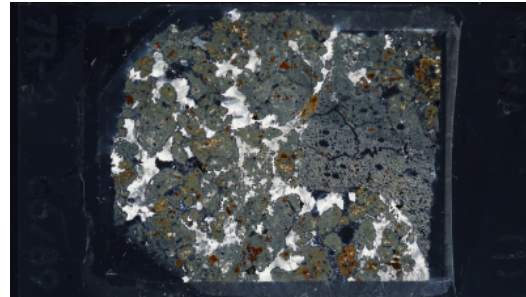
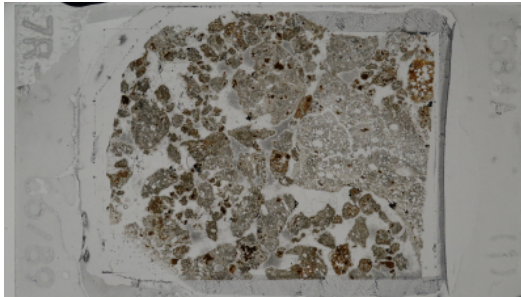


THIN SECTION LABEL ID: **397T-U1584A-7R-1-W 86/89-TSB-TS 1** Thin section no.: 1
 Observer: RB Unit/subunit:
 Thin section summary: pumice/scoria lapilli, with clasts of altered basalts are welded by the carbonate cement. vesicles in the most of the pumice lapilli are elliptical/elongated with their major axes aligned in one direction at some places vesicles are spherical. Vesicles are empty or filled with zeolite.

Plane-polarized: 64161191

Cross-polarized: 64161211



Sediments and Sedimentary Rock

Complete lithology name: lapillistone

Texture	%	Constituent	%
Gravel texture:		Volcaniclastic:	
Sand texture:		Carbonate:	20
Silt texture:		Siliclastic:	
Clay texture:		Biogenic silica:	

Framework grain abundance

D=dominant; A=abundant; C=common; R=rare; Tr=trace

Component	Rel. abundance	Component	Rel. abundance
Quartz		Calcite (allogenic)	C
Feldspar		Mica	
Clay minerals		Glauconite	
Lithic grains	C	Zeolite	R
Chert		Undifferentiated calcareous bioclasts	

Dominant Cement: carbonate

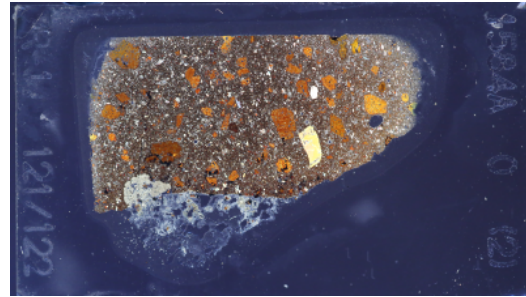
Volcanic glass roundness: sub-rounded Lithic grain roundness: sub-rounded

THIN SECTION LABEL ID: **397T-U1584A-7R-1-W 122/123-TSB_ICP-TS 2** Thin section no.: 2
 Observer: WN Piece no.:
 Thin section thickness: Unit/subunit:
 Thin section summary: Highly olivine-augite phyric basalt with minor plagioclase. Olivine is completely replaced by iddingsite in both phenocrysts and groundmass. Sparse cpx phenocrysts are fresh; more cpx is present in the groundmass. Plagioclase is moderately altered to sericite. There is a subtle trachytic texture to the larger groundmass plagioclase grains. Mesostasis is moderately to highly altered. Few oxides are present; primary oxides are enclosed in olivine.

Plane-polarized: 64191351



Cross-polarized: 64191371



Igneous Petrology

Lithology: highly **olivine-augite-plagioclase phyric basalt**
Grain size distribution: bimodal **Groundmass grain size (avg.):** fine-grained
Major texture: porphyritic **Minor Texture:** trachytic

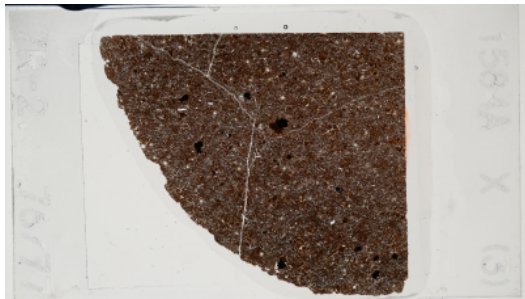
Phenocrysts	Original (%)	Present (%)	Replaced (%)	Size min. (mm)	Size max. (mm)	Shape	Habit	Comments
Olivine	8		8	0.8	2.4	subhedral	subhedral	completely altered to iddingsite
Plagioclase	2	2		0.16	0.3	euhedral	elongate	moderately altered to sericite
Clinopyroxene	1	1		0.2	3.2	subhedral	tabular	phenocrysts shards with only minor alteration
Oxide Fe-Ti	1	1		0.06	0.2	euhedral	euhedral	Large, blocky oxides within altered olivine

Groundmass	Original (%)	Present (%)	Replaced (%)	Size min. (mm)	Size max. (mm)	Shape	Habit	Comments
Olivine	12		12	0.02	0.07	subhedral	equant	all altered to iddingsite
Plagioclase	9	8	1	0.1	0.3	subhedral	tabular	large for groundmass but still not large enough for phenocrysts
Clinopyroxene	5	5		0.05	0.15	subhedral	equant	
Fe-Ti oxide	2	1	8	0.04	0.08	euhedral	equant	N/A
Mesostasis	60	25	35	N/A	N/A	N/A	N/A	moderately altered

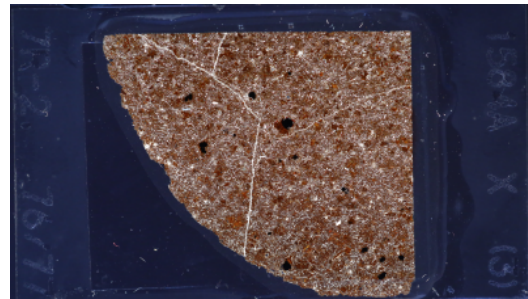
Vesicle	Original (%)	Empty (%)	Filled (%)	Size min. (mm)	Size max. (mm)	Shape	Comments
Vesicle	2	2		0.1	0.2	rounded	lined with secondary mineral but not often filled.

THIN SECTION LABEL ID: **397T-U1584A-7R-2-W 76/77-TSB_ICP-TS 3** Thin section no.: 3
 Observer: DH Piece no.:
 Thin section thickness: Unit/subunit:
 Thin section summary: Aphyric basalt with a fine-grained groundmass comprising of mainly slightly altered plagioclase. The olivine in the groundmass and mesostasis has been completely replaced with iddingsite. There is a trachytic texture to the larger groundmass plagioclase grains. Mesostasis is moderately to highly altered. Oxides are present in the groundmass phase.

Plane-polarized: 64191311



Cross-polarized: 64191331



Igneous Petrology

Lithology:

aphyric basalt

Grain size distribution: bimodal

Groundmass grain size (avg.): microcrystalline

Major texture: trachytic

Minor Texture:

Groundmass	Original (%)	Present (%)	Replaced (%)	Size min. (mm)	Size max. (mm)	Shape	Habit	Comments
Olivine	3		3	0.2	0.7	subhedral	equant	
Plagioclase	40	30	10	0.1	0.8	subhedral	tabular	Microphenocrysts and groundmass plagioclase crystals are relatively fresh with a few of the microphenocrysts being completely altered.
Fe-Ti oxide	1			0.4	0.8	euhedral	equant	N/A
Mesostasis	56	10	46	N/A	N/A	N/A	N/A	Mesostasis has been mostly replaced, there are some visible pyroxene portions that are still present.

THIN SECTION LABEL ID: **397T-U1584A-8R-CC-W 8/9-TSB-TS 4**

Thin section no.: 4

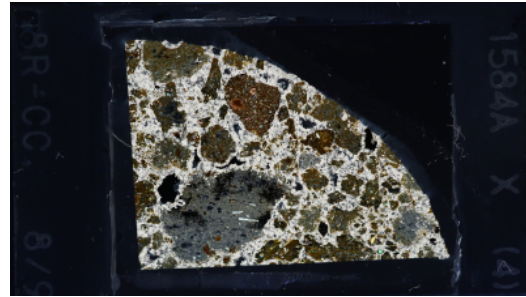
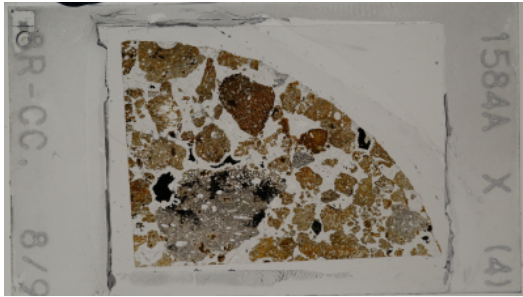
Observer:

Unit/subunit:

Thin section summary: highly vesicular lapilli (pumice?), and lithic clasts welded together with carbonate cement. lithic clasts are altered basalt. groundmass and mafic phenocrysts are altered to Fe-oxyhydroxides and clay. some clasts has relatively less altered pyroxene and plagioclase phenocrysts. carbonate cement have some fossil test morphology preserved at some places. vesicles in lapilli are filled with carbonate and or zeolite. some are unfilled vesicles.

Plane-polarized: 64191391

Cross-polarized: 64191411



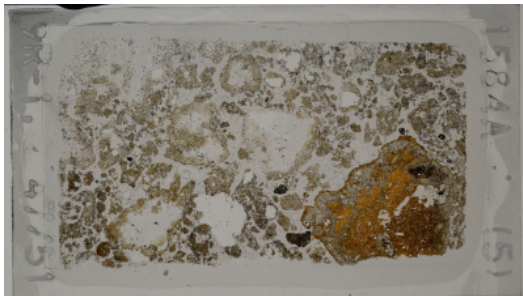
Sediments and Sedimentary Rock

Complete lithology name: Lapillistone with volcanic lithics

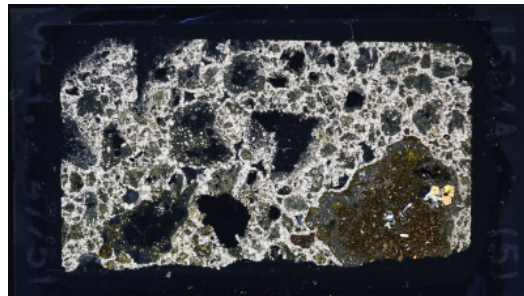
Texture	%	Constituent	%
Gravel texture:		Volcaniclastic:	80
Sand texture:		Carbonate:	20
Silt texture:		Siliclastic:	
Clay texture:		Biogenic silica:	

THIN SECTION LABEL ID: **397T-U1584A-9R-1-W 47/51-TSB-TS 5** Thin section no.: 5
 Observer: RB/MT Unit/subunit:
 Thin section summary: Highly vesicular lapilli. Vesicles filled with zeolites. Zeolites show radial and fibrous growth (philipsite). Lapilli are cemented together by carbonate. Carbonate grains do not show two sets of cleavage. There is fresh volcanic clasts

Plane-polarized: 64191431



Cross-polarized: 64191451



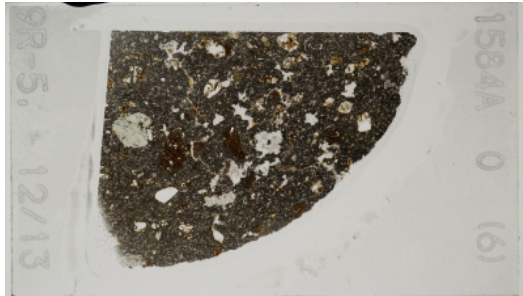
Sediments and Sedimentary Rock

Complete lithology name: Lapillistone/volanic breccia

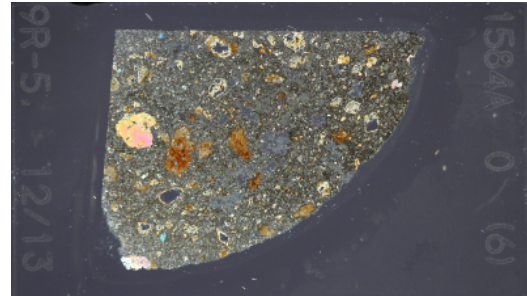
Texture	%	Constituent	%
Gravel texture:		Volcaniclastic:	60
Sand texture:		Carbonate:	40
Silt texture:		Siliclastic:	
Clay texture:		Biogenic silica:	

THIN SECTION LABEL ID: **397T-U1584A-9R-5-W 12/13-TSB_ICP-TS 6** Thin section no.: 6
 Observer: DH Piece no.:
 Thin section thickness: Unit/subunit:
 Thin section summary: Highly olivine-pyroxene phyric basalt with plagioclase dominantly making up the groundmass structure. The olivine has been completely replaced with iddingsite and a secondary mineral. The pyroxene phenocrysts are generally in good condition with a few exhibiting signs of being broken down. The groundmass pyroxene is in a similar condition to the phenocrysts. The plagioclase is mostly altered in the microphenocryst and groundmass phase. The mesostasis is highly altered. There are Fe-Ti oxides present in the groundmass and within the olivine skeletons.

Plane-polarized: 64111621



Cross-polarized: 64111641



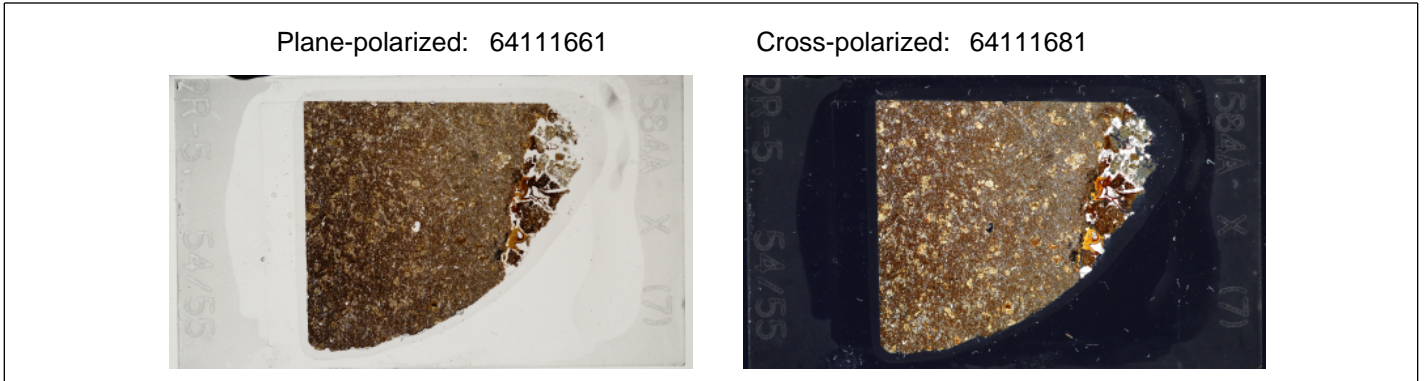
Igneous Petrology

Lithology: highly **olivine-pyroxene phyric basalt**
Grain size distribution: bimodal **Groundmass grain size (avg.):** microcrystalline
Major texture: trachytic **Minor Texture:** aphanitic

Phenocrysts	Original (%)	Present (%)	Replaced (%)	Size min. (mm)	Size max. (mm)	Shape	Habit	Comments
Olivine	9		9	1	4.5	subhedral	subhedral	completely altered to iddingsite
Clinopyroxene	2	2		0.5	4	subhedral	equant	Some are relatively unaltered but a few are broken up and are weathering.
Oxide Fe-Ti	2	2				euohedral	euohedral	Large, blocky oxides within altered olivine and the groundmass

Groundmass	Original (%)	Present (%)	Replaced (%)	Size min. (mm)	Size max. (mm)	Shape	Habit	Comments
Olivine	12		12	0.1	0.1	subhedral	equant	all altered to iddingsite
Plagioclase	15	5	10	0.1	1	subhedral	tabular	Plagioclase range in sizes, but the larger phenocrysts border on microphenocryst size, but in very low abundance.
Clinopyroxene	4	4		0.2	0.5	subhedral	equant	
Fe-Ti oxide	10	2	9	0.05	0.05	euohedral	equant	N/A
Mesostasis	46	16	30	N/A	N/A	N/A	N/A	Has been completely altered.

THIN SECTION LABEL ID: **397T-U1584A-9R-5-W 54/55-TSB_ICP-TS 7** Thin section no.: 7
 Observer: DH/RB Unit/subunit:
 Thin section summary: Domain 1: 95% of the thin section. Moderately olivine phyric basalt; Olivine crystals are mostly altered. Plagioclase microphenocrysts are partially sericitized to fresh and have a trachytic texture. Mesostasis has been completely altered, oxidized red/brown. Domain 2: 5% domain of the thin section: vesicular lapilli and altered lithic clasts welded together with carbonate cement. At some place carbonate is lined with dark brown (clay/Fe-oxyhydroxide) mass



Sediments and Sedimentary Rock

Complete lithology name: lappilistone (5 % domain of the thin section- 95% is basalt)

Texture	%	Constituent	%
Gravel texture:		Volcaniclastic:	
Sand texture:		Carbonate:	30
Silt texture:		Siliclastic:	
Clay texture:		Biogenic silica:	

Framework grain abundance

D=dominant; A=abundant; C=common; R=rare; Tr=trace

Component	Rel. abundance	Component	Rel. abundance
Quartz		Calcite (allogenic)	C
Feldspar		Mica	
Clay minerals		Glauconite	
Lithic grains	C	Zeolite	R
Chert		Undifferentiated calcareous bioclasts	

Dominant Cement: clay

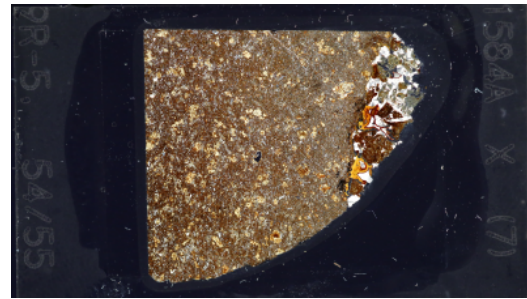
Volcanic glass roundness: sub-rounded **Lithic grain roundness:** sub-rounded

THIN SECTION LABEL ID: **397T-U1584A-9R-5-W 54/55-TSB_ICP-TS 7** Thin section no.: 7
 Observer: DH/RB Piece no.:
 Thin section thickness: Unit/subunit:
 Thin section summary: Domain 1: 95% of the thin section. Moderately olivine phyric basalt; Olivine crystals are mostly altered. Plagioclase microphenocrysts are partially sericitized to fresh and have a trachytic texture. Mesostasis has been completely altered, oxidized red/brown. Domain 2: 5% domain of the thin section: vesicular lapilli and altered lithic clasts welded together with carbonate cement. At some place carbonate is lined with dark brown (clay/Fe-oxhydroxide) mass

Plane-polarized: 64111661



Cross-polarized: 64111681



Igneous Petrology

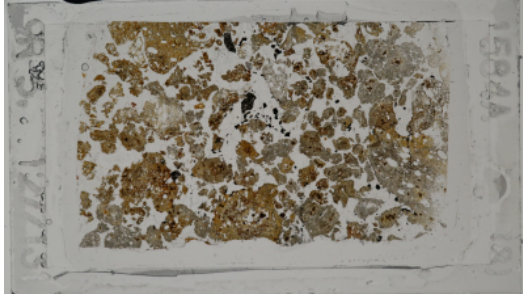
Lithology: moderately **olivine-plagioclase phyric basalt**
Grain size distribution: bimodal **Groundmass grain size (avg.):** fine-grained
Major texture: fibrous **Minor Texture:** trachytic

Phenocrysts	Original (%)	Present (%)	Replaced (%)	Size min. (mm)	Size max. (mm)	Shape	Habit	Comments
Olivine	11	0	11	0.1	1	euhedral	euhedral	Completely serpentinized with iddingsite rims
Plagioclase	1	0.5	0.5	0.5	3	subhedral	tabular	Seritized

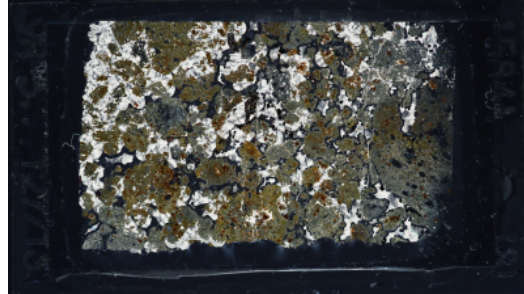
Groundmass	Original (%)	Present (%)	Replaced (%)	Size min. (mm)	Size max. (mm)	Shape	Habit	Comments
Plagioclase	30	15	15	0.2	0.8	subhedral	tabular	Plagioclase is moderately fresh, but there are crystals that have been seritized.
Fe-Ti oxide			11					N/A
Mesostasis	58	5	53	N/A	N/A	N/A	N/A	Has been completely altered, oxidized red/brown.
Glass	0	0		N/A	N/A	N/A	N/A	

THIN SECTION LABEL ID: **397T-U1584A-9R-5-W 127/131-TSB-TS 8** Thin section no.: 8
 Observer: RB Unit/subunit:
 Thin section summary: vesicular lapilli, lithic clasts welded together by carbonate and zeolite cement. Vesicles in the lapilli are filled with zeolite. zeolite lines the carbonate in vugs and veins.

Plane-polarized: 64161271



Cross-polarized: 64161291



Sediments and Sedimentary Rock

Complete lithology name: lapillistone

Framework grain abundance

D=dominant; A=abundant; C=common; R=rare; Tr=trace

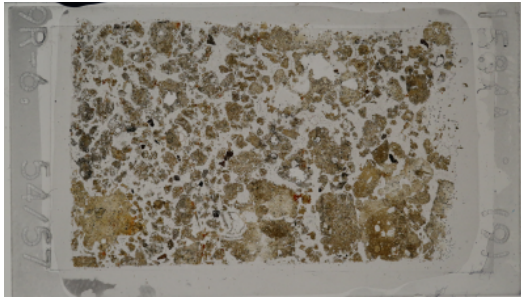
Component	Rel. abundance	Component	Rel. abundance
Quartz		Calcite (allogenic)	C
Feldspar		Mica	
Clay minerals		Glauconite	
Lithic grains		Zeolite	C
Chert		Undifferentiated calcareous bioclasts	

Dominant Cement: carbonate

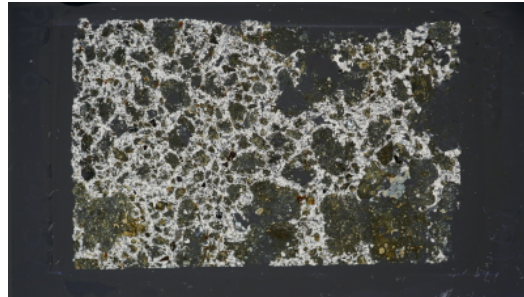
Volcanic glass roundness: sub-rounded Lithic grain roundness: sub-rounded

THIN SECTION LABEL ID: **397T-U1584A-9R-6-W 54/57-TSB-TS 9** Thin section no.: 9
 Observer: RB/MT Unit/subunit:
 Thin section summary: Highly vesicular lapilli. Vesicles filled with zeolites. Zeolites show radial and fibrous growth (philipsite). Lapilli are cemented together by carbonate. There are highly altered volcanic clasts. Groundmass of volcanic clasts are altered to Fe-oxyhydroxides, plagioclase laths are are relatively less altered.

Plane-polarized: 64191471



Cross-polarized: 64191491



Sediments and Sedimentary Rock

Complete lithology name: Lapillistone/volcanic breccia

Texture	%	Constituent	%
Gravel texture:		Volcaniclastic:	50
Sand texture:		Carbonate:	50
Silt texture:		Siliclastic:	
Clay texture:		Biogenic silica:	