

# LER 14-DAY TRAVERSE

## BPLF North Side (Day 4)

### Crew A

(i.e., N2)

**Distance: 11400 m**

**Total Time: 9:06 hrs**

**Drive Time: 3:06 hrs**

**Total EVA Time EV1: 5:15 hrs**

**Total EVA Time EV2: 5:15 hrs**

**Primary objective (with K10 input):** Characterize the lava flow and collect a vertical section of samples through the flow; the secondary objective is to characterize younger sediments that cover the lava flow.

Station 1a (& possibly 1c): Describe and sample the lava flow and overlying sediments exposed in basin walls; describe and sample sediment on the basin floor.

Station 2: Describe and sample bedrock layer below the lava flow and the bottom of flow if visible; describe that contact; sample sediment in channel/wash

Station 3: Describe and sample a cross-section of the flow; the top of the flow is well-exposed

Station 4: Same as Station 3; is it the same flow as that/those at Stations 1 and 3?

Station 5: Describe and sample the relatively dark-albedo unit in layered mesa; compare to layered unit at Station 2

Station 6: Similar to Stations 2 and 3; describe and sample bedrock layer beneath flow, the base of the flow, and any contact zone

### DETAILED TASKS

**RED: Instructs crew to egress and ingress**

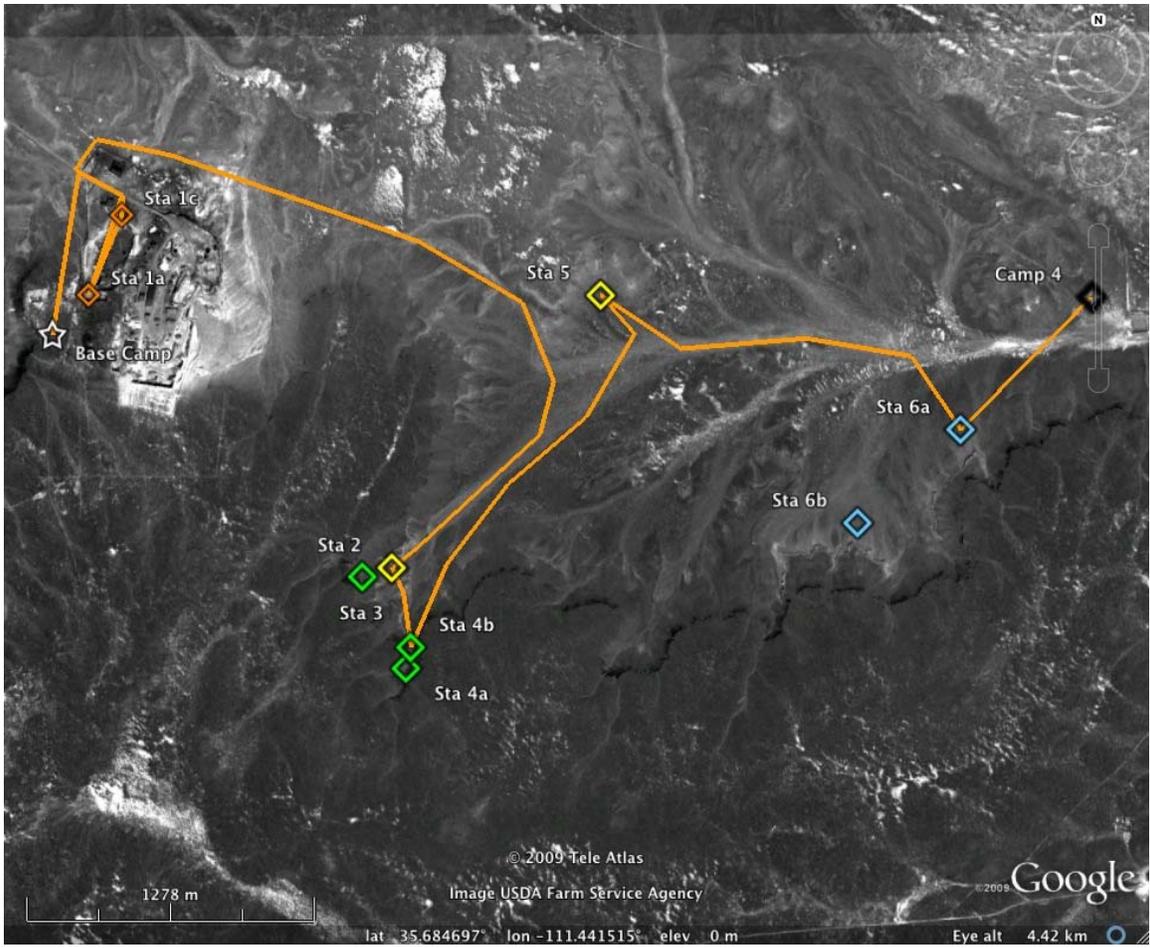
**Blue: Brief comment regarding relation to major science objective(s)**

**Bold: Major tasks (to be incorporated into cuff check list)**

*Normal font: specific suggestions and pointers*

**Green: elapsed (cumulative) time of nominal plan**

**NOTE: Includes input from K10 robotic reconnaissance**



**N2 Traverse Overview Map.**



### Station 1a and 1c

**Drive A** (including test drive, 0.23):

Comment on vehicle performance and trafficability issues (surface relief; boulders, vegetation, etc.)

Comment on any outcrops near entrance to basin and within basin interior.

Note the location of Station 1c; you may need to return to it. Drive south through the basin to the south end of the basin to Station 1a. Park a safe distance from the vertical wall and beware of falling rock.

**Mission priorities should guide station selection. Samples of any lava flow(s) and, ideally, a cross-section through it(them) are the highest science priority. An assessment of layered terrain is a secondary priority. Because the vertical basin walls are not visible in orbital photogeologic evaluations, unexpected features or lithologies may be encountered.**

(0:23)

**EV1 & EV2: Egress**

(0:38)

**Station 1 (a):** south end of basin (0:45 plus egress and ingress)



**Station 1a north facing face (image from K10 recon Plan 030A, Stn 04).**



**Station 1a west facing face (image from K10 recon Plan 030A, Stn 04).**



**Station 1a south facing face (image from K10 recon Plan 031A, Stn 03).**

**Describe any lithologies exposed in the basin walls and on the basin floor**

Is the entire flow (or flows) revealed in cross-section?

How thick is the flow (or flows)?

What is the top of the flow like?

What is the bottom of the flow like?

Describe any contacts.

Are there any changes vertically (e.g., any stratification?) or laterally?

**EV1: Collect representative material on basin floor**

Is it bedrock or sediment? If sediment, describe components, sizes, etc.

**EV2: Collect a representative sample from the top, middle, and bottom of flow if exposed; collect any bounding units, if exposed.**

Describe textural diversity of lava samples, e.g., color, grain size, vesicles, vugs, lineations, identifiable minerals including phenocrysts etc.

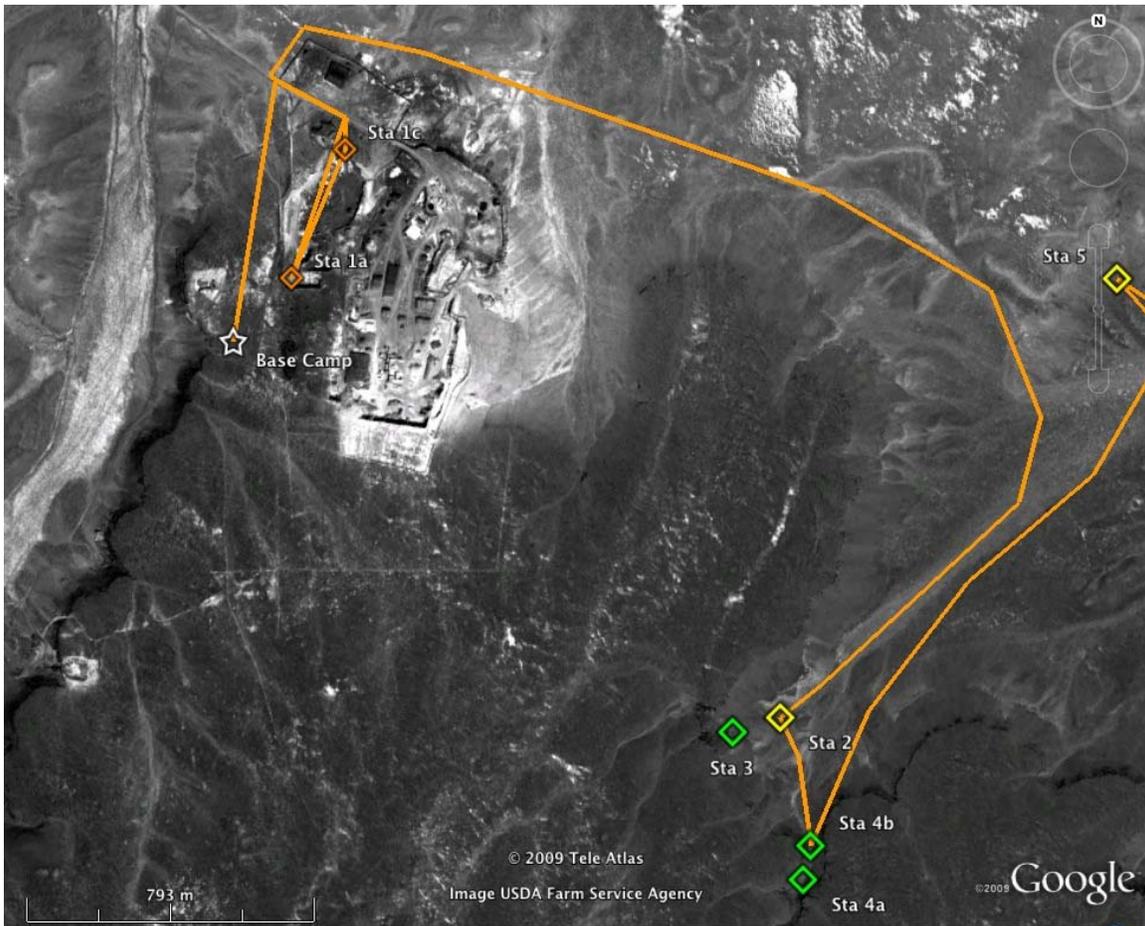
If vertical wall is too hazardous or high for sampling, advise EV1 so that he can prepare to use exterior steering controls to move to another location within basin

**EV1 & EV2: If you need to move to another location to safely sample the top of the flow, use aft (exterior) steering controls. Go to Station 1c and repeat collecting activities above for the top of the flow and overlying sediments.**

**(1:23)**

**When the station is complete, ingress.**

**(1:33)**



**Route from Station 1c to Stations 2, 3, and 4.**

**Drive B:** Drive north to basin entrance; divert west to circumnavigate an off-limits trafficability zone, and then head east towards Station 2 (60 min).

**Observe/Comment on the geologic setting of layered units north of the lava flow(s).**

Describe any contacts and outcrop features that may help determine their origins. Describe any sediment cover. When approaching the lavas again, try to determine if there is a single flow or multiple flows.

**Lava Flow:**

- Variation in thickness?
- Any macroscopic stratification/changes in texture?
- Single flow ? Multiple flows?
- Variable slopes of flow edge?

**Layered units:**

- Variation in thickness?
- Variation in lithology?
- Lateral and vertical continuity of major strata/ledges?

Any macroscopic textures indicative of depositional environment?

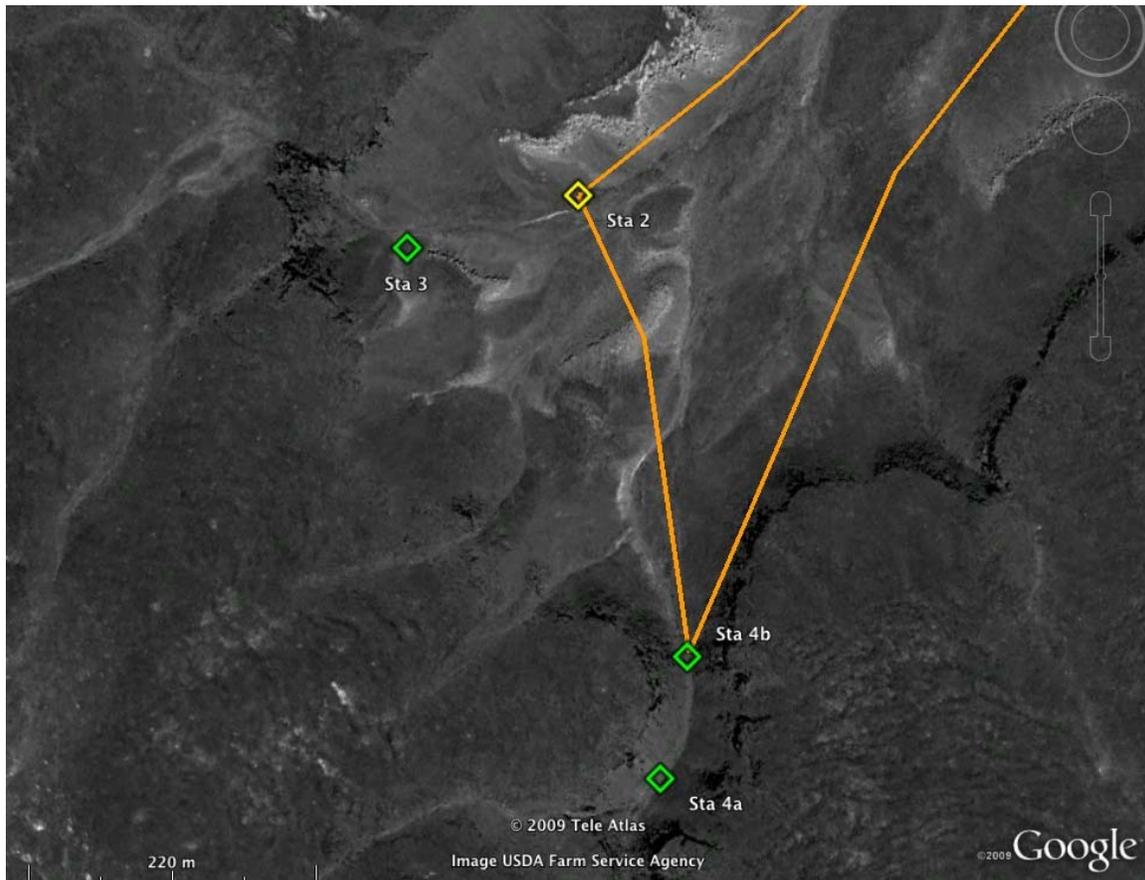
As you approach Station 2:

**Comment on contact of lava flow and layered unit:**

Is contact exposed?

Is the contact always the same elevation?

Is the same layered unit always at the contact?



**Station 2, Station 3, and Station 4.**

**Based on K10 reconnaissance, the layered unit beneath the lava flow at Station 2 may also outcrop near Station 3. Crew should evaluate. If it appears the layered unit is truly available at Station 3 and the contact with the lava flow better exposed, crew may delete Station 2 from the traverse and collect all bedrock lithologies at Station 3.**

**(2:33)**

**EV1 & EV2: egress**

While egressing, describe outcrop. Look ahead to Stations 3 and 4, if visible, and determine if they can be accessed using aft (external) steering controls.

**(2:48)**



**Station 2 base layer outcrop (image from K10 recon Plan 041A, Stn 01)**

**Station 2:** Sample bedrock layer below flow and the bottom of flow; sample channel sediment (0:25 plus egress and ingress)

**Characterize contact relationships with layered unit (both sides if evident)**

**Describe textural characteristics of layered unit:**

Grain size? Heterogeneous? Homogeneous?

Fluvial or eolian features? Volcanic features?

EV2: **Collect representative sample of layered unit**

EV1: **Trench channel deposit and collect representative samples of trench walls, commenting on any layering that may be visible.**

**(3:13)**

**EV1 & EV2: Ingress.**

**(3:23)**

**LUNCH (45 min)**

**(4:08)**

**Drive C:** Drive to Station 3 to sample cross-section through the basalt flow (5 min)

**Make geological observations of layered unit beneath lava flow**

Is it continuous, faulted, or folded?

**Describe lava flow along the flow margin and at the top of the flow**

Does it look the same as it did at Station 1?

Major changes in thickness?

How flat (or not) is contact with layered unit?

(4:13)

**EV1 & EV2: Egress.**

(4:28)



**Station 3 lava flow outcrop (image from K10 recon Plan 041A, Stn 01)**

**Station 3:** Outcrop of lava flow in face of cliff (0:30 plus egress and ingress if necessary)

**Basalt flow:**

How thick?

Is the flow top visible? If so, is it aa, pohoehoe, or too eroded to determine?

Is it internally stratified or massive?

What are the textural varieties? In vertical profile?

Any phenocrysts or xenoliths?

From this vantage point, does it look continuous with outcrop at

Station 4?

Is the base of the flow visible? Compare to Stations 1 and 2. (In any descriptions, please discriminate between the true base of the flow and any covered margins)

**Collect comprehensive suite of samples of all major lithologies**

**3-6 basalt samples; more, if basalt does not correlate with Station**

**1.**

**Sample of contact zone at top of flow and overlying material**

**Sample of contact zone at base of flow and underlying material**

(4:58)

**EV1 & EV2: Ingress or, if crew feels it is feasible, use aft (exterior) steering controls to reach Station 4.**

(5:08)

The main objective at Station 4 is to determine if the basalt there is the same as that seen at Stations 1 and 3 or a different flow. EV2 should describe the margin of the flow(s) while en route to Station 4 to help with that assessment.

Based on K10 reconnaissance, the LER may not be able to reach Station 4a in the vehicle. Crew may need to park lower on the slope at Station 4b and walk up to basalt outcrops.

**Drive D:** (10 min)

Drive across valley to Station 4; this may require going downhill from Station 3 and across valley before driving up slope again to Station 4.

(5:18)

**EV1 & EV2: Egress or, if crew arrived in suit ports, then off-gress.**

(5:33)



**Station 4 view south (image from K10 recon Plan 042, Stn 01)**

**Station 4:** Outcrop of lava flow in face of cliff (0:25 plus egress and ingress if necessary)

**Basalt flow:**  
How thick?

determine? Is the flow top visible? If so, is it aa, pahoehoe, or too eroded to

Is it internally stratified or massive?

Any phenocrysts or xenoliths?

What are the textural varieties? In vertical profile?

Station 3? From this vantage point, does it look continuous with outcrop at

Is the base of the flow visible? Compare to Stations 1, 2, and 3.

**Collect comprehensive suite of samples of all major lithologies**

**3-6 basalt samples; more, if basalt does not correlate with Sta. 1.**

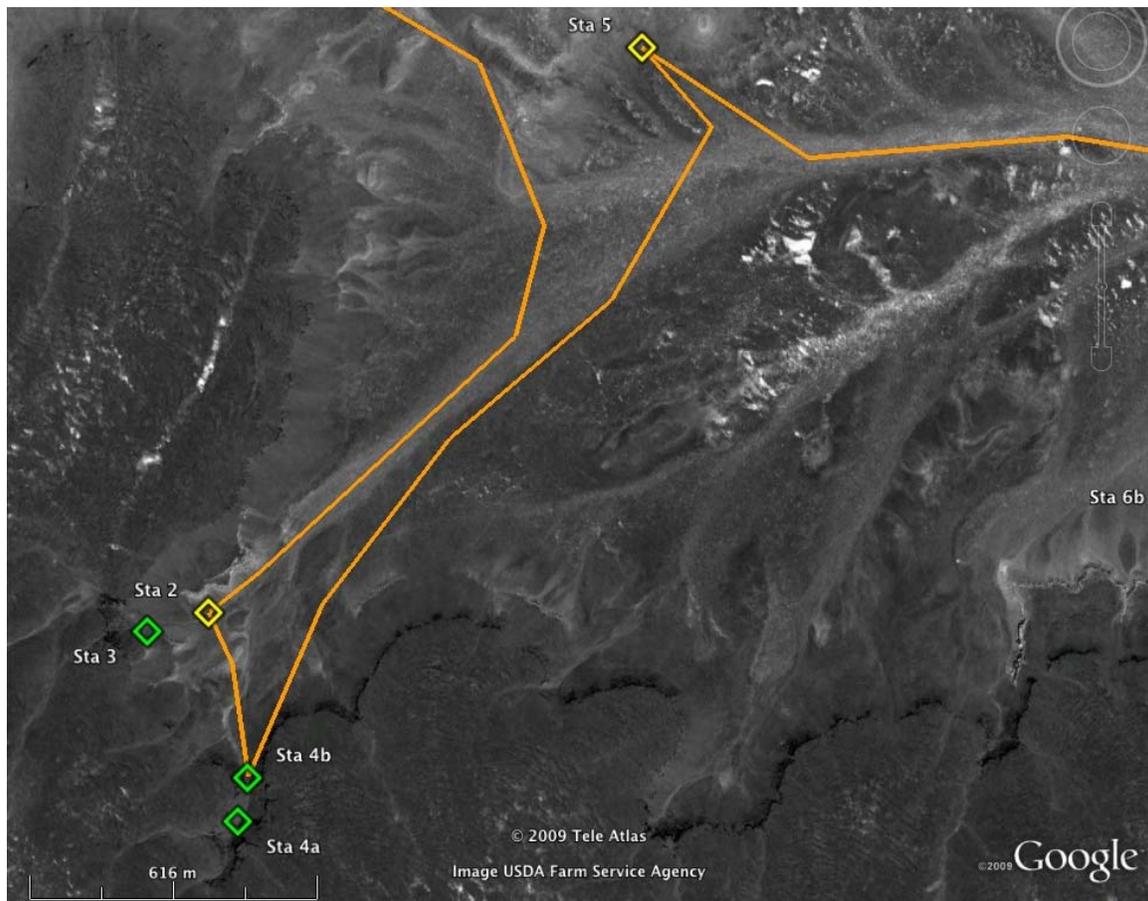
**Sample of contact zone at top of flow and overlying material**

**Sample of contact zone at base of flow and underlying material**

(5:58)

**EV1 & EV2: Ingress.**

(6:08)



**Route from Station 4 to Station 5**

**Drive E:** Descend to valley floor and drive northeast, across channel sediments, to a mesa within the layered unit (30 min)

**Make running observations of the layered units in the foreground and any changes to them that may be visible in the distance. This will provide geologic context for work at Station 5.**

Are you going up section or down section?

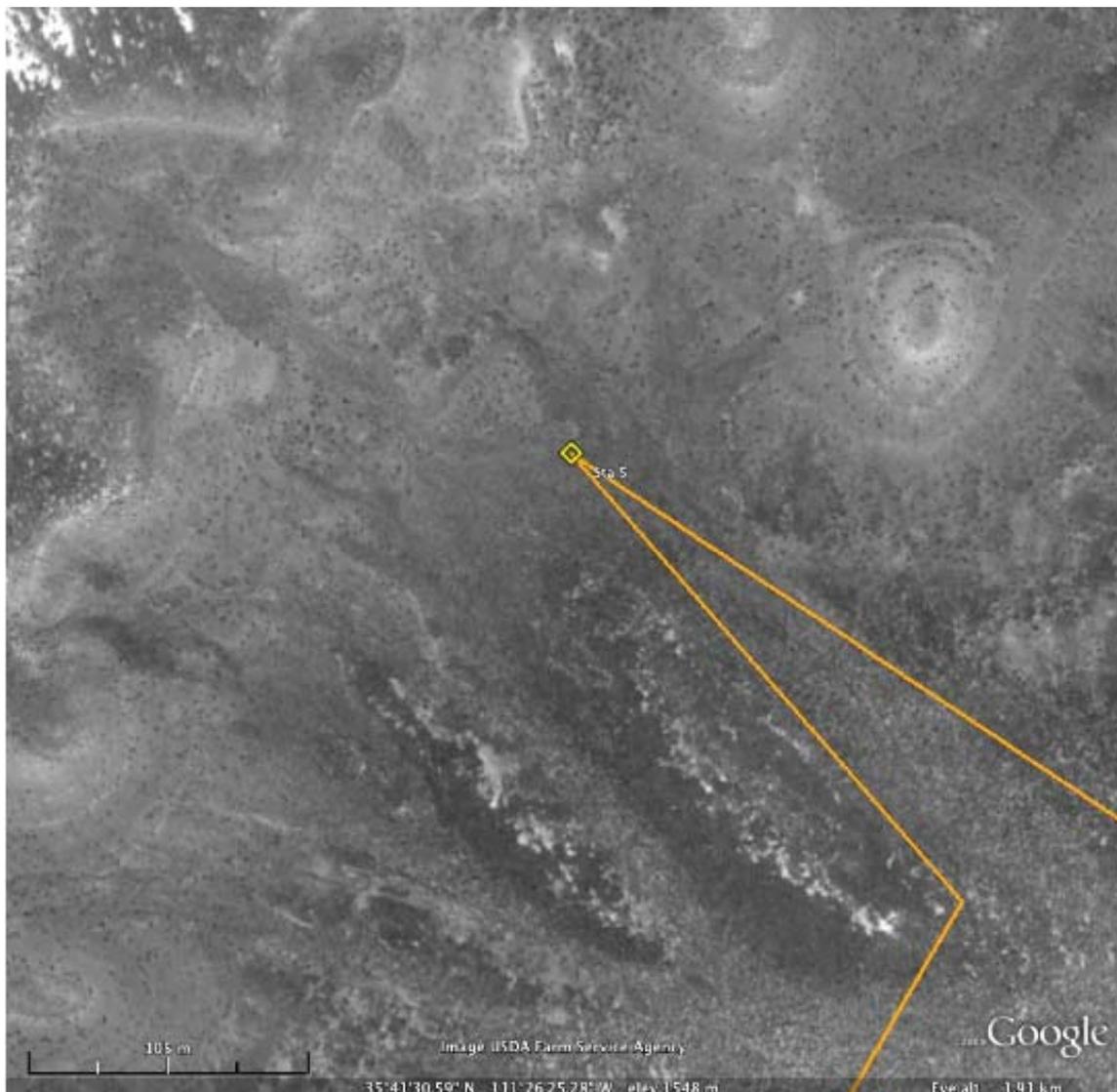
Any differences relative to earlier observations of the layered unit beneath the lava flow?

Are there fluvial deposits? Eolian deposits? Both?

(6:38)

**EV1 & EV2: Egress**

(7:13)



**Station 5**

**Station 5:** Sample layered units in stratified mesa, scoop channel sediment and any bright albedo sediment (20 min plus egress and ingress)

**Describe stratigraphy in mesa.**

**Describe textures of strata and deduce depositional processes; if possible, determine flow direction.**

**Collect a representative samples of the layered units (3-4 samples), preferably in stratigraphic context.**

Describe and characterize each sample by grain size, porosity, maturity, and flow features.

(7:13)

**EV1 & EV 2: Ingress**

(7:23)



**Route from Station 5 to Station 6**

**Drive F:** Drive east-southeast across layered unit and channel sediments (34 min).

**Describe the layered unit(s) along the base of the lava flow.**

Are the layers the same?

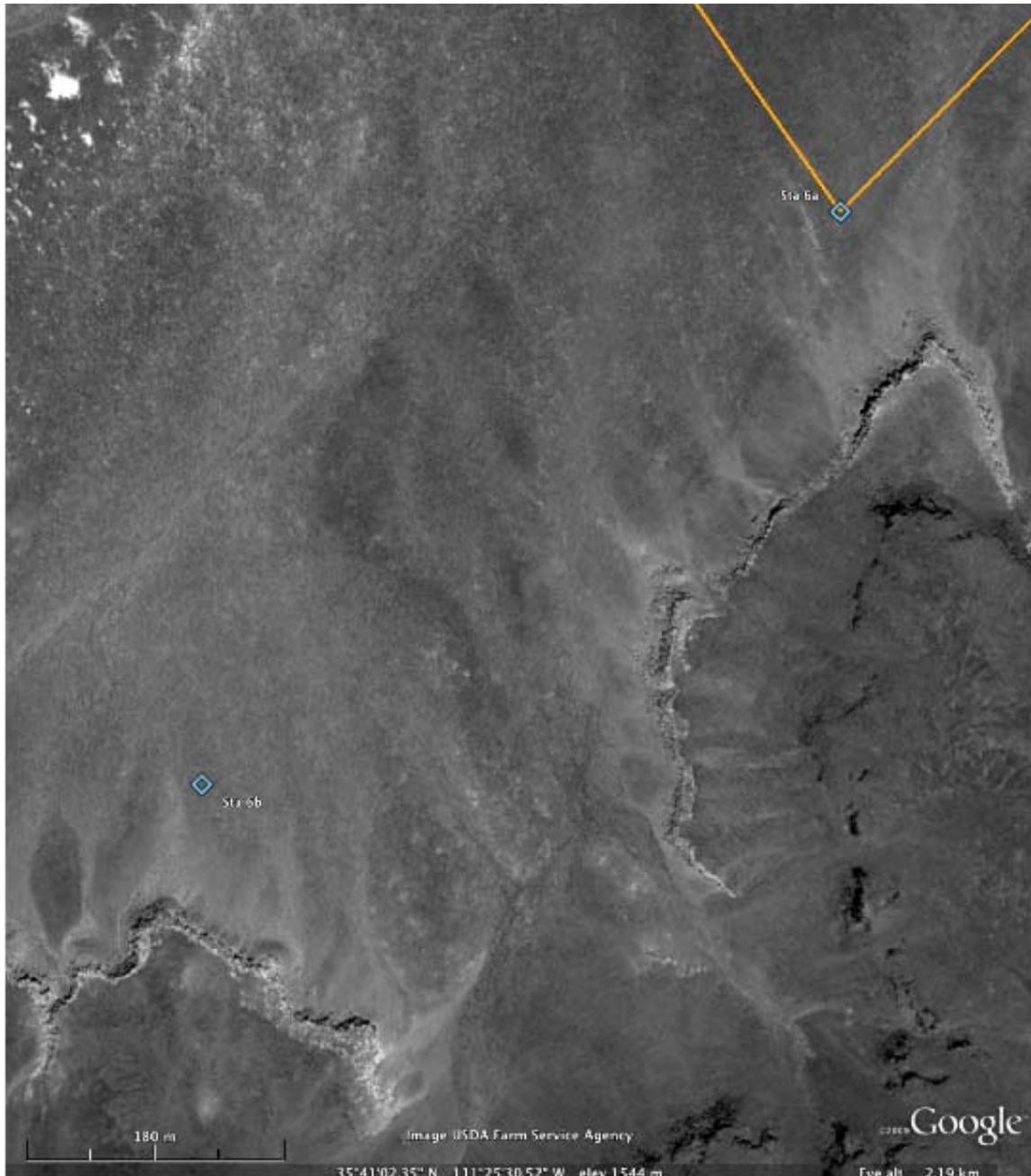
Does the contact with the lava flow go up or down section as one traces the flow to the east?

Crew have two options for Station 6 (a or b). The goal is to describe and sample an outcrop of a layered unit underling the lava flow, the contact with the lava flow (if exposed), and the base of the lava flow. The layered unit is visible at both 6a and 6b in orbital imagery. The crew should select the best location for the sampling.

(7:57)

**EV1 & EV2: Egress**

(8:12)



**Station 6a and 6b**

**Station 6 (a or b):** Sample bedrock layer below flow and the bottom of flow (0:20 plus egress and ingress)

**Characterize layered unit**

Describe and sample the layered unit

What are the textures?

Grain size? Heterogeneous? Homogeneous?

Fluvial or eolian features? Volcanic features?

**Describe the contact with the base of the lava flow**

**Describe the basalt**

How thick?

Is it internally stratified or massive?

Any phenocrysts or xenoliths?

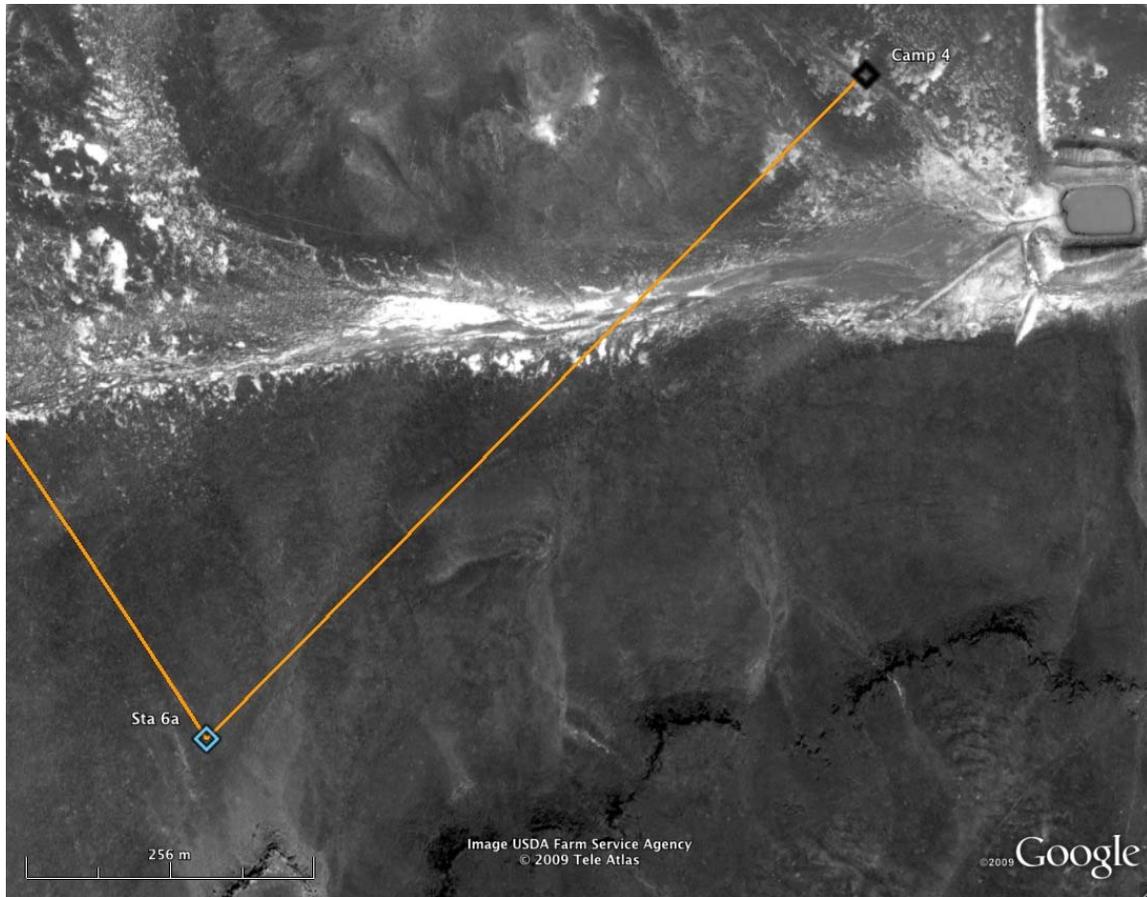
What are the textural varieties? In vertical profile?

Is the base of the flow visible? Compare to Stations 1, 2, and 3.

(8:32)

**EV1 & EV 2: Ingress**

(8:42)



### Route to Camp 4

**Drive G:** Drive north-northeast to Camp 4 (24 min).

**Make running observations of the layered units.**

Are there any changes to them?

Are you moving up section or down section?

This will provide context for future segments of the traverse.

**(9:06)**

**End-of-day Debriefing (in LER):** details TBD in real time, i.e., outstanding issues and potential clarifications, as well as **synthesis** of the back-room's perception(s) re. major geologic findings

**End of Day**