

LITHOLOGIC LOG

Project: Emigrant

Hole: E-13 (3028-213)

Elevation: 4880

Date Drilled: 9-22-83

Location: SE $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 25, T1N, R36E

Method: Rotary air/foam

Geologist: Deymonaz

Gamma: N/A

Depth (m) Description

0-90
(0-27) (Ordovician Palmetto Fm.)
Limestone - Med. to lt. gray and red. Finely to coarsely crystalline with numerous calcite veins. Red iron staining throughout the unit. Minor amount of hard silicic shales and chert.

90-120
(27-37) Cavern - Open cavity along range front fault. Drill pipe dropped free 9-120. Unable to amke connection at 120' without plugging bit with fine sand and clay. Ran probe in open hole to 115', temp. of 49.68°C.

Drilled dry 0-60
Foam injection 60-120

LITHOLOGIC LOG

Project: Emigrant

Hole: E-12 (3028-212)

Elevation: 5840

Date Drilled: 9-21-83

Location: NW¼ SE¼ Sec. 16, T1S, R37E

Method: Rotary air/foam

Geologist: Deymonaz

Gamma: N/A

Depth (ft) (m)	Description
0-3 (0-1)	<u>Gravel</u> - Angular gravels of shales, siltstone and silicic volcanic rock in lt. tan silty, sandy matrix.
3-30 (1-9)	<u>Conglomerate</u> - Angular silicic shales or siltstones in a lt. brown sandy matrix. May be fault breccia as in o/c 100' east of drill hole.
30-100 (9-30)	<u>Siltstone</u> - Medium to lt. gray to lt. greenish gray thin bedded Paleozoic siltstone. Hard enough to scratch steel. Very fractured and drills much easier than hardness suggests. Thin quartz and some calcite veins, common yellow iron staining and/or clay along fractures. Trace of disseminated pyrite. 70-100', thin interbeds of lt. and dark gray siltstone.
100-125 (30-38)	<u>Siltstone and limestone</u> - Siltstone as above with minor thin beds of dark gray limestone. Common calcite filled fractures.
125-150 (38-46)	<u>Limestone</u> - (Lower Cambrian Harkless Fm) - Med.-dark gray, numerous small, white and clear calcite filled fractures. <1% small disseminated pyrite, also along small tight fractures. Minor thin beds of dark gray siltstones. Minor yellow clay along fractures.
150-180 (46-55)	<u>Andesite dike</u> - Pale green, fine grained, mostly altered to clay. <1% fine disseminated pyrite. Unable to identify individual mineral grains.
180-200 (55-61)	<u>Limestone</u> - As 125-150.

LITHOLOGIC LOG

Project: Emigrant

Hole: E-11 (3028-11)

Elevation: 5040

Date Drilled: 9-15-83

Location: NW $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 6, T1S, R37E

Method: Rotary air/foam injection

Geologist: Deymonaz

Gamma: N/A

Depth (m)	Description
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Drilled 100-200 ft. west of small area of bleached and silicified rock and sulfur, manganese and ulexite deposition.

0-43
(0-13)

Siltstone - Lt. gray, tan and pale green, soft to firm. Minor sand sized material either as thin interbeds or dissiminated throughout the siltstone. Thin red interval of lithic xl tuff 12-13', may be small dike.

43-45
(13-14)

Lithic xl tuff - Brick red, firm, altered to clay. 15% altered xls of feldspars and biotite, trace of quartz and 20% small lithic frags.

45-80
(14-24)

Lithic xl tuff, siltstone and sandstone - Tuff as above except lt. green and soft, altered to soft sandy clay. May be air fall deposit. Interbeds of siltstone and sandstone. Returns as fine sandy powder. 60-80 cuttings coated with red powder.

80-392
(24-120)

Tuff - Lt. to med. greenish gray, altered to clay. Common fresh appearing small biotite 0.1-0.3mm. Some fine quartz grains and common altered white feldspars in clay matrix. Has green and white mottled appearance. Occasional large (2mm) biotite. Common small rounded, hard reddish aphanite lith frags <1-2mm. Some altered white material may be pumice. V. lt.-gray, soft sandy ash 250-280'.

392-400
(120-122)

Chalcedoney - Med. to lt. gray amorphous silica. Very hard, water entry at 398' "silica cap".

400-405
(122-123.5)

Xl lithic tuff - Lt. gray, salt & pepper appearance, brittle. Second water entry at 403.

405-406
(123.5-124)

Chalcedoney - As 392-400, additional water, 55-60 GPM lifted to surface.

Drilled dry 0-280
Foam injection 280-406

LITHOLOGIC LOG

Project: Emigrant

Hole: E-10 (3028-210)

Elevation: 5240

Date Drilled: 9-22-83

Location: NE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 19, T1S, R37E

Method: Rotary air/foam

Geologist: Deymonaz

Gamma: N/A

(ft)
Depth (m)

Description

0-200
(0-61)

Gravels (Qoq) - Poorly consolidated, angular to subrounded gravels as in surrounding outcrops. Poorly bedded, gently dipping with material ranging from sand sized to 1 meter in diameter but generally less than 10cm. Gravels primarily silicic xl tuffs and flow rocks with minor siltstones, cherts and limestones. First water at 40 feet, volume increased with depth to 890 GPM at TD.

Drilled dry 0-10
Foam injection 10-200

LITHOLOGIC LOG

Project: Emigrant

Hole: E-9 (3028-209)

Elevation: 5600

Date Drilled: 9-22-83

Location: SE¼ NW¼ Sec. 29, T1N, R37E

Method: Rotary air/foam

Geologist: Deymonaz

Gamma: N/A

(ft) Depth (m)	Description
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Spudded in canyon at base of Emigrant Fm. outcrop on north side of canyon. Nearby surface outcrop thin bedded, coarsely crystalline limestone. Med. greenish gray to greenish brown. Rust red, soft amorphous grains common in limestone. Thin shaley interbeds. Beds dipping generally 10-26° to east.

0-100
(0-30)

Limestone and shale - (Upper and Middle Cambrian Emigrant Fm) Med. gray, lt. gray and lt. red to brick red. Not crystalline as in surface outcrops. 60-80% limestone 20-40% shales. Much of shales rust red. Entire section pervasively fractured. Occasional thin chert beds or lenses.

100-160
(30-49)

Shales & limestone - (Upper and Middle Cambrian Emigrant Fm) Hard siliceous shales, med. gray and red as above with thin interbeds of med. to dk. gray limestone.

Drilled dry 0-50'
Foam injection 50'-160'

LITHOLOGIC LOG

Project: Emigrant

Hole: E-8 (3028-208)

Elevation: 5550

Date Drilled: 9-21-83

Location: Gen. Sec. 20, T1S, R37E

Method: Rotary air/foam

Geologist: Deymonaz

Gamma: N/A

Depth (m)	Description
0-2 (0-0.6)	<u>Sand & Gravel</u> - Unconsolidated material.
2-120 (0.6-37)	Siltstone - Lt. tan, firm with 1-5% small angular to subangular red, dark gray and green silicic aphanitic and porphyritic lithic fragments. 1-5mm. Also some finer sand sized material. Trace of small altered biotite and quartz grains.
120-130 (37-40)	<u>Sandstone</u> - Lt. gray, coarse, well cemented.
130-160 (40-49)	<u>Siltstone</u> - As in 2-120'.
160-200 (49-61)	<u>Sandstone (Tertiary)</u> - Similar to 120-130 interval but slightly coarser, grains 1-1.5mm.
	Drilled dry 0-100 Foam injection 100-200

LITHOLOGIC LOG

Project: EmigrantHole: E-7 (3028-207)Elevation: 6000Date Drilled: 9-22-83Location: SW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 27, T1S, R37EMethod: Rotary air/foamGeologist: DeymonazGamma: N/ADepth (ft)
Depth (m)

Description

Site next to surface outcrop of sandy shales. White, lt. brown and reddish brown. Sharp lateral color changes.

0-30
(0-9)

Shale (Tertiary) - Thin bedded, sandy, lt. reddish brown, firm, common clear to white gypsum, trace of biotite. Minor thin white siltstone interbeds.

30-50
(9-15)

Shale - As above but lighter colored with tan and red layers. Common limonite stains along fracture surfaces.

50-60
(15-18)

Shale - As above except lt. gray.

60-68
(18-21)

Shale - As above except lt. to med. gray. Some fine laminations and small (<1 mm) altered biotite.

68-78
(21-24)

Siltstone - Med. gray, as 0 - 30 but massive.

78-115
(24-36)

Siltstone - Lt. brown with thin lighter colored beds, and sandy.

115-200
(36-61)

Siltstone - Med. gray, as above with trace of very fine disseminated pyrite.

Drilled dry 0 - 120'
Foam injection 120' - 200'

LITHOLOGIC LOG

Project: Emigrant

Hole: E-6 (3028-206)

Elevation: 5360

Date Drilled: 9-21-83

Location: Gen. Sec. 8, T1S, R37E

Method: Rotary air/foam

Geologist: Deymonaz

Gamma: N/A

(ft) Depth (m)	Description
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Surface outcrop next to drill hole of thin bedded (2-3cm) lt. tan siltstone. Pervasive tight fractures with common manganese coating.

0-85
(0-26)

Siltstone - Lt. tan to lt. tan as in outcrop with minor reddish brown iron stains. Mostly altered to montmorillonitic clays, rare clear gypsum.

85-200
(26-61)

Siltstone (Tertiary) - Similar to above except med. gray. Common small (1mm) angular white feldspar completely altered to clay. Very mild sulfur odor in cuttings, drillers also noted slight odor while drilling.

LITHOLOGIC LOG

Project: Emigrant

Hole: E-5 (3028-205)

Elevation: 5320

Date Drilled: 9-20-83

Location: NW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 5, T1S, R37E

Method: Rotary air/foam

Geologist: Deymonaz

Gamma: N/A

(ft) Depth (m)	Description
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0-8
(0-2.5)

Sand and gravel - Tertiary and Paleozoic subrounded to subangular gravels in sandy silt matrix.

8-20
(2.5-6)

Claystone - siltstone - Tan to lt. green, thinly bedded with common clear gypsum.

20-200
(6-61)

Claystone (Tertiary) - Lt. to med. green, firm. Minor iron and manganese staining along tight fractures. Very consistent through interval except for slight color variations. No gypsum or calcite noted.

Drilled dry 0-80
Foam injection 80-200

LITHOLOGIC LOG

Project: Emigrant

Hole: E-4 (3028-204)

Elevation: 4880

Date Drilled: 9-15-83

Location: NW $\frac{1}{4}$, NW $\frac{1}{4}$ Sec. 4, T1S, R37E

Method: Rotary air

Geologist: Deymonaz

Gamma: _____

(ft) Depth (m)	Description
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0-95
(0-29)

Sandy conglomerate, Sandstone - Pale to medium reddish brown, may be reworked air fall tuff. 10-50% small angular (1-10mm) lith frags of siltstone and minor limestone and silicic volcanic rx. Sand composed of quartz grains, lith frags and small biotite, pumice and ash matrix. Appears to be alternating beds of sandstone and conglomerate. Same material at surface striking N80E and dipping 11° south.

95-190
(29-58)

Sandy siltstone - Lt. greenish-gray, 5-10% lith frags as above. Sand in silt/clay matrix.

190-200
(58-61)

Sandy siltstone - As above, except lt. med. gray and becoming damp.

Drilled dry to TD.

LITHOLOGIC LOG

Project: Emigrant

Hole: E-3 (3028-203)

Elevation: 5680

Date Drilled: 9-14-83

Location: NW¼, SE¼, Sec. 32, T1N, R37E

Method: Rotary air

Geologist: Deymonaz

Gamma: N/A

Depth (m) Description

0-200
(0-1)

Sandy Conglomerate - Hole drilled next to outcrop and drilled entirely in same material with no observed variations. Massive, sandy conglomerate with angular to subrounded rock from 2 mm to 0.5 m, consisting of Paleozoic siltstones, shales, limestone, and Tertiary volcanic rock in sandy matrix with with some silt and clay. Moderately indurated.

Drilled dry to TD.

LITHOLOGIC LOG

Project: Emigrant

Hole: E-2 (3028-202)

Elevation: 5280

Date Drilled: 9-14-83

Location: NE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 31, T1N, R37E

Method: Rotary air

Geologist: Deymonaz

Gamma: N/A

(ft) Depth (m)	Description
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0-30
(0-9)

Sandstone - siltstone - Spudded in next to surface o/c in same material. Thinly bedded tuffaceous sandstones and sandy siltstones. Lt. tan, beds 1 in. to 1 ft. thick. 10-15% small xls of altered feldspars with minor quartz and chloritized biotite. 20% small dk. gray lith frags of limestone and siltstone.

30-145
(9-44)

Sandy siltstone - Lt. tan, similar to above except finer grained, cuttings come out as fine sandy powder. Xls as above decrease to 5% and lith frags as above.

145-180
(44-55)

Sandy siltstone - As above except pale red.

180-200

Sandy siltstone (Tertiary) - As 30-145'.

Drilled dry to TD.

LITHOLOGIC LOG

Project: Emigrant

Hole: E-1 (3028-201)

Elevation: 4880

Date Drilled: 9-14-83

Location: Cen, NE¼ Sec. 36, T1N, R36E

Method: Rotary air/foam

Geologist: Deymonaz

Gamma: N/R

(ft) Depth (m)	Description
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Site in wash near lt. green silstones.

0-95
(0-29)

Siltstone - (Tertiary) - Lt. green, soft, trace of gypsum, minor sandy beds.

95-200
(29-61)

Siltstone and conglomerate (Tertiary) - Siltstone as above with lt. brown siltstone and small gravels (1-5 mm) of angular aphanitic flow rocks and Paleozoic siltstones, limestones and chert.

Drilled dry 0 - 50
Foam injection 50 - 200