125.0	Beforsite, Ap rich	Mcb2	94	○								
1079	7T- 4	-	-	129.3	Beforsite, Ap rich	Mcb2	94				○					
1080	7-130	-	-	130.0	Beforsite, Ap rich	Mcb2	94	○	○							
1081	7-135	-	-	135.0	Beforsite, Ap rich	Mcb2	94	○								
1082	7X- 1a	-	-	136.6	Beforsite, Ap rich	Mcb2	94						○			
1083	7X- 1b	-	-	136.7	Beforsite, Ap rich	Mcb2	94						○			
1084	7-140	-	-	140.0	Beforsite, Ap rich	Mcb2	94	○								

B-1 List of Samples from the Orange Area (15)

No.	Sample No.	X m	Y m	Depth m	Rock Name	Rock Code	Analytical methods									
							Year	REE	WR	TS	PS	PO	XR	EA	IA	PA
1085	7-145	-	-	145.0	Beforsite, Ap rich	Mcb2	94	○								
	7R- 1														○	
1086	7X- 2	-	-	148.0	Beforsite, Ap rich	Mcb2	94						○			
1087	7-150	-	-	150.0	Beforsite, Ap rich	Mcb2	94	○	○							
	MJNO-8															
1088	8- 0	-	-	0.0	Beforsite, weathered	Mcb2	94	○								
1089	8- 3	-	-	3.0	Beforsite, weathered	Mcb2	94	○								
1090	8- 12	-	-	10.0	Beforsite	Mcb2	94	○								
1091	8- 15	-	-	15.0	Beforsite	Mcb2	94	○								
1092	8- 20	-	-	20.0	Slate, Bre. & carbonated	Nsh	94	○								
1093	8- 25	-	-	25.0	Slate, Bre. & carbonated	Nsh	94	○	○							
1094	8- 30	-	-	30.0	Beforsite, Phl rich	Mcb2	94	○								
1095	8- 35	-	-	35.0	Beforsite, Phl rich	Mcb2	94	○								
	8X- 1												○			
1096	8- 40	-	-	40.0	Beforsite, Phl rich	Mcb2	94	○								
1097	8- 45	-	-	45.0	Beforsite, Phl rich	Mcb2	94	○								
1098	8- 50	-	-	50.0	Beforsite, Phl rich	Mcb2	94	○	○							
1099	8- 55	-	-	55.0	Beforsite, Phl rich	Mcb2	94	○								
	8T- 2										○					
1100	8X- 2	-	-	55.0	Beforsite, Ap rich	Mcb2	94						○			
1101	8- 61	-	-	61.5	Beforsite, Phl rich	Mcb2	94	○								
1102	8- 65	-	-	65.0	Beforsite, Ap rich	Mcb2	94	○								
1103	8- 67	-	-	67.3	Beforsite, Ap rich	Mcb2	94	○	○							
1104	8- 70	-	-	70.0	Beforsite, Ap rich	Mcb2	94	○								
1105	8- 75	-	-	75.0	Beforsite, Ap rich	Mcb2	94	○								
	8T- 3										○					
1106	8- 80	-	-	80.0	Beforsite, Ap rich	Mcb2	94	○	○							
1107	8- 85	-	-	85.0	Beforsite, Ap rich	Mcb2	94	○								
1108	8T- 4	-	-	87.3	Beforsite, Ap rich	Mcb2	94				○					
1109	8- 90	-	-	90.0	Beforsite, Ap rich	Mcb2	94	○	○							
1110	8- 95	-	-	95.0	Beforsite, Ap rich	Mcb2	94	○								
1111	8-100	-	-	100.0	Beforsite, Phl rich	Mcb2	94	○	○							
1112	8-105	-	-	105.0	Beforsite, Ap rich	Mcb2	94	○								
1113	8-110	-	-	110.0	Beforsite, Ap rich	Mcb2	94	○								
1114	8-115	-	-	115.0	Beforsite, Ap rich	Mcb2	94	○								
1115	8-120	-	-	120.0	Beforsite, Ap rich	Mcb2	94	○	○							
	8R- 1	-	-	120.0	Beforsite, Ap rich	Mcb2									○	
1116	8-125	-	-	125.0	Beforsite, Ap rich	Mcb2	94	○								
1117	8-130	-	-	130.0	Beforsite, Ap rich	Mcb2	94	○								
1118	8-135	-	-	135.0	Beforsite, Ap rich	Mcb2	94	○								
1119	8-137	-	-	137.3	Beforsite, Ap rich	Mcb2	94	○	○							
1120	8T- 5	-	-	142.8	Syenite, Phl	Msu	94				○					
1121	8-145	-	-	145.0	Beforsite, Phl rich	Mcb2	94	○								
1122	8-150	-	-	150.0	Beforsite, Phl rich	Mcb2	94	○								

B–2 Whole Rock Analyses and Normative mineral Assemblages of the Orange Area

Abbreviation of the normative minerals in the list

Q:	quartz	SiO_2
C:	corundum	Al_2O_3
or:	orthoclase	$K_2O.Al_2O_3.6SiO_2$
ab:	albite	$Na_2O.Al_2O_3.6SiO_2$
an:	anorthite	$CaO.Al_2O_3.2SiO_2$
lc:	leucite	$K_2O.Al_2O_3.4SiO_2$
ne:	nepheline	$Na_2O.Al_2O_3.2SiO_2$
kp:	kaliophilite	$K_2O.Al_2O_3.2SiO_2$
ac:	acmite	$Na_2O.Fe_2O_3.4SiO_2$
ns:	sodium metasilicate	$Na_2O.SiO_2$
ks:	potassium metasilicate	$K_2O.SiO_2$
cs:	calcium orthosilicate	$CaO.SiO_2$
mt:	magnetite	$FeO.Fe_2O_3$
hm:	hematite	Fe_2O_3
tn:	titanite	$CaO.TiO_2.SiO_2$
pf:	perofskite	$CaO.TiO_2$
ru:	rutile	TiO_2
ap:	apatite	$3(3CaO.F_2O_5).CaF_2$
wo-di:	wollastonite	$CaO.SiO_2$
en-di:	$MgSiO_3$ in diopside	$MgO.SiO_2$
fs-di:	$FeSiO_3$ in hedenbergite	$FeO.SiO_2$
en-hy:	enstatite	$MgO.SiO_2$
fs-hy:	ferrosilite	$FeO.SiO_2$
fo-ol:	forsterite	$2MgO.SiO_2$
fa-ol:	fayalite	$2FeO.SiO_2$
ca:	calcite	$CaO.CO_2$
ma:	magnesite	$MgO.CO_2$
sd:	siderite	$FeO.CO_2$
sr:	sirontianite	$SrO.CO_2$
NaCO3:	sodium carbonate	$Na_2O.CO_2$
K2CO3:	potassium carbonate	$K_2O.CO_2$

B-2 Whole Rock Analyses and Normative mineral Assemblage of the Orange Area (1)

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Sample No.	Bb400	Bb500	Bb515	Bb600	C420	Cb315	Cb415	Cb500	Cb515	Cb600	Cb615	Cc315	Cc400	Cc415	Cc500	Cc515	Cc600	Da300	Da320	Db400
Rock code	Mcbl	Mcbl	Mcbl	Mcbl	Kdd	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Ngn	Mcbl	Mcbl
	Weight percentage																			
SiO2	1.02	0.26	1.86	0.88	44.17	2.72	1.92	0.82	2.96	1.52	0.12	2.16	1.08	0.98	0.56	11.02	1.36	54.94	6.89	1.20
TiO2	0.01	< 0.01	0.03	0.01	1.02	0.03	0.01	0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	0.03	0.01	< 0.01	< 0.01	0.47	0.07	0.01
Al2O3	0.10	0.08	0.82	0.22	14.62	0.74	0.53	0.19	0.70	0.15	0.03	0.02	0.10	0.27	0.15	0.07	0.02	17.13	2.34	0.16
Fe2O3	0.08	0.06	4.87	5.11	0.60	0.66	8.52	0.18	1.47	3.34	1.91	2.89	5.95	3.25	1.43	4.09	0.88	3.22	0.74	2.31
FeO	2.95	2.30	3.69	1.27	3.60	3.19	2.46	0.35	3.45	1.79	3.52	4.32	3.25	3.19	2.52	1.29	1.86	0.13	4.29	3.09
MnO	0.05	0.04	1.32	1.03	0.54	0.81	0.94	0.03	0.30	0.89	0.32	1.12	1.25	1.05	0.81	0.85	1.16	0.15	0.94	0.99
MgO	16.72	15.79	14.72	15.15	7.60	17.39	17.83	18.64	19.39	18.74	18.82	16.60	15.67	17.89	18.82	16.83	19.15	1.30	16.05	17.36
CaO	28.56	26.32	25.87	29.67	4.76	27.87	24.34	27.91	25.77	28.49	28.66	27.37	27.59	28.05	28.27	26.67	29.08	4.73	27.61	30.09
Na2O	0.02	0.02	0.02	0.02	3.33	0.21	0.15	0.02	0.06	0.02	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.42	0.09	0.03
K2O	0.07	0.02	0.01	0.14	4.70	0.44	0.11	0.14	0.07	< 0.01	< 0.01	0.01	0.02	0.07	0.05	0.01	< 0.01	8.78	0.91	0.02
P2O5	0.09	< 0.01	1.33	0.94	0.01	2.98	0.41	0.04	1.14	< 0.01	0.32	< 0.01	< 0.01	1.65	0.71	< 0.01	0.92	1.82	2.98	< 0.01
H2O(+)	0.96	0.78	1.42	1.27	0.44	0.45	0.51	0.81	0.57	0.65	0.46	0.92	1.56	0.39	0.44	0.91	0.33	2.44	1.06	0.60
H2O(-)	0.28	0.16	0.56	0.07	0.42	0.43	0.59	0.27	0.29	0.11	0.26	0.10	0.22	0.15	0.24	0.15	0.23	0.42	0.26	0.06
CO2	47.32	49.82	37.43	42.18	8.04	41.17	40.97	45.25	42.32	42.47	44.28	43.25	41.30	39.37	44.16	37.12	41.66	2.94	34.22	43.13
Sum	98.23	95.67	93.95	97.96	93.85	99.09	99.29	94.66	98.50	98.20	98.73	98.80	98.02	96.36	98.19	99.05	96.68	98.89	98.45	99.06
	Weight percentage																			
Q	0.93	0.26	1.59	0.78	–	2.41	1.71	0.76	1.98	–	–	1.88	0.84	–	0.22	6.40	–	18.96	–	–
C	0.09	0.08	0.72	0.20	4.23	0.65	0.47	0.18	0.47	0.09	0.00	0.02	0.06	0.15	0.06	0.02	–	7.12	1.08	0.08
or	–	–	0.06	–	28.98	–	–	–	0.37	0.05	–	–	0.11	–	0.26	0.05	–	53.30	3.39	0.10
ab	–	–	0.16	–	29.40	–	–	–	0.45	0.15	–	–	0.08	–	0.15	0.15	–	3.65	–	0.02
an	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
lc	–	–	–	–	–	–	–	–	–	–	0.04	–	–	0.30	–	–	0.04	–	1.13	–
ne	–	–	–	–	–	–	–	–	–	–	0.04	–	–	0.08	–	–	0.02	–	0.37	0.11
kp	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ac	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.03	–	–	–
ns	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ks	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
cs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
mt	–	–	4.57	–	0.91	–	–	–	1.89	4.25	2.42	–	1.86	4.31	1.25	5.22	1.13	0.94	0.96	2.89
hm	0.07	0.06	1.39	4.55	–	0.58	7.57	0.17	–	–	–	2.52	3.99	–	0.39	–	–	2.66	–	–
tn	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
pf	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ru	0.01	0.01	0.03	0.01	1.06	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.48	0.06	0.01
ap	0.19	0.02	2.87	1.94	0.02	6.11	0.84	0.09	2.34	0.02	0.65	0.02	0.02	3.50	1.44	0.02	1.92	4.33	6.20	0.02
wo-di	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
en-di	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
fs-di	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
en-hy	–	–	–	–	5.30	–	–	–	–	0.60	–	–	–	–	–	4.88	–	0.75	–	–
fs-hy	–	–	–	–	4.10	–	–	–	0.21	0.99	–	–	–	–	–	0.52	–	–	–	–
fo-ol	–	–	–	–	3.03	–	–	–	–	0.40	–	–	–	0.50	–	–	1.30	–	3.16	–
fa-ol	–	–	–	–	2.58	–	–	–	–	0.73	0.22	–	–	1.63	–	–	2.08	–	6.27	3.07
ca	60.64	61.30	52.75	59.31	11.60	49.56	49.47	60.62	50.36	58.36	57.78	55.65	57.08	55.35	55.75	54.81	58.54	5.60	49.72	60.61
ma	31.71	32.72	28.68	28.22	8.51	32.17	33.14	36.27	35.99	33.38	34.45	30.22	29.03	32.90	34.36	26.88	33.48	2.17	26.37	31.32
sd	4.99	4.26	5.99	3.77	–	6.52	5.57	0.65	4.86	–	3.55	8.74	6.31	–	4.66	–	–	–	–	0.89
sr	1.25	1.23	1.21	1.01	0.29	1.09	0.85	1.04	1.07	0.98	0.84	0.92	0.64	1.25	1.46	1.03	1.45	0.04	1.28	0.89
Na2CO3	0.03	0.03	–	0.03	–	0.32	0.23	0.03	–	–	–	0.03	–	–	–	–	–	–	–	–
K2CO3	0.09	0.03	–	0.18	–	0.57	0.14	0.19	–	–	–	0.01	–	–	–	–	–	–	–	–

B-2 Whole Rock Analyses and Normative mineral Assemblage of the Orange Area (2)

No.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Sample No.	Db415	Db515	Db600	Db700	Db715	Dc320	Dc405	Dc415	Dc500	Dc515	Dc600	Dc615	Dc700	Ea300	Ea320	Ea410	Ea600	Ea710	Eb315	Eb400
Rock code	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mfn	Mcbl	Mcbl	Mcbl	Mcbl	Mgr	Mcbl	Mcbl	Mcbl	Msu	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl
	Weight percentage																			
SiO2	0.48	0.28	0.42	0.04	0.26	23.08	0.26	0.48	0.24	0.34	67.26	0.24	1.20	2.13	25.59	0.58	0.40	0.34	1.46	0.36
TiO2	0.01	0.01	0.01	< 0.01	< 0.01	0.38	0.01	0.01	0.01	0.01	0.02	0.01	< 0.01	0.10	0.27	0.01	0.02	0.01	< 0.01	< 0.01
Al2O3	0.04	0.04	0.07	0.01	0.05	11.22	0.12	0.06	0.02	0.13	12.96	0.10	0.06	0.35	6.28	0.01	0.01	0.01	0.16	0.08
Fe2O3	1.27	1.73	8.38	1.91	5.11	3.14	0.67	4.83	3.24	5.54	6.76	5.00	7.92	1.64	1.39	11.42	3.43	2.97	2.97	5.82
FeO	3.35	3.22	1.83	3.15	2.16	2.32	3.79	3.19	2.36	0.17	0.43	1.16	1.00	5.03	2.74	0.16	2.13	1.74	6.97	2.69
MnO	0.92	0.98	1.18	0.92	1.06	0.26	0.81	1.01	0.86	0.69	0.01	1.08	0.91	1.05	0.25	1.22	0.86	0.83	0.91	1.09
MgO	18.44	17.75	17.83	18.24	19.38	1.57	19.51	19.06	18.78	18.06	0.66	19.54	17.57	16.94	1.69	19.90	19.96	20.34	11.64	17.88
CaO	27.79	27.08	25.70	28.80	27.32	26.81	28.21	26.67	28.23	29.16	0.28	26.99	24.99	27.36	33.82	23.46	27.52	27.65	25.90	26.97
Na2O	0.02	0.02	0.02	0.01	0.02	0.82	0.03	0.04	0.02	0.05	3.65	0.02	0.02	0.04	2.15	0.03	0.02	0.02	0.03	0.03
K2O	< 0.01	< 0.01	0.01	< 0.01	0.02	4.05	0.03	0.02	< 0.01	0.02	4.26	0.02	0.01	0.54	1.11	0.01	0.01	0.01	0.05	0.01
P2O5	< 0.01	< 0.01	< 0.01	< 0.01	0.05	1.86	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05	2.36	0.04	0.03	0.03	0.05	< 0.01
H2O(+)	1.32	0.66	2.43	0.70	0.48	2.73	0.99	0.98	0.50	1.48	0.47	0.99	1.47	0.90	2.00	0.98	0.54	0.46	0.64	0.70
H2O(-)	0.30	0.12	0.11	0.16	0.22	0.31	0.05	0.08	0.20	0.12	0.31	0.19	0.07	0.23	0.13	0.14	0.25	0.11	0.27	0.34
CO2	44.18	46.24	40.88	45.15	43.14	20.11	43.92	42.06	43.66	43.16	0.70	42.97	43.16	43.12	20.00	40.60	44.64	44.66	40.75	42.07
Sum	98.14	98.15	98.88	99.12	99.28	98.66	98.42	98.50	98.14	98.94	97.78	98.32	98.40	99.48	99.78	98.56	99.82	99.18	91.81	98.06

	Weight percentage																			
Q	—	0.25	0.24	—	—	0.58	—	—	—	—	30.27	0.04	1.10	0.10	—	0.39	—	—	1.34	0.13
C	—	0.04	0.02	—	—	5.01	0.04	—	—	0.02	2.41	0.04	0.06	—	—	—	—	—	0.15	0.02
or	0.05	—	0.05	—	—	21.84	—	—	—	0.10	25.91	0.10	—	1.66	5.87	0.05	0.05	0.05	—	0.05
ab	0.13	—	0.15	—	—	6.33	—	—	—	0.32	31.79	0.15	—	—	11.98	—	—	—	—	0.22
an	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.76	—	—	—	—	—
lc	—	—	—	0.04	0.08	—	0.13	0.08	0.04	—	—	—	—	—	—	—	—	—	—	—
ne	—	—	—	—	0.07	—	0.13	0.10	0.02	0.03	—	—	—	—	2.32	—	—	—	—	—
kp	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ac	0.02	—	—	0.06	0.02	—	—	0.11	0.09	—	—	—	—	0.26	—	0.20	0.13	0.13	—	—
ns	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ks	—	—	—	0.00	—	—	—	—	—	—	—	—	—	0.31	—	0.00	0.00	0.00	—	—
cs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
mt	1.61	—	4.00	0.76	6.45	4.16	0.88	6.20	4.07	0.61	1.48	5.62	—	1.93	1.80	2.57	4.20	3.68	—	5.71
hm	—	1.54	4.74	1.10	—	—	—	—	—	4.43	5.94	0.55	7.28	—	—	8.44	—	—	2.73	1.20
tn	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
pf	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.41	—	—	—	—	—
ru	0.01	0.01	0.01	0.01	0.01	0.35	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.09	—	0.01	0.02	0.01	0.01	0.01
ap	0.02	0.02	0.02	0.02	0.10	3.93	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.10	4.89	0.08	0.06	0.06	0.11	0.02
wo-di	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7.83	—	—	—	—	—
en-di	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.76	—	—	—	—	—
fs-di	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.92	—	—	—	—	—
en-hy	—	—	—	—	—	1.80	—	—	—	—	0.54	—	—	—	—	—	—	—	—	—
fs-hy	0.16	—	—	—	—	2.00	—	—	—	—	—	—	—	0.93	—	—	0.34	0.25	—	—
fo-ol	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
fa-ol	0.74	—	—	—	0.48	—	0.38	0.96	0.44	—	—	—	—	—	—	—	0.30	0.29	—	—
ca	57.00	56.36	53.71	57.96	55.52	51.94	59.67	55.64	57.81	59.65	0.64	55.72	53.61	55.32	52.86	49.20	55.00	56.15	55.42	55.58
ma	33.88	33.09	33.38	32.88	35.35	1.49	36.98	35.62	34.45	33.09	0.97	36.14	33.77	30.74	—	37.45	35.77	37.04	22.36	33.01
sd	4.91	6.91	2.71	6.05	0.83	—	0.59	0.16	1.88	1.04	—	0.48	3.24	7.72	—	0.84	1.63	1.43	13.36	2.93
sr	1.49	1.74	0.96	1.13	1.09	0.59	1.17	1.10	1.16	0.67	—	1.14	0.88	0.85	0.59	0.77	2.52	0.92	4.42	1.12
Na2CO3	—	0.03	—	—	—	—	—	—	—	—	—	—	0.03	—	—	—	—	—	0.05	—
K2CO3	—	0.01	—	—	—	—	—	—	—	—	—	—	0.01	—	—	—	—	—	0.07	—

B-2 Whole Rock Analyses and Normative mineral Assemblage of the Orange Area (3)

No.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Sample No.	Eb415	Eb500	Eb515	Eb610	Eb700	Eb715	Ec300	Ec310	Ec400	Ec415	Ec500	Ec600	Ec620	Ec700	Ec715	F700	F810	Fb400	Fb415	Fb500
Rock code	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Msu	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Msu	Mcbl	Mcbl	Mcbl
	Weight percentage																			
SiO2	0.32	0.38	0.72	1.80	1.84	0.30	1.06	40.02	0.44	0.42	0.70	0.75	< 0.01	0.82	0.68	2.63	25.74	1.06	1.10	1.92
TiO2	0.01	0.01	0.03	0.01	0.01	0.01	< 0.01	0.12	< 0.01	0.01	0.01	0.01	< 0.01	< 0.01	0.01	0.01	0.56	0.01	0.01	0.01
Al2O3	0.06	0.08	0.26	0.18	0.13	0.08	0.13	18.48	0.12	0.08	0.04	0.19	0.08	0.05	0.23	0.01	7.27	0.30	0.28	0.15
Fe2O3	0.96	2.43	4.04	0.92	6.68	6.27	4.12	1.38	0.63	0.37	4.40	4.21	3.97	3.61	7.80	5.78	1.03	6.68	2.40	1.60
FeO	4.08	3.45	4.82	3.55	1.16	1.00	4.10	2.36	3.59	3.53	0.90	2.09	1.33	2.26	2.13	1.00	4.25	2.23	3.04	3.75
MnO	0.80	0.92	1.09	0.80	0.92	0.93	1.18	0.87	1.48	1.16	1.22	0.98	1.05	0.90	1.17	0.98	0.23	0.91	0.88	0.88
MgO	16.75	18.36	15.89	18.08	15.35	18.25	15.17	2.13	18.51	18.66	18.28	19.16	15.34	16.57	16.99	16.96	1.70	16.76	16.65	15.26
CaO	28.26	27.84	27.17	26.96	27.98	26.72	26.88	9.08	28.30	28.32	27.78	27.61	28.77	27.69	26.78	28.87	30.34	27.38	28.76	29.98
Na2O	0.04	0.02	0.02	0.01	0.02	0.01	0.02	2.92	0.04	0.05	0.01	0.02	0.02	0.02	0.02	0.04	2.97	0.02	0.03	0.01
K2O	0.01	0.01	0.02	0.04	0.03	< 0.01	0.02	6.10	0.02	0.01	< 0.01	0.04	0.01	0.01	0.03	0.02	1.57	0.08	0.08	0.02
P2O5	< 0.01	0.21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.27	0.03	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	2.29	< 0.01	< 0.01	0.35
H2O(+)	0.54	0.81	1.01	0.78	1.68	1.52	1.13	1.46	0.79	0.55	1.07	0.80	0.05	0.74	0.98	1.56	1.90	1.13	0.87	0.75
H2O(-)	0.54	0.11	0.11	0.24	0.18	0.14	0.25	0.28	0.29	0.39	0.19	0.26	0.35	0.24	0.40	0.23	0.04	0.27	0.13	0.29
CO2	44.56	43.71	42.16	45.01	42.40	43.14	43.34	9.13	44.24	44.55	43.68	42.94	47.28	45.50	41.62	40.77	18.75	41.36	44.31	43.03
Sum	96.94	98.34	97.35	98.39	98.39	98.39	97.42	94.60	98.49	98.14	98.30	99.07	98.28	98.43	98.85	98.90	98.64	98.20	98.55	98.00
	Weight percentage																			
Q	0.29	—	0.47	1.59	1.66	0.27	0.96	—	—	—	0.62	—	—	0.74	0.39	1.25	—	0.56	0.96	1.67
C	0.05	0.03	0.18	0.16	0.12	0.07	0.12	7.23	0.03	—	0.04	0.10	0.07	0.05	0.14	—	—	0.16	0.24	0.13
or	—	0.05	0.11	—	—	—	—	36.84	—	—	—	0.21	—	—	0.16	0.05	8.42	0.42	—	—
ab	—	0.15	0.15	—	—	—	—	21.95	—	—	—	0.15	—	—	0.15	—	11.27	0.15	—	—
an	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.70	—	—	—
lc	—	—	—	—	—	—	—	—	0.08	0.04	—	—	—	—	—	—	—	—	—	—
ne	—	—	—	—	—	—	—	1.79	0.16	0.17	—	—	—	—	—	—	6.25	—	—	—
kp	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ac	—	—	—	—	—	—	—	—	—	0.05	—	—	—	—	—	0.26	—	—	—	—
ns	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ks	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02	—	—	—	—
cs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
mt	—	3.09	1.64	—	—	—	—	2.05	0.81	0.45	—	5.35	—	—	1.32	5.65	1.36	2.92	—	—
hm	0.86	—	2.44	0.81	6.02	5.60	3.72	—	—	—	3.88	—	3.65	3.25	5.93	1.07	—	3.88	2.09	1.39
tn	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
pf	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.87	—	—	—
ru	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.12	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	—	0.01	0.01	0.01
ap	0.02	0.43	0.02	0.02	0.02	0.02	0.02	0.64	0.06	0.08	0.02	0.02	0.02	0.02	0.02	0.08	4.82	0.02	0.02	0.71
wo-di	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5.27	—	—	—
en-di	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.94	—	—	—
fs-di	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.41	—	—	—
en-hy	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.46	—	—	—	—
fs-hy	—	0.16	—	—	—	—	—	—	—	—	—	0.18	—	—	—	—	—	—	—	—
fo-ol	—	—	—	—	—	—	—	0.15	—	—	—	—	—	—	—	—	1.33	—	—	—
fa-ol	—	0.42	—	—	—	—	—	3.81	0.93	0.84	—	1.13	—	—	—	—	2.57	—	—	—
ca	58.83	56.38	56.11	55.63	58.84	55.68	56.72	20.83	58.37	58.27	57.16	56.46	61.69	58.20	54.87	58.88	50.35	56.42	58.57	59.94
ma	31.23	33.63	29.40	33.42	28.92	34.07	28.67	4.38	34.23	34.44	33.69	35.10	29.46	31.20	31.19	29.80	—	30.94	30.37	27.74
sd	8.03	4.62	8.73	7.10	3.46	3.18	8.81	—	4.04	4.46	3.45	0.29	4.04	5.25	4.60	—	—	3.47	6.31	7.43
sr	0.61	1.04	0.74	1.19	0.90	1.08	0.92	0.22	1.28	1.19	1.12	1.01	1.02	1.25	1.21	1.48	0.46	1.07	1.28	0.95
Na2CO3	0.06	—	—	0.02	0.03	0.02	0.03	—	—	—	0.02	—	0.03	0.03	—	—	—	—	0.05	0.02
K2CO3	0.01	—	—	0.05	0.04	0.01	0.03	—	—	—	0.01	—	0.01	0.01	—	—	—	—	0.10	0.03

B-2 Whole Rock Analyses and Normative mineral Assemblage of the Orange Area (4)

No.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Sample No.	Fb515	Fb600	Fb615	Fb700	Fb715	Fc400	Fc415	Fc500	Fc515	Fc600	Fc615	Fc715	Gb500	Gb515	Gb600	Gc400	Gc415	Gc500	Gc515	Gc600
Rock code	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl
	Weight percentage																			
SiO2	0.74	0.14	0.26	2.40	0.58	2.46	0.12	0.22	0.36	0.32	0.26	1.00	2.16	1.60	0.36	0.22	0.04	0.26	0.26	0.66
TiO2	0.01	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	0.01	< 0.01	0.01	0.02	0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Al2O3	0.14	0.05	0.06	0.09	0.08	0.07	0.05	0.04	0.08	0.06	0.06	0.29	1.25	0.68	0.09	0.04	0.03	0.06	0.09	0.17
Fe2O3	4.49	5.67	2.01	3.71	1.16	5.55	0.68	0.89	2.05	4.51	3.17	3.13	8.95	6.48	1.98	1.67	3.76	2.50	8.22	2.03
FeO	1.96	2.72	2.31	3.52	3.05	4.05	3.52	3.05	2.13	1.00	2.00	1.73	1.33	5.84	5.08	4.88	4.32	3.08	0.17	4.02
MnO	0.91	1.01	0.79	0.98	0.88	0.93	0.76	0.76	0.81	0.85	0.83	0.92	1.02	1.33	1.05	1.06	1.04	0.83	1.19	0.94
MgO	17.36	17.40	17.87	15.73	17.41	15.17	18.04	17.97	16.95	16.99	16.60	17.53	12.49	11.85	15.43	14.59	15.37	15.94	8.20	14.29
CaO	30.21	28.06	28.43	28.33	29.97	26.70	29.04	29.52	29.67	28.77	28.06	27.94	28.08	27.58	27.90	28.50	27.32	27.97	36.27	29.90
Na2O	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.04	0.17	0.08	0.01	0.03	0.03	0.01	0.01	0.04
K2O	0.05	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.18	0.10	0.08	0.01	0.01	0.01	0.02	0.01	0.02
P2O5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	< 0.01	< 0.01	1.11	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.06
H2O(+)	1.02	0.98	0.62	1.07	0.87	1.30	0.87	0.73	0.91	0.70	0.98	0.18	2.17	1.38	0.10	0.92	1.01	1.16	2.11	0.57
H2O(-)	0.18	0.02	0.32	0.19	0.15	0.32	0.05	0.27	0.09	0.24	0.24	0.16	0.09	0.08	0.09	0.08	0.05	0.06	0.17	0.05
CO2	41.62	43.12	45.52	42.41	44.34	41.31	45.94	45.18	45.18	43.23	45.79	42.20	36.49	39.37	44.00	43.65	43.79	43.34	39.31	43.76
Sum	98.73	99.21	98.24	98.47	98.53	97.90	99.11	98.68	98.32	96.71	98.03	96.42	94.33	96.37	96.12	95.67	96.93	96.25	96.03	96.52
	Weight percentage																			
Q	—	0.04	0.23	2.01	—	2.19	0.10	0.04	0.32	0.29	0.24	0.89	0.73	1.43	0.32	0.20	0.04	0.23	0.23	0.58
C	0.03	0.02	0.05	0.06	0.05	0.06	0.04	—	0.07	0.05	0.05	0.26	0.80	0.61	0.08	0.04	0.03	0.05	0.08	0.15
or	—	0.05	—	0.05	0.05	—	—	0.05	—	—	—	—	0.55	—	—	—	—	—	—	—
ab	—	0.07	—	0.07	0.07	—	—	0.13	—	—	—	—	1.33	—	—	—	—	—	—	—
an	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
lc	0.20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ne	0.12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
kp	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ac	—	—	—	—	—	—	—	0.02	—	—	—	—	—	—	—	—	—	—	—	—
ns	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ks	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
cs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
mt	5.71	2.00	—	0.03	1.45	—	—	1.11	—	—	—	—	3.49	—	—	—	—	—	—	—
hm	—	3.54	1.78	3.22	—	4.94	0.59	—	1.80	4.02	2.87	2.79	5.87	5.78	1.76	1.50	3.38	2.23	7.24	1.79
tn	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
pf	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ru	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.14	0.01	0.01	0.01
ap	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.08	0.02	0.02	2.29	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.12
wo-di	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
en-di	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
fs-di	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
en-hy	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
fs-hy	—	—	—	—	0.03	—	—	0.04	—	—	—	—	—	—	—	—	—	—	—	—
fo-ol	0.81	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
fa-ol	0.47	—	—	—	1.36	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ca	61.83	56.88	58.68	57.70	60.34	55.47	58.54	59.53	60.59	59.88	59.25	55.10	60.54	57.48	58.01	59.80	57.33	58.26	74.65	61.45
ma	29.58	31.59	33.04	28.70	31.40	28.23	32.57	32.46	31.05	31.67	31.40	32.66	24.16	22.12	28.74	27.42	28.89	31.61	15.12	26.37
sd	—	4.85	5.06	7.24	3.65	8.18	6.82	5.41	4.76	3.05	4.73	4.36	2.04	11.82	10.08	9.86	8.90	6.44	2.21	8.08
sr	1.23	0.93	1.09	0.90	1.58	0.87	1.28	1.18	1.28	0.99	1.41	1.35	0.36	0.50	0.95	1.10	1.23	1.11	0.41	1.36
Na2CO3	—	—	0.02	—	—	0.02	0.02	—	0.03	0.02	0.02	0.06	—	0.12	0.02	0.05	0.05	0.02	0.02	0.06
K2CO3	—	—	0.03	—	—	0.01	0.01	—	0.03	0.01	0.01	0.24	—	0.11	0.01	0.01	0.01	0.03	0.01	0.03

B-2 Whole Rock Analyses and Normative mineral Assemblage of the Orange Area (5)

No.	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Sample No.	Gc615	Gc700	H700	I500	I800	J900	Ja715	Jb800	Jb815	L400A	K500	K825	K900	Kb620	Kb715	Kb815	Kc800	Kc815	L110	L625
Rock code	Mcb1	Mcb1	Mcs	Msu	Msr	Mgr	Mgr	Mcb2	Mcb2	Mcs	Msu	Ktd	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Msw	Kdd
	Weight percentage																			
SiO2	0.30	0.32	28.96	52.87	51.28	66.51	59.50	1.82	0.28	19.12	55.82	64.35	0.54	1.00	0.50	1.14	0.04	0.30	70.30	37.48
TiO2	< 0.01	< 0.01	0.13	0.46	0.24	0.01	0.13	0.06	0.01	0.21	0.38	0.08	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.17	1.61
Al2O3	0.04	0.08	7.09	19.69	15.44	18.20	13.60	0.50	0.09	5.86	19.51	15.19	0.11	0.09	0.05	0.04	0.03	0.07	12.89	18.84
Fe2O3	4.37	0.51	1.26	0.23	2.62	1.00	2.94	0.80	0.62	0.90	0.20	4.11	0.20	1.25	0.65	1.06	0.13	0.38	1.27	1.47
FeO	2.49	3.79	1.77	2.35	2.45	0.58	0.53	4.18	3.52	1.61	3.48	0.20	3.85	3.25	3.65	2.92	3.32	2.93	1.10	7.30
MnO	1.00	0.90	0.12	0.04	0.20	0.01	0.13	1.14	0.86	0.13	0.08	0.12	1.17	1.18	0.93	0.75	0.83	0.81	0.08	0.15
MgO	16.96	16.07	0.76	0.19	0.64	0.01	1.30	15.28	15.43	0.73	1.62	0.51	17.72	14.29	15.55	15.42	16.80	16.29	0.87	6.41
CaO	27.45	28.67	28.53	1.76	7.52	0.12	3.91	27.88	30.26	35.71	0.61	1.46	29.85	31.25	30.93	29.81	30.58	30.32	1.21	8.01
Na2O	0.02	0.01	0.93	7.19	5.65	10.91	3.26	0.03	0.05	2.11	3.86	4.02	0.05	0.15	0.03	0.16	0.02	0.06	4.47	2.84
K2O	0.01	0.02	4.93	8.84	6.59	0.05	8.57	0.41	0.03	2.96	10.94	1.84	0.04	0.05	0.02	0.04	0.02	0.03	4.55	2.18
P2O5	< 0.01	0.05	1.45	0.05	0.51	0.05	0.07	1.09	2.72	0.89	0.16	0.05	2.30	1.90	3.69	4.37	2.53	1.76	0.12	0.54
H2O(+)	1.13	0.56	1.62	2.36	2.06	0.52	0.63	0.32	0.80	1.62	1.02	0.68	1.20	0.45	0.57	0.34	0.44	0.32	0.38	2.36
H2O(-)	0.17	0.10	0.36	0.11	0.16	0.25	0.21	0.20	0.16	0.26	0.33	0.13	0.12	0.07	0.09	0.06	0.12	0.18	0.13	0.30
CO2	44.73	45.05	21.04	3.84	3.62	0.68	4.16	42.35	43.57	26.90	0.96	1.17	41.46	40.67	40.26	39.58	41.34	45.25	1.48	5.44
Sum	98.69	96.14	98.95	99.98	98.98	98.90	98.94	96.06	98.40	99.01	98.97	93.91	98.62	95.61	96.93	95.70	96.21	98.71	99.02	94.93
	Weight percentage																			
Q	0.27	0.29	2.23	–	–	5.01	8.49	1.64	0.25	–	–	34.75	–	–	0.15	1.05	–	0.27	25.57	–
C	0.04	0.07	0.20	–	–	0.80	–	0.45	0.08	–	1.34	6.68	–	–	–	0.04	–	0.06	0.61	10.84
or	–	–	26.01	52.56	39.13	0.30	50.49	–	–	15.01	65.87	11.51	–	0.26	0.11	–	–	–	26.86	13.30
ab	–	–	7.03	15.23	19.87	90.84	22.17	–	–	2.55	9.28	36.00	–	0.16	0.13	–	–	–	37.78	24.80
an	–	–	–	–	–	–	–	–	–	–	–	0.80	–	–	–	–	–	–	–	3.68
lc	–	–	–	–	–	–	–	–	–	–	–	–	0.17	–	–	–	0.08	–	–	–
ne	–	–	–	20.12	12.49	–	–	–	–	4.97	13.00	–	0.17	–	–	–	0.02	–	–	–
kp	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ac	–	–	–	0.33	4.50	–	4.70	–	–	2.24	–	–	0.06	0.85	0.09	–	0.10	–	–	–
ns	–	–	–	–	–	–	–	–	–	0.25	–	–	–	–	–	–	–	–	–	–
ks	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
cs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
mt	–	–	1.63	–	1.56	–	1.90	–	–	–	0.30	1.11	0.23	1.19	0.80	–	0.12	–	1.84	2.20
hm	3.91	0.46	–	0.12	–	1.02	–	0.72	0.56	–	–	3.59	–	–	–	0.97	–	0.34	–	–
tn	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
pf	–	–	–	–	0.41	–	–	–	–	0.31	–	–	–	–	–	–	–	–	–	–
ru	0.01	0.01	0.12	0.46	–	0.01	0.13	0.05	0.01	–	0.39	0.09	0.01	0.01	0.01	0.01	0.01	0.01	0.17	1.66
ap	0.02	0.10	3.00	0.12	1.19	0.12	0.16	2.27	5.66	1.77	0.38	0.12	4.83	3.92	7.61	9.31	5.32	3.62	0.28	1.29
wo-di	–	–	–	–	4.51	–	–	–	–	0.58	–	–	–	–	–	–	–	–	–	–
en-di	–	–	–	–	1.33	–	–	–	–	0.21	–	–	–	–	–	–	–	–	–	–
fs-di	–	–	–	–	3.35	–	–	–	–	0.37	–	–	–	–	–	–	–	–	–	–
en-hy	–	–	1.58	–	–	–	0.64	–	–	–	–	1.34	–	–	–	–	–	–	1.30	7.36
fs-hy	–	–	2.19	–	–	–	0.14	–	–	–	–	–	–	0.27	0.20	–	–	–	1.12	5.79
fo-ol	–	–	–	–	0.19	–	–	–	–	0.95	1.97	–	–	–	–	–	–	–	–	6.39
fa-ol	–	–	–	–	0.53	–	–	–	–	1.84	5.04	–	0.98	0.13	–	–	–	–	–	5.52
ca	57.38	59.85	55.53	3.98	10.60	0.13	8.89	55.60	56.02	68.31	0.95	3.07	56.79	59.73	54.19	51.65	57.79	58.08	2.47	15.87
ma	31.76	30.11	0.10	0.40	–	0.02	2.17	28.77	29.01	–	1.10	–	33.59	26.59	28.94	29.65	31.90	30.25	0.72	–
sd	5.77	7.76	–	4.44	–	1.11	–	8.84	7.27	–	–	–	2.31	6.16	6.88	6.23	3.81	6.13	–	–
sr	0.80	1.31	0.38	0.53	0.35	0.04	0.12	1.07	1.02	0.65	0.40	0.95	0.87	0.73	0.92	0.79	0.85	1.11	1.28	1.31
Na2CO3	0.03	0.02	–	1.71	–	0.62	–	0.05	0.08	–	–	–	–	–	–	0.25	–	0.09	–	–
K2CO3	0.01	0.03	–	–	–	–	–	0.54	0.04	–	–	–	–	–	–	0.05	–	0.04	–	–

B-2 Whole Rock Analyses and Normative mineral Assemblage of the Orange Area (6)

No.	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Sample No.	L800	La200	Lb605	Lb615	Lb700	Lb715	Lb800	Lc615	Lc700	Lc715	Lc800	M220	M710	Mb600	Mb615	Mb700	Mc600	Mc615	Mc700	Mc715
Rock code	Mcb2	Msp	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Mcs	Mcb2	Mcb2	Mcb2	Mcd	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2
	Weight percentage																			
SiO2	0.53	53.13	0.36	0.42	0.76	1.24	0.32	1.02	0.62	3.30	4.58	0.43	0.78	1.30	1.24	2.04	0.30	5.40	0.34	1.20
TiO2	0.01	0.32	0.01	< 0.01	0.01	0.01	< 0.01	0.02	< 0.01	0.13	0.01	0.01	0.03	0.01	< 0.01	0.01	< 0.01	0.03	< 0.01	0.01
Al2O3	0.01	20.72	0.07	0.06	0.03	0.04	0.01	0.06	0.05	1.14	1.34	0.01	0.01	0.43	0.22	0.40	0.08	0.94	0.11	0.07
Fe2O3	0.61	0.20	1.22	0.87	1.72	3.39	0.85	2.01	1.67	5.84	1.26	2.00	3.09	2.26	3.72	1.90	0.31	1.48	0.03	1.19
FeO	2.84	1.67	3.75	3.45	4.35	2.89	3.19	1.33	2.99	5.45	3.65	6.87	3.87	4.22	2.11	2.69	2.96	3.82	2.79	3.25
MnO	0.80	0.06	0.95	0.81	0.97	0.82	0.89	0.79	0.97	1.88	0.98	1.32	0.66	1.03	1.01	1.03	0.83	0.75	0.79	0.95
MgO	15.53	0.36	13.33	15.87	16.44	15.87	17.60	2.45	15.49	11.14	14.76	3.96	16.03	16.16	17.52	17.36	18.07	17.34	16.54	16.83
CaO	31.55	2.84	30.89	29.54	26.05	27.33	28.53	44.85	28.76	27.66	28.54	39.17	29.13	28.00	26.31	27.46	28.91	24.86	30.48	28.75
Na2O	0.06	6.00	0.07	0.06	0.04	0.09	0.07	0.19	0.09	0.40	0.47	0.04	0.24	0.06	0.05	0.04	0.02	0.24	0.04	0.03
K2O	0.01	7.20	0.02	0.07	0.01	0.03	0.02	0.06	0.02	0.08	0.07	0.29	0.10	0.27	0.24	0.20	0.05	0.97	0.05	0.06
P2O5	7.31	0.15	4.58	1.68	1.01	1.30	0.39	0.93	2.72	0.48	3.62	0.14	2.89	< 0.01	0.95	2.67	0.63	0.78	2.98	0.90
H2O(+)	1.36	3.78	0.96	1.24	0.29	0.93	0.92	0.65	1.00	1.00	0.81	1.14	0.52	0.19	0.57	1.05	0.59	0.45	0.38	0.88
H2O(-)	0.21	0.10	0.06	0.04	0.39	0.25	0.04	0.21	0.06	0.26	0.05	0.14	0.45	0.30	0.33	0.19	0.17	0.21	0.38	0.29
CO2	37.46	2.88	37.68	42.33	43.83	41.35	42.88	39.51	41.82	37.71	38.17	41.64	41.80	40.87	42.60	40.33	43.49	36.13	41.33	43.63
Sum	98.29	99.41	93.95	96.45	97.90	95.54	95.72	94.08	96.27	96.47	98.31	97.16	99.60	95.11	96.88	97.37	96.42	93.40	96.25	98.04
	Weight percentage																			
Q	0.49	—	0.33	0.38	0.67	1.14	—	0.86	0.57	0.60	3.15	0.36	0.69	—	1.12	0.93	—	—	—	1.05
C	0.01	3.14	0.07	0.05	0.03	0.04	—	0.05	0.05	0.35	0.93	0.01	0.01	0.04	0.20	0.11	—	—	—	0.06
or	—	43.75	—	—	—	—	—	—	—	0.42	0.37	—	—	—	—	1.05	—	—	—	—
ab	—	30.30	—	—	—	—	—	—	—	3.02	1.00	—	—	—	—	0.30	—	—	—	—
an	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
lc	—	—	—	—	—	—	0.04	—	—	—	—	—	—	1.14	—	—	0.21	—	0.21	—
ne	—	11.87	—	—	—	—	—	—	—	—	—	—	—	0.25	—	—	0.06	—	0.14	—
kp	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.52	—	—
ac	—	—	—	—	—	—	0.47	—	—	—	—	—	—	—	—	—	0.03	1.64	0.04	—
ns	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ks	—	—	—	—	—	—	0.02	—	—	—	—	—	—	—	—	—	—	0.15	—	—
cs	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
mt	—	0.30	—	—	—	—	0.88	—	—	1.32	—	—	—	2.98	—	1.95	0.39	1.15	0.02	—
hm	0.56	—	1.13	0.78	1.53	3.11	—	1.70	1.54	4.31	1.12	1.69	2.73	—	3.36	0.35	—	—	—	1.04
tn	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
pf	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ru	0.01	0.33	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.12	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.03	0.01	0.01
ap	15.59	0.36	9.82	3.50	2.07	2.77	0.82	1.82	5.81	0.99	7.45	0.28	5.91	0.02	1.99	5.50	1.30	1.66	6.13	1.82
wo-di	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
en-di	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
fs-di	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
en-hy	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
fs-hy	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
fo-ol	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.53	—	—
fa-ol	—	1.51	—	—	—	—	0.06	—	—	—	—	—	—	1.51	—	—	0.37	6.18	0.37	—
ca	47.14	6.35	53.73	57.33	55.34	54.99	59.42	86.06	54.24	56.42	49.31	77.17	52.18	59.48	52.90	49.72	58.27	51.12	55.08	56.22
ma	29.90	0.77	25.80	29.81	30.49	30.50	33.43	4.33	29.88	20.82	27.41	7.02	29.58	30.75	33.11	32.28	33.57	29.55	30.72	30.73
sd	6.19	1.16	8.03	7.07	8.71	6.30	3.92	3.31	6.74	11.35	7.59	12.82	7.38	2.67	5.21	5.00	2.26	—	4.80	6.77
sr	0.02	0.16	0.96	0.89	1.09	0.97	0.94	1.51	0.99	0.28	1.16	0.23	1.01	1.15	1.71	2.82	3.53	2.63	2.49	2.18
Na2CO3	0.09	—	0.11	0.09	0.06	0.14	—	0.27	0.14	—	0.51	0.06	0.36	—	0.08	—	—	—	—	0.05
K2CO3	0.01	—	0.03	0.09	0.01	0.04	—	0.07	0.03	—	—	0.36	0.13	—	0.32	—	—	—	—	0.08

B-2 Whole Rock Analyses and Normative mineral Assemblage of the Orange Area (7)

No.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
Sample No.	Mc800	N220	Na700	Nc600	Nc620	0600	P100	T 5A	T 7A	T 9A	T 11A	T 13A	1- 20	1- 30	1- 45	1- 60	1-120	1-130	1-140	1-150
Rock code	Mcb2	Msp	Msw	Mcb2	Mcb2	Msw	Msw	Mcb1	Msp	Mcs	Msu	Mcs	Mcb1	Ncb1	Mcb1	Nsh	Msu	Msu	Msu	Msu
	Weight percentage																			
SiO2	2.88	47.28	52.74	0.44	17.94	65.01	50.29	0.03	57.24	9.13	61.15	4.54	4.34	3.28	0.92	17.53	2.00	30.40	10.95	8.22
TiO2	0.04	0.70	0.45	0.01	1.04	0.07	0.46	0.01	0.03	0.08	0.12	0.02	0.04	0.02	< 0.01	1.33	0.37	2.13	1.78	0.61
Al2O3	0.94	16.06	20.30	0.10	5.91	18.20	22.09	0.04	15.34	2.68	14.67	0.03	1.22	0.89	0.14	10.69	1.29	14.50	5.22	4.48
Fe2O3	1.48	4.52	1.83	5.56	1.66	0.47	1.70	3.12	1.06	0.54	2.16	1.46	1.44	1.24	1.64	4.30	1.34	4.09	1.48	1.66
FeO	3.79	1.87	1.39	4.25	8.04	0.13	1.58	3.30	0.20	0.60	0.64	0.52	5.56	5.25	5.58	9.80	1.69	2.52	5.45	3.32
MnO	1.04	0.12	0.14	1.58	0.76	0.06	0.13	0.79	0.17	0.16	0.07	0.40	1.24	1.10	1.33	1.15	0.61	0.06	0.25	0.46
MgO	13.56	0.49	0.28	11.81	8.32	0.03	0.13	19.24	0.25	0.25	0.48	1.56	15.71	16.51	16.22	10.73	0.54	1.18	1.12	0.77
CaO	29.16	5.64	2.15	28.69	20.64	1.22	1.43	28.90	4.23	45.72	2.53	49.89	25.55	25.50	27.87	14.76	45.43	15.34	41.84	37.82
Na2O	0.19	9.90	8.79	0.05	0.69	9.13	11.23	0.09	1.05	1.13	3.45	0.77	0.03	0.06	0.03	0.06	0.16	0.17	0.03	0.05
K2O	0.25	4.63	5.72	0.01	3.52	2.80	5.20	0.03	12.99	0.99	11.76	0.18	0.72	0.60	0.05	2.07	0.03	8.48	1.32	1.17
P2O5	0.20	0.56	0.21	2.94	2.34	0.44	0.14	0.04	0.13	0.02	0.08	1.78	1.39	0.55	< 0.01	3.95	3.54	12.54	6.99	2.84
H2O(+)	0.34	3.62	3.04	0.61	0.90	0.90	1.50	0.37	0.91	0.37	0.58	0.42	1.00	0.74	0.11	3.85	0.81	2.25	2.28	2.34
H2O(-)	0.44	0.25	0.19	0.29	0.30	0.33	0.24	0.07	0.07	0.07	0.06	0.18	0.16	0.24	0.23	0.49	0.19	0.65	0.42	0.26
CO2	40.08	3.98	2.38	41.06	23.26	1.26	3.78	41.72	4.85	37.06	1.66	35.58	39.02	41.25	44.28	16.72	36.16	0.50	19.58	31.32
Sum	94.39	99.62	99.61	97.40	95.32	100.05	99.90	97.75	98.52	98.80	99.41	97.33	97.42	97.23	98.42	97.43	94.16	94.81	98.71	95.32
	Weight percentage																			
Q	—	—	—	0.40	—	6.21	—	—	10.84	0.67	2.98	—	—	0.07	0.80	—	1.74	—	—	7.32
C	0.32	—	—	0.09	0.91	1.57	1.64	—	2.22	0.27	—	—	0.35	0.13	0.12	8.41	1.12	—	—	3.99
or	1.31	27.74	34.60	—	17.31	16.68	30.93	—	71.72	4.70	69.52	—	3.79	3.13	—	12.32	—	—	—	—
ab	1.43	15.93	29.89	—	—	70.58	28.34	—	—	5.27	9.99	—	0.23	0.45	—	0.51	—	—	—	—
an	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17.10	9.68	—
lc	—	—	—	—	1.75	—	—	0.13	—	—	—	0.11	—	—	—	—	—	44.88	5.80	—
ne	—	22.59	24.04	—	2.97	—	26.27	0.02	—	—	—	—	—	—	—	—	—	0.97	0.13	—
kp	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.88	—	—
ac	—	13.26	1.63	—	—	—	—	0.58	—	—	6.25	3.49	—	—	—	—	—	—	—	—
ns	—	2.86	—	—	—	—	—	—	—	—	2.82	0.33	—	—	—	—	—	—	—	—
ks	—	—	—	—	—	—	—	—	—	—	—	0.21	—	—	—	—	—	—	—	—
cs	—	—	—	—	—	—	—	—	—	—	—	3.11	—	—	—	—	—	20.21	6.66	—
mt	1.91	—	1.90	—	2.26	—	—	3.83	—	—	—	—	1.86	1.59	—	6.28	—	7.37	2.04	—
hm	—	—	—	5.10	—	0.47	1.71	—	1.06	0.43	—	—	—	—	1.43	—	1.16	—	—	1.48
tn	—	—	—	—	—	—	—	—	—	—	0.30	—	—	—	—	—	—	—	—	—
pf	—	—	—	—	—	—	—	—	—	—	—	0.03	—	—	—	—	—	4.51	2.87	—
ru	0.04	0.71	0.46	0.01	0.98	0.07	0.46	0.01	0.03	0.06	—	—	0.04	0.02	0.01	1.34	0.32	—	—	0.54
ap	0.41	1.32	0.50	6.24	5.09	1.03	0.33	0.08	0.30	0.04	0.19	3.41	2.87	1.13	0.02	9.21	7.12	—	15.36	5.86
wo-di	—	—	—	—	—	—	—	—	—	—	0.49	—	—	—	—	—	—	—	—	—
en-di	—	—	—	—	—	—	—	—	—	—	0.23	—	—	—	—	—	—	—	—	—
fs-di	—	—	—	—	—	—	—	—	—	—	0.25	—	—	—	—	—	—	—	—	—
en-hy	—	—	—	—	—	—	—	—	—	—	0.97	—	—	—	—	3.94	—	—	—	—
fs-hy	1.41	—	—	—	—	—	—	—	—	—	1.06	—	2.43	1.08	—	10.43	—	—	—	—
fo-ol	—	0.73	—	—	0.50	—	—	—	—	—	—	0.97	—	—	—	1.69	—	—	0.42	—
fa-ol	0.26	2.87	0.03	—	10.78	—	—	—	—	—	—	0.47	0.47	—	—	4.92	—	—	1.52	—
ca	59.92	11.61	4.48	53.15	38.54	1.51	2.93	61.37	9.49	85.77	4.92	87.13	49.30	51.13	56.57	22.48	82.68	1.41	54.85	70.95
ma	25.18	0.17	0.60	22.65	15.75	0.06	0.27	32.78	0.52	0.42	—	—	29.24	30.51	29.49	17.27	0.98	—	—	1.44
sd	5.09	—	1.78	9.87	—	0.35	3.18	—	0.68	1.13	—	—	7.08	8.39	11.09	—	3.69	—	—	6.22
sr	2.73	0.22	0.10	2.39	3.15	—	0.14	1.21	0.06	0.75	0.04	0.76	2.36	2.39	0.36	1.22	0.91	0.68	0.67	0.59
Na2CO3	—	—	—	0.08	—	1.47	3.81	—	1.80	0.49	—	—	—	—	0.05	—	0.24	—	—	0.08
K2CO3	—	—	—	0.01	—	—	—	—	1.27	—	—	—	—	—	0.06	—	0.04	—	—	1.53

B–2 Whole Rock Analyses and Normative mineral Assemblage of the Orange Area (8)

No.	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
Sample No.	2- 20	2- 30	2-40	2- 50	2- 60	2- 65	2- 70	2- 75	3- 20	3- 30	3- 40	3- 60	3- 80	3-100	3-120	3-140	4- 20	4- 30	4- 40	4- 60
Rock code	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl	Mcbl
	Weight percentage																			
SiO_2	0.44	2.80	24.76	16.04	6.24	2.58	5.87	1.87	0.97	0.12	1.00	0.78	0.28	2.54	0.32	1.19	10.49	5.25	0.08	0.28
TiO_2	0.01	0.06	0.23	0.12	0.04	< 0.01	0.13	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	0.14	0.18	< 0.01	< 0.01
Al_2O_3	0.10	0.92	9.27	5.00	1.84	0.73	1.90	0.61	0.02	0.05	0.07	0.06	0.03	0.08	0.05	0.05	2.14	1.31	0.03	0.03
Fe_2O_3	3.60	7.23	5.18	4.87	4.31	26.67	6.29	5.37	0.82	2.44	2.71	1.92	1.10	5.54	4.39	1.56	0.77	0.37	0.17	0.68
FeO	1.79	1.29	2.45	1.96	1.53	0.20	1.78	1.63	2.32	4.40	3.31	2.44	3.36	2.10	1.72	2.55	6.28	6.33	4.14	3.27
MnO	1.05	1.47	0.64	0.81	0.19	0.19	1.20	1.01	0.83	1.06	0.97	0.80	0.79	1.01	0.97	0.90	0.61	0.79	0.81	0.80
MgO	17.10	15.01	21.44	20.07	17.78	0.88	18.99	17.99	19.04	18.12	18.57	19.55	19.77	18.42	18.70	18.89	18.55	18.61	18.47	18.56
CaO	27.80	27.47	10.29	16.92	24.83	31.04	22.96	26.58	28.39	27.37	26.17	28.15	28.74	25.66	27.35	26.53	19.73	21.93	27.07	27.54
Na_2O	0.02	0.05	0.25	0.18	0.06	0.01	0.11	0.04	0.01	0.02	0.02	0.01	0.01	0.04	0.01	0.01	0.12	0.04	0.01	0.05
K_2O	0.04	0.56	8.01	3.45	1.34	0.01	1.18	0.31	0.01	0.02	0.10	0.14	0.05	0.34	0.05	< 0.01	2.09	0.88	0.01	< 0.01
P_2O_5	1.36	5.88	0.44	1.02	0.71	< 0.01	0.34	1.61	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	2.30	< 0.01	< 0.01	< 0.01
$H_2O(+)$	0.55	0.46	1.17	0.91	0.91	5.65	1.49	1.06	0.68	1.19	0.36	0.34	0.37	0.81	0.40	0.42	0.58	0.50	0.15	0.04
$H_2O(-)$	0.51	0.32	0.19	0.47	0.46	1.37	0.10	0.11	0.08	0.08	0.07	0.05	0.06	0.06	0.06	0.04	0.07	0.10	0.03	0.04
CO_2	42.86	32.36	14.07	26.34	35.55	26.86	36.21	38.70	44.75	43.55	42.51	43.62	43.97	41.27	42.62	42.52	29.87	37.99	44.78	43.59
Sum	97.23	95.88	98.39	98.16	95.79	96.21	98.55	96.90	97.94	98.44	95.88	97.88	98.55	97.89	96.66	94.69	93.74	94.29	95.77	94.91
	Weight percentage																			
Q	0.40	0.34	–	–	–	2.45	–	–	0.00	–	–	–	–	1.71	0.03	–	–	–	0.07	–
C	0.09	0.22	0.18	0.91	0.27	0.69	0.40	0.19	–	–	–	–	–	–	–	0.02	–	0.27	0.03	–
or	–	3.08	–	4.94	3.24	–	3.65	1.66	0.05	–	–	–	–	0.39	0.24	0.05	–	0.63	–	–
ab	–	0.39	–	–	–	–	–	0.30	0.04	–	–	–	–	–	–	0.08	–	–	–	–
an	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
lc	–	–	–	11.17	3.18	–	2.09	–	–	0.08	0.27	0.23	0.12	–	–	–	–	3.33	–	0.04
ne	–	–	1.06	0.78	0.25	–	0.46	0.00	–	0.07	–	–	–	–	–	–	–	0.17	–	0.05
kp	–	–	28.55	–	–	–	–	–	–	–	–	–	–	–	–	–	6.28	–	–	–
ac	–	–	–	–	–	–	–	–	0.03	0.02	0.13	0.07	0.07	0.26	0.07	–	0.84	–	–	0.26
ns	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ks	–	–	–	–	–	–	–	–	–	–	0.05	0.12	0.03	0.39	0.01	–	0.17	–	–	–
cs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
mt	–	7.72	6.97	6.64	5.18	–	8.26	7.04	1.02	3.11	3.40	2.43	1.40	6.08	5.62	2.05	0.62	0.50	–	0.76
hm	3.25	1.41	–	–	0.40	25.34	–	–	–	–	–	–	–	0.63	–	–	–	–	0.15	–
tn	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
pf	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ru	0.01	0.06	0.21	0.11	0.04	0.01	0.12	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.13	0.17	0.01	0.01
ap	2.85	12.69	0.95	2.22	1.52	0.02	0.71	3.37	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	4.98	0.02	0.02	0.02
wo-di	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
en-di	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
fs-di	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
en-hy	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
fs-hy	–	–	–	–	–	–	–	–	1.66	–	–	–	–	–	0.14	1.73	–	–	–	–
fo-ol	–	–	32.79	12.11	4.20	–	3.60	0.73	–	–	–	0.15	0.07	–	–	–	7.74	–	–	–
fa-ol	–	–	1.35	0.81	–	–	0.24	0.33	–	0.07	2.18	1.41	0.38	–	–	0.67	12.31	8.76	–	0.25
ca	54.92	42.94	21.04	34.23	51.47	68.86	47.61	51.69	57.45	56.41	53.94	58.11	60.16	53.09	56.69	56.15	36.43	47.99	56.17	58.34
ma	32.33	29.26	11.17	24.98	29.26	1.75	31.65	33.16	34.52	33.46	34.29	35.76	36.10	34.14	34.72	35.81	29.54	36.49	34.33	35.22
sd	4.74	0.38	–	–	–	0.68	–	–	2.80	4.70	2.22	–	–	1.65	1.09	2.02	–	0.67	8.12	3.91
sr	1.32	1.51	0.71	1.10	0.99	0.17	1.22	1.52	2.40	2.05	3.49	1.71	1.66	1.64	1.37	1.40	1.07	0.99	1.07	1.13
Na_2CO_3	0.03	–	–	–	–	0.02	–	–	–	–	–	–	–	–	–	–	–	–	0.02	–
K_2CO_3	0.05	–	–	–	–	0.01	–	–	–	–	–	–	–	–	–	–	–	–	0.01	–

B-2 Whole Rock Analyses and Normative mineral Assemblage of the Orange Area (9)

No.	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Sample No.	4- 80	4-100	4-120	4-140	5- 30	5- 40	5- 50	5- 60	5- 70	5- 80	5- 90	5-100	6- 10	6- 30	6- 50	6- 70	6- 90	6-110	6-129	6-150
Rock code	Mcb1	Mcb1	Mcb1	Mcb1	Mcb1	Mcb1	Mcb1	Mcb1	Mcb1	Mcb1	Mcb1	Mcb1	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Msu
	Weight percentage																			
SiO2	0.22	0.10	< 0.01	0.16	5.27	8.28	12.72	10.95	9.11	1.86	0.18	2.25	1.00	1.35	3.05	12.21	2.41	3.04	2.46	8.33
TiO2	< 0.01	< 0.01	< 0.01	< 0.01	0.01	0.03	0.02	0.02	0.02	0.07	< 0.01	0.01	< 0.01	< 0.01	0.01	0.02	< 0.01	0.02	0.06	0.19
Al2O3	0.03	0.02	0.02	0.01	1.34	2.24	3.59	2.60	1.95	0.31	0.04	0.78	0.04	0.48	0.71	3.08	0.43	0.29	0.46	3.36
Fe2O3	0.08	0.24	0.55	0.96	3.03	1.78	2.16	2.90	2.70	1.96	1.76	1.66	0.29	0.97	0.50	3.06	0.26	0.56	0.24	0.68
FeO	3.44	4.04	4.29	4.78	3.00	2.98	4.19	3.90	3.60	3.78	4.13	3.79	3.61	5.39	3.45	3.33	4.26	3.99	2.83	2.75
MnO	0.79	0.84	0.94	0.88	0.97	0.94	0.75	0.77	0.72	0.94	0.89	0.84	0.82	0.88	0.91	0.69	1.05	0.90	0.48	0.76
MgO	19.10	19.25	19.00	20.26	21.64	21.59	23.05	21.22	21.84	20.20	19.87	18.95	17.41	17.38	19.19	18.11	20.40	16.83	2.66	2.65
CaO	26.77	27.58	27.82	26.29	23.13	22.46	18.72	20.51	21.07	26.03	26.92	26.09	29.06	26.78	25.82	19.04	24.43	27.91	45.85	38.51
Na2O	0.03	0.02	0.02	< 0.01	0.10	0.09	0.14	0.08	0.03	0.01	0.01	0.01	0.05	0.08	0.03	0.15	0.06	0.24	0.15	0.57
K2O	0.01	< 0.01	< 0.01	< 0.01	0.62	1.30	1.97	1.42	1.11	0.01	< 0.01	0.07	0.04	0.25	0.59	1.69	0.43	0.18	0.34	1.20
P2O5	< 0.01	< 0.01	< 0.01	< 0.01	0.03	1.03	0.39	0.30	< 0.01	< 0.01	< 0.01	1.10	2.87	< 0.01	0.92	0.11	4.93	1.59	3.55	1.16
H2O(+)	0.18	0.01	0.10	0.24	0.65	0.91	1.41	1.26	1.33	0.15	0.15	0.01	0.16	0.49	0.62	1.43	0.22	0.20	0.12	0.64
H2O(-)	0.03	0.01	0.02	0.02	0.08	0.06	0.22	0.21	0.17	0.16	0.05	0.01	0.08	0.06	0.08	0.13	0.04	0.03	0.10	0.08
CO2	44.36	45.01	43.71	44.03	38.15	33.81	28.21	30.74	33.94	41.74	43.51	38.88	39.50	42.18	41.75	36.00	37.15	39.16	39.12	32.54
Sum	95.06	97.15	96.51	97.67	98.02	97.50	97.54	96.88	97.60	97.23	97.54	94.45	94.94	96.31	97.63	99.05	96.08	94.94	98.42	93.42
	Weight percentage																			
Q	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.76	–	–	2.01	–
C	–	–	–	–	0.44	0.60	1.06	0.80	0.65	0.25	0.01	0.64	–	0.07	0.02	0.92	–	–	0.38	0.97
or	–	–	–	–	–	–	–	–	1.60	–	–	–	–	–	1.45	9.13	–	–	–	6.14
ab	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.16	–	–	–	2.36
an	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
lc	0.04	0.04	0.04	0.04	–	–	–	–	3.49	0.04	0.04	0.30	0.16	1.05	1.29	–	1.74	0.76	–	–
ne	0.05	0.02	0.02	–	0.40	0.36	0.56	0.32	0.13	0.04	0.04	0.04	–	0.33	0.12	–	–	0.24	–	0.99
kp	–	–	–	–	6.08	10.36	17.85	13.04	–	–	–	–	–	–	–	–	–	–	–	–
ac	0.12	0.10	0.10	0.07	–	–	–	–	–	–	–	–	0.35	–	–	–	0.42	1.23	–	–
ns	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ks	–	–	–	0.00	–	–	–	–	–	–	–	–	0.01	–	–	–	0.05	–	–	–
cs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
mt	0.04	0.26	0.68	1.23	3.82	2.25	2.71	3.62	3.61	2.56	2.32	2.23	0.22	1.27	0.64	4.06	0.15	0.12	–	0.85
hm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.20	–
tn	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
pf	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ru	0.01	0.01	0.01	0.01	0.01	0.03	0.02	0.02	0.02	0.06	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.05	0.17
ap	0.02	0.02	0.02	0.02	0.06	2.08	0.78	0.60	0.02	0.02	0.02	2.36	6.16	0.02	1.89	0.23	10.82	3.34	6.71	2.33
wo-di	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
en-di	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
fs-di	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
en-hy	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
fs-hy	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.50	–	–	–	–
fo-ol	–	–	–	–	8.83	14.68	25.45	20.87	9.77	1.12	–	1.66	–	–	–	–	–	0.07	–	0.05
fa-ol	0.31	0.02	–	0.30	5.30	6.19	7.86	7.46	4.10	3.89	0.41	4.01	2.21	1.69	3.38	–	3.64	5.28	–	3.95
ca	56.30	57.16	59.35	55.90	46.91	43.01	36.82	40.46	45.37	54.68	57.09	53.36	54.73	56.51	50.92	40.35	39.71	54.71	78.52	74.82
ma	35.98	35.74	36.31	38.59	32.89	28.36	22.71	24.32	30.42	36.31	37.75	34.20	33.75	32.85	35.55	34.63	40.44	31.84	4.54	4.74
sd	5.96	5.47	2.42	2.82	–	–	–	–	–	–	1.12	–	0.65	5.37	2.39	2.99	0.82	–	4.99	–
sr	1.18	1.16	1.05	1.03	1.15	1.12	0.91	0.84	0.83	1.03	1.19	1.19	1.77	0.83	2.35	1.25	2.20	2.40	1.99	2.63
Na2CO3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.21	–
K2CO3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.41	–

B-2 Whole Rock Analyses and Normative mineral Assemblage of the Orange Area (10)

No.	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196
Sample No.	7- 10	7- 30	7- 50	7- 70	7- 90	7-110	7-130	7-150	8- 25	8- 50	8- 67	8- 80	8- 90	8-100	8-120	8-137
Rock code	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Nsh	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2	Mcb2
	Weight percentage															
SiO2	0.42	1.55	1.03	1.02	0.10	0.02	0.46	1.56	0.28	35.97	0.90	0.81	8.45	0.85	0.22	1.24
TiO2	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.19	< 0.01	< 0.01	0.04	< 0.01	< 0.01	< 0.01
Al2O3	0.07	0.03	0.03	0.03	0.02	0.02	0.03	0.02	0.12	3.97	0.03	0.03	1.55	0.02	0.02	0.38
Fe2O3	0.57	1.16	0.36	0.15	0.06	0.02	0.01	0.26	0.31	5.11	0.12	0.45	0.19	0.41	0.28	0.33
FeO	4.44	3.88	3.07	3.31	3.28	3.78	3.99	4.09	4.57	4.60	3.39	1.15	4.40	5.00	3.80	3.95
MnO	0.95	0.88	0.78	0.82	0.88	1.01	0.91	0.88	1.04	0.15	0.94	0.69	0.71	0.86	1.05	0.88
MgO	17.22	17.05	16.91	17.08	17.48	18.94	15.71	16.12	17.58	19.82	17.66	16.80	18.11	16.71	18.94	17.68
CaO	29.71	28.56	30.00	30.50	30.60	28.87	30.19	28.43	28.14	2.66	29.30	30.10	24.82	29.72	29.90	29.51
Na2O	0.09	0.05	0.14	0.13	0.02	0.02	0.06	0.11	0.02	4.22	0.09	0.06	0.23	0.03	0.01	0.03
K2O	< 0.01	0.34	0.05	0.05	0.01	0.01	0.02	0.03	0.04	4.23	0.02	0.02	1.32	0.01	< 0.01	0.07
P2O5	1.43	2.74	4.42	3.86	3.35	0.31	5.14	3.52	0.18	1.19	2.33	2.87	4.43	4.06	0.32	2.34
H2O(+)	0.19	0.56	0.91	0.57	0.65	0.32	0.04	0.07	0.03	0.02	0.31	0.01	0.12	0.33	0.15	0.14
H2O(-)	0.03	0.05	0.05	0.05	0.04	0.04	0.10	0.20	0.04	0.10	0.06	0.02	0.09	0.05	0.05	0.09
CO2	34.92	41.83	38.67	38.73	39.20	40.95	42.19	38.99	43.54	2.51	41.68	40.38	31.67	35.58	44.05	41.33
Sum	90.06	98.70	96.43	96.31	95.70	94.32	98.86	94.29	95.90	84.74	96.84	93.40	96.13	93.64	98.81	97.98
	Weight percentage															
Q	–	1.36	–	–	–	–	0.42	0.08	–	–	–	0.45	–	–	–	–
C	–	0.03	–	–	–	–	0.03	–	0.04	–	–	–	–	–	–	0.23
or	–	–	–	–	–	–	–	0.10	–	3.93	–	0.11	0.77	–	–	–
ab	–	–	–	–	–	–	–	–	–	–	–	0.04	–	–	–	–
an	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
lc	0.05	–	0.12	0.12	0.04	0.05	–	–	0.17	16.85	0.08	–	5.10	0.05	0.04	0.29
ne	0.17	–	–	–	0.02	0.03	–	–	0.08	–	0.02	–	0.32	0.03	0.02	0.12
kp	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ac	0.42	–	0.96	0.40	0.10	0.06	–	0.69	–	17.33	0.31	0.38	0.51	0.18	0.03	–
ns	–	–	0.00	0.13	–	0.01	–	0.02	–	5.16	0.07	–	0.15	–	–	–
ks	–	–	0.03	0.03	–	–	–	0.02	–	1.08	–	–	–	–	–	–
cs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
mt	0.65	–	–	–	0.03	–	–	–	0.40	–	–	0.14	–	0.50	0.35	0.42
hm	–	1.02	–	–	–	–	0.01	–	–	–	–	0.19	–	–	–	–
tn	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
pf	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ru	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.22	0.01	0.01	0.04	0.01	0.01	0.01
ap	3.47	5.58	9.42	8.29	7.34	0.69	10.76	7.46	0.37	3.23	4.81	6.09	9.56	9.26	0.67	4.80
wo-di	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
en-di	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
fs-di	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
en-hy	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
fs-hy	–	–	–	–	–	–	–	1.99	–	–	–	–	–	–	–	–
fo-ol	0.18	–	–	0.08	0.00	–	–	–	–	37.50	–	–	4.87	0.62	0.01	–
fa-ol	0.14	–	1.25	1.88	0.02	–	–	–	0.42	7.93	1.86	–	6.78	1.49	0.49	2.98
ca	68.07	51.27	51.94	55.01	57.83	64.05	49.43	50.86	58.51	2.99	54.64	56.29	41.33	56.03	61.75	54.64
ma	25.81	31.37	32.53	32.82	33.18	33.80	29.69	30.85	33.01	3.66	32.94	32.17	29.46	30.41	35.43	32.73
sd	–	7.73	2.66	–	–	–	8.18	6.41	5.70	–	3.97	3.03	–	–	–	2.66
sr	1.02	1.11	1.09	1.23	1.42	1.31	1.37	1.52	1.29	0.11	1.29	1.12	1.13	1.44	1.21	1.12
Na2CO3	–	0.08	–	–	–	–	0.09	–	–	–	–	–	–	–	–	–
K2CO3	–	0.44	–	–	–	–	0.03	–	–	–	–	–	–	–	–	–