

# **Appendix A**

## **HANDSAMPLE AND LOCATION DESCRIPTIONS**

All samples were collected from the Eyjafjöll Volcanic System, during two separate trips. Summer 1990, Dr. Robert Duncan and Dr. Shaul Levi collected and took field descriptions for samples Ey-1 to Ey-20, STF-1, -3, -5. During the summer of 1991 Dr. Robert Duncan and I gathered the rest of the samples, Ey-21 to Ey-55. All samples were taken from exposed outcrops unless otherwise specified (for example, some were float, or moraine material.) Considerable effort was made to obtain the freshest samples possible, and also to find samples that span the entire age and compositional range of the system. The following descriptions are displayed according to sampling sections, as shown on the map of Eyjafjöll, Figure 4.01.

#### **Merkurker, Sauðá**

Ey-43: Merkurker, Sauðá. Olivine, plagioclase, clinopyroxene grey basalt from stream outflow, base of cliffs, northern margin of system.

Ey-44: Merkurker, Sauðá. Plagioclase (rare) grey basalt from intrusion (sill?) or ponded flow, lots of this material everywhere, coming down stream cuts. Small jointed pattern (cubed?). Very fresh.

#### **Kambagil**

Ey-55: Northern-most holocene flow. Series of thin flows. Olivine (< 1% - but large) and plagioclase (mostly) pyric.

#### **Seljalandsheiði**

Ey-2: Seljalandsheiði. Western part of section, above falls. Grey basalt with large open, clean vesicles; thick, massive flow, jointed; fresh; plagioclase and rare olivine phenocrysts;

Ey-3: Seljalandsheiði. Fagrafell, western end of section, quarry site; with two or three flows, all massive, jointed; large plagioclase phenocrysts in light grey matrix; olivine and clinopyroxene also; fresh; small, clean vesicles.

Ey-33: Seljalandsheiði. Hyaloclastite body, west end of system at Fagrafell quarry; huge body forming rounded hill ( $\approx$  40 m); basaltic pumice fragments and feldspar crystals (rare) in glassy (palagonitic) matrix. Cut by Ey-34.

Ey-34: Seljalandsheiði. Fagrafell. Aphyric grey basalt dike cutting (vertical) Ey-33 body. Fresh.

Ey-4a: Seljalandsheiði. Holocene flow in northern part of section erupted from Bláfell. Vesicular; plagioclase, rare olivine phenocrysts; very fresh. Flow-banded, plagioclase aligned.

Ey-4b: Seljalandsheiði. Same flow as Ey-4a, but with less vesicularity, fewer phenocrysts.

Ey-36: Seljalandsheiði. Northern part of section. Bláfell intrusion. Olivine, clinopyroxene (rare) phyric grey basalt forming irregular intrusion through cinder cone.

Ey-37: Seljalandsheiði. Northern part of section. Bláfell intrusion? Olivine, clinopyroxene dark basalt; vesicular, from north side of cinder cone. Small intrusion.

Ey-38: Seljalandsheiði. Northern part of section. Clinopyroxene, olivine phyric grey basalt flow from base of canyon north of Bláfell; basal unit; volcanic sediments above, eroded, then hyaloclastite grading to Ey-39.

Ey-39: Seljalandsheiði. Northern part of section. Olivine, clinopyroxene plagioclase phyric flow above Ey-38.

Ey-40: Seljalandsheiði. Northern part of section. Aphyric (rare plagioclase) grey basalt from massive ridge-capping flow mid-section of ridge west of Bláfell. Very fresh.

Ey-41: Seljalandsheiði. Northern part of section. Clinopyroxene dominant (some plagioclase, less olivine) grey basalt from cap rock atop older section (ridge) west of Bláfell. Very thick  $\geq 50$  m. Fresh.

Ey-42: Seljalandsheiði. Northern part of section. Bláfell. Northern part of section. Plagioclase phyric holocene flow; near south margin close to Ey-41 section. (Ey-4c)

### Hvammsmúli

Ey-1: Hvammsmúli. Ankaramite locality (Steinthorsson, 1964) at base, Hvammur farm; massive, jointed unit, coarse-grained with slight alteration penetrating from surfaces; olivine and clinopyroxene in fresh matrix; some vesicles filled with green clays.

Ey-17: Hvammsmúli. Thin flow (1-2 m) above sediments atop massive ankaramite flow at Hvammur farm. Very vesicular, olivine, clinopyroxene phenocrysts in blue-grey matrix (ankaramite). Fresh?

Ey-32: Hvammsmúli. Ankaramite locality; olivine phyric lava collected for He isotopes (probably Ey-17 or very close.)

Ey-18: Hvammsmúli. Thin flow (2 m), approximately 3 flows above Ey-17. More compact, jointed flow. Vesicular, plagioclase, clinopyroxene phenocrysts in grey to oxidized matrix. Fresh.

Ey-19: Hvammsmúli. Vesicular flow (2 m) above Ey-18. Pyroxene phyric.

Ey-20: Hvammsmúli. Massive, rare vesicular (3 m) flow, one flow below a thick hyaloclastite layer. Very similar lithology to Ey-18, 19 and intervening.

Ey-52: Hvammsmúli. Below Ey-53 at top of section. Highly weathered and oxidized. clinopyroxene, olivine and plagioclase phyric  $< 1\%$ .  $\geq 50$  m thick. Grey basalt.

Ey-53: Hvammsmúli. Topmost flow atop section. Very thick > 50 m. Plagioclase phyrlic.

Ey-54: Hvammsmúli. Base of section. Up from Ystiskáli farm. Very fresh (nice ring!!) aphyric dark grey basalt. Topmost of 8? 2-4 m. thick flows. (similar to Ey-18 or Ey-19? or instead even lower?)

### Asólfsskálaegg

Ey-48: Asólfsskálaegg. Above Asólfsskáli, east of Miðskálaá. Cliff wall - massive ( $\geq 50$  m thick) flow with broad columnar structure. Plagioclase phyrlic with some (rare) olivine and clinopyroxene. Grey basalt, not very fresh; lowest exposed flow.

Ey-49: Asólfsskálaegg. Olivine, clinopyroxene and vesicles - ankaramite float at saddle. Fresh. Massive; wide columns;  $\geq 50$  m thick.

Ey-50: Asólfsskálaegg. Further up ridge crest from Ey-49. Same ankaramite with less phenocrysts? Platy cleavage.

### Steinafjall

Ey-5: Steinafjall. Nupakot farm; unit 2 (Kristjánsson et al., 1978). Fine grained, blue-grey basalt, rare plagioclase phenocrysts. Dated by I. McDougall at  $0.78 \pm 0.03$  Ma. Fresh.

STF-1: Steinafjall. Lava 3 (Kristjánsson et al., 1978), above 0.78 Ma dated by I. McDougall. Fine-grained, blue-grey basalt with some trachytic texture, fracturing. Very fresh.

STF-3: Steinafjall. Ankaramite, very fresh, from above STF-1, 2. Not in place.

Ey-6: Steinafjall. Nupakot farm; unit 7 (Kristjánsson et al., 1978). Very fine-grained, massive, jointed unit just at the Brunhes-Matuyama boundary (+). Should be  $\approx 0.73$  Ma. Rare plagioclase phenocrysts. Fresh, except fracture surfaces (blackened).

Ey-7: Steinafjall. = midway up mountain; massive, jointed unit above and between thick hyaloclastites. Above Ey-6. Fine grained, very fresh. Aphyric.

Ey-8: Steinafjall. Above Ey-7 and hyaloclastite. Very massive, 20-25 m. thick; Clinopyroxene -rich, plagioclase phyrlic in blue-grey matrix, very fresh.

Ey-9: Steinafjall. Massive (plagioclase, clinopyroxene rich) ankaramite over series of thin ankaramite flows over very thick hyaloclastite. Very fresh, = 35m?

Ey-10: Steinafjall. Thin (2 m) ankaramite sequence above red band of hyaloclastite/sediments.

Ey-11: Steinafjall. Vesicular, massive clinopyroxene, plagioclase phyrlic flow just below major tillite sediments. Very fresh vesicles, otherwise?

Ey-12: Steinafjall. Extremely fresh, plagioclase (rare) phyrlic, fine-grained thin flow in sequence of thin flows on top of tillite/hyaloclastite (major time break). Tillite unconformably overlies dikes and lavas of earlier episode.

Ey-15: Steinafjall. Ridge capping flow just under Ey-14.

Ey-14: Steinafjall. Ridge-capping flow just under Ey-13.

Ey-13: Steinafjall. Porphyritic, massive (20-30m) flow, top of the section. Very fresh. Overlies series of thinner units.

Ey-16: Steinafjall. Massive, vertically-fractured aphyric lava just under tillite; several dikes running through but this sample seems far from any. = 20 m thick.

Ey-27: Steinafjall. Fellshaus. Aphyric grey basalt from the top of block to the west of the valley - filling section (ie. "old" massif). (North of

Steinafjall) This section consists of fairly uniform aphyric lavas. Some volcanic sediments through section. Cinder cone products?

Ey-30: Steinafjall. Fellshaus. Blue-grey aphyric lava flow from older section below Ey-27. Looks like a volcanic center  $\approx$  200 m north, below capping series of volcanic sediments, then 3-5 flows (Ey-27 is one of them). Very center is shot with dikes, highly discolored along joint planes (to orange-rust-brown) and surrounding rocks are zeolitized. This flow unit is furthest away and fresh.

### Lambafellsheiði

Ey-22: Lambafellsheiði. Seljavellir. Olivine, clinopyroxene, plagioclase basalt from massive flow (irregular, depression-filling, columnar jointed - broad with platy joints as well).  $\approx$  10m from section at thermal hotspots.

Ey-23: Lambafellsheiði. Seljavellir. Very similar to Ey-22, but fewer phenocrysts. Vertical columns much more linear. Entire section looks similar in composition; erupted rapidly? into low (stream valley?). Rests on hyaloclastite with nodules of plagioclase only, fine grained blue grey basalt, fairly altered.

Ey-31: Lambafellsheiði. Blue-grey, compact aphyric lava capping Lambafell.  $\approx$  10 m thick, columnar jointed and platy cleavage. Jónsson plots a crater here - no evidence. Slight dip to North?

Ey-24: Lambafellsheiði. Plagioclase aphyric, compact grey basalt at the top of a thick sequence of hyaloclastites (?), volcanic sediments (glacial outwash?); Lowermost of a series (5-6) of flows, 1-2 m each. Uppermost is striated. Generally fresh with some patchy alteration.

Ey-26: Lambafellsheiði. Plagioclase phyric grey basalt from the top of the sequence. Cinder base; contact not exposed, but valley-filling. Resting against mass of Ey-27, 30.

### Raufarfell

Ey-47: Raufarfell. ≈60% of way up cliff (in float). Makes up ≈ 40-50% of float. Columnar structures. Some zeolite fillings. Olivine and clinopyroxene phyric.

### Skógaheiði

STF-5: Skógaheiði. Hillside up above Skógar, gently dipping, aphyric vesicular lava. Looks young, but older than last glacial period.

Ey-21: Skógaheiði. Fine grained, aphyric basalt from west side of tracks to saddle between Eyjafjöll and Myrdasjökull summits. Flat-lying, striated, platy cleavage. Not clear which center it erupted from (or even locally?). Fresh.

Ey-45: Skógaheiði. Hilltop before Skógaá far above Skógar, between and just south of fissures. Vesicles (small and many); perhaps larger grained than Ey-46.

Ey-46: Skógaheiði. same as Ey-45, not as vesicular.

### Top of mountain, till surrounding edges of glacier Eyjafjöll

Ey-28: From glacial till atop Eyjafjöll (southern part, east of Fellshaus), Plagioclase, clinopyroxene phyric, compact basalt; very fine grained matrix. Exceedingly fresh.

Ey-29: From glacial till atop Eyjafjöll (southern part, east of Fellshaus), Plagioclase phyric (≈30%), dark basalt; very fine grained matrix. Very fresh.

Ey-25: Plagioclase phyric obsidian from glacial moraine near southern toe of glacier, east of Fellshaus.