Basaltic dykes and their xenoliths from the Gerroa–Kiama region, southern Sydney Basin, New South Wales: evidence for multiple intrusive episodes

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Received 2 December 2020; accepted 29 September 2021

SUPPLEMENTAL DATA

Australian Journal of Earth Sciences (2022), *69*, https://doi.org/10.1080/08120099.2022.2000024

Copies of Supplementary Papers may be obtained from the Geological Society of Australia's website (www.gsa.org.au), the Australian Journal of Earth Sciences website (www.ajes.com.au) or from the National Library of Australia's Pandora archive (https://pandora.nla.gov.au/tep/150555).

Supplemental data

Table S1. Phillips PW2400 XRF spectrometer lower limits of detection.

Trace elements	ppm	Major oxides	ppm
As	2.5	SiO_2	61.5
Ba	8.0	Al_2O_3	25.6
Ce	15.4	TiO_2	27.7
Cd	3.0	Fe_2O_3	11.7
Co	2.9	MnO	13.7
Cr	2.9	MgO	59.7
Cu	2.0	CaOs	12.4
Ga	1.0	Na_2O	164.2
Mo	1.8	K_2O	9.7
Nb	1.0	P_2O_5	12.6
Ni	2.0	SO_3	20.4
Pb	2.0		
Rb	1.0		
Sb	2.9		
Sn	3.9		
Sr	0.9		
Th	2.8		
U	2.9		
V	2.9		
Y	1.0		
Zn	1.8		
Zr	1.0		

Table S2. Limits of detection for the Olympus INNOV-X handheld fpXRF analyser

Element	Limit of Detection (ppm & wt%)
Mg	1%
Al	<0.5%
Si	<0.5%
P	800–1500
S	150–300
Cl	100–200
K	40–60
Ca	25–40
Ti	7–15
Cr	5–10
V	7–15
Mn	10
Fe	10
Co	10–20
Ni	10–20
Cu	5–7
Zn	3–5
Ga	3–5

Element	Limit of Detection (ppm)
As	1–3
Se	1–3
Y	3–5
Br	1–3
Rb	1–3
Sr	1–3
Zr	1–3
Mo	1–3
Ag	40–50
Cd	12–15
Sn	20–25
Sb	15–20
Ba	15–30
Hg	2–4
Tl	2–4
Pb	2–4
Nb	3–5

Table S3. Summary of petrographic descriptions of the sampled dykes (AB, alkali basalt; Foid, foidite; AB/Foid, transitional AB/Foid; And/Bas, basaltic andesite).

Samples	Rock type	Texture	Phenocrysts	Groundmass	Xenocrysts/xenoliths	Secondary minerals
SA-17-01 A SA-17-06 A SA-17-06 G SA-17-08 B SA-17-09 G SA-17-14 SA-17-15 B SA-17-16 A SA-17-18 A 14/16 14/17 (SA-17-07)	AB/Foid Foid AB/Foid Foid Foid AB/Foid AB AB And/Bas Foid AB/Foid	Porphyritic amygdaloidal	Clinopyroxene (fresh and altered) Skeletal olivine Plagioclase (fresh and altered) Microphenocryst /pheno-cryst sizes range from 0.1–2.5 mm. Phenocryst to ground-mass ratio ranges from 1:10 to 1:200	Extremely fine-grained to fine-grained and contains: Augite/Ti-augite Plagioclase Olivine Opaques (such as pyrite)	Sample may contain xenocrysts: Ti-augite (common) Anorthoclase (rare) Ti-augite xenocrysts are generally zoned and display polybaric crystallisation. Some Ti-augite xenocrysts are partially resorbed.	Moderate to intense and pervasive chlorite alteration, with Fe^{2+}-rich and Fe^{3+}-rich chlorite. Chlorite, fibrous zeolite (most likely thomsonite), carbonate, chabazite and pumpellyite filled vesicles (0.1–2.0 mm). Skeletal olivine phenocrysts are replaced by chlorite and carbonate. Carbonate overprinting anorthoclase xenocryst. Cross-cutting veinlets and micro veinlets of carbonate. Pyrite in vesicles altering to hematite.
SA-17-04 A SA-17-05 B SA-17-08 A SA-17-10 SA-17-12 A SA-17-13 A SA-17-15 A 14/04 Dyklet B	AB AB AB/Foid AB AB AB AB/Foid	Porphyritic/ micro-porphyritic/ Glomero-porphyritic	Plagioclase (fresh and altered) Former olivine Clinopyroxene (fresh and altered) Micro-phenocryst/ pheno-cryst sizes range from 0.1–1.2 mm. Glomerophenocrysts can be up to 5 x 5 mm Phenocryst to ground-mass ratio ranges from 1:2 to 1:20	Extremely fine-grained. Can be micro-aphanitic. Contains: Plagioclase Clinopyroxene Opaques	No apparent xenocrysts or xenoliths.	Intense and pervasive chlorite and carbonate alteration. Olivine phenocrysts completely replaced by chlorite and/or carbonate. Some of the chlorite has weathered to smectite. Some plagioclase laths have been replaced/overprinted by carbonate. Cross-cutting micro-veinlets of carbonate.
SA-17-05 A 14/01 14/03	AB AB	Intergranular	Olivine (fresh and altered) Plagioclase Augite Phenocryst sizes range from 0.5–1.0 mm. Phenocryst to groundmass ratio ranges from 4:10–1:20.	Fine to medium-grained. Contains: Plagioclase Clinopyroxene Ilmenite Olivine (fresh and altered) Opaques	May contain xenocrysts of biotite, zoned plagioclase and former olivine.	Minor Fe^{2+} rich chlorite alteration in groundmass. Some olivine phenocrysts are partially replaced by chlorite. Cross-cutting chlorite veinlet. Chlorite-filled microvesicle (0.2 mm).

14/05 (a) (SA-17-18)	And/Bas AB	Aphanitic	No apparent phenocrysts in sample.	Fine-grained groundmass with elongate plagioclase grains, Ti-augite and opaques. Groundmass becomes slightly more coarse-grained near xenolith contact. Plagioclase: 45% Ti-augite: 45% Opaques: 10%	Coarse-grained xenolith (grain size up to 2–3 cm) with quartz, plagioclase, orthopyroxene and Na-amphibole. Quartz is strongly recrystallised and has reaction rims where it meets the host basalt. Quartz and ortho-pyroxene display undulose extinction. Melt invading xenolith, with quenched textured crystallites between xenolith grains. Overgrowth around orthopyroxene where it contacts with host basalt.	Intense and pervasive chlorite alteration. Vesicles (up to 4 mm) filled with carbonate–zeolite and rimmed by chlorite. Vesicle filled with zeolite and rimmed with pyrite and chlorite. Vesicles filled with chlorite–pyrite, chlorite–carbonate–pyrite, chlorite–spinel. Zoned chlorite-filled vesicle with Mg-rich chlorite in centre rimmed by Fe-rich chlorite. Chlorite filling in fractures in ortho-pyroxene xenolith grain.
14/05 (b) (SA-17-18)	And/Bas AB	Sparsely porphyritic	Clinopyroxene: 100% Rare phenocrystic clinopyroxene. Phenocryst to groundmass ratio = 1:1000	Fine-grained groundmass with fresh plagioclase, Ti-augite, spinel and apatite needles. Plagioclase: 35% Ti-augite: 35% Spinel: 15% Apatite: 15%	1. Alkali gabbro xenolith: Plagioclase, microcline, orthopyroxene, green clinopyroxene and platy ilmenite. Biotite enclosed in microcline. Very strongly sutured grain boundaries and reaction rim. 2. Biotite-rich gabbro xenolith: Strongly deformed with abundant biotite, plagioclase, clinopyroxene, orthopyroxene and minor apatite. Sutured grain boundaries and augite-rich reaction rim. 3. Charnockite xenolith: quartz (some display weak undulose extinction), rutile needles in quartz, orthopyroxene (with exsolution lamellae), and plagioclase with intergranular biotite. Biotite in xenolith fractures. Intensely sutured grain boundaries. Quartz, plagioclase and orthopyroxene are co-crystallised.	Amygdales (1–3 mm on average) filled with calcite, chlorite–carbonate, and Mg-rich chlorite. Chlorite replacing earlier phases of minerals and chlorite–calcite infilling cavity in alkali gabbro xenolith. Chlorite replacing biotite and infilling fractures in biotite-rich gabbro xenolith. Intergranular biotite altering to chlorite with spatially associated overprinting opaques in charnockite xenolith.

14/05 (c) (SA-17-18)	And/Bas AB	Micro-amygdaloidal	No apparent phenocrysts in sample.	Extremely fine-grained, quenched groundmass with spindle-shaped plagioclase, Ti-augite, and opaques that form aggregates. Plagioclase: 45% Ti-augite: 45% Opaques: 10%	No apparent xenocrysts or xenoliths.	Intense and pervasive Fe-rich chlorite alteration, with chlorite replacing earlier phases such as Ti-augite. Microvesicles (0.2 mm on average) filled with chlorite.
14/05 (d) (SA-17-18)	And/Bas AB	Aphanitic	No apparent phenocrysts in sample.	Fine-grained groundmass with plagioclase, intergranular olivine, and Ti-augite. Plagioclase: 50% Ti-augite: 30% Former olivine: 15% Opaques: 5%	1. Charnockite xenolith: Quartz (showing weak to moderate undulose extinction), orthopyroxene (with exsolution lamellae), plagioclase, intergranular clinopyroxene and biotite. Xenolith has reaction rim and strongly sutured grain boundaries with intensely fractured grains. 2. Granitic type xenolith: Plagioclase, quartz (displaying moderate undulose extinction), and apatite. Xenolith's grain boundaries are sutured.	Weak and pervasive chlorite alteration with chlorite replacing former olivine in groundmass.

14/05 H (SA-17-18)	And/Bas AB	Aphanitic amygdaloidal	No apparent phenocrysts in sample.	Fine-grained, uniform groundmass with quenched crystallites, elongate spindle-shaped grains and disseminated anhed-ral to euhedral pyrite, chalcopyrite and sphalerite grains. Anhedral pyrite aggregates. Sphaler-ite and chalcopyrite associated with crystallites. Plagioclase: 50% Clinopyroxene: 48% Sulfides: 2%	**Xenocryst:** Common quartz xenocrysts. Some xenocrysts are resorbed and have well-defined reaction rims. **Xenoliths:** Granitic xenoliths with quartz, plagioclase and alkali feldspar. Some xenoliths disaggregated into the basalt and are invaded by crystallites in the melt. Some quartz grains display undulose extinction and recrystallisation.	Chlorite-filled vesicles (up to 1.2 mm) and micro-vesicles (0.3-0.6 mm). Pyrite intergrown with chlorite.
14/05 H (b) (SA-17-18)	And/Bas AB	Sparsely porphyritic	Ti augite (0.5 mm). Phenocryst to groundmass ratio = 1:1000	Fine-grained groundmass with quenched, elongate grains. Plagioclase: 50% Ti-augite: 48% Sulfide minerals: 2%	1. Gabbroic xenolith: Plagioclase, alkali feldspar, clinopyroxene, orthopyroxene and pyrite. Cumulate texture with sharp contact with basalt. 2. Granitic xenolith: Quartz and alkali feldspar. Rare apatite grain. Clinopyroxene reaction rims. 0.5 mm reaction rim between the xenoliths.	Weak chlorite alteration.

Table S4. Major and trace element laboratory XRF analyses of the two least altered basalts (SA-17-05 A and 14/01) and granitic xenolith (SA-17-18B), along with corrected fpXRF TiO_2, Nb, Y and Zr data.

Element	**SA-17-05 A (lab XRF)**	**14/01 (lab XRF)**	**SA-17-18 B (lab XRF)**	**SA-17-05 A (fp XRF)**	**14/01 (fp XRF)**
SiO_2 (wt%)	47.42	47.36	71.77		
TiO_2 (wt%)	1.91	2.07	0.17	2.29	2.51
Al_2O_3 (wt%)	14.34	14.89	13.25		
Fe_2O_3 (wt%)	13.84	13.18	2.19		
MgO (wt%)	8.17	6.34	0.82		
CaO (wt%)	8.69	9.60	2.44		
Na_2O (wt%)	3.44	3.88	3.74		
K_2O (wt%)	0.56	0.50	3.37		
P_2O_5 (wt%)	0.29	0.31	0.02		
SO_3 (wt%)	0.09	0.10	0.60		
LOI	1.24	1.31	1.30		
Total	100.19	99.73	99.76		
Ba (ppm)	158.00	148.00	654.00		
Co (ppm)	67.00	50.00	54.00		
Cr (ppm)	253.00	213.00	41.00		
Cu (ppm)	80.00	84.00	6.00		
Nb (ppm)	18.00	18.00	<1	21	21
Ni (ppm)	206.00	134.00	23.00		
Pb (ppm)	<2	4.00	24.00		
Rb (ppm)	27.00	23.00	66.00		
Sn (ppm)	<4	<4	<4		
Sr (ppm)	432.00	449.00	393.00		
Th (ppm)	<3	<3	<3		
V (ppm)	182.00	187.00	21.00		
Y (ppm)	25.00	28.00	2.00	25	26
Zn (ppm)	130.00	124.00	15.00		
Zr (ppm)	139.00	151.00	62.00	134	143
As (ppm)	<3	<3	7.00		
Ce (ppm)	158.00	148.00	41.00		
Cd (ppm)	16.00	51.00	3.00		
Ga (ppm)	<3	<3	15.00		
U (ppm)	–	–	4.00		
Mo (ppm)	67	50	<1		

Table S5. Laboratory ICP-MS analyses (ppm) for the two least-altered basaltic dykes (14/01 and SA-17-05A, both alkali basalts) and granitic xenolith (SA-17-18B).

Sample	14/01	SA-17-05A	SA-17-18B
Element			
Li	9	12	7
Be	1.0	0.9	0.4
Sc	23	22	1
V	188	185	13
Cr	230	258	6
Ni	219	190	15
Cu	73	69	3
Zn	123	127	12
Ga	21	20	13
Rb	16	20	54
Sr	424	384	351
Y	22	21	1
Zr	135	126	55
Nb	19	17	1
Ba	169	182	743
La	30.6	16.0	764.2
Ce	36	30.8	24.2
Pr	19.7	5.8	2.1
Nd	29.8	19.2	6.0
Sm	5.0	4.7	0.7
Eu	1.7	1.6	0.8
Gd	5.4	5.1	0.4
Tb	0.81	0.77	0.05
Dy	4.6	4.3	0.2
Ho	0.89	0.83	0.05
Er	2.26	2.11	0.1
Tm	0.3	0.3	0.02
Yb	2.5	1.9	0.16
Lu	0.26	0.24	0.03
Hf	3.4	3.2	1.5
Th	1.9	1.8	0.4

Table S6. Uncorrected (U) and corrected (C) pXRF values (ppm) for Ti, TiO_2, Zr, Y and Nb for the basaltic dykes studied.

Sample	Ti (U)	Ti (C)	TiO_2 (C)	Zr (U)	Zr (C)	Y (U)	Y (C)	Nb (U)	Nb (C)
SA1701A	25384	22084	36836	463	440	35	39	163	135
SA1701B	14873	12940	21584	250	238	20	22	60	50
SA1702	29364	25567	42646	555	527	63	69	206	171
SA1703	7494	6520	10875	165	157	23	25	8	7
SA1704A	15879	13815	23043	175	166	25	28	24	20
SA1705A	15772	13722	22888	162	154	23	25	25	21
SA1705B	15960	13885	23160	173	164	27	30	24	20
SA1706A	29778	25907	43213	425	404	25	28	108	90
SA1706F	24932	21691	36181	347	330	20	22	86	71
SA1706G	24111	20977	34990	362	344	23	25	94	78
SA1708A	24013	20891	34846	532	505	27	30	110	91
SA1708B	22168	19286	32169	485	461	24	26	100	83
SA1708C	21780	18949	31607	470	447	32	35	98	81
SA1709B	21958	19103	31864	495	470	26	29	104	86
SA1709C	20962	18237	30419	465	442	27	30	94	78
SA1709D	21083	18346	30601	484	460	24	26	101	84
SA1709H	22595	19658	32790	501	476	35	39	98	81
SA1709G	21271	18506	30868	480	456	22	24	98	81
SA1710	25794	22441	37432	459	436	28	31	109	90
SA1712A	11403	9921	16548	156	148	22	24	22	18
SA1713A	14775	12854	21440	163	155	23	25	23	19
SA1714	19344	16829	28071	338	321	23	25	101	84
SA1714_2	21935	19083	31830	376	357	28	31	128	106
SA1715A	23476	20424	34067	350	333	22	24	89	74
SA1715B	24677	21469	35810	344	327	23	25	83	69
SA1715C	24145	21006	35038	342	325	22	24	84	70
SA1716A	23433	20387	34006	420	399	28	31	107	89
SA1718A	18666	16239	27087	334	317	22	24	73	61
SA1719	8189	7124	11883	256	243	23	25	8	7
SA1720	8951	7787	12989	191	181	20	22	8	7
1401	17284	15037	25082	185	176	24	26	25	21
1402	20395	17744	29597	483	459	25	28	97	81
1404	19301	16792	28009	334	317	22	24	109	90
1405	8253	7180	11976	174	165	20	22	8	7
1416	18484	16081	26823	431	409	24	26	119	99
1417	25206	21929	36468	467	444	28	31	116	96

Table S7. Laboratory XRD analyses of selected dyke and surrounding host rock samples.

Sample	Sample type	Identified minerals
SA-17-01 A	Dyke (AB/Foid)	Analcime, pumpellyite, illite, clinochlore, augite, diopside, pigeonite, albite, quartz, aragonite
SA-17-05 A	Dyke (AB)	Clinochlore, albite, edenite, anorthite, augite, ferrosilite
SA-17-13 B	Sandstone at dyke contact	Quartz, anorthite, clinochlore, kaolinite-montmorillonite, albite, calcite
SA-17-13 C	Sandstone 1.7 m south of contact	Anorthite, albite, clinoferrosilite, paragonite, augite, clinochlore
SA-17-16 B	Sandstone at dyke contact	Quartz, hematite, albite, clinochlore, paragonite, calcite
SA-17-18 B	Granitic xenolith	Quartz, anorthite, albite, orthoclase
14/01	Dyke (AB)	Kaolinite, albite, augite, ferrosilite, edenite
14/05 (SA-17-18)	Dyke (And/Bas)	Anorthite, quartz, albite, clinochlore, orthoclase

Detailed dyke measurements

SA-17-01: Dyke north of Werri Beach

S 34° 43' 46.6'' E 150° 50' 26.4''

POM	L (m)	W (cm)	T	P	Notes
–	0.00	94.00	–	–	
NC	2.00	85.00	095°	83°N	
SC			090°	86°N	
–	4.00	94.00	–	–	
NC	6.00	106.00	106°	–	Quartz vein on NC
SC			105°	77°N	
NC	8.00	94.00	099°	76°N	
SC			095°	85°N	
NC	10.00	80.00	091°	89°N	
SC				85°N	
NC	12.00	90.00	095°	82°N	
SC			096°	83°N	
NC	14.00	85.00	095°	84°N	
–	15.60	–	–	–	Inter-fingering between basalt and sediment (photo)
NC	20.00	47.00	090°	83°N	
SC					
–	22.00	78.00	–	–	
–	24.00	80.00	095°	–	
–	26.00	70.00	093°	–	
–	28.00	73.00	100°	–	
–	30.00	76.00	090°	–	
–	32.00	57.00	070°	–	

POM, point of measurement; NC, northern contact; SC, southern contact; L, length; W, width; T, trend; P, plunge.

Dyke SA-17-01 (photo facing west).

Dyke SA-17-01 becoming sill (photo facing west).

SA-17-02: Dyklet north of Werri Beach

S 34° 43' 45.8'' E 150° 50' 26.7''

POM	L (m)	W (cm)	T	P
–	0.00	2.00	112°	–
NC	2.00	5.50	117°	78°S
SC				83°N
Before Inflection (NC)	3.00	4.00	114°	80°S
Before Inflection (SC)				78°N
After inflection			136°	–
–	5.00	6.50	138°	–
–	7.00	9.00	141°	–
Inflection (photo)	8.80	–	178°	–
–	9.00	7.50	140°	–
–	11.00	9.50	145°	–
At 11.5 m dyke ends and starts off ~ 30 cm to the south				
NC	13.00	9.00	145°	80°S
SC			143°	81°N
Before Inflection (NC)	13.80	14.00	149°	75°S
Before Inflection (SC)			147°	79°N
After Infection (NC)	13.90	9.00	079°	85°SE
After Inflection (SC)			085°	84°NW
NC	14.00	15.00	122°	88°S
SC			125°	75°N
–	15.00	16.00	125°	–
–	17.00	17.00	125°	–
SC	19.00	22.00	125°	86°N
SC (slight inflection)	19.50	24.00	145°	75°N
SC	19.80	24.00	121°	81°N
SC	21.00	26.00	115°	85°N
Inflection	21.20	–	118°	77°N
SC	22.30	24.00	127°	84°N
SC	23.00	25.00	126°	80°N
–	24.70	23.00	128°	–

POM, point of measurement; NC, northern contact; SC, southern contact; L, length; W, width; T, trend; P, plunge.

Dyklet SA-17-02 (photo facing east)

SA-17-03: Dyklet north of Werri Beach

S 34° 43' 46.7'' E 150° 50' 27.2''

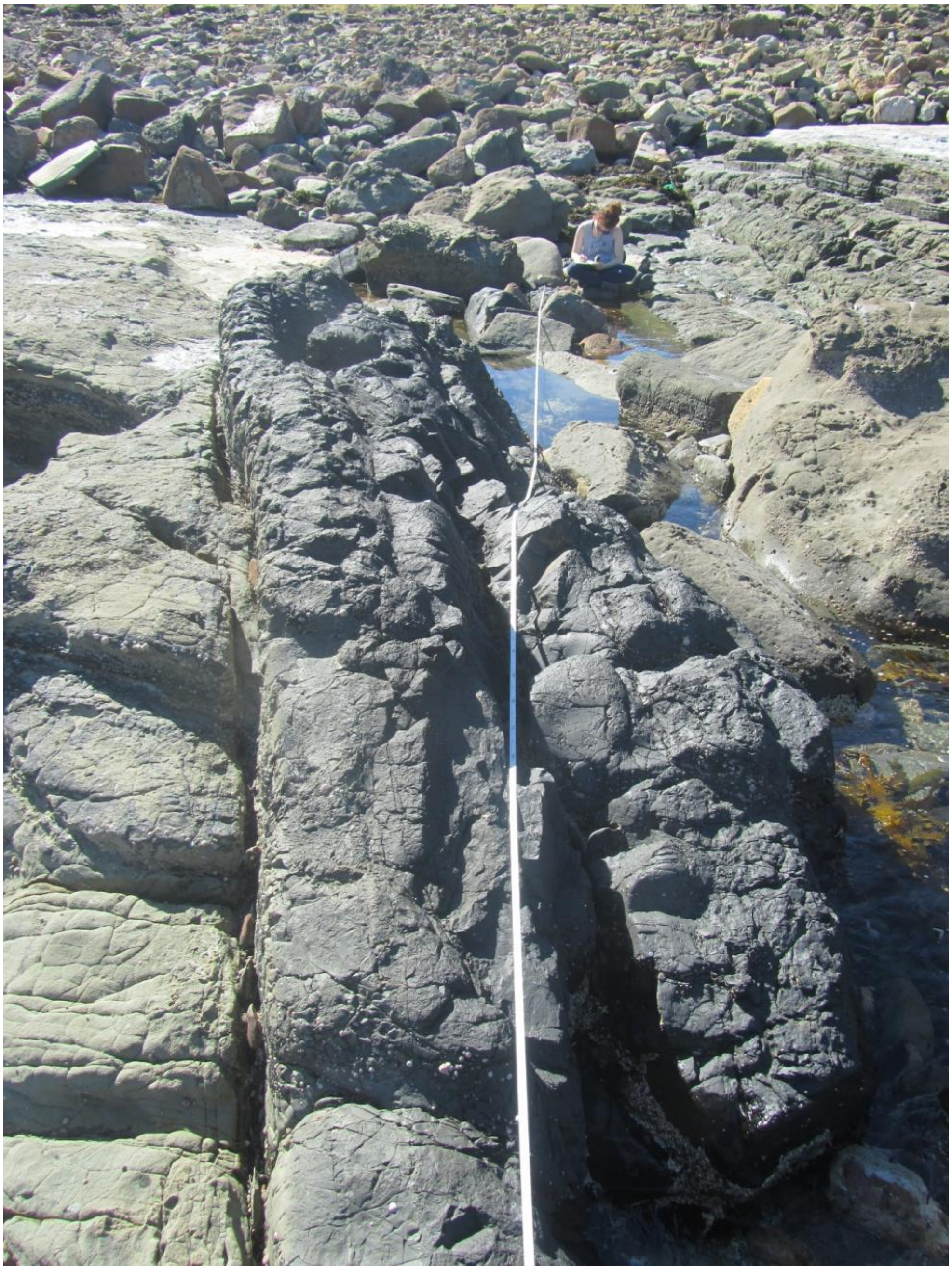
Dyklet is 5.00 cm–10.00 cm wide and 13.00 m in total length. Trend = 92°.

SA-17-04: Dyke north of Werri Beach

S 34° 43' 41.30'' E 150° 50' 28.20''

POM	Length (m)	Width (m)	Trend	Plunge
–	0.00	2.80	–	–
NC	5.00	2.85	130°	75°N
SC			126°	78°S
NC	10.00	2.90	123°	86°N
SC			135°	83°N
SC	16.00	2.50	131°	79°N
–	19.00	1.20	–	–

POM, point of measurement; NC, northern chill margin; SC, southern chill margin



Dyke SA-17-04 (photo facing northwest).

SA-17-05: Dyke north of Werri Beach

S 34° 43' 41.7'' E 150° 50' 28.5''

POM	Length (m)	Width (cm)	Trend	Plunge
NC	0.00	34.00	132°	86°N
SC			142°	74°S
–	1.80	40.00	–	–
NC	4.00	25.00	125°	75°N
SC			132°	87°N
NC	6.00	160.00	120°	70°N
SC			125°	90°
SC	9.00	114.00	126°	75°S

POM, point of measurement; NC, northern chill margin; SC, southern chill margin

Dyke SA-17-05 (photo facing southeast).

SA-17-06: Dyke at Blackhead, Gerroa

S 34° 46' 49.10" E 150 °49' 17.00"

POM	Length (m)	Trend	Plunge
NC	5.00	115°	80°S
SC		106°	74°N
NC	7.00	102°	60°S
SC		105°	70°N
NC	14.00	104°	74°S
SC		110°	74°N
NC	15.00	112°	75°S
SC		106°	79°N
NC	17.00	106°	82°S
SC		112°	80°N
NC	20.00	100°	75°S
SC		112°	85°N
NC	22.00	110°	80°S
SC		104°	85°N

POM, point of measurement; NC, northern contact between sandstone and basalt; SC, southern contact

Length (m)	Width (cm)
6.70	56.00
8.60	49.00
10.50	50.00
12.50	48.00
15.00	55.00
17.00	52.00
19.50	60.00
21.00	60.00
23.00	60.00

Figure 6: Dyke SA-17-06 (photo facing ~ west).

Brecciated chill margin of dyke SA-17-06 (photo facing ~ west).

SA-17-07: Synkinematic dyke (14/17) at Shelly Beach, Gerroa

S 34° 46' 12.4'' E 150° 49' 36.2''

POM	Length (m)	Trend	Plunge
Western contact	0.00	065°	85°E
Western contact	0.38	054°	86°E
Western contact	0.65	056°	89°E
Eastern contact	1.30	060°	90°
Eastern Contact	1.40	063°	90°

POM, point of measurement

Dyke SA-17-07 (photo facing southwest)

SA-17-08: Dyke north of Werri Beach

S 34° 43' 39.70" E 150° 50' 31.60"

POM	Length (m)	Trend	Plunge	Width (m)	Notes
NC	5.30	117°	90°	0.41	At 5 m, dyke is 20 cm wide
–	11.00	119°	90°	1.30	
NC	14.85	120°	90°	1.15	
Fracture		118°	85°S	–	Fracture is 30 cm south of northern contact, trend is sub-parallel to dyke
NC	18.80	119°	90°	1.20	Northern chill margin is ~20 cm wide
Fracture		116°	78°S	–	
NC	26.20	120°	75°N	1.22	
Fracture surface between contact and northern chill margin		120°	84°N		Northern Chill Margin (NCM) is 20.30 cm wide Southern Chill Margin (SCM) is 28.00 cm wide
Fracture surface between contact and southern chill margin		117°	80°S		
SC	26.20	115°	86°S	1.22	
NC	30.20	116°	90°	1.12	NCM = 34 cm wide, SCM = 22 cm wide
SC		110°	82°N		
NC	35.60	115°	90°	1.20	NCM = 24 cm
SC		116°	79°N		SCM = 21 cm
Fracture		115°	75°S	–	Fracture is 10 cm in from southern margin contact (centre of dyke)
NC	40.90	117°	85°N	65 cm exposed – does go wider	NCM = 10 cm SCM = 6.5 cm
NC	41.30	120°	88°N	–	
NC	44.70	115°	90°	60 cm exposed	NCM = 11 cm
NC	50.80	120°	90°	1.10	NCM = 10 cm
SC		116°			SCM = 21 cm
NC	55.00	120°	90°	1.13	NCM = 12 cm
SC		123°	80°S		SCM = 22 cm
NC	60.60	120°	84°N	1.16	NCM = 21 cm
SC			80°N		SCM = 28 cm
NC	63.80	120°	90°	1.07	NCM = 17 cm
SC		118°	86°N		SCM = 27 cm
NC	65.60	121°	89°N	0.94	NCM = 20 cm
SC		117°	85°N		SCM = 35 cm
Fracture	71.60	195°	80°W	–	Major cross-cutting fracture, main vein = 2 cm wide
NC	74.20	115°	90°	0.39	NCM = 2 cm
SC		116°	76°N		SCM = 3 cm
NC	78.60	122°	90°	0.12	No clear chill margin
SC		117°	78°N		
NC	81.00	116°	88°N	0.08	Sub-parallel quartz veins near dyke
SC			90°		
NC	84.00	120°	90°	0.06	
SC		115°	81°N		
At 84.6 m, dyke disappears and becomes a fracture					
Fracture	87.10	123°	80°N	–	
	94.10	123°	85°N	–	
	97.30	120°	85°S	–	
	101.30	115°	90°	–	

POM, point of measurement; NC, northern contact; NCM, northern chill margin; SC, southern contact; SCM, southern chill margin

Dyke SA-17-08 (photo facing west).

SA-17-09: Dyke north of Werri Beach

S 34° 43' 40.30" E 150° 50' 33.80"

POM	L (m)	W (cm)	T	P	Notes
NC	1.85	4.50	114°	84°S	
SC			118°	79°N	
NC	4.40	5.00	117°	85°N	Inflection of dyke at 4.10 m, photo where dyke narrows out to nothing
SC			115°	80°N	
NC	10.00	11.00	120°	87°N	
SC			121°	82°N	
NC	15.00	15.00	120°	88°S	
SC			121°	90°	
NC	19.70	22.00	114°	90°	
SC			115°	76°S	
NC	26.00	34.00	116°	78°N	
SC			120°	82°N	
NC	28.90	38.00	118°	80°N	
SC			120°	76°N	
NC	33.90	98.00	117°	90°	
SC			124°	85°N	
NC	38.90	91.00	115°	89°N	
SC			112°	90°	
NC	43.90	93.00	110°	89°N	
SC			120°	85°N	
NC	48.90	106.00	112°	85°N	At 47.6m, dyke becomes more fractured on southern side
SC			115°	86°N	
NC	53.90	107.00	120°	86°N	
SC			114°	84°N	
NC	58.90	107.00	110°	86°N	At this point, sediment along both sides of dyke becomes more metamorphosed for about 7 cm (in width)
SC			117°	85°S	
NC	63.90	101.00	116°	90°	
SC			112°	85°N	
NC	68.90	102.00	119°	88°N	
SC			115°	87°N	
NC	74.60	110.00	116°	85°N	
SC			123°	82°S	
NC	78.60	103.00	117°	85°N	
SC			120°	86°N	

POM, point of measurement; NC, northern contact; SC, southern contact; L, length; W, width; T; trend; P, plunge

Dyke SA-17-09 (photo facing east)

SA-17-10: 40 cm wide slightly sinuous dyke north of Werri Beach

S 34° 43' 28.50'' E 150° 50' 41.80''

Trend = 126°, Plunge = 83°S (NC)

Dyke SA-17-10 (photo facing northwest).

SA-17-11: Dyke north of Werri Beach

S 34° 43' 29.20'' E 150° 50' 39.40''

POM	T	P
NC	125°	85°S
NC	128°	70°N
NC	119°	60°N

POM, point of measurement; T, trend; P, plunge

Dyke SA-17-11 (photo facing northwest)

Shear zone in dyke SA-17-11

SA-17-12: Dyke north of Werri Beach

S 34° 43’ 32.60’’ E 150° 50’ 36.20’’

POM	T	P
NC	124°	81°N
SC	126°	79°N
South shear surface	130°	83°S
North shear surface	121°	84°N

POM, point of measurement; T, trend; P, plunge

Dyke SA-17-12 (photo facing northwest).

SA-17-13: Dyke north of Werri Beach

S 34° 43' 34.50" E 150° 50' 36.20"

POM	L (m)	W (cm)	T	P	Notes
Slickenlines plane (SC)	1.00	–	100°	86°S	Dyke sheared on both contacts, marked with slickenlines. Shears are very narrow (5–10 mm in width) and marked by quartz. Microfractures in quartz. Direction of movement is up. Angle between slickenlines and plane begins as ~ 45° then becomes 90° (see sketch).
Slickenline plane (NC)			095°	85°S	Direction of movement is to the East. Slickenlines are parallel to strike of plane.
Dyke offshoot (SC)	0.70	15.00	094°	87°S	1 m offset. Offshoot is 1 cm wide at 0 m.
Dyke offshoot (NC)			090°	–	
Main dyke	0.00	35.00 exposed	098°	70°N	
Main dyke	0.25	50.00	163°	65°NE	
Main dyke (NC) I*	1.00	67.00	095°	70°NE	
Main dyke (SC) I*			094°	76°NE	
Main dyke (NC) I*	2.10	63.00	126°	70°N	
Main dyke (SC)			109°	72°N	
Main dyke (NC) I*	3.30	64.00	160°	70°NE	
Main dyke (SC) I*			146°	68°NE	
Dyke offshoot	3.90	Notes	085°	75°N	1.9 m long. 15 cm wide where it starts and 1 cm wide at end.
Main dyke (NC)	4.70	70.00	095°	80°N	
Main dyke (SC)			105°	72°N	
Main dyke (NC)	6.00	80.00	110°	78°N	
Main dyke (SC)			104°		
Main dyke (NC)	7.70	67.00	098°	75°N	
Main dyke (SC) I*			112°	65°N	
Main dyke (NC) I*	8.70	70.00	120°	78°N	
Main dyke (SC) I*			116°	62°N	
Main dyke (NC)	9.50	70.00	134°	24°N	
Main dyke (SC)	10.00	55.00	110°	22°N	Inflation lobe, 24 cm thick
Dyke offshoot	11.30	Notes	093°	75°N	24 cm wide where it starts, 1 cm wide where it ends then it becomes veins, total length of offshoot is 3.88 m
Main dyke (NC)	11.50	86.00	110°	75°N	Dyke highly fractured along NC
Main dyke (SC)			104°	76°N	
Shear zone 1		–	116°	76°N	Quartz in shear plane
Shear zone 2		–	098°	72°N	
Main dyke (NC)	13.40	80.00	126°	80°N	Quartz vein 2 cm wide
Main dyke (SC)			136°	77°N	
Main dyke (NC)	16.00	81.00	094°	65°N	
Main dyke (SC) I*			120°	77°N	
Main dyke (NC)	18.60	–	082°	70°N	
Main dyke (SC)			085°		
Main dyke (NC)	19.20	70.00	093°	84°N	
Main dyke (SC)			090°	85°N	
Main dyke (NC)	21.30	68.00	100°	85°N	
Main dyke (SC)			105°		
Main dyke (NC) I*	23.30	82.00	130°	85°N	Shearing in centre of basalt. Dyke straightens out for 4.67 m, both margins are sheared
Main dyke (SC)			134°		
Main dyke (NC)	24.70	76.00	135°	84°N	

POM	L (m)	W (cm)	T	P	Notes
Main dyke (SC)				70°S	
Main dyke (NC)	27.00	62.00	135°	88°N	
Main dyke (SC)			125°	80°S	
Main dyke (NC) I*	29.00	54.00	125°	86°N	
Main dyke (SC)			135°	84°N	
Main dyke (NC) I*	30.10	43.00	074°	65°SE	
Main dyke (SC)			065°	66°SE	
Main dyke (NC)	31.80	50.00	077°	70°S	
Main dyke (SC)			067°	90°	
Main dyke (NC)	33.30	–	098°	–	
Main dyke (NC)	34.30	–	090°	–	
Main dyke (NC) I*	35.30	35.00–62.00	130°	80°N	
Main dyke (SC)				78°S	
Main dyke (NC)	37.30	47.00	135°	85°N	
Main dyke (SC)			142°	78°S	
Main dyke (NC)	39.3	44.00	135°	78°N	
Main dyke (SC)			125°	78°S	

POM, point of measurement; NC, northern contact; SC, southern contact; I*, inflection point; L, length; W, width; T, trend; P, plunge

Dyke SA-17-13 (photo facing northwest).

SA-17-14: Dyke north of Werri Beach

S 34° 43' 38.50" E 150° 50' 36.50"

POM	L (m)	W (cm)	T	P	Notes
NC	0.00	80.00	067°	88°N	Sandstone is intensely foliated around margins of dyke
SC			070°	86°N	
NC	2.00	–	065°	80°S	
SC			075°	85°N	
NC	5.00	80.00	076°	83°S	
SC			070°	85°S	
NC	13.00	70.00	075°	90°	
SC			074°	76°N	
NC	14.50	73.00	075°	85°N	
SC			074°	82°N	
Slickenlines plane	15.20	–	072°	88°S	Direction of movement is down. (Angle between slickenlines and plane is 90°)
NC	18.00	80.00	068°	80°N	
SC			073°	86°S	
Slickenlines plane		–	075°	86°S	Direction of movement is up. Angle between slickenlines and plane is 90°)
NC	20.00	87.00	070°	85°N	
SC			074°	80°S	
NC	22.00	93.00	073°	80°N	
SC			077°		
NC	25.00	111.00	074°	77°N	
SC			080°	76°S	
NC	27.00	111.00	071°	81°N	
SC			074°	90°	
NC	29.00	115.00	067°	78°N	
SC			078°	83°N	
NC	31.00	115.00	073°	80°N	
SC			075°	85°N	
NC	33.00	120.00	073°	80°N	
SC			075°	90°	
NC	35.00	130.00	073°	86°N	
SC			072°	80°N	
NC	37.00	140.00	066°	90°	
SC			072°		
NC	39.00	124.00	075°	79°N	
SC			072°	90°	
NC	41.00	83.00	075°	81°N	
SC			074°		
SC	43.00	94.00 exposed	077°	90°	
SC	45.00	38.00 exposed	073°	81°N	
SC	47.00	43.00	075°	80°N	Sheared on margins – foliations (shear fabric)
NC	49.00	15.00	078°	80°S	
SC			075°	84°N	
NC	51.00	8.50	077°	73°S	
–	53.00	5.50	076°	–	
–	55.00	5.50	080°	–	Dyke continues on for another 5 m, getting thinner then becomes fracture

POM, point of measurement; NC, northern contact; SC, southern contact; L, length; W, width; T, trend; P, plunge

Dyke SA-17-14 (photo facing southeast).

SA-17-14_2: Dyke north of Werri Beach, ~3m NW of SA-17-14

POM	L (m)	T	P	W (cm)	Notes
NC	0	070°	83° N	31	
NC	3	075°	83° N	45	
SC	3	070°	80° S	45	
NC	6	070°	85° N	41	
SC	6	068°	86° S	41	
NC	8	070°	86° N	32	
EC	8.2	160°	-	12	Inflection (photo)
NC	8.3	096°	-	31	
NC	9	073°	-	15	Dyke is now offset 130 cm to the SE
NC	10	073°	-	6	

POM, point of measurement; NC, northern contact; SC, southern contact; L, length; W, width; T, trend; P, plunge

SA-17-15: Dyke at Gerroa

S 34° 46' 46.10" E 150° 49' 09.40"

POM	L (m)	W (cm)	T	P
NC	1.00	88.00	280°	67°N
SC			286°	70°N
NC	3.00	90.00	290°	86°N
SC			285°	67°N
NC	6.00	67.00	279°	77°N
NC	9.00	72.00	289°	60°N
SC			295°	
NC	12.00	75.00	292°	72°N
SC			290°	70°N
NC	15.00	87.00	285°	71°N
SC				68°N
NC	17.60	86.00	280°	76°N
SC			282°	60°N
NC	20.30	100.00	284°	80°N
SC			282°	61°N
SC	24.00	96.00	287°	61°N
SC	27.00	98.00	285°	67°N
SC	30.00	97.00	292°	61°N

POM, point of measurement; NC, northern contact; SC, southern contact; L, length; W, width; T, trend; P, plunge

Shear plane measurements

POM	L (m)	T	P
Southern Plane	8.3	306°	65°N
Southern Plane	10.4	285°	60°N
Northern Plane		290°	71°N

POM, point of measurement; L, length; T, trend; P, plunge

Dyke SA-17-15 (photo facing east).

SA-17-16: Dyke at Gerroa

S 34° 46' 32.40'' E 150° 49' 02.90''

Eastern contact: T = 232°, P = 85°SE

Western contact: T= 230°, P = 83° SE

Close-up of dyke SA-17-16 (photo facing northeast).

SA-17-17: Possible dyke at Gerroa

S 34° 46’ 28.90’’ E 150° 49’ 18.50’’

Trend of metamorphosed sediment = 113°, Plunge appears to be vertical/sub-vertical

Note: no sign of dyke however there is evidence once existed here based on metamorphosed sediment.

View along potential dyke SA-17-17 (photo facing northeast).

SA-17-18: Dyke at Boat Harbour, Gerringong (14/05)

S 34° 45’ 24.00’’ E 150° 49’ 54.00’’

Southern lobe measurements of dyke SA-17-18

POM	L (m)	W (cm)	T	P	Notes
SC	0.00	54.00	117°	90°	
SC	3.00	75.00	114°	83°N	
NC	6.00	100.00	120°	87°N	Dyke quite foliated on NC
SC				85°N	
NC	9.00	90.00	114°	88°N	Siltstone metamorphosed for 1 m at SC and for 40 cm at NC
SC			117°		
NC	12.00	83.00	111°	83°N	
SC			115°	84°N	
NC	13.00	87.00	115°	79°N	
SC			113°	86°N	
NC	14.00	80.00	125°	87°N	
SC			114°		
SC	15.00	72.00	115°	87°N	
NC	16.00	68.00	115°	89°N	
SC			113°	87°N	
NC	17.00	50.00	132°	85°N	
SC			121°	83°N	
NC	18.00	18.00	135°	79°S	
SC			111°	77°N	

POM, point of measurement; NC, northern contact; SC, southern contact; L, length; W, width; T, trend; P, plunge

Notes:

- Sediment intermixing with dyke from 14.00–15.30 m
- Crustal xenoliths only visable from 13.00–18.40 m, some xenoliths are foliated
- Dyke deformed from 14.0–15.30 m
- Little dyklet (1.00 mm–3.50 cm in width) starts off at 13.40 m and joins the main dyke at 14.50 m

At 12.30 m, the northern lobe starts 1.10 m north of the southern lobe

Northern lobe measurements of dyke SA-17-18

POM	L (m)	W (cm)	T	P	Notes
S. dyklet	0.00	0.30	110°	–	Dyklets are 25 cm apart
N. dyklet	0.20	1.00	108°	90°	
S. dyklet	1.00	4.00	121°	–	Dyklets are 31 cm apart
N. dyklet		3.00	124°	–	
S. dyklet	2.00	5.50	116°	–	Dyklets are 32 cm apart
N. dyklet		3.50	105°	–	
S. dyklet	3.00	9.00	085°	–	Dyklets are 20 cm apart
N. dyklet		5.50	105°	85°N	
S. dyklet	4.00	15.00	115°	–	Dyklets are 14 cm apart, N. dyklet disappears at this point, new lobe starts at 4.2 m
N. dyklet		3.00	110°	85°N	
New lobe	5.00	At 4.30 m, it’s 2.00 cm wide. At 5.00 m, its 25.00 cm wide	110°	88°S	S. dyklet and new lobe are 36 cm apart
S. dyklet		–	120°	87°N	
At 5.90 m new lobe (main dyke) and S. dyklet join					
NC	6.00	57.00	117°	87°N	
SC			131°	81°S	
NC	7.00	80.00	117°	85°N	Photo of microxenoliths at 6.9 m
SC			131°	73°S	
NC	8.00	97.00	120°	–	
SC			123°	–	

POM	L (m)	W (cm)	T	P	Notes
NC	9.00	77.00	135°	–	
SC			116°	80°S	
NC	10.00	100.00	116°	87°N	Clear flow banding in basalt at centre of dyke
SC			115°		
NC	11.00	94.00	116°	87°N	
SC				83°N	
NC	12.00	94.00	116°	–	
SC			115°	90°	
Dyke disappears under water and reappears at 17.5 m, underwater it continues on with the same trend and thickness					
NC	17.50	80.00	119°	87°N	
NC	20.00	97.00	112°	86°N	
SC			113°	87°N	
NC	23.00	95.00	115°	75°N	Amygdale in basalt at 24.65 m, it's 1 cm wide and stops at 24.90 m where it's 9 cm wide (photo). Likely opaline silica
SC			114°	85°N	
NC	26.00	90.00	116°	76°N	Clear flow banding in vesicles at 25 m
SC			115°	82°N	
NC	29.00	90.00	115°	86°N	Exposed xenoliths, largest is 5 cm in length
SC			118°	87°N	
SC	30.00	96.00	115°	86°N	
NC	33.00	94.00	110°	83°N	Distinct lobe from 30.3–33.9 m
SC			115°	88°N	
NC	36.00	80.00	119°	90°	2nd distinct lobe from 33.9–36 m
SC			117°	88°N	
NC	39.00	98.00	111°	90°	3rd distinct lobe from 37–39.2 m
SC			113°	85°N	
NC	42.00	90.00	115°	90°	4th lobe from 39.7–48 m
SC			117°		
NC	45.00	100.00	117°	87°N	
SC			111°	88°N	
NC	48.00	94.00	115°	88°N	
SC			116°	87°N	

POM, point of measurement; S. dyklet: southern dyklet / N. dyklet: northern dyklet; NC, northern contact; SC, southern contact; L, length; W, width; T, trend; P, plunge

Notes:

- Intense fracturing between lobes (photo)
- Sediment basalt mixing in between lobes
- 36.20–37.20 m mixed zone of sediment and basalt (photo)
- The sediment in between the lobes has been injected from the southern side
- 39.20–39.70 m mixed zone of sediment and basalt (photo)

Dyke SA-17-18 (photo facing ~ south).

Gabbroic xenoliths in dyke SA-17-18

Dyke lobe junction in dyke SA-17-18

SA-17-19: Dyke at Blackhead, Gerroa

S 34° 47’ 00.3’’ E 150° 49’ 20.0’’

Notes:

- Dyke is trending 158° with a near vertical plunge (85 NE)
- Width: from 0.00–37.00 m it’s up to 1.70m wide, from 38.00–60.00 m it’s 85.00 cm wide
- Dyke is 60.00 m plus long

Dyke SA-17-19 (photo facing southeast)

SA-17-20: Dyke at Blackhead, Gerroa

S 34° 46’ 51.6’’ E 150° 49’ 15.3’’

At end of dyke:

S 34° 46’ 51.5’’ E 150° 49’ 17.2’’

Notes:

- Dyke trends almost E–W (105° N 70°)
- 47 plus meters long from cliff to sea, 2–3 m gully
- Wall in gully 100° S 81°

Dyke SA-17-20 (photo facing ~ northwest).

List of samples and the analyses performed on each sample

Sample number	Sample type	GPS location	Analyses
SA-17-01 A	Dyke	S 34° 43' 46.6" E 150° 50' 26.4"	fpXRF; XRD; petrographic analysis
SA-17-01 B	Chilled margin		fpXRF; petrographic analysis
SA-17-01 D	Sandstone at dyke contact		fpXRF
SA-17-02	Dyke	S 34° 43' 45.8" E 150° 50' 26.7"	fpXRF
SA-17-03	Dyke	S 34° 43' 46.7" E 150° 50' 27.2"	fpXRF
SA-17-04 A	Chilled margin	S 34° 43' 41.5" E 150° 50' 27.9"	fpXRF; petrographic analysis
SA-17-05 A	Dyke	S 34° 43' 41.7" E 150° 50' 28.5"	Lab XRF; fpXRF; XRD; petrographic analysis
SA-17-05 B	Chilled margin		fpXRF; petrographic analysis
SA-17-06 A	Brecciated chilled margin	S 34° 46' 49.1" E 150° 49' 17.0"	fpXRF; petrographic analysis
SA-17-06 E	Breccia with pyrite and calcite		petrographic analysis
SA-17-06 F	Dyke south contact at 13.75 m		fpXRF
SA-17-06 G	Dyke south contact at 19.20 m		fpXRF; petrographic analysis
SA-17-08 A	Northern chill margin at 75.6 m	S 34° 43' 40.50" E 150° 50' 32.80"	fpXRF; petrographic analysis
SA-17-08 B	Dyke at 75.6 m		fpXRF; petrographic analysis
SA-17-08 C	Southern chill margin at 75.6 m		fpXRF
SA-17-09 B	Dyke at 5.75 m	S 34° 43' 40.00" E 150° 50' 33.90"	fpXRF
SA-17-09 C	Dyke at 19.10 m		fpXRF
SA-17-09 D	Southern chill margin at 42.60 m		fpXRF
SA-17-09 G	Dyke 30 cm in from contact at 53.9 m		fpXRF; petrographic analysis
SA-17-10	Dyke	S 34° 43' 28.50" E 150° 50' 41.80"	fpXRF; petrographic analysis
SA-17-11	Sandstone at contact	S 34° 43' 29.20" E 150° 50' 39.40"	fpXRF; petrographic analysis
SA-17-12 A	Dyke	S 34° 43' 32.60" E 150° 50' 36.20"	fpXRF; petrographic analysis
SA-17-12 B	Sediment incorporated in dyke		petrographic analysis
SA-17-13 A	Dyke at 1 m	S 34° 43' 34.50" E 150° 50' 36.20"	fpXRF; petrographic analysis
SA-17-13 B	Sandstone on SC at 18.1 m		fpXRF; XRD; petrographic analysis
SA-17-13 C	Sandstone 1.7 m south of Southern contact		fpXRF; XRD; petrographic analysis
SA-17-14	Dyke at 20.5 m	S 34° 43'38.5" E 150° 50' 36.5"	fpXRF; petrographic analysis
SA-17-14_2	Dyke at 0 m		fpXRF
SA-17-15 A	Dyke (northern contact) at 2.35 m	S 34° 46' 46.1" E 150° 49' 09.4"	fpXRF; petrographic analysis
SA-17-15 B	Centre of dyke at 2.35 m		fpXRF; petrographic analysis
SA-17-15 C	Dyke (southern contact) at 2.35 m		fpXRF
SA-17-16 A	Dyke	S 34° 46' 32.40"	fpXRF; petrographic analysis

Sample number	Sample type	GPS location	Analyses
SA-17-16 B	Sandstone at contact	E 150° 49' 02.90"	fpXRF; XRD; petrographic analysis
SA-17-17	Metamorphosed sediment	S 34° 46' 28.9" E 150° 49' 18.5"	fpXRF; petrographic analysis
SA-17-18 A	Dyke	S 34° 45' 24.0" E 150° 49' 54.0"	fpXRF; petrographic analysis
SA-17-18 B	Granitic xenolith		Lab XRF; fpXRF; XRD; petrographic analysis
SA-17-19	Dyke	S 34° 47' 00.3" E 150° 49' 20.0"	fpXRF
SA-17-20	Dyke	S 34° 46' 51.6" E 150° 49' 15.3"	fpXRF
14/01	Dyke	S 34° 43' 35.54" E 150° 50' 32.39"	Lab XRF; fpXRF; XRD; petrographic analysis
14/02	Dyke	S 34° 43' 35.30" E 150° 50' 40.03"	fpXRF
14/03	Dyke	S 34° 43' 29.57" E 150° 50' 42.66"	petrographic analysis
14/04	Dyke	S 34° 43' 32.17" E 150° 50' 41.45"	fpXRF; petrographic analysis
14/16	Dyke	N/D	fpXRF; petrographic analysis
14/17 (SA-17-07)	Dyke	S 34° 46' 12.4" E 150° 49' 36.2"	fpXRF; petrographic analysis
Dyklet B	Dyklet	S 34° 43' 40.00" E 150° 50' 33.90"	fpXRF; petrographic analysis

Results of petrographic analysis for dyke samples

Sample	Texture	Phenocrysts	Groundmass	Xenocrysts/Xenoliths	Secondary minerals
SA-17-01 A	Porphyritic amygdaloidal	Ti-augite: 60% Skeletal olivine: 30% Plagioclase: 10% Euhedral Ti-augite, skeletal olivine and plagioclase phenocrysts. Average phenocryst size is 0.7 mm. Phenocryst to ground-mass ratio: 1:20	Fine-grained, rich in Ti-augite. Ti-augite: 70% Plagioclase: 25% Opaque minerals: 5%	Xenocrysts: Ti-augite (common) Anorthoclase (rare) Ti-augite xenocrysts are generally zoned and display polybaric crystallisation. Some Ti-augite xenocrysts are partially resorbed.	Intense and pervasive chlorite alteration, with Fe^{2+} rich and Fe^{3+} rich chlorite. Chlorite, fibrous zeolite (most likely thomsonite), carbonate and pumpellyite filled vesicles (up to 1.2 mm). Skeletal olivine phenocrysts are replaced by chlorite and carbonate. Carbonate overprinting anorthoclase xenocryst. Cross-cutting veinlets and micro veinlets of carbonate.
SA-17-01 B	Sparsely porphyritic amygdaloidal	Former plagioclase: 50% Former augite: 50% No primary phases left as all phenocrysts (up to 2.0 mm) have been replaced by chlorite or carbonate. Phenocryst to ground-mass ratio: 1:100	Extremely fine-grained groundmass with plagioclase, augite and opaque minerals.	No apparent xenocrysts or xenoliths.	Intense and pervasive chlorite and carbonate alteration. Abundant zoned vesicles filled with chlorite and then calcite. Vesicles filled with vermicular chlorite, carbonate, and zeolite. Vesicle sizes range from 0.2–1.2 mm. Some vesicles are interconnected.
SA-17-04 A	Porphyritic	Plagioclase: 80% Former olivine: 20% Twinned plagioclase laths (up to 1.0 mm) displaying a rough flow-alignment and euhedral to subhedral skeletal olivine (up to 0.8 mm). Phenocryst to ground-mass ratio = 1:2	Extremely fine-grained. Micro-aphanitic	No apparent xenocrysts or xenoliths.	Intense and pervasive chlorite and carbonate alteration. Olivine phenocrysts completely replaced by chlorite and/or carbonate. Some plagioclase laths have been replaced/overprinted by carbonate. Cross-cutting micro-veinlets of carbonate.

Sample	Texture	Phenocrysts	Groundmass	Xenocrysts/Xenoliths	Secondary minerals
SA-17-05 A	Intergranular	Olivine: 35% Plagioclase: 35% Augite: 30% Subhedral fresh olivine phenocrysts (up to 1.0 mm), lath-shaped plagioclase (up to 0.8 mm) and subhedral augite phenocrysts (up to 0.5 mm). Phenocryst to ground-mass ratio = 4:10	Medium-grained. Lath-shaped plagioclase grains show no apparent flow orientation. Clinopyroxene in the form of augite and Ti-augite. Plagioclase: 40% Clinopyroxene: 30% Ilmenite: 20% Olivine: 10%	No apparent xenocrysts or xenoliths.	Minor Fe^{2+} rich chlorite alteration in groundmass. Some olivine phenocrysts are partially replaced by chlorite. Cross-cutting chlorite veinlet. Chlorite-filled microvesicle (0.2 mm).
SA-17-05 B	Porphyritic	Plagioclase: 60% Former olivine: 40% Twinned plagioclase laths (up to 0.8 mm) displaying a rough flow-alignment and euhedral to subhedral skeletal olivine (up to 0.9 mm). Phenocryst to ground-mass ratio = 1:2	Extremely fine-grained. Micro-aphanitic	No apparent xenocrysts or xenoliths.	Intense and pervasive chlorite alteration. Olivine phenocrysts completely replaced by carbonate. Some plagioclase laths have been replaced or overprinted by carbonate.
SA-17-06 A	Porphyritic amygdaloidal	Former olivine: 60% Clinopyroxene: 40% Euhedral to subhedral former olivine phenocrysts (0.5 mm in size) and euhedral clino-pyroxene phenocrysts (up to 0.9 mm) Phenocryst to ground-mass ratio = 1:20	Groundmass is extremely fine-grained and contains crystallites of pyroxene and Ti-augite. Micro-aphanitic	Skeletal olivine xenocryst replaced by chlorite.	Moderate and pervasive chlorite alteration. Abundant chlorite-filled micro-vesicles and vesicles (from 0.1–1.0 mm). Chlorite replacing olivine phenocrysts and xenocryst.

Sample	Texture	Phenocrysts	Groundmass	Xenocrysts/Xenoliths	Secondary minerals
SA-17-06 G	Porphyritic amygdaloidal	Augite: 70% Former olivine: 30% Euhedral to subhedral former olivine phenocrysts (up to 1.0 mm), subhedral augite phenocrysts (up to 0.6 mm) and glomerophenocrysts (0.4–1.0 mm). Phenocryst to ground-mass ratio = 1:20	Very fine-grained groundmass containing crystallites of augite. Augite: 70% Plagioclase: 25% Opaque minerals: 5%	No apparent xenocrysts or xenoliths.	Chlorite alteration is intense and pervasive, with chlorite-filled vesicles (up to 1.0 mm) and chlorite replacing both groundmass and olivine phenocrysts. Moderate carbonate alteration, with carbonate overprinting Mg and Fe-rich chlorite in vesicles and replacing olivine phenocrysts. Cross-cutting carbonate micro-veinlets.
SA-17-08 A	Micro-porphyritic	Former olivine: 100% Phenocrysts and micro-phenocrysts of former olivine (up to 0.5 mm). Phenocryst to ground-mass ratio = 1:20	Fine-grained groundmass containing crystallites of pyroxenes and plagioclase, as well as opaque minerals. Pyroxene: 68% Plagioclase: 30% Opaque minerals: 2%	No apparent xenocrysts or xenoliths.	Intense and pervasive chlorite alteration. Olivine phenocrysts completely replaced by chlorite. Abundant and pervasive chlorite-filled microvesicles (0.4 mm). Some of the chlorite has weathered to smectite.
SA-17-08 B	Sparsely porphyritic amygdaloidal	Ti-augite: 60% Former olivine: 40% Sample is phenocryst-poor with microphenocrysts (0.4 mm) and microglomero-phenocrysts (0.4 mm) of Ti-augite and former olivine phenocrysts (up to 1.2 mm). Phenocryst to ground-mass ratio: 1:200	Fine-grained groundmass rich in unaligned plagioclase laths and abundant pyrite forming aggregates. Plagioclase: 50% Clinopyroxene: 20% Olivine: 20% Pyrite: 10%	Zoned Ti-augite xenocryst (1.0 mm).	Moderate and pervasive yellow-green chlorite alteration. Abundant vesicles (0.3–1.0 mm) filled with chlorite, carbonate or chlorite–carbonate. Former olivine in groundmass and phenocrysts replaced by chlorite and carbonate.
SA-17-09 C	Porphyritic	Former plagioclase: 80% Former olivine: 20% Microphenocrysts and phenocrysts of former plagioclase and olivine (<0.1–1.1 mm). Phenocryst to ground-mass ratio = 1:20	Extremely fine-grained groundmass, slightly quenched with very elongate primary plagioclase grains displaying a slight flow orientation. Micro-aphanitic	No apparent xenocrysts or xenoliths.	Intense and pervasive carbonate and chlorite alteration, although the former is more dominant. Microphenocrysts replaced by carbonate and chlorite. Abundant carbonate spotting all throughout sample.
SA-17-09 G	Porphyritic amygdaloidal	Former olivine: 100% Phenocrysts and micro-	Fine-grained ground-mass with aggregates of	No apparent xenocrysts or xenoliths.	Moderate and pervasive chlorite alteration. Olivine microphenocrysts and phenocrysts

Sample	Texture	Phenocrysts	Groundmass	Xenocrysts/Xenoliths	Secondary minerals
		phenocrysts of former olivine (0.1–0.6 mm). Phenocryst to ground-mass ratio = 1:10	Ti-augite. Pyrite is present as disseminated subhedral grains and aggregates. Pyrite infilling vesicles and the space between grains. Ti-augite: 40% Plagioclase: 40% Red-brown clinopyroxene: 10% Former olivine: 5% Pyrite: 5%		replaced by chlorite. Vesicles (up to 1.3 mm) filled with chlorite, zeolite, zeolite–carbonate, zeolite–chlorite, and zeolite–carbonate–chlorite. Zeolite alteration in the groundmass (moderately common and pervasive, unevenly distributed).
SA-17-09 H	Micro-porphyritic	Former Olivine: 100% Microphenocrysts and phenocrysts of olivine (<0.1–0.5 mm). Phenocryst to ground-mass ratio = 1:10	Fine-grained ground-mass, slightly quenched with Ti-augite and very elongate primary plagioclase grains displaying a flow orientation. Micro-aphanitic	No apparent xenocrysts or xenoliths.	Intense and pervasive carbonate and chlorite alteration. Microphenocrysts and phenocrysts of former olivine replaced by carbonate and chlorite. Carbonate filling microvesicles (0.2–0.4 mm). Abundant carbonate spotting throughout sample. Aggregates of cross-cutting opaques.
SA-17-10	Glomero-porphyritic	Former olivine: 80% Former plagioclase: 20% Phenocryst (up to 1.0 mm), micro-phenocrysts and glomerophenocrysts (5 x 5 mm) of former olivine. Former plagioclase phenocrysts (up to 0.8 mm). Phenocryst to ground-mass ratio = 1:10	Very fine-grained groundmass with crystallites. Micro-aphanitic	No apparent xenocrysts or xenoliths.	Intense and pervasive chlorite and carbonate alteration. Phenocrysts and glomerophenocryst of former olivine replaced by chlorite and then carbonate. Former plagioclase phenocrysts also replaced by chlorite and carbonate.

Sample	Texture	Phenocrysts	Groundmass	Xenocrysts/Xenoliths	Secondary minerals
SA-17-12 A	Glomero-porphyritic	Former olivine: 50% Plagioclase: 50% Abundant phenocrysts (0.5–1.0 mm) and glomeropheno-crysts (up to 1.2 mm) of former olivine. Flow-aligned, twinned, lath-shaped plagioclase phenocrysts (up to 1.0 mm). Phenocryst to ground-mass ratio = 1:5	Very fine-grained with laths of plagioclase and crystallites. Micro-aphanitic	Equant plagioclase xenocrysts (0.4 mm across).	Moderate and pervasive chlorite and carbonate alteration. Sub-parallel, cross-cutting carbonate microveinlets. Multi-generational carbonate-chlorite vein displaying shear fabrics and two distinctive chlorite compositions. Chlorite-carbonate filled micro-vesicles (0.3 mm). Carbonate and chlorite replacing former olivine phenocrysts and glomerophenocrysts.
SA-17-13 A	Porphyritic	Former olivine: 50% Plagioclase: 49% Augite: <1% Microphenocrysts and phenocrysts (0.1–0.7 mm) of former olivine. Euhedral lath-shaped plagioclase (up to 1.0 mm). Rare augite microphenocryst. Phenocryst to ground-mass ratio = 1:5	Fine-grained, plagioclase-rich groundmass with augite crystallites and space-fill pyrite. Plagioclase: 80% Augite: 19% Pyrite: <1%	Former olivine xenocrysts (up to 1.2 mm) replaced by chlorite.	Moderate and pervasive chlorite and carbonate alteration. Chlorite and chlorite-carbonate replacing former olivine phenocrysts. Chlorite replacing former olivine xenocrysts. Opaque aggregates associated with chlorite alteration. Plagioclase laths overprinted by chlorite. Uncommon carbonate overprinting chlorite.
SA-17-14	Porphyritic amygdaloidal	Ti-augite: 60% Former olivine: 40% Euhedral Ti-augite pheno-crysts (up to 1.0 mm, some zoned) and Ti-augite glomerophenocrysts (up to 1.0 mm). Former euhedral olivine phenocrysts (up to 1.0 mm) replaced by chlorite. Phenocryst to ground-mass ratio = 3:10	Very fine-grained groundmass. Plagioclase: 70% Olivine: 25% Opaque minerals: 5%	Zoned Ti-augite xenocrysts (up to 1.3 mm) some with resorbed interiors.	Moderate chlorite alteration. Yellow-green chlorite replacing former olivine phenocrysts and green chlorite replacing olivine in groundmass. Vesicles (up to 5.0 mm) filled with vermicular chlorite, fibrous zeolite, and opaque minerals. Rare carbonate alteration on margin of vesicle.

Sample	Texture	Phenocrysts	Groundmass	Xenocrysts/Xenoliths	Secondary minerals
SA-17-15 A	Glomero-porphyritic	Clinopyroxene: 75% Olivine: 25% Clinopyroxene phenocrysts (with Ti-rich rims, 0.4–1.0 mm, some zoned) and glomerophenocrysts. Former olivine phenocrysts (up to 1.2 mm) replaced by chlorite. Phenocryst to ground-mass ratio = 1:10	Fine-grained ground-mass with brown Fe^{2+} rich augite. Micro-aphanitic	No apparent xenocrysts or xenoliths.	Moderate and pervasive chlorite alteration, intense in some areas of the groundmass. Chlorite replacing former olivine phenocrysts. Some former olivine phenocrysts are replaced by both chlorite and carbonate. Uncommon carbonate alteration in groundmass. Cross-cutting carbonate veinlets.
SA-17-15 B	Porphyritic amygdaloidal	Ti-augite: 50% Former olivine: 50% Microphenocrysts and phenocrysts (up to 0.7 mm) of euhedral to subhedral Ti-augite. Former olivine phenocrysts (up to 2.5 mm). Phenocryst to ground-mass ratio = 1:10	Clinopyroxene-rich groundmass (red-brown clinopyroxene and Ti-augite) with disseminated pyrite. Micro-aphanitic	Xenocryst of Clinopyroxene.	Intense and pervasive chlorite alteration. Former olivine phenocrysts replaced by chlorite and chlorite–carbonate. Micro-veinlets of carbonate and zeolite. Zoned amygdales (up to 2.0 mm) of carbonate with chlorite and pyrite in the centre. Pyrite replacing bladed euhedral crystals in vesicles. Pyrite in vesicles altering to hematite. Amygdales of chabazite and zeolite. Zoned euhedral crystals of Ti-augite growing into vesicle.
SA-17-16 A	Micro-porphyritic amygdaloidal	Augite: 60% Former olivine: 40% Microphenocryst (0.4 mm), glomeromicrophenocrysts (0.5 mm) of euhedral augite. Phenocrysts (1.4 mm) of former olivine replaced by chlorite. Phenocryst to ground-mass ratio = 1:10	Clinopyroxene-rich fine-grained groundmass with abundant opaques. Micro-aphanitic	No apparent xenocrysts or xenoliths.	Common chlorite and chlorite-carbonate filled vesicles (up to 1.2 mm). Two types of chlorites in vesicles, yellow-green and Mg-rich chlorite. Yellow-green chlorite replacing former olivine phenocrysts. Uncommon green chlorite alteration in groundmass. Euhedral calcite crystals on vesicle walls. Cross-cutting micro-veinlets of carbonate.
SA-17-18 A	Micro-porphyritic amygdaloidal	Clinopyroxene: 100% Microphenocrysts of clinopyroxene (up to 0.3 mm) Microphenocryst to groundmass ratio = 1:200	Very fine-grained groundmass with opaque minerals forming aggregates and unaligned, lath-shaped plagioclase grains. Opaque minerals: 35% Ti-augite: 35% Plagioclase: 30%	No apparent xenocrysts or xenoliths.	Abundant chlorite–carbonate filled vesicles (1.0 mm on average, up to 5.0 mm). Vesicles filled with Mg-rich and Fe^{2+}-rich chlorite. Pervasive and moderately intense yellow-green chlorite alteration in groundmass. Uncommon carbonate alteration in groundmass.

Sample	**Texture**	**Phenocrysts**	**Groundmass**	**Xenocrysts/Xenoliths**	**Secondary minerals**
14/01	Intergranular	Olivine: 100% Phenocrysts of olivine and former olivine (up to 0.8 mm). Phenocryst to ground-mass ratio = 1:50	Fine-grained ground-mass rich in twinned plagioclase laths with a weakly developed flow alignment. Plagioclase: 60% Former olivine: 25% Augite: 15%	Uncommon, zoned plagioclase xenocrysts (up to 1.0 mm).	Olivine phenocrysts mostly replaced by chlorite. Olivine in groundmass also largely replaced by chlorite. Some olivine is replaced by iddingsite. Cross-cutting chlorite and chlorite–hematite–carbonate veins. Euhedral pyrite grains associated with chlorite alteration.
14/03	Intergranular	Former olivine: 100% Phenocrysts of former olivine (up to 1.0 mm). Phenocryst to ground-mass ratio = 1:20	Medium-grained groundmass with lath-shaped plagioclase grains and Ti-augite. Plagioclase: 55% Ti-augite: 35% Opaques: 10%	Abundant biotite xenocrysts (0.4 mm on average but up to 1.0 mm). Zoned plagio-clase xenocryst (1.0 mm) with undulose extinction. Former olivine xenocryst (1.0 mm).	Olivine xenocrysts and phenocrysts replaced by chlorite. Xenocrystic biotite partially replaced by chlorite. Chlorite overprinting plagioclase in groundmass.
14/04	Porphyritic	Former olivine: 60% Former clinopyroxene: 40% Skeletal phenocrysts (up to 1.1 mm) of clinopyroxene. Former olivine phenocrysts (up to 1.2 mm). Rare unaltered olivine. Phenocryst to ground-mass ratio = 1:5	Very fine-grained groundmass. Micro-aphanitic	No apparent xenocrysts or xenoliths.	Very intense and pervasive Fe^{3+} chlorite alteration. Zoned aragonite vesicle with calcite in centre.

Sample	Texture	Phenocrysts	Groundmass	Xenocrysts/Xenoliths	Secondary minerals
14/05 (a) (SA-17-18)	Aphanitic	No apparent phenocrysts in sample.	Fine-grained ground-mass with elongate plagioclase grains, Ti-augite and opaque minerals. Groundmass becomes slightly more coarse-grained near xenolith contact. Plagioclase: 45% Ti-augite: 45% Opaque minerals: 10%	Coarse-grained xenolith (grain size up to 2–3 cm) with quartz, plagioclase, orthopyroxene, and Na-amphibole. Quartz is strongly recrystallised and has reaction rims where it meets the host basalt. Quartz and orthopyroxene display undulose extinction. Melt invading xenolith, with quenched textured crystallites between xenolith grains. Overgrowth around ortho-pyroxene where it is in contact with host basalt.	Intense and pervasive chlorite alteration. Vesicles (up to 4 mm) filled with carbonate–zeolite and rimmed by chlorite. Vesicle filled with zeolite and rimmed with pyrite and chlorite. Vesicles filled with chlorite–pyrite, chlorite–carbonate–pyrite, chlorite–spinel. Zoned chlorite-filled vesicle with Mg-rich chlorite in centre rimmed by Fe-rich chlorite. Chlorite filling in fractures in orthopyroxene xenolith grain.

Sample	Texture	Phenocrysts	Groundmass	Xenocrysts/Xenoliths	Secondary minerals
14/05 (b) (SA-17-18)	Sparsely porphyritic	Clinopyroxene: 100% Rare phenocrystic clinopyroxene. Phenocryst to ground-mass ratio = 1:1000	Fine-grained ground-mass with fresh plagioclase, Ti-augite, spinel and apatite needles. Plagioclase: 35% Ti-augite: 35% Spinel: 15% Apatite: 15%	1. Alkali gabbro xenolith: plagioclase, micro-cline, orthopyroxene, green clinopyroxene and platy ilmenite. Biotite enclosed in microcline. Very strongly sutured grain boundaries and reaction rim. 2. Biotite-rich gabbro xenolith: strongly deformed with abundant biotite, plagioclase, clinopyroxene, ortho-pyroxene and minor apatite. Sutured grain boundaries and augite-rich reaction rim. 3. Charnockite xenolith: quartz (some display weak undulose extinction), rutile needles in quartz, ortho-pyroxene (with exsolution lamellae), and plagioclase with intergranular biotite. Biotite in xenolith fractures. Intensely sutured grain boundaries. Quartz, plagioclase and orthopyroxene are co-crystallised.	Amygdales (1–3 mm on average) filled with calcite, chlorite–carbonate, and Mg-rich chlorite. Chlorite replacing earlier phases of minerals and chlorite–calcite infilling cavity in alkali gabbro xenolith. Chlorite replacing biotite and infilling fractures in biotite-rich gabbro xenolith. Intergranular biotite altering to chlorite with spatially associated overprinting opaque minerals in charnockite xenolith.
14/05 (c) (SA-17-18)	Aphanitic	No apparent phenocrysts in sample.	Extremely fine-grained, quenched groundmass with spindle-shaped plagioclase, Ti-augite, and opaque minerals that form aggregates. Plagioclase: 45% Ti-augite: 45% Opaque minerals: 10%	No apparent xenocrysts or xenoliths.	Intense and pervasive Fe-rich chlorite alteration, with chlorite replacing earlier phases such as Ti-augite. Microvesicles (0.2 mm on average) filled with chlorite.

Sample	Texture	Phenocrysts	Groundmass	Xenocrysts/Xenoliths	Secondary minerals
14/05 (d) (SA-17-18)	Aphanitic	No apparent phenocrysts in sample.	Fine-grained ground-mass with plagioclase, inter-granular olivine, and Ti-augite. Plagioclase: 50% Ti-augite: 30% Former olivine: 15% Opaque minerals: 5%	1. Charnockite xenolith: Quartz (showing weak to moderate undulose extinction), ortho-pyroxene (with exsolution lamellae), plagioclase, intergranular clinopyroxene and biotite. Xenolith has reaction rim and strongly sutured grain boundaries with intensely fractured grains. 2. Granitic type xenolith: Plagioclase, quartz (displaying moderate undulose extinction), and apatite. Xenolith has strongly sutured grain boundaries	Weak and pervasive chlorite alteration with chlorite replacing former olivine in groundmass.
14/05 H (SA-17-18)	Aphanitic amygdaloidal	No apparent phenocrysts in sample.	Fine-grained, uniform groundmass with quenched crystallites, elongate spindle-shaped grains and disseminated anhedral to euhedral pyrite, chalcopyrite and sphalerite grains. Anhedral pyrite aggregates. Sphalerite and chalcopyrite associated with crystallites. Plagioclase: 50% Clinopyroxene: 48% Sulfides: 2%	**Xenocryst:** Common quartz xenocrysts. Some xenocrysts are resorbed and have well-defined reaction rims. **Xenoliths:** Granitic xenoliths with quartz, plagioclase and alkali feldspar. Some xenoliths disaggregated into the basalt and are invaded by crystallites in the melt. Some quartz grains display undulose extinction and quartz recrystallisation.	Chlorite-filled vesicles (up to 1.2 mm) and microvesicles (0.3–0.6 mm). Pyrite intergrown with chlorite and magnetite.

Sample	Texture	Phenocrysts	Groundmass	Xenocrysts/Xenoliths	Secondary minerals
14/05 H (b) (SA-17-18)	Sparsely porphyritic	Ti augite (0.5 mm). Phenocryst to ground-mass ratio = 1:1000	Fine-grained ground-mass with quenched, elongate grains. Plagioclase: 50% Ti-augite: 48% Sulfide minerals: 2%	1. Gabbroic xenolith (Theralite?): Plagioclase, alkali feldspar, clino-pyroxene, orthopyroxene and pyrite. Cumulate texture with sharp contact with basalt. 2. Granitic xenolith: Quartz and alkali feldspar. Rare apatite grain. Clinopyroxene reaction rims. 0.5 mm wide reaction rim between two xenolith types.	Weak chlorite alteration.
14/16	Glomero-porphyritic amygdaloidal	Former olivine: 50% Clinopyroxene: 50% Phenocrysts of former olivine (up to 2.0 mm). Phenocrysts and glomerophenocrysts (up to 1.0 mm) of clinopyroxene in the form of Ti-augite and zoned clinopyroxene with Ti-rich rims. Phenocryst to ground-mass ratio = 1:10	Fine-grained ground-mass. Olivine: 45% Augite: 35% Plagioclase: 20%	Resorbed clinopyroxene anticryst.	Abundant zoned vesicles (up to 1.2 mm) filled with chlorite, chlorite–carbonate, and zeolite–carbonate. Some vesicles are elongated and flow-aligned. Two forms of chlorite in vesicles: Fe^{2+} rich chlorite, which comes in first followed by Mg-rich chlorite. Former olivine phenocrysts replaced by Fe^{2+} rich chlorite.
14/17	Micro-porphyritic	Former olivine: 100% Microphenocrysts (up to 0.4 mm) of former olivine. Phenocryst to ground-mass ratio = 1:15	Very fine-grained groundmass with Ti-augite crystallites. Ti-augite: 50% Plagioclase: 50%	No apparent xenocrysts or xenoliths.	Former olivine microphenocrysts replaced by chlorite. Microvesicles filled with chlorite.

Geostatistical analysis

Table S8. Results of factor analysis and LDA.

Sample	Rock type	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8	Alk Basalt	Andesitic Basalt	Basalt	Foidite
SA-17-01 A	Foidite	0.51	–0.16	–0.74	1.59	1.11	0.17	–0.50	3.59	0.00	0.00	0.00	1.00
SA-17-01 B	Foidite	0.02	–0.89	0.17	–0.77	–0.67	1.54	–1.84	0.91	0.00	0.00	0.00	1.00
SA-17-02	Foidite	–0.68	0.43	–0.04	4.50	0.45	1.95	1.47	–0.40	0.00	0.00	0.00	1.00
SA-17-03	Basalt	–2.21	0.06	–1.68	–0.57	–0.87	1.41	–1.44	–0.29	0.00	0.00	1.00	0.00
SA-17-04 A	Alk-Basalt	–0.08	–1.72	0.33	–0.59	–0.32	0.49	2.02	–0.80	1.00	0.00	0.00	0.00
SA-17-05 A	Alk-Basalt	–0.51	–1.48	0.54	0.16	–0.55	–0.75	0.78	0.71	1.00	0.00	0.00	0.00
SA-17-05 B	Alk-Basalt	–0.62	–1.35	0.08	–0.63	–0.26	1.32	1.50	–1.06	1.00	0.00	0.00	0.00
SA-17-06 A	Foidite	0.48	1.20	1.64	0.23	–0.81	–0.65	0.31	–0.53	0.00	0.00	0.00	1.00
SA-17-06 F	Foidite	0.76	–0.31	1.39	–0.21	–0.68	–0.34	–0.69	–0.15	0.00	0.00	0.00	1.00
SA-17-06 G	Foidite	0.17	–0.75	1.26	0.79	–0.06	–0.50	–2.05	–0.68	0.00	0.00	0.00	1.00
SA-17-08 A	Foidite	1.44	0.02	–0.76	0.32	0.52	–1.29	0.46	–1.17	0.00	0.00	0.00	1.00
SA-17-08 B	Foidite	0.79	0.02	–1.05	–0.57	1.64	–0.36	–0.33	–1.01	0.00	0.00	0.00	1.00
SA-17-08 C	Foidite	0.12	0.57	–1.42	–0.18	0.49	1.71	–0.13	–1.38	0.00	0.00	0.00	1.00
SA-17-09 B	Foidite	0.67	1.84	–0.84	–0.26	–0.96	–0.15	–0.18	0.39	0.00	0.00	0.00	1.00
SA-17-09 C	Foidite	0.87	0.62	–0.82	0.09	–0.84	–0.12	–0.07	–0.11	0.00	0.00	0.00	1.00
SA-17-09 D	Foidite	1.35	0.03	–0.75	–0.51	0.53	–0.80	0.54	–0.90	0.00	0.00	0.00	1.00
SA-17-09 H	Alk-Basalt	0.07	0.29	–0.77	1.83	–0.48	–0.54	–0.77	–1.43	1.00	0.00	0.00	0.00
SA-17-09 G	Foidite	1.27	0.70	–0.87	–0.86	0.14	–0.24	0.19	0.62	0.00	0.00	0.00	1.00
SA-17-10	Foidite	1.00	0.69	–0.91	–0.57	–0.38	1.33	0.36	0.54	0.00	0.00	0.00	1.00
SA-17-12 A	Alk-Basalt	–0.65	–1.18	–0.60	–1.23	–0.45	1.63	0.36	0.01	1.00	0.00	0.00	0.00
SA-17-13 A	Alk-Basalt	–0.22	–1.75	0.84	0.32	–0.83	–0.93	0.88	0.48	1.00	0.00	0.00	0.00
SA-17-14	Foidite	–0.80	–0.31	0.85	–0.37	2.49	0.56	–1.25	–0.74	0.00	0.00	0.00	1.00
SA-17-14_2	Foidite	–0.31	1.85	1.24	–0.58	–0.17	1.41	0.75	0.47	0.00	0.00	0.00	1.00
SA-17-15 A	Foidite	0.67	–0.87	0.62	0.32	–0.79	0.04	–1.74	0.18	0.00	0.00	0.00	1.00
SA-17-15 B	Foidite	0.14	0.58	2.00	–0.27	–0.75	0.30	–0.17	–0.92	0.00	0.00	0.00	1.00

Sample	Rock type	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8	Alk Basalt	Andesitic Basalt	Basalt	Foidite
SA-17-15 C	Foidite	0.40	–0.09	1.12	–0.06	–0.74	0.26	–0.94	0.14	0.00	0.00	0.00	1.00
SA-17-16 A	Foidite	0.59	0.02	0.29	0.02	1.06	–0.29	0.88	0.08	0.00	0.00	0.00	1.00
SA-17-18 A	Foidite	0.67	–0.60	–0.56	–0.23	–0.66	–0.01	–0.49	1.37	0.00	0.00	0.00	1.00
SA-17-19	Andesitic Basalt	–1.83	0.60	–1.03	0.45	–0.74	–1.38	–0.84	0.14	0.00	1.00	0.00	0.00
SA-17-20	Andesitic Basalt	–1.94	–0.51	–0.81	0.41	0.15	–1.92	–0.91	–0.28	0.00	1.00	0.00	0.00
14_01	Alk-Basalt	–0.18	–1.53	0.05	–0.06	–0.50	–0.40	1.39	0.87	1.00	0.00	0.00	0.00
14_02	Foidite	1.25	–0.02	–1.10	–0.23	0.43	–0.49	0.32	0.26	0.00	0.00	0.00	1.00
14_04	Foidite	–0.84	0.11	1.30	–0.82	3.55	0.24	–0.38	0.69	0.00	0.00	0.00	1.00
14_05	Basalt	–2.45	2.16	0.55	–0.84	–0.31	–1.16	1.36	1.06	0.00	0.00	1.00	0.00
14_16	Foidite	0.42	1.35	1.15	–0.26	–0.50	–0.11	0.08	–0.12	0.00	0.00	0.00	1.00
14_17	Foidite	0.67	0.55	0.48	0.33	0.53	–0.48	0.27	0.02	0.00	0.00	0.00	1.00