

U.S. DEPARTMENT OF THE INTERIOR  
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CORE LITHOLOGY  
STATE OF HAWAII  
SCIENTIFIC OBSERVATION HOLE 4  
KILAUEA VOLCANO, HAWAII

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## INTRODUCTION

The Scientific Observation Hole (SOH) program is sponsored by the State of Hawaii to drill and core research holes deep into Kilauea's East Rift Zone. This report consists of complete lithologic and temperature logs of the 6,565 ft of core from a 2,001-m-deep well recovered from SOH 4, located 8 km southwest of the town of Pahoa at an elevation of 366 m (1,200 feet) above sea level (asl; Fig. 1). This document synthesizes several types of information, and its purpose is to serve as a catalog and reference of the drill core. The original core log sheets, which are the basis of this document was derived are located at the University of Hawaii at Manoa.

Continuous core of this nature and depth is unprecedented in the Hawaiian Islands and provides an unequalled stratigraphic record of the physical and chemical development of the volcano. In addition, the cores provide samples on which to conduct physical property and chemical studies that will impact our basic understanding of volcanic island development and constrain future geologic and geophysical models.

### LITHOLOGIC SUMMARY

A total of 1,463 units are identified in the 2,001 m of core from SOH 4, stored in 691 boxes. Units include a'a and pahoehoe flows, dikes, ash, carbonates, pillow lava, sand, hyaloclastites and volcanoclastite. Volcanoclastites are fine-grained subaqueously deposited volcanics. Specific characteristics used to distinguish unit types are presented in Figure 2. The breakdown by unit type in percent is as follows:

UNIT	PERCENT OF CORE
Dike	33.2%
Pahoehoe	35.2
A'a	21.7
Ash	1.1
Pillow lavas and Hyaloclastites	7.6*
Carbonates	1.03
Sand	0.17

\* includes Volcanoclastics

**FLOWS:** Subaerial lava flows comprise 58% of the core and subaqueous flows 7% (including pillows, hyaloclastite, and volcanoclastics). The deepest subaerial flow occurs at a depth of 1,402 m (4,597 ft) below sea level (bsl). The transition from subaerial to subaqueous emplacement extends over 162 meters, starting with the shallowest subaqueous unit at 1,329 m (4,357 ft) bsl to the last carbonate at 1,461 m (4,790 ft) bsl.

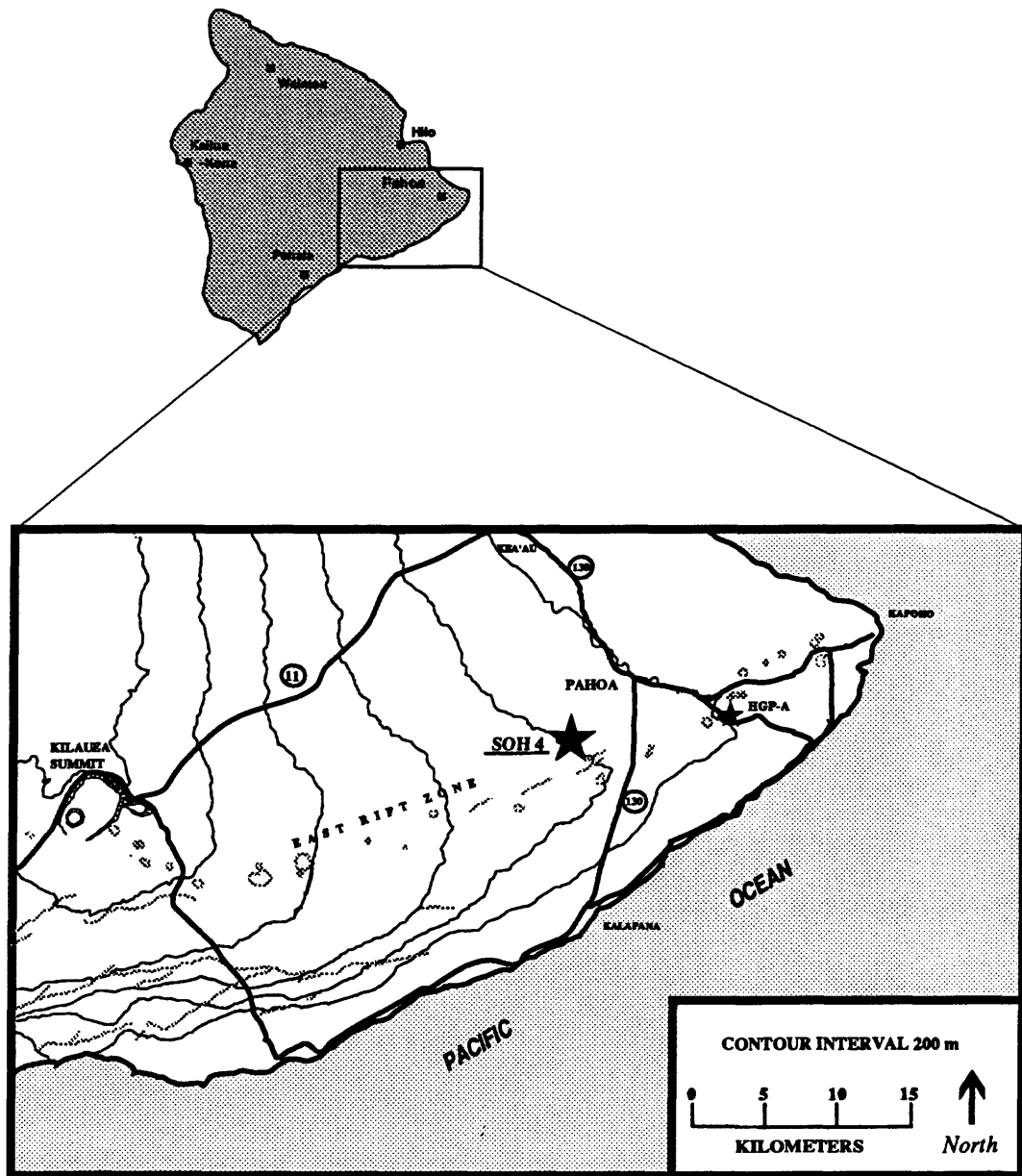
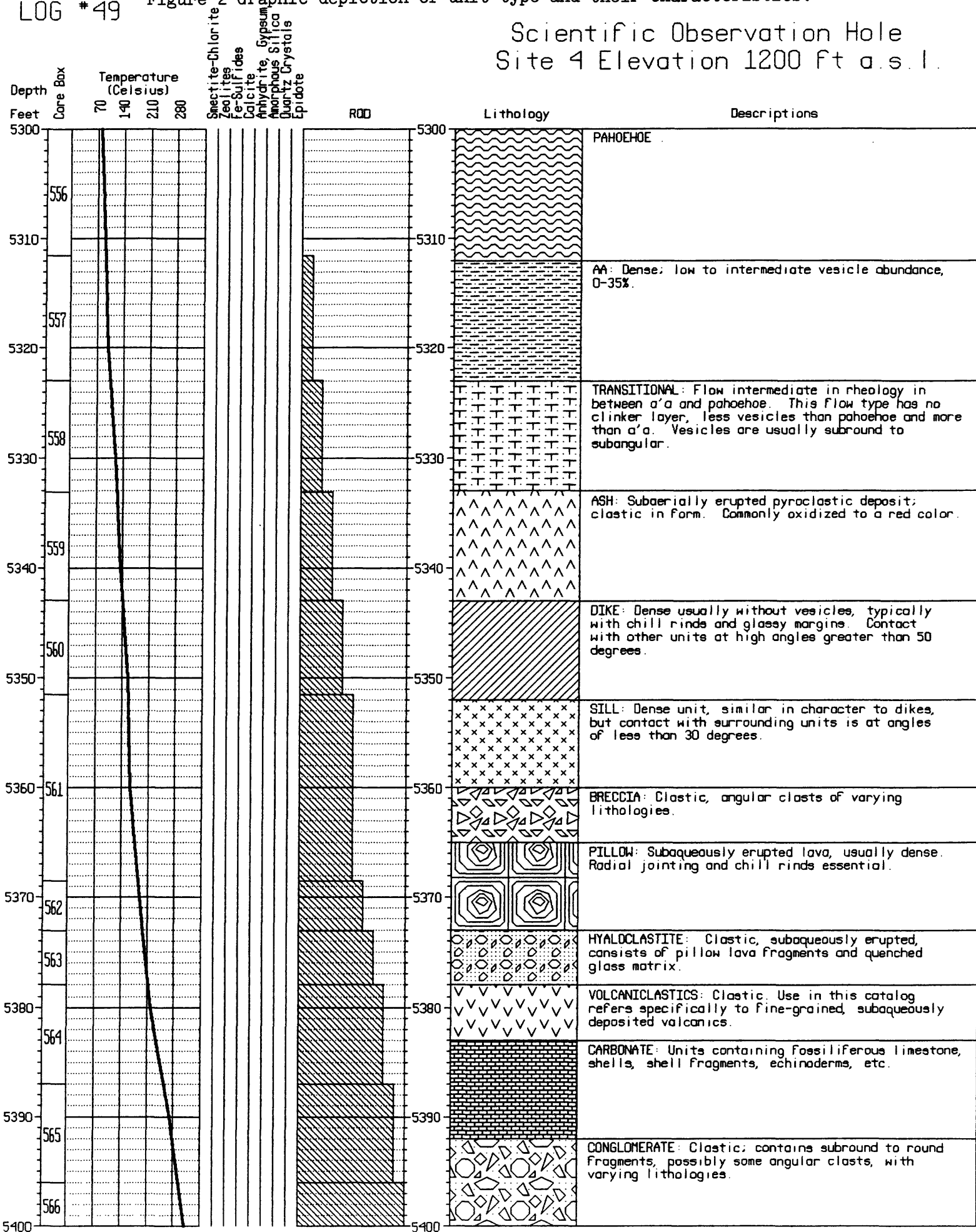


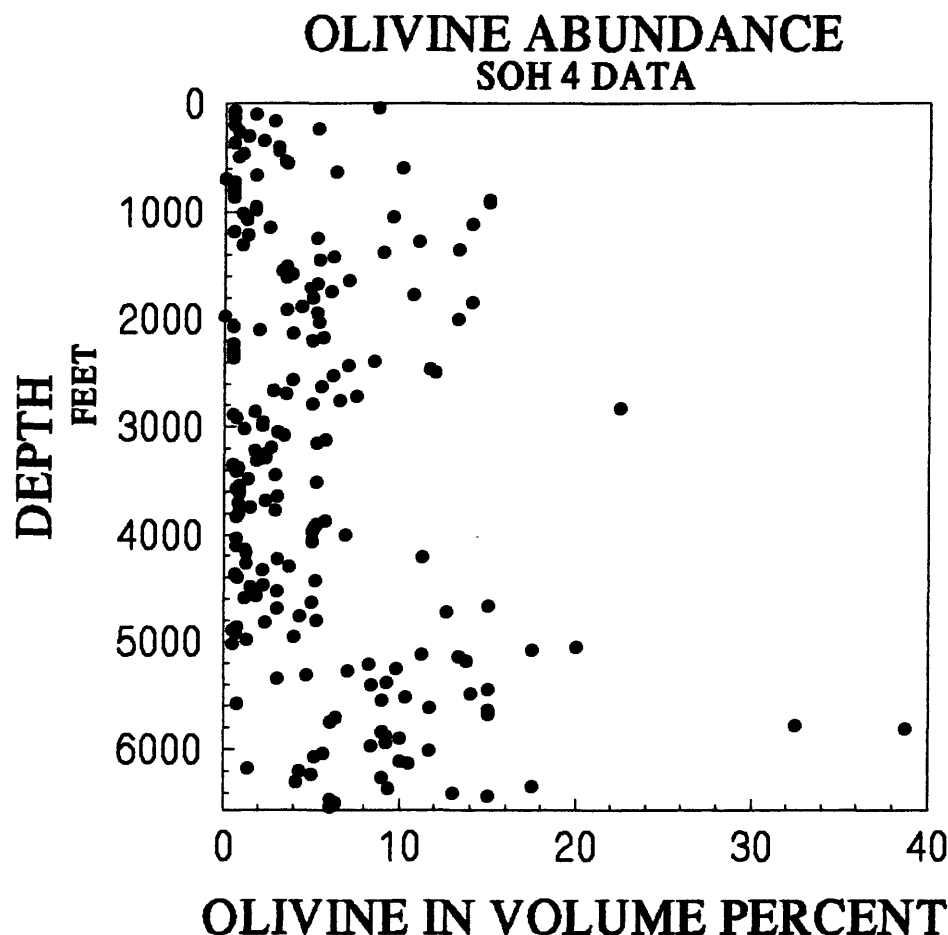
Figure 1: Site location map for SOH 4.

LOG # 49

Figure 2 Graphic depiction of unit type and their characteristics.

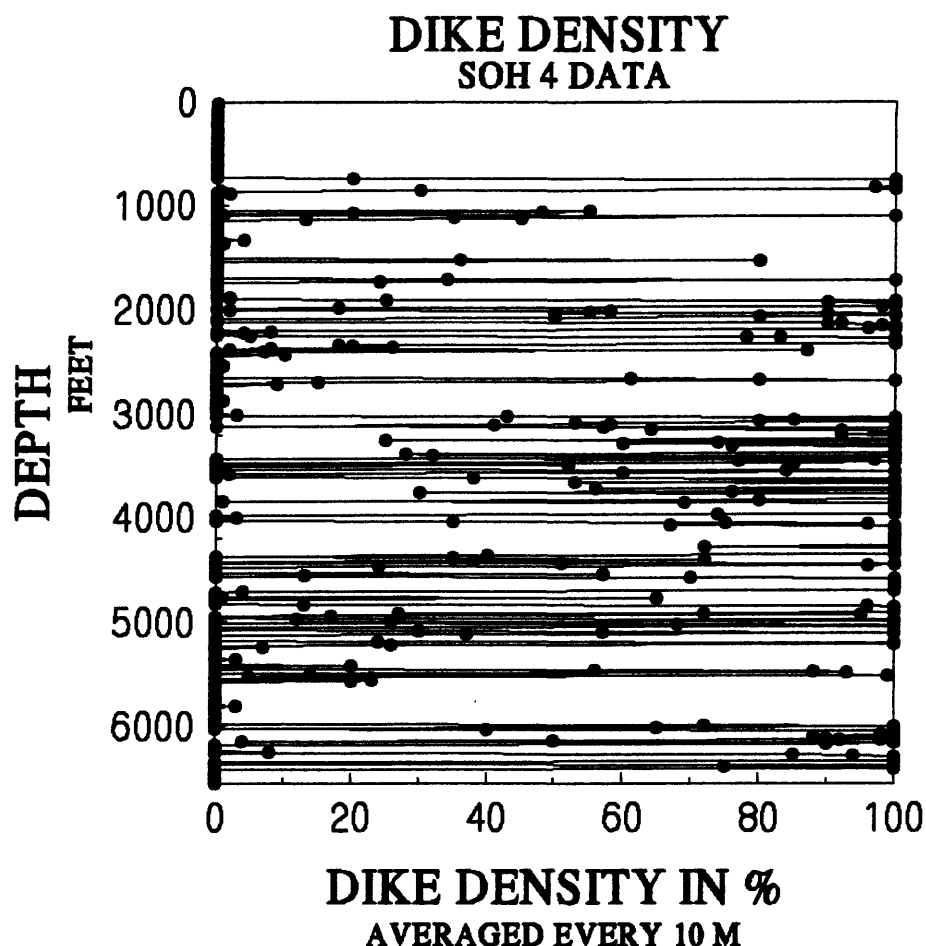
Scientific Observation Hole  
Site 4 Elevation 1200 Ft a.s.l.

A general observation is that olivine phyric flows are more common at greater depths (Fig. 3).



**ASH:** A total of 19 Ash units, generally thin (<15 cm), are randomly distributed in the vertical section.

**DIKES:** Regions marked by frequent dikes, averaging 80% and greater dike rock per 30 m of core occur in the interval between 915 and 1,525 m (3,000-5,000 ft) depth bsl (Fig. 4). The presence of this high intensity of dikes versus flow units comes as a surprise, because the sheeted dike complex and region of current dike emplacement is at the 3,000-4,000-m depth. Dikes have chill margins (glassy contacts) that cross-cut the sub-horizontal flow units and therefore are younger than the units with which they are in contact. A thick (30 m, 98 ft) sill occurs at a depth of 135 m (443 ft) asl.



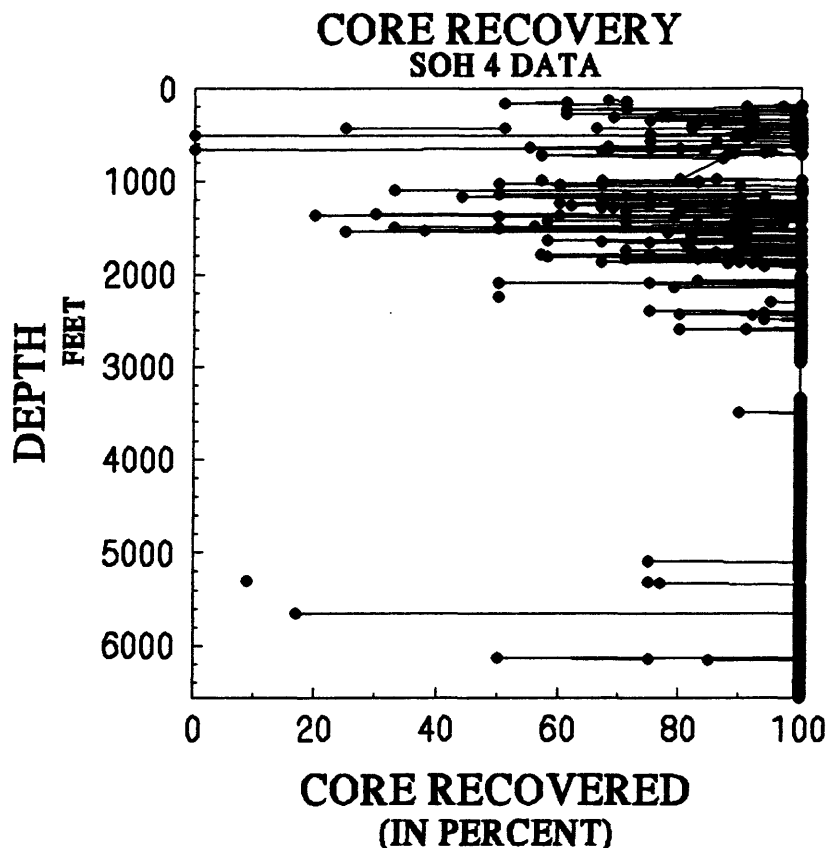
**CARBONATES:** Marine carbonates in the form of breccias, fossiliferous limestone and conglomerates were found at depths of 1,337-1,491 m (4,120-4,889 ft) bsl. The presence of shallow water foraminifera associated with the deposits suggest that this material formed in a lagoon or beach environment (pers. comm. J. Resig, 1990). The presence of shallow-water carbonates may be interpreted in several different ways, e.g., (1) Kilauea has subsided by 4,889 ft (1,491 m) and is much older than previously thought; (2) faulting has occurred and has displaced the old shoreline; and (3) the deposits represent the contact between Mauna Loa and Kilauea along an old Mauna Loa shoreline.

Using current subsidence rates of 2.4 mm/yr (Moore and Thomas, 1988) would yield ages of 557,083 to 621,250 years B.P. An alternative viewpoint is that the subsidence rates are too modest and that the sinking of the island has occurred at greater rates to arrive at the currently accepted age of Kilauea at approximately 250,000 to 400,000 years.

#### LOGGING SPECIFICS

The average core recovery rate for the entire SOH 4 drill hole is 93.6% (Fig. 5). Figure 2 is a sample core log illustrating the symbols used to depict different lithologies and descriptive terminology for the unit types. All graphical

representations of data presented in this reference are depicted for the entire box. For example, the graphic depiction of lithology is based on the dominate lithologic type, even though more than one type of unit may appear in a box. Secondary mineralogy bars reflect the presence of the mineral, but not the unit in which they occur. In all cases, the written core descriptions have additional detail on unit types and the occurrence of secondary minerals. Finally, all depths are reported in feet.



RQD, Rock Quality Data, was adapted from engineering and indicates the degree to which the core is fractured; higher values mean more competent or intact core. The scale is in percent, 0-100, and measurements begin at 280-ft depth (281 m asl). RQD is averaged for the entire box of core.

The third set of columns depicts the presence or absence of secondary minerals. With the exception of smectite-chlorite field, the secondary minerals usually represent <1% of the core. Smectite-chlorite is used to represent any type of clay mineral. Zeolites are also not discriminated on the bar graphs. When these secondary minerals have been specifically identified, their name appears in the core description section of the log. In most cases, the mineral identifications made in the field should be

considered preliminary until confirmed by X-ray diffraction or by other methods.

Temperature data were taken from Termacal Engineering survey of SOH 4 on May 22, 1990 (pers. comm. D. Thomas, 1990). Data were collected starting at the 335.5 m asl (100-ft depth, from surface) down to 1,616.5 m bsl (6,500-ft depth).

#### ACKNOWLEDGMENTS

The data presented here was obtained while I worked for the Hawaii Natural Energy Institute. I would like to thank Dr. Don Thomas for allowing me the opportunity to work on such an exciting project. Dr. Martha Sykes and Dr. Terry Keith for providing secondary mineral XRD information and identification. Finally, I would like to acknowledge James P. Reed of Rockware for setting up the output format and for instructing me on the software usage.

SOH 4

Scientific Observation Hole  
Site 4 Elevation 1200 ft a.s.l.

Depth Feet	Core Box	Temperature (Celsius)				Mineralogical Data						ROD	Lithology	Descriptions
		70	140	210	280	Smectite-Chlorite	Zeolites	Fe-Sulfides	Calcite	Anhydrite, Gypsum	Amorphous Silica	Quartz Crystals		
0	1													PAHOEHOE, 1840 eruption, 20% olivine phenocrysts, microphenocrysts in a light gray groundmass.
10	2													PAHOEHOE, picritic, 20% olivine phenocrysts, microphenocrysts, groundmass light gray feldspathic at contact plant mold found. 2) A'a, 1% plagioclase laths in a bluish gray groundmass. Unit 2 appears to be an admixture of clinker and A'a ridges or large clinker blocks.
20	3													AA with 2% plagioclase as microlaths and rhombs in a dark gray groundmass.
30	4													AA, vesicular (10-20%), with 1-2% plagioclase as microlaths; groundmass dark gray.
40	5													AA, Units 1 & 2) 3% plagioclase as rhombs, and microlaths, <1% olivine-plagioclase intergrowths. 1) A'a, dark blue gray groundmass, less vesicles. 2) more vesicles blue gray groundmass, coarser grained phenocrysts.
50	6													AA, Units 1-3) 2-3% plagioclase phenocrysts, laths in a blue gray groundmass. <1% olivine-plagioclase intergrowths.
60	7													AA, with <1% plagioclase as rhombs and microlaths and <1% olivine as phenocrysts and olivine-plagioclase intergrowths.
70	8													AA, 2-3% plagioclase; <1% olivine-plagioclase intergrowths, plagioclase as laths; rhombs; <1% olivine phenocrysts; gray groundmass.
80	9													AA, 2-3% plagioclase, <1% olivine-plagioclase intergrowths; groundmass bluish gray.
90	10													AA, <1% plagioclase as rhombs, microphenocrysts; rare olivine-plagioclase; dark gray groundmass.
100	11													CLINKER, 5-7% plagioclase as laths, microphenocrysts; dark gray groundmass. 2) Pahoe-hoe; 3% plagioclase as microphenocrysts; microlaths; groundmass dark gray.
	12													PAHOEHOE, 3% plagioclase as microphenocrysts in a dark gray groundmass. 2) Pahoe-hoe, 3% plagioclase as laths; 4% olivine phenocrysts in a feldspathic groundmass.
	13													PAHOEHOE (units 1, 2, 3), 3% plagioclase as laths; in a gray groundmass.
	14													PAHOEHOE, 3% plagioclase as laths, rare olivine and microgabbros in a blue gray feldspathic groundmass.
	15													PAHOEHOE, Units 1, 2) Pahoe-hoe 3% plagioclase as blades, laths; groundmass is feldspathic, gray.
	16													PAHOEHOE, 3% plagioclase laths; rare olivine-plagioclase and microgabbros found; the groundmass is feldspathic.
	17													PAHOEHOE, 3% plagioclase as laths, in a feldspathic groundmass, gray in color.
	18													CLINKER, 3% plagioclase as laths, rare olivine phenocrysts and microgabbros, groundmass gray and feldspathic.
	19													AA, 3% plagioclase, <<1% olivine phenocrysts and microgabbros in a gray feldspathic groundmass.
	20													AA, 5% plagioclase phenocrysts, laths and 3% olivine phenocrysts in a light gray feldspathic groundmass.
	21													AA, 3% plagioclase phenocrysts, laths, 3% olivine phenocrysts in a light gray feldspathic groundmass.
	22													CLINKER, with 5% plagioclase as laths, microgabbros, groundmass: bluish gray
	23													AA, 5% plagioclase laths, 5% olivine phenocrysts and rare olivine-plagioclase; groundmass is dark gray

# CATALOG OF SOH 4 CORE

Depth Feet	BOX	Temp (C) 70 140 210 280	Sp-Ci Feol	Fe-S Cal	Am/Gy Am/Si	X/Dtz Lp	ROD	Lithology	Descriptions
100	23								AA, here may just be clinker blocks. 2) A'a with 5% plagioclase phenocrysts, laths, blades and microphenocrysts, 5% olivine phenocrysts and rare olivine-plagioclase intergrowths. groundmass is dark gray.
110	24								AA, Flow with 5% plagioclase as phenocrysts, bladed, rhombs and microphenocrysts; <<1% olivine phenocrysts and olivine-plagioclase intergrowths. groundmass is feldspathic and light gray in color.
	25								AA with 5% plagioclase phenocrysts, blades, microphenocrysts, <<1% olivine and olivine-plagioclase intergrowths in a feldspathic matrix. 2) Pahoe-hoe with 3% plagioclase lath and microphenocrysts in a dark gray matrix.
120	1A								LOST CORE WHEN CHANGING DRILL SIZE.
									AA, <1% plagioclase and olivine phenocrysts in a feldspathic light gray matrix. 2) A'a thin bedded unit with 2-3% plagioclase phenocrysts and laths. Unit 2 is thermally oxidized, the groundmass is a dark bluish gray color.
130	2A								AA, 2-3% plagioclase as rhombs, blades, laths, microphenocrysts in a dark blue groundmass; rare gabbro; 2 AND 3) A'a, 2-3% plagioclase, rhombs, laths in a dark gray matrix. Rare olivine and/or olivine-pyroxene grains seen. 4) A'a, 2-3% plagioclase as fibrous clots, laths, microlaths in a dark blue feldspathic matrix.
140									AA, 2-3% plagioclase in a dark gray feldspathic matrix. 2) Clinker, has greater abundance of plagioclase phenocrysts, microphenocrysts as fibrous intergrowths, microlaths, groundmass: dark bluish gray.
150	3A								AA core, dense with 7% plagioclase as phenocrysts, microphenocrysts and laths, olivine and olivine-plagioclase intergrowths at <<1% in a feldspathic matrix. 2) Pahoe-hoe with 3% plagioclase as phenocrysts, microphenocrysts in a dark gray matrix.
160	4A								AA, 2-3% plagioclase as clots, microphenocrysts and <<1% olivine-plagioclase intergrowths. groundmass is feldspathic and light gray in color. 2) Transitional, 3-5% plagioclase as clots, mostly as microphenocrysts <1mm, groundmass is feldspathic bluish gray in color. 3) Pahoe-hoe, 3-5% plagioclase clots, mostly microphenocrysts, groundmass bluish gray color rare olivine phenocrysts found.
170	5A								PAHOEHOE units with 3-5% plagioclase phenocrysts, as intergrowths, blades and mphs. The groundmass is feldspathic and light gray.
180	6A								PAHOEHOE units (5) with 1-3% plagioclase as phenocrysts, microphenocrysts in a gray to light gray feldspathic matrix
190	7A								PAHOEHOE; see next page for description.
200	8A								

# CATALOG OF SOH 4 CORE

Depth	Feet	Box	Temp (C)	70	140	210	280	350	420	490	560	630	700	770	840	910	980	1050	1120	1190	1260	1330	1400	1470	1540	1610	1680	1750	1820	1890	1960	2030	2100	2170	2240	2310	2380	2450	2520	2590	2660	2730	2800	2870	2940	3010	3080	3150	3220	3290	3360	3430	3500	3570	3640	3710	3780	3850	3920	3990	4060	4130	4200	4270	4340	4410	4480	4550	4620	4690	4760	4830	4900	4970	5040	5110	5180	5250	5320	5390	5460	5530	5600	5670	5740	5810	5880	5950	6020	6090	6160	6230	6300	6370	6440	6510	6580	6650	6720	6790	6860	6930	7000	7070	7140	7210	7280	7350	7420	7490	7560	7630	7700	7770	7840	7910	7980	8050	8120	8190	8260	8330	8400	8470	8540	8610	8680	8750	8820	8890	8960	9030	9100	9170	9240	9310	9380	9450	9520	9590	9660	9730	9800	9870	9940	10010	10080	10150	10220	10290	10360	10430	10500	10570	10640	10710	10780	10850	10920	10990	11060	11130	11200	11270	11340	11410	11480	11550	11620	11690	11760	11830	11900	11970	12040	12110	12180	12250	12320	12390	12460	12530	12600	12670	12740	12810	12880	12950	13020	13090	13160	13230	13300	13370	13440	13510	13580	13650	13720	13790	13860	13930	14000	14070	14140	14210	14280	14350	14420	14490	14560	14630	14700	14770	14840	14910	14980	15050	15120	15190	15260	15330	15400	15470	15540	15610	15680	15750	15820	15890	15960	16030	16100	16170	16240	16310	16380	16450	16520	16590	16660	16730	16800	16870	16940	17010	17080	17150	17220	17290	17360	17430	17500	17570	17640	17710	17780	17850	17920	17990	18060	18130	18200	18270	18340	18410	18480	18550	18620	18690	18760	18830	18900	18970	19040	19110	19180	19250	19320	19390	19460	19530	19600	19670	19740	19810	19880	19950	20020	20090	20160	20230	20300	20370	20440	20510	20580	20650	20720	20790	20860	20930	21000	21070	21140	21210	21280	21350	21420	21490	21560	21630	21700	21770	21840	21910	21980	22050	22120	22190	22260	22330	22400	22470	22540	22610	22680	22750	22820	22890	22960	23030	23100	23170	23240	23310	23380	23450	23520	23590	23660	23730	23800	23870	23940	24010	24080	24150	24220	24290	24360	24430	24500	24570	24640	24710	24780	24850	24920	24990	25060	25130	25200	25270	25340	25410	25480	25550	25620	25690	25760	25830	25900	25970	26040	26110	26180	26250	26320	26390	26460	26530	26600	26670	26740	26810	26880	26950	27020	27090	27160	27230	27300	27370	27440	27510	27580	27650	27720	27790	27860	27930	28000	28070	28140	28210	28280	28350	28420	28490	28560	28630	28700	28770	28840	28910	28980	29050	29120	29190	29260	29330	29400	29470	29540	29610	29680	29750	29820	29890	29960	30030	30100	30170	30240	30310	30380	30450	30520	30590	30660	30730	30800	30870	30940	31010	31080	31150	31220	31290	31360	31430	31500	31570	31640	31710	31780	31850	31920	31990	32060	32130	32200	32270	32340	32410	32480	32550	32620	32690	32760	32830	32900	32970	33040	33110	33180	33250	33320	33390	33460	33530	33600	33670	33740	33810	33880	33950	34020	34090	34160	34230	34300	34370	34440	34510	34580	34650	34720	34790	34860	34930	35000	35070	35140	35210	35280	35350	35420	35490	35560	35630	35700	35770	35840	35910	35980	36050	36120	36190	36260	36330	36400	36470	36540	36610	36680	36750	36820	36890	36960	37030	37100	37170	37240	37310	37380	37450	37520	37590	37660	37730	37800	37870	37940	38010	38080	38150	38220	38290	38360	38430	38500	38570	38640	38710	38780	38850	38920	38990	39060	39130	39200	39270	39340	39410	39480	39550	39620	39690	39760	39830	39900	39970	40040	40110	40180	40250	40320	40390	40460	40530	40600	40670	40740	40810	40880	40950	41020	41090	41160	41230	41300	41370	41440	41510	41580	41650	41720	41790	41860	41930	42000	42070	42140	42210	42280	42350	42420	42490	42560	42630	42700	42770	42840	42910	42980	43050	43120	43190	43260	43330	43400	43470	43540	43610	43680	43750	43820	43890	43960	44030	44100	44170	44240	44310	44380	44450	44520	44590	44660	44730	44800	44870	44940	45010	45080	45150	45220	45290	45360	45430	45500	45570	45640	45710	45780	45850	45920	45990	46060	46130	46200	46270	46340	46410	46480	46550	46620	46690	46760	46830	46900	46970	47040	47110	47180	47250	47320	47390	47460	47530	47600	47670	47740	47810	47880	47950	48020	48090	48160	48230	48300	48370	48440	48510	48580	48650	48720	48790	48860	48930	49000	49070	49140	49210	49280	49350	49420	49490	49560	49630	49700	49770	49840	49910	49980	50050	50120	50190	50260	50330	50400	50470	50540	50610	50680	50750	50820	50890	50960	51030	51100	51170	51240	51310	51380	51450	51520	51590	51660	51730	51800	51870	51940	52010	52080	52150	52220	52290	52360	52430	52500	52570	52640	52710	52780	52850	52920	52990	53060	53130	53200	53270	53340	53410	53480	53550	53620	53690	53760	53830	53900	53970	54040	54110	54180	54250	54320	54390	54460	54530	54600	54670	54740	54810	54880	54950	55020	55090	55160	55230	55300	55370	55440	55510	55580	55650	55720	55790	55860	55930	56000	56070	56140	56210	56280	56350	56420	56490	56560	56630	56700	56770	56840	56910	56980	57050	57120	57190	57260	57330	57400	57470	57540	57610	57680	57750	57820	57890	57960	58030	58100	58170	58240	58310	58380	58450	58520	58590	58660	58730	58800	58870	58940	59010	59080	59150	59220	59290	59360	59430	59500	59570	59640	59710	59780	59850	59920	59990	60060	60130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# CATALOG OF SOH 4 CORE

Depth Feet	Box	Temp (C) 70 140 210 280	Sw-CI Feol Fe-S Cal Am/Gy Am/Si Y/Otz Cpt	ROD	Lithology	Descriptions
300	17A					AA, 3) A'a, 3% plagioclase as rhombs, blades and microphenocrysts with 1% olivine as phenocrysts in a bluish gray groundmass. 4) A'a with 1-2% plagioclase phenocrysts, microlaths in a bluish gray groundmass, olivine rare.
310	18A					AA, core with <1% plagioclase as bladed phenocrysts in a light gray feldspathic groundmass. 2) A'a with 1% plagioclase phenocrysts in a bluish gray groundmass. 3) Proximal A'a with 5% olivine-plagioclase intergrowths, 3% olivine phenocrysts and 3% plagioclase phenocrysts and laths all in a gray feldspathic groundmass.
320	19A					AA, <1% plagioclase blebs and laths in a light gray feldspathic groundmass. 2) Aa, 3% olivine and plagioclase as rhombs, olivine-plagioclase intergrowths in a light gray feldspathic groundmass. 3) Aa, <1% plagioclase laths and olivine in a light gray feldspathic groundmass.
330	20A					PAHOEHOE, rubble, <1% plagioclase as laths in a dark bluish gray groundmass. Units 2 to 6) Same lithology as Unit 1.
340	21A					AA, micro plagioclase-olivine intergrowths, microlites of plagioclase in a light gray feldspathic groundmass. 2) A'a, plagioclase blades, laths and rhombs in a gray feldspathic groundmass.
350	22A					AA, with 3-4% plagioclase as laths and microphenocrysts in a light gray feldspathic groundmass. 2) Transitional flow vesicular top with dense core contains 1% plagioclase as laths, microphenocrysts in a bluish gray groundmass.
360	23A					AA to Transitional Flow with 1% plagioclase as laths within a light gray feldspathic groundmass. 2) Pahoehoe, jumbled lobes/rubble with <<1% plagioclase as laths in a dark gray groundmass. 3) Pahoehoe with 1% plagioclase within a feldspathic groundmass bluish gray in color.
370	24A					PAHOEHOE, with 1% plagioclase as laths in a bluish gray sugary groundmass. 2) Transitional flow with 1% plagioclase as rhombs and blades in a feldspathic groundmass.
380	25A					AA, <<1% plagioclase in a light gray feldspathic groundmass. 2) Pahoehoe, top 120 cm light pinkish gray grades to light gray feldspathic groundmass for rest of box, <<1% plagioclase found.
390	26					PAHOEHOE, with 3% olivine phenocrysts light green in color with 4% plagioclase as laths, microlaths in a sugary bluish gray groundmass; Unit 1 has an internal contact 2) Transitional, 1% plagioclase as rhombs, blades, and microlaths in a feldspathic light gray groundmass.
400	27					TRANSITIONAL, see next page for description.

# CATALOG OF SOH 4 CORE

Depth Feet	80X	70	Temp (C)	140	210	280	Sp-CI	Feol	Fe-S	Cal	Am/Gy	Am/Si	X/Otz	Lpi	ROD	Lithology	Descriptions
400																	Transitional, 1% plagioclase as, rhombs, blades and laths in a feldspathic fine grained groundmass. 2) Transitional, with 3% olivine phenocrysts, 1% olivine-plagioclase intergrowths and 2% plagioclase as equant, blades and microlaths; groundmass is dark bluish gray. PAHOEHOE, 3) Dike-like unit intruded the void space of the Transitional unit. This unit has 3-5% plagioclase as laths and microphenocrysts all in a bluish gray groundmass.
410																	CLINKER, 1st 61 cm of dense clinker with 1% plagioclase as laths in a charcoal gray groundmass. 2) Vesicular clinker 15-20%, with 2-3% plagioclase as equant Rhombs and laths in dark gray groundmass
420																	
430																	AA, with 1% olivine phenocrysts and 1% olivine-plagioclase intergrowths; 3-5% plagioclase as laths, and microphenocrysts in a bluish gray groundmass. 2) Transitional, with 1% olivine phenocrysts, olivine-plagioclase intergrowths; 5% plagioclase laths, some microphenocrysts, groundmass is feldspathic and dark gray.
440																	AA with 3-5% plagioclase as laths and occasional rhombs in a feldspathic light gray groundmass. 2) Transitional flow with <1% plagioclase as laths, microphenocrysts in a light gray feldspathic groundmass.
450																	AA with 1% plagioclase as equant phenocrysts, microphenocrysts and laths in a light gray feldspathic groundmass. 2) A'a, 1% plagioclase as lath and microphenocrysts an occasional larger phenocrysts seen. The groundmass is gray.
460																	AA with 1-3% plagioclase rhombs and laths in a light gray feldspathic groundmass, bottom 39 cm thermally oxidized to dark reddish gray. 2) A'a, aphyric, top 23 cm thermally oxidized to dark reddish gray, remainder of unit light gray feldspathic groundmass.
470																	AA, aphyric, light gray feldspathic groundmass; bottom 28 cm thermally altered to dark gray. 2) Pahoehe, 1% plagioclase as laths in a light gray feldspathic groundmass, top 30 cm thermally oxidized to dark gray, <1% small olivine.
480																	PAHOEHOE, with 1% olivine phenocrysts and 1% olivine-plagioclase intergrowths, 2-3% plagioclase as equant rhombs and mps. The groundmass is gray and feldspathic. 2) Pahoehe, with 1% olivine as phenocrysts, microphenocrysts with 1% plagioclase as laths, microphenocrysts in a light gray feldspathic groundmass.
490																	AA, sparsely phytic with plagioclase laths in a light gray feldspathic groundmass.
500																	PAHOEHOE, 1% olivine, and <1% plagioclase in a gray groundmass. 2) Pahoehe, 3% plagioclase laths in an oxidized groundmass. Units 3 & 4) Pahoehe 10% olivine in an oxidized groundmass 5) Pahoehe, 5% plagioclase laths in an oxidized groundmass.

# CATALOG OF SOH 4 CORE

Depth Feet	BOX	Temp (C) 70 140 210 280	Sm-CI Zn-S Fe-S Cu Am-Gy An-Si V/Tz Cp	ROD	Lithology	Descriptions
500	36					6) Pahoe-hoe, 3% olivine, 3% plagioclase-olivine phenocrysts, microphenocrysts in a sugary gray groundmass. PAHOEHOE, Units 7 & 8) Pahoe-hoe 3% plagioclase and phenocrysts, mph, laths in a Feldspathic gray groundmass.
510	37					PAHOEHOE, with a medium gray aphyric Feldspathic groundmass. 2) Pahoe-hoe, 1% plagioclase blades, laths and rhombs in a light gray Feldspathic groundmass. 3) Pahoe-hoe, 1% plagioclase blades and laths, <1% olivine in a thermally oxidized dark reddish gray Feldspathic groundmass.
520	38					PAHOEHOE, <1% plagioclase blades and laths in dark reddish gray thermally altered groundmass. 2) Transitional, <1% plagioclase blades and laths in light gray Feldspathic groundmass; top 30 cm thermally oxidized to dark reddish gray.
530	39					TRANSITIONAL, <1% plagioclase blades and laths in light gray Feldspathic groundmass. 2) Pahoe-hoe, 1-3% plagioclase blebs and olivine in a gray Feldspathic groundmass.
540	40					PAHOEHOE, <1% plagioclase blebs and <1% olivine in a gray Feldspathic groundmass. 2) A.a, plagioclase blebs, laths, blades in a light gray Feldspathic groundmass.
550	41					AA, <1% plagioclase blebs, laths and blades in light gray Feldspathic groundmass. 2) Ash, orange colored, weathered. 3) Pahoe-hoe, 1-5% olivine, <1% plagioclase laths in a light gray Feldspathic groundmass.
560	42					PAHOEHOE, 1-5% olivine, <1% plagioclase laths in a light gray Feldspathic groundmass, thermally oxidized.
570	43					PAHOEHOE, with 10% olivine as phenocrysts, microphenocrysts, also rare micragabbros found, in a light bluish gray groundmass. 2) Pahoe-hoe, picritic, 15-20% olivine as phenocrysts, microphenocrysts in a bluish gray groundmass. 3) Pahoe-hoe, rubble, picritic basalt; thermally oxidized.
580	44					AA, 1-5% olivine and plagioclase blades, laths and blebs in a pinkish gray Feldspathic groundmass.
590	45					AA, 5% olivine phenocrysts and microphenocrysts and 1% plagioclase as equant phenocrysts all in a diktytaxitic Feldspathic groundmass.
600	46					PAHOEHOE, 4% olivine phenocrysts (altered), microphenocrysts, plagioclase at 1% as phenocrysts, microphenocrysts in a diktytaxitic, bluish gray groundmass. 2) Pahoe-hoe, 4% olivine phenocrysts, microphenocrysts in a diktytaxitic thermally oxidized groundmass. Units 3 and 4) Pahoe-hoe with 6-8% olivine phenocrysts and microphenocrysts in a light gray diktytaxitic groundmass.
	47					PAHOEHOE, 8% olivine, in a light gray Feldspathic GM

Depth	Temp (C)	Sm-Cl
Feet	70	Zeol
BOX	140	Fe-S
	210	Cal
	280	An/Gy
		Am, Si
		X/Otz
		Epi

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# CATALOG OF SOH 4 CORE

Depth Feet	BOX	70	Temp (C)	140	210	280	Sa-CI	Feol	Fe-S	Cal	Am/Gy	Am/Si	X/Otz	Ep	ROD	Lithology	Descriptions
700																	A a, <1% plagioclase laths and blades in a light gray feldspathic groundmass. AA, Unit 2) plagioclase laths and blades, plagioclase-olivine intergrowths, in a light gray feldspathic groundmass.
710	56																AA, dense core with rare olivine phenocrysts and <1% plagioclase as microphenocrysts all in diktytaxitic light gray groundmass.
720	57																AA, <<1% plagioclase laths and blades in a light gray feldspathic groundmass.
730	58																AA, <1% plagioclase laths and blades in a light gray feldspathic groundmass, with prominent diktytaxitic texture. 2) Sill, plagioclase blebs in a light gray feldspathic groundmass, incorporation of red vesicular clinkers surrounded by chill margin. 3) Pahoe-hoe, microphyric intergrowths of plagioclase-olivine in a light gray feldspathic groundmass. *****7 feet of core lost here*****.
740	59																
750	60																PAHOEHOE with <1% olivine as phenocrysts and <1% plagioclase as phenocrysts microphenocrysts all in a bluish gray groundmass. 2) Sill with <1% olivine phenocrysts, microphenocrysts and 1% plagioclase as blades laths, microphenocrysts and plagioclase intergrowths all in a feldspathic groundmass.
760	61																SILL: with <1% olivine, <1% plagioclase as microphenocrysts and rare olivine-plagioclase intergrowths all in a feldspathic light gray groundmass.
770	62																SILL, with <1% olivine phenocrysts, <1% plagioclase microphenocrysts all in a light gray diktytaxitic groundmass. 2) Pahoe-hoe, 3% plagioclase, as laths, microphenocrysts and intergrowths of olivine-plagioclase. This unit is thermally oxidized red.
780	63																SILL, plagioclase blebs and olivine-plagioclase intergrowths in a light gray feldspathic groundmass.
790	64																SILL, plagioclase blebs and occasional olivine-plagioclase intergrowths in a light gray feldspathic groundmass.
800	65																SILL, with <<1% rare olivine phenocrysts and <1% plagioclase blades and microphenocrysts all in a light gray diktytaxitic groundmass.

# CATALOG OF SOH 4 CORE

CATALOG OF SOH 4 CORE																
		Temp (C)													Descriptions	
Depth	BOX	70	140	210	280	Sr-CI	Zeol	Fe-S	Cal	Am/Gy	Am/Si	X/Qtz	Epl	ROD	Lithology	Descriptions
Feet																
800	65														XXXXXX XXXXXX XXXXXX	SILL, with <1% rare olivine phenocrysts and <1% plagioclase blades and microphenocrysts all in a light gray diktytaxitic matrix.
	66														XXXXXX XXXXXX XXXXXX	SILL, with rare olivine phenocrysts and <1% plagioclase as laths and bladed phenocrysts all in a feldspathic light gray matrix.
810															XXXXXX XXXXXX XXXXXX	
	67														XXXXXX XXXXXX XXXXXX	SILL, with <1% olivine as microphenocrysts and <1% plagioclase as blades/laths and microphenocrysts all in a light gray diktytaxitic matrix.
820															XXXXXX XXXXXX XXXXXX	
	68														XXXXXX XXXXXX XXXXXX	SILL, plagioclase blades and laths, olivine-plagioclase intergrowths in a light gray feldspathic matrix. 2) A'a clinker, highly vesicular, aphyric, red clinker incorporated into unit 1.
830															XXXXXX XXXXXX XXXXXX	
	69														XXXXXX XXXXXX XXXXXX	SILL, with <1% rare olivine phenocrysts and <1% plagioclase laths, microphenocrysts in a feldspathic gray matrix.
840															XXXXXX XXXXXX XXXXXX	
	70														XXXXXX XXXXXX XXXXXX	SILL, with <1% olivine as phenocrysts, microphenocrysts and <1% plagioclase as microphenocrysts in a fine grained light gray feldspathic matrix.
850															XXXXXX XXXXXX XXXXXX	
	71														XXXXXX XXXXXX XXXXXX	SILL, with <1% olivine as phenocrysts, microphenocrysts and <1% plagioclase as laths and microphenocrysts all in a feldspathic matrix. Units 2 & 4) Pahoe-hoe unit with 5% plagioclase as rhombs, blades, laths and microphenocrysts. The groundmass when not oxidized is bluish gray. 3) Sill, a tiny intrusion into Unit 2; thickness 20 mm; aphyric and the groundmass is charcoal-black in color.
860															XXXXXX XXXXXX XXXXXX	
	72														XXXXXX XXXXXX XXXXXX	PAHOEHOE, 5% plagioclase as phenocrysts, microphenocrysts, laths in a light bluish gray oxidized matrix. 2) Sill, aphyric in a black matrix 3) Pahoe-hoe with <1% plagioclase as laths in a dark bluish gray matrix.
870															XXXXXX XXXXXX XXXXXX	
	73														XXXXXX XXXXXX XXXXXX	PAHOEHOE, with <1% plagioclase as microphenocrysts in a dull gray matrix. 2) Pahoe-hoe, massive, dense, aphyric, groundmass well-crystallized.
880															XXXXXX XXXXXX XXXXXX	
	74														XXXXXX XXXXXX XXXXXX	PAHOEHOE, dense, aphyric, the groundmass is diktytaxitic and light gray. 2) Sill with 3% plagioclase as rhombs, laths, microphenocrysts in a dark bluish gray matrix. 3) Pahoe-hoe, with 15% olivine phenocrysts and microphenocrysts in a diktytaxitic matrix.
890															XXXXXX XXXXXX XXXXXX	
	75														XXXXXX XXXXXX XXXXXX	PAHOEHOE, Units 1 and 2) with 15% olivine as phenocrysts, microphenocrysts in a feldspathic light gray matrix.
900	76														XXXXXX XXXXXX XXXXXX	PAHOEHOE, picritic basalt, plagioclase blades, laths and blebs, and olivine-plagioclase intergrowths in a light gray feldspathic groundmass.

# CATALOG OF SOH 4 CORE

Depth	Feet	Box	Temp (C)	70	140	210	280	Ca-CI	Fe-S	Ca-S	Am-Si	X/Dtz	Lpi	ROD	Lithology	Descriptions
	900	76														2) Ash, altered, orange in color. PAHOEHOE, 3) picritic basalt, plagioclase blades, laths and blebs, olivine, and olivine-plagioclase in a light gray feldspathic groundmass.
	910	77														PAHOEHOE, Units 1, 2 and 3) picritic basalt, >5% plagioclase blades, laths, blebs; olivine-plagioclase intergrowths in light gray feldspathic groundmass. 4) A.a, 3% plagioclase blades and laths, <1% olivine in a light gray feldspathic groundmass. 5) Sill, between units 2, 3; 3% plagioclase laths and blades in a dense light gray feldspathic groundmass.
	920	78														PAHOEHOE, 1-5% plagioclase blades and laths, olivine-plagioclase intergrowths in a light gray feldspathic groundmass. 2) Sill, 1-5% plagioclase blades and laths in a diktytaxitic light gray groundmass. 3) Pahoehe, 1-5% plagioclase rhombs, blades, and laths in a light gray feldspathic groundmass.
	930	79														PAHOEHOE, 1-5% plagioclase rhombs, blades and laths, olivine-plagioclase intergrowths, olivine in a light gray feldspathic groundmass. Areas of dense vesiculation have been crushed to rubble.
	940	80														PAHOEHOE, with 1-5% plagioclase phenocrysts, microphenocrysts and laths. Olivine is present at 1%; all in a light gray diktytaxitic groundmass
	950	81														PAHOEHOE, 1-5% plagioclase rhombs, blades and laths, olivine-plagioclase intergrowths, <1% olivine in a diktytaxitic, light gray groundmass. 2) Ash, altered orange in color.
	960	82														PAHOEHOE, <1% plagioclase blades and laths, olivine-plagioclase intergrowths in a light gray feldspathic groundmass.
	970	83														PAHOEHOE, 1-5% plagioclase blades and laths, olivine-plagioclase intergrowths in a light gray feldspathic groundmass. 2) A.a, 1-5% plagioclase rhombs, olivine-plagioclase intergrowths, and olivine in a light gray feldspathic groundmass.
	980	84														AA, <1% rhombs, blades and laths in a light gray feldspathic groundmass
	990	85														PAHOEHOE, Units 1, 2) with 1% olivine phenocrysts, microphenocrysts all in a dark bluish gray feldspathic groundmass.
	1000	86														AA, 1-5% plagioclase microlites, <1% blades and laths, in a light gray feldspathic groundmass.



# CATALOG OF SOH 4 CORE

Depth Feet	80X	70	Temp (C) 140 210 280	SiO <sub>2</sub> FeO CaO Al <sub>2</sub> O <sub>3</sub> MgO K <sub>2</sub> O Na <sub>2</sub> O TiO <sub>2</sub> P <sub>2</sub> O <sub>5</sub> L.O.I.	ROD	Lithology	Descriptions
1100	93						DIKE, 4) <1% plagioclase laths and blades in a dark gray, microvesicular basalt.
1110	94						DIKE, with <1% plagioclase blades and laths and microgabbros in a holocrystalline, light gray groundmass.
1120	95						DIKE, <1% plagioclase blades and laths, blebs in a light gray groundmass. 2) Pahoe-hoe, >5% plagioclase blades and laths, blebs, olivine-plagioclase intergrowths, 3% olivine (altered) in a light gray feldspathic groundmass; first 180 cm of unit thermally altered to reddish gray.
1130	96						DIKE, <1% plagioclase blades and laths, blebs in a light gray groundmass. 2) Pahoe-hoe rubble, >5% plagioclase blebs in a light gray feldspathic groundmass. 3) Dike, <1% plagioclase blebs, blades and laths in a light gray groundmass. 4) Pahoe-hoe, 3% plagioclase blades and laths, blebs, <1% olivine (altered) in a light gray groundmass.
1140	97						PAHOEHOE, 3% plagioclase blades and laths, blebs in a light gray feldspathic groundmass. 2) Dike, aphyric dark gray basalt. 3) Pahoe-hoe, >5% plagioclase blebs in a light gray feldspathic groundmass. Units 4 and 5) Dike (as above) cuts unit 3 twice. 6) Pahoe-hoe, microphyric <5% plagioclase blebs in a light gray feldspathic groundmass.
1150	98						PAHOEHOE, 4% olivine-plagioclase intergrowths and 3% plagioclase as blades, laths in an feldspathic, oxidized groundmass. 2) Pahoe-hoe with 3% olivine-plagioclase intergrowths, 2% plagioclase blades, laths all in a feldspathic light gray groundmass. 3) Scoriaceous Pahoe-hoe (spatter?), very vesicular with <1% olivine-plagioclase intergrowths and 2% plagioclase laths; groundmass is altered. 4) Pahoe-hoe with 3% olivine-plagioclase intergrowths, 2% plagioclase as laths, microphenocrysts all in a feldspathic light gray groundmass.
1160	99						PAHOEHOE, with 3% plagioclase blebs, <1% olivine-plagioclase intergrowths in a light gray feldspathic groundmass. 2) A.a. with <1% plagioclase microphenocrysts in a light gray feldspathic groundmass. 3) Pahoe-hoe, with <1% olivine-plagioclase intergrowths and <1% plagioclase microphenocrysts in a light gray feldspathic groundmass.
1170	100						PAHOEHOE, with <1% olivine-plagioclase intergrowths and plagioclase microphenocrysts in a light gray feldspathic groundmass. 2) A.a. <1% plagioclase blades and laths in a light gray feldspathic groundmass. 3) Pahoe-hoe rubble, highly vesicular. 4) Pahoe-hoe, <1% plagioclase rhombs, blades and laths, and <1% olivine plagioclase intergrowths in a light gray feldspathic groundmass.
1180	101						PAHOEHOE, with <1% plagioclase rhombs, blades and laths, olivine-plagioclase intergrowths, and <1% olivine in a light gray feldspathic groundmass. 2) A.a. with 3% plagioclase rhombs, blades and laths in a light gray feldspathic groundmass.
1190	102						AA, 3% plagioclase rhombs, blades and laths in a light gray feldspathic groundmass. 2) Pahoe-hoe, 3% plagioclase rhombs, blades and laths, <1% olivine plagioclase intergrowths in a light gray feldspathic groundmass.
1200	103						PAHOEHOE, <1% plagioclase rhombs, blades and laths, <1% olivine plagioclase intergrowths in a light gray feldspathic groundmass.

# CATALOG OF SOH 4 CORE

Depth Feet	BOX	70	Temp (C)	140	210	280	Sm-Ct	Zeol	Fe-S	Cal	Am/Gy	Am-Si	Y/Qtz	Cpt	ROD	Lithology	Descriptions
1200	103																AA, 2) 7% plagioclase rhombs, blades and laths, 1% olivine in a light gray feldspathic groundmass.
1210	103A																PAHOEHOE, Units 1 and 2) 3% olivine-plagioclase intergrowths and 2% plagioclase as blades, laths all in a light gray feldspathic groundmass. 3) Pahoehoe, with 2% olivine-plagioclase intergrowths, 2% plagioclase as laths, microphenocrysts in a light gray feldspathic groundmass.
1220	104																PAHOEHOE, rubble, <1% plagioclase laths and blades in a light gray feldspathic groundmass.
1230	105																PAHOEHOE, <1% plagioclase laths and blades in a light gray feldspathic groundmass. 2) A.a, 3% plagioclase blebs, laths and blades, and <1% olivine-plagioclase intergrowths in a light gray feldspathic groundmass.
1240	106																PAHOEHOE, with 7% olivine phenocrysts, microphenocrysts light green in color all in a light gray diktytaxitic groundmass. 2) Pahoehoe unit and rubble with 10% olivine as phenocrysts, microphenocrysts in a light gray diktytaxitic groundmass. 3) Pahoehoe unit with 10% olivine mostly as microphenocrysts some phenocrysts, in a light gray diktytaxitic, groundmass.
1250	107																PAHOEHOE, with 8% olivine as phenocrysts, microphenocrysts in a light gray diktytaxitic groundmass. Units 2 & 3) Pahoehoe, with 15% olivine, mostly as microphenocrysts and phenocrysts in a feldspathic groundmass.
1260	108																PAHOEHOE, with 5% olivine as phenocrysts, microphenocrysts (some altered) in a light gray diktytaxitic groundmass. 2) Pahoehoe with 7% olivine as phenocrysts, microphenocrysts in a charcoal gray groundmass. 3) Pahoehoe, with 1% olivine phenocrysts and 2% plagioclase as rhombs, laths and blades in a charcoal gray groundmass.
1270																	
1280	109																AA, <1% plagioclase blebs in a light gray feldspathic groundmass. 2) Pahoehoe, <<1% plagioclase blebs in a light gray feldspathic groundmass.
1290	110																PAHOEHOE, <<1% plagioclase blebs in a light gray feldspathic groundmass.
1300	111																PAHOEHOE, 10% plagioclase rhombs, blades and laths, <1% olivine in a light gray feldspathic groundmass.

# CATALOG OF SOH 4 CORE

Depth Feet	BOX	Temp (C) 70 140 210 280	Sm-Ct Zeol	Fe-S Cal	Am/Gy An/Si	Al/Orz Epi	ROD	Lithology	Descriptions
1300	111								Ash, altered, yellow brown in color. PAHOEHOE, 10% plagioclase rhombs, blades and laths, olivine, and olivine-plagioclase intergrowths in a light gray Feldspathic groundmass.
1310	112								PAHOEHOE, with 4% plagioclase as phenocrysts, microphenocrysts and <1% olivine-plagioclase intergrowths in a gray groundmass. 2) Transitional, 10% plagioclase as phenocrysts, microphenocrysts and <1% olivine-plagioclase intergrowths. 3) Pahoehoe, 2% olivine-plagioclase intergrowths, 8% plagioclase blades, microphenocrysts and Rhombs all in a light gray Feldspathic groundmass. 4) Scoriaeous Pahoehoe with 2% olivine-plagioclase intergrowths and 7% plagioclase in a dark gray groundmass. 5) Pahoehoe, with 25% olivine phenocrysts in a light gray Feldspathic groundmass.
1320	113								PAHOEHOE, picrite, 15% olivine, olivine-plagioclase intergrowths, plagioclase blebs in a light gray Feldspathic groundmass. 2) Pahoehoe, <1% plagioclase blebs in a light gray Feldspathic groundmass.
1330	114								PAHOEHOE with <<1% plagioclase blebs in a light gray Feldspathic groundmass. 2) Pahoehoe, 15% plagioclase blebs and microphenocrysts, 1-5% olivine, and olivine-plagioclase intergrowths in a light gray Feldspathic groundmass. 3) Dike, <1% plagioclase microphenocrysts in a dark gray basalt.
1340	115								PAHOEHOE, Units 1 & 2) picritic, 15% plagioclase microphenocrysts, 10% olivine and olivine-plagioclase intergrowths in a light gray Feldspathic groundmass. 3) Pahoehoe rubble, with gritty soil, 1-5% plagioclase microphenocrysts and olivine microphenocrysts (altered) in a pinkish gray Feldspathic groundmass.
1350	116								PAHOEHOE, 15% plagioclase rhombs, blades and laths, 1-5% olivine and olivine-plagioclase intergrowths in a pinkish gray Feldspathic groundmass. 2) Pahoehoe, 10% plagioclase rhombs, blades and laths, 1-5% olivine and olivine-plagioclase intergrowths in a light gray Feldspathic groundmass.
1360	117								PAHOEHOE, 15% olivine-phenocrysts and microphenocrysts, 10% plagioclase blades, microphenocrysts, <1% gabbroic inclusions in Feldspathic groundmass. 2) Pahoehoe, <1% olivine phenocrysts in a gray groundmass. 3) Dike, <1% olivine phenocrysts and microphenocrysts in dark gray groundmass. 4) Pahoehoe with <<1% plagioclase rhombs and blades in a Feldspathic groundmass.
1370									
1380	118								PAHOEHOE, Units 1 & 2) <<1% plagioclase rhombs, blades and laths and <1% olivine-plagioclase intergrowths in a light gray Feldspathic groundmass. Units 3 & 4) Pahoehoe, 10% plagioclase and olivine-plagioclase microphenocrysts in a light gray Feldspathic groundmass.
1390	119								PAHOEHOE, with 4% olivine as microphenocrysts and 2% plagioclase as microphenocrysts in a dark gray Feldspathic groundmass. 2) Pahoehoe with 2% olivine as microphenocrysts and <1% plagioclase as microphenocrysts in a diktytaxitic light gray groundmass.
1400	120								PAHOEHOE, 3% plagioclase microphenocrysts and olivine-plagioclase microphenocrysts in a light gray Feldspathic groundmass laths

# CATALOG OF SOH 4 CORE

Depth	Feet	Box	Temp (C)	70	140	210	280	SO <sub>4</sub> -Cl	FeO	Ca	Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	ROD	Lithology	Descriptions
	1400	120													PAHOEHOE, 3) rubble, 3% plagioclase phenocrysts and olivine-plagioclase phenocrysts in a light gray feldspathic groundmass, <1% plagioclase blades and laths.
	1410	121													PAHOEHOE, with 5% olivine as microphenocrysts, occasional phenocrysts in a light gray feldspathic groundmass. 2) Pahoehoe, with 7-10% olivine as microphenocrysts and rare phenocrysts in a feldspathic light gray groundmass.
	1420	122													PAHOEHOE, 3% plagioclase and olivine-plagioclase phenocrysts, <1% olivine (altered) in a light gray feldspathic groundmass. 2) Pahoehoe, 3% plagioclase and olivine-plagioclase phenocrysts in a light gray feldspathic groundmass.
	1430	123													PAHOEHOE with 10% olivine microphenocrysts and phenocrysts in a gray feldspathic groundmass. 2) Pahoehoe, 15% olivine phenocrysts and phenocrysts in a gray feldspathic groundmass.
	1440	124													PAHOEHOE, <1% plagioclase blebs and olivine (altered) in a light gray feldspathic groundmass. 2) Pahoehoe, <1% plagioclase blebs in a light gray feldspathic groundmass. 3) Pahoehoe, <1% plagioclase blebs and olivine in a light gray feldspathic groundmass. 4) Pahoehoe, <1% plagioclase blebs and olivine-plagioclase intergrowths in a light gray feldspathic groundmass.
	1450	125													PAHOEHOE with <1% plagioclase blebs and sparse olivine-plagioclase intergrowths in a light gray feldspathic groundmass. 2) Pahoehoe, <1% plagioclase blebs and occasional gabbroic inclusions in a light gray feldspathic groundmass.
	1460	126													PAHOEHOE: <1% olivine as phenocrysts and phenocrysts in a dark blue diktytaxitic groundmass. 2) Pahoehoe with <1% olivine phenocrysts and phenocrysts and <1% plagioclase as phenocrysts in a diktytaxitic light gray groundmass.
	1470	127													TRANSITIONAL, <1% plagioclase blebs and gabbroic inclusions in a light gray feldspathic groundmass. 2) Pahoehoe, <1% plagioclase blebs, olivine (altered) in a light gray feldspathic groundmass. *****6 Ft. OF CORE LOST HERE IN UNIT 2*****
	1480														
	1490	128													PAHOEHOE, and rubble, 1% olivine as phenocrysts, phenocrysts, plagioclase at 4% as phenocrysts and olivine-plagioclase intergrowths all in a gray groundmass. 2) Transitional, with 5% olivine as rhombs, phenocrysts in a light gray diktytaxitic groundmass. 3) Pahoehoe, with 6% olivine as mostly phenocrysts and phenocrysts all in a light gray diktytaxitic groundmass.
	1500	129													PAHOEHOE, with 10% olivine phenocrysts and phenocrysts, plagioclase is found at <1% as phenocrysts and rubble in a light gray feldspathic groundmass.

## CATALOG OF SOH 4 CORE

Depth	Feet	BOX	Temp (C)	70	140	210	280	Si-Ci	Zeol	Le-S	Cal	Mg-Si	Al-Si	X/Qtz	Ep	ROD	Lithology	Descriptions
1500																		PAHOEHOE, and rubble with 7% olivine phenocrysts, microphenocrysts with <1% plagioclase microphenocrysts all in a light gray diktytaxitic groundmass.
1510	129																	PAHOEHOE, Units 1 & 3) with 5% olivine phenocrysts and microphenocrysts in a light gray feldspathic groundmass. 2) Pahoehe, oxidized, aphanitic, gray-green feldspathic groundmass.
1520	130																	PAHOEHOE, rubble with <1% plagioclase blebs in a light gray feldspathic groundmass. 2) Oike, 3% plagioclase laths, olivine-plagioclase intergrowths, and gabbroic inclusions in a dark gray basalt.
1530	131																	DIKE, with 3% olivine as phenocrysts, microphenocrysts; and plagioclase at 3% as phenocrysts, microphenocrysts and laths in a steel blue groundmass. Gabbros are commonly found. 2) Transitional, with 2% olivine as phenocrysts, microphenocrysts in a gray groundmass. This unit is mostly rubble.
1540	132																	TRANSITIONAL, <1% plagioclase blebs and 2% olivine (altered), olivine-plagioclase in a light gray feldspathic groundmass. 2) Pahoehe, 1% plagioclase blebs in a light gray feldspathic groundmass.
1550	133																	PAHOEHOE, scoriaceous, 3% olivine phenocrysts, microphenocrysts, olivine-plagioclase intergrowths, plagioclase laths and microphenocrysts and gabbroic inclusions (all totaling <5%), in a feldspathic dark gray groundmass.
1560	134																	PAHOEHOE with 15% plagioclase blebs, olivine-plagioclase intergrowths in a light gray feldspathic groundmass. 2) Breccia, angular, and vesicular clasts 5% plagioclase blebs in a groundmass of red and gray ash. 3) Transitional, 2% plagioclase blebs, blades and laths, and olivine-plagioclase intergrowths in a light gray feldspathic groundmass.
1570	135																	TRANSITIONAL, <1% plagioclase blebs, olivine-plagioclase intergrowths in a light gray feldspathic groundmass. 2) Pahoehe, 10% plagioclase blebs and olivine-plagioclase intergrowths in a light gray feldspathic groundmass.
1580	136																	PAHOEHOE, 10% plagioclase blades and laths and 5% olivine-plagioclase intergrowths in a light gray feldspathic groundmass. 2) Breccia, angular, vesicular clasts with 10% plagioclase blades, in a red and gray altered Ash-like matrix. 3) Pahoehe, 5% plagioclase blades, blades and laths in a light gray diktytaxitic groundmass.
1590	137																	AA, 1-5% olivine microphenocrysts, 10% plagioclase laths and microphenocrysts in a diktytaxitic gray groundmass. 2) Pahoehe, 1% olivine phenocrysts and microphenocrysts in a dark gray feldspathic groundmass. 3) Pahoehe, fractured with <1% olivine microphenocrysts and <1% plagioclase laths and microphenocrysts in a gray feldspathic groundmass.
1600	138																	PAHOEHOE, see next page for description.
	139																	

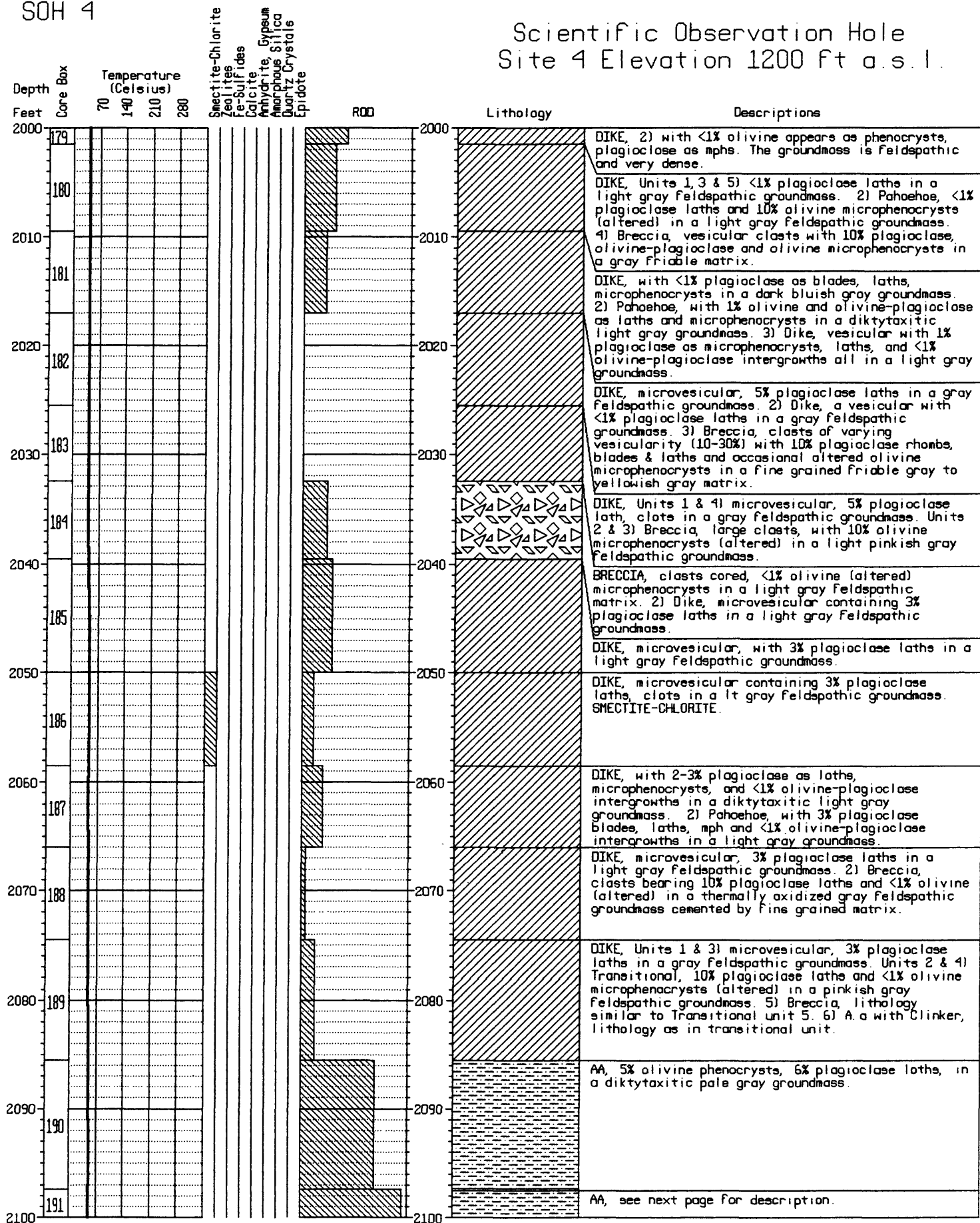
CATALOG OF SOH 4 CORE															
Depth	BOX	Temp (C)				Sn-Cu	Feol	Caol	Am/Gy	Am/Si	X/Dtz	Lpi	ROD	Lithology	Descriptions
Feet		70	140	210	280										
1600															
139															Pahoehoe, <<1% plagioclase blebs in a light gray feldspathic groundmass. BRECCIA, 2) with vesicular clasts containing <1% plagioclase laths, in a gray highly altered ash-like matrix. 3) Pahoehoe, <1% plagioclase phenocrysts in a light gray diktytaxitic groundmass.
1610	140														PAHOEHOE, 1% olivine phenocrysts (altered), in a diktytaxitic gray groundmass. 2) Pahoehoe, 1% olivine phenocrysts (altered), in a gray groundmass.
1620	141														PAHOEHOE, 15% plagioclase and olivine-plagioclase phenocrysts in a light gray feldspathic groundmass. 2) Breccia, clasts with 10% plagioclase laths in a gray highly altered ash-like matrix. Units 3, 4 and 5) Pahoehoe, 15% plagioclase and olivine-plagioclase phenocrysts in a light gray diktytaxitic groundmass.
1630	142														AA, and clinker, with 7-10% olivine as phenocrysts, microphenocrysts in a feldspathic groundmass.
1640	143														AA, with 7% olivine as phenocrysts, microphenocrysts in a diktytaxitic light gray groundmass. 2) Transitional with 7% olivine as phenocrysts, microphenocrysts in a bluish gray feldspathic groundmass. 3) Pahoehoe rubble with 10% olivine as phenocrysts in a light gray feldspathic groundmass. *****3 FT. OF CORE LOST HERE*****
1650	144														PAHOEHOE, rubble with 7% plagioclase laths in a light feldspathic groundmass.
1660	145														PAHOEHOE, rubble with <1% olivine phenocrysts in a gray groundmass. 2) Pahoehoe, competent, with <1% olivine, phenocrysts in gray groundmass.
1670	146														PAHOEHOE, with, 1% plagioclase blebs and, 1% olivine (altered) in a light gray diktytaxitic groundmass. 2) Pahoehoe, 7% plagioclase phenocrysts in a reddish gray feldspathic groundmass.
1680	147														PAHOEHOE, with 5-7% olivine as phenocrysts, microphenocrysts in a light gray diktytaxitic groundmass. Units 2 & 5) Pahoehoe with 3% olivine as microphenocrysts, rare phenocrysts in a light gray groundmass. Unit 2 is scoriaceous, Unit 5 is diktytaxitic. Units 3 & 4) Scoriaceous Pahoehoe with 5% olivine as phenocrysts, microphenocrysts in a light gray feldspathic groundmass.
1690	148														PAHOEHOE, with 3% olivine phenocrysts and microphenocrysts in a light gray diktytaxitic groundmass. 2) Pahoehoe unit with 5% olivine as phenocrysts and microphenocrysts in a light gray diktytaxitic groundmass.
1700	149														PAHOEHOE, with 7% olivine as phenocrysts, phenocrysts in a diktytaxitic groundmass, light gray in color.

CATALOG OF SOH 4 CORE																
Depth	BOX	Temp (C)				Sn-Cr	Zn-S	Ca/S	Al/Si	Fe/Si	Mg/Si	X/Si	Epi	ROD	Lithology	Descriptions
Feet		70	140	210	280											
1700	149															PAHOEHOE, 2) with 5-7% olivine as phenocrysts, microphenocrysts in a light gray diktytaxitic groundmass.
1710	150															PAHOEHOE with 7% olivine as microphenocrysts in a light bluish gray diktytaxitic groundmass. 2) Dike with 3% plagioclase as blades/laths and microphenocrysts and olivine is present at <1% as phenocrysts in a feldspathic groundmass.
1720	151															DIKE, with <1% plagioclase lath and blades, rhombs in a microvesicular light gray groundmass.
1730	152															DIKE, with <1% plagioclase rhombs, laths and blades in a microvesicular light gray groundmass. 2) Pahoehoe, 5% plagioclase rhombs, laths and blades and 5% olivine, and olivine-plagioclase intergrowths in a light gray feldspathic groundmass. *****2 FT OF CORE LOST HERE*****
1740	153															PAHOEHOE, with 7% olivine as phenocrysts, microphenocrysts and olivine-plagioclase intergrowths, 3% plagioclase as blades, laths and microphenocrysts; the groundmass is diktytaxitic and light gray. 2) Pahoehoe with 10% olivine as phenocrysts, microphenocrysts and plagioclase-olivine intergrowths; 2-3% plagioclase as blades, laths, and microphenocrysts in a feldspathic light gray groundmass.
1750	154															PAHOEHOE, units 1 & 3) with 5% plagioclase blebs and olivine-plagioclase microphenocrysts in a reddish gray oxidized feldspathic groundmass. 2) Pahoehoe, 5% plagioclase rhombs, blades and laths and 5% olivine-plagioclase intergrowths in a light gray feldspathic groundmass.
1760	155															PAHOEHOE, rubble with 12% olivine phenocrysts, microphenocrysts in a bluish gray groundmass. 2) Pahoehoe with 7-10% olivine phenocrysts, microphenocrysts in diktytaxitic light gray groundmass; plagioclase is found at 1% in the form of Rhombs and microlaths. 3) Pahoehoe with 10% olivine as microphenocrysts in a dark. Thermally oxidized groundmass.
1770	156															PAHOEHOE, 1-5% plagioclase rhombs, blades and laths, olivine-plagioclase intergrowths, 3% olivine microphenocrysts in a light gray feldspathic groundmass. 2) Ash, thin unit 5 cm thick, red. 3) Pahoehoe, 1-5% plagioclase rhombs, blades and laths, olivine-plagioclase intergrowths, 3% olivine microphenocrysts in a light gray diktytaxitic groundmass.
1780	157															AA, and clinker vesicular with 5-7% olivine as microphenocrysts and occasional phenocrysts in a light gray diktytaxitic groundmass.
1790	158															AA, 3% olivine phenocrysts and microphenocrysts, in a light gray diktytaxitic groundmass.
1800	159															AA, 1-5% plagioclase laths, olivine and olivine-plagioclase intergrowths in a light gray diktytaxitic groundmass. 2) Ash, containing 20% olivine and olivine-plagioclase clots.

# CATALOG OF SOH 4 CORE

CATALOG OF SOH 4 CORE																		
Depth	Feet	BOX	Temp (C)	70	140	210	280	So-CI	Zeol	Fe-S	Cal	Am/Gy	Am/Si	X/Otz	Epi	ROD	Lithology	Descriptions
1900	168																TRANSITIONAL, 1-5% plagioclase, olivine-plagioclase microphenocrysts, rare large plagioclase rhombs and laths in a light gray diktytaxitic groundmass.	
1910	169																TRANSITIONAL, 10% plagioclase and olivine-plagioclase microphenocrysts in a light gray diktytaxitic groundmass. 2) Ash, with thermally oxidized, vesicular clasts. 3) Pahoehoe, 10% plagioclase and olivine-plagioclase clots in a light gray diktytaxitic groundmass. 4) Dike, dark gray microvesicular, with 1-5% plagioclase laths.	
1920	170																DIKE, with 7% plagioclase laths and microphenocrysts, all in a gray, microvesicular diktytaxitic groundmass.	
1930	171																AA, with 3% plagioclase microphenocrysts and laths and <1% olivine microphenocrysts in a feldspathic groundmass. 2) Dike, <1% olivine microphenocrysts and 5% plagioclase laths and microphenocrysts in a dark gray groundmass.	
1940	172																DIKE, 5% plagioclase laths in a microvesicular diktytaxitic light gray groundmass.	
1950	173																DIKE, 5% plagioclase laths in a microvesicular diktytaxitic light gray groundmass.	
1960	174																DIKE, 5% plagioclase laths in a microvesicular diktytaxitic light gray groundmass.	
1970	175																DIKE, 5% plagioclase laths in a microvesicular diktytaxitic light gray groundmass.	
1980	176																PAHOEHOE with 5% olivine as phenocrysts, microphenocrysts in gray diktytaxitic groundmass, rare plagioclase. 2) Dike, with 5% plagioclase as fibrous clots and <1% olivine in a microvesicular steel blue colored groundmass. 3) Pahoehoe, with 15% olivine as microphenocrysts, phenocrysts, <1% plagioclase as phenocrysts equant in form, groundmass is light gray diktytaxitic.	
1990	177																PAHOEHOE, 10% olivine phenocrysts and microphenocrysts (altered) and 10% plagioclase laths, microphenocrysts in gray groundmass. 2) Pahoehoe, 25% olivine phenocrysts and microphenocrysts (altered), 7% plagioclase laths in a gray groundmass. 3) Scoria Fall deposit, altered, oxidized to red and purple clays. 4) Pahoehoe, 10% olivine phenocrysts and microphenocrysts, 3% plagioclase laths in gray groundmass.	
	178																PAHOEHOE, 7% plagioclase blades, laths and microphenocrysts and 3% olivine microphenocrysts, in a light gray diktytaxitic groundmass. Rare microgabbros. 2) Breccia, clasts same lithology as above, in a friable fine grained matrix. Unit may be made up of more than 1 flow, compaction by lithostatic loading makes for complications.	
2000	179																PAHOEHOE, with 10% olivine as microphenocrysts, phenocrysts, microgabbros. The groundmass is light gray diktytaxitic.	

# Scientific Observation Hole Site 4 Elevation 1200 Ft a.s.l.



CATALOG OF SOH 4 CORE																
Depth	BOX	Temp (C)				Si-Ci	Zeol	Fe-S	Ca	Al/Si	Am/Si	X/Otz	Epi	ROD	Lithology	Descriptions
Feet		70	140	210	280											
2100																
191																A a, dense (<1% vesicles), with 4% olivine as microphenocrysts and rare phenocrysts and 1% plagioclase as blades, laths and microphenocrysts in a light gray diktytaxitic groundmass. DIKE, 2) vesicular, with 4% olivine as microphenocrysts and rare phenocrysts, and 1% plagioclase as microphenocrysts and laths in a gray groundmass.
2110																DIKE, Units 1 & 3) vesicular 35%, 4% olivine phenocrysts and 1% plagioclase laths in a red and gray groundmass. Units 2 & 4) A a, 7% olivine phenocrysts and microphenocrysts, 20% plagioclase laths in a thermally oxidized diktytaxitic groundmass.
193																AA, with 10% plagioclase as rhombs, bladed phenocrysts and microlaths. Olivine at <1% as phenocrysts, microphenocrysts, groundmass is Feldspathic and thermally oxidized. 2) Ash, soil here, thin. 3) Pahoehe, 1-2% plagioclase as blades, laths, <1% olivine as microphenocrysts in a light gray diktytaxitic groundmass.
194																PAHOEHOE, <1% olivine, 5% plagioclase laths, in a gray-pink groundmass thermally altered; highly Fractured. 2) Dike, 35% vesicularity, 4% olivine, <1% plagioclase in a gray groundmass.
2130																PAHOEHOE, Units 1 & 3) with 5% olivine as microphenocrysts, rare phenocrysts in a diktytaxitic groundmass light gray in color. 2) Dike, vesicular with 3% olivine as microphenocrysts, rare phenocrysts in a feldspathic groundmass.
195																
2140																PAHOEHOE, with 7-10% olivine as microphenocrysts, phenocrysts all in a diktytaxitic light gray groundmass. Crystal setting apparent. 2) Dike, vesicular with 5% olivine as microphenocrysts in a light gray diktytaxitic groundmass.
196																
2150																DIKE, vesicular with 5-7% olivine as microphenocrysts and rare phenocrysts in a diktytaxitic groundmass.
197																
2160																DIKE, microvesicular, <1% olivine and olivine-plagioclase intergrowths (altered) in a light gray diktytaxitic groundmass.
198																
2170																DIKE, Units 1 & 2) microvesicular, 5% olivine and olivine-plagioclase intergrowths (altered) in a light gray diktytaxitic groundmass. Lower 50% of unit consists of rubble and gray clay. SNECTITE-CHLORITE.
199																
2180																DIKE, vesicular(15%), with 5% plagioclase and olivine-plagioclase intergrowths (altered) in a light gray diktytaxitic groundmass. 2) Dike, microvesicular, 1-3% plagioclase rhombs, blades and laths in a gray Feldspathic groundmass.
200																
2190																DIKE, microvesicular, 1-7% plagioclase rhombs, blades and laths in a gray Feldspathic groundmass; plagioclase pheno % increases from 1% at top of box to 5-7% at bottom.
201																
2190																
202																DIKE, microvesicular, 1-3% plagioclase rhombs, blades and laths in a gray Feldspathic groundmass. Description for unit below is the same as here.
2200																

# CATALOG OF SOH 4 CORE

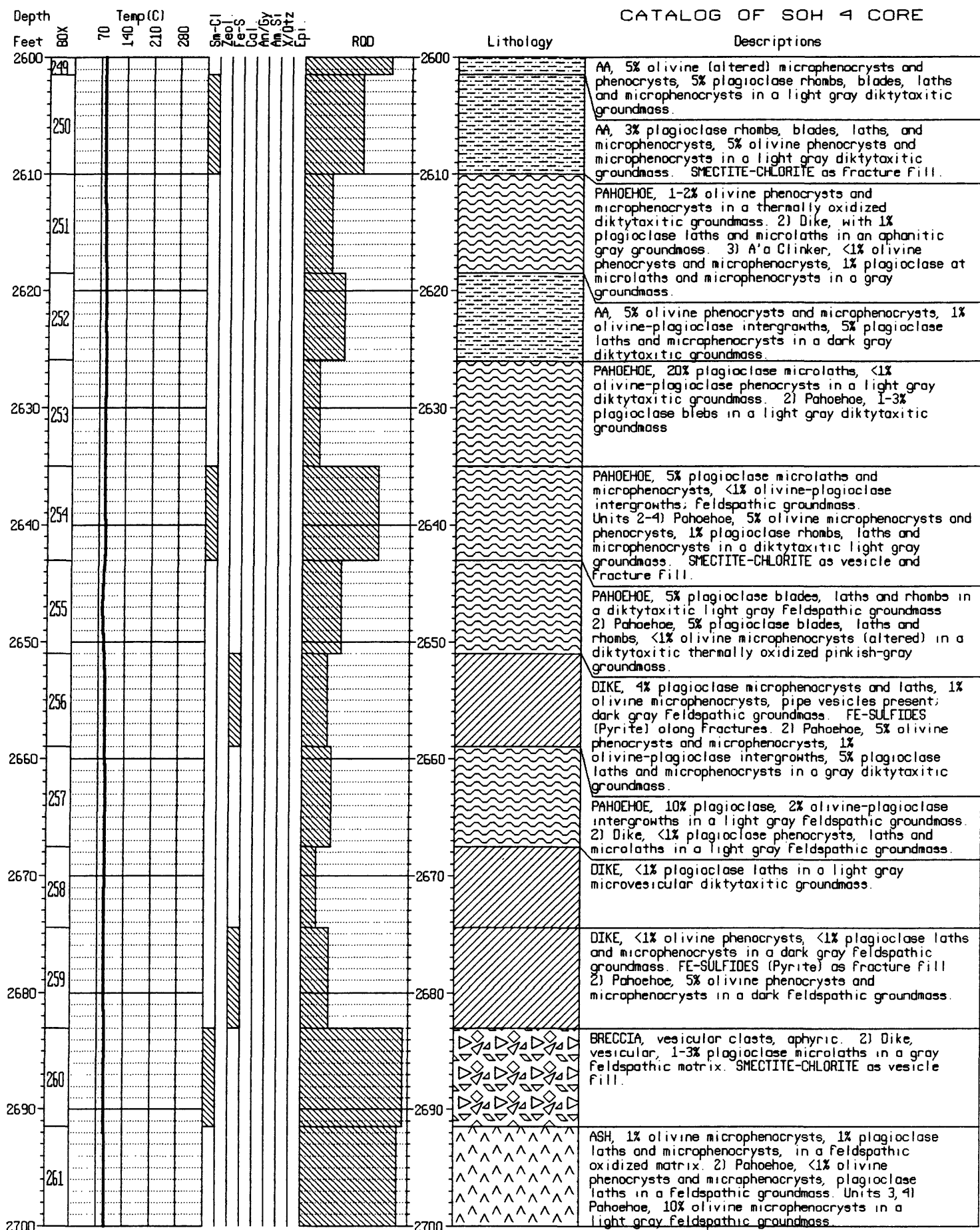
Depth Feet	BOX	Temp (C) 70 140 210 280	Sm-Ct Znol Fe-S Cal An/Sy Am/Si X/Dtz Cpi	ROD	Lithology	Descriptions
2200						AA, 2) <1% plagioclase microphenocrysts in a light pinkish gray feldspathic groundmass.
2203						
2210	204					AA, <1% plagioclase microphenocrysts in a light gray diktytaxitic groundmass.
2215						
2220	205					AA, <1% plagioclase microphenocrysts in a light gray diktytaxitic groundmass. 2) Pahoe-hoe, 5% plagioclase blebs in a light pinkish gray Feldspathic groundmass.
2225						
2230	206					PAHOEHOE, 7% plagioclase laths in a pink thermally oxidized groundmass. Units 2 & 4) Breccia, with clasts of pahoe-hoe in an indurated red or black ash matrix. 3) Pahoe-hoe 10% plagioclase laths. FE-SULFIDE (Pyrite) are common along all fractures.
2235						
2240	207					PAHOEHOE, <1% olivine (altered), 5% plagioclase laths, highly fractured and rubbly, FE-SULFIDE (Pyrite) coating 40% of Fractures planes in a pink-gray groundmass. *****3 FT OF CORE LOST*****
2245						
2250	208					BRECCIA, clasts <1% alivine phenocrysts (altered) in a dark, medium to fine grained, thermally oxidized, indurated matrix. 2) DiKE, aphyric dark gray Feldspathic basalt.
2255						
2260	209					BRECCIA, clasts with <1% plagioclase blebs in a dark, medium to fine grained reddish black, indurated matrix. 2) DiKE, microvesicular with 1-3% plagioclase clots in a light gray diktytaxitic groundmass, occasional pipe vesicles, lower 35% of this unit is brecciated.
2265						
2270	210					DIKE, aphyric, in a blue gray groundmass. 2) Pahoe-hoe <1% olivine phenocrysts, 10% plagioclase laths and in a diktytaxitic, sugary gray groundmass; FE-SULFIDE (Pyrite) crystals in vesicles and on Fractures. 3) DiKE same as Unit 1.
2275						
2280	211					DIKE, vesicularity increasing downward from 0% at top of box, to 5% at bottom with 1-3% plagioclase clots and <1% olivine-plagioclase intergrowths and rare microgabbros in a light gray diktytaxitic groundmass.
2285						
2290	212					DIKE, <1% plagioclase laths in a light gray diktytaxitic groundmass. AMORPHOUS SILICA, SMECTITE-CHLORITE.
2295						
2300	213					DIKE, 20% plagioclase laths, <1% olivine in a diktytaxitic gray groundmass; fractures common, encrusted with GYPSUM (ANHYDRITE), FE-SULFIDES (Pyrite) crystals.
2305						
2310	214					DIKE, 3% plagioclase lath clots and <<1% olivine-plagioclase intergrowths in a light gray diktytaxitic groundmass.
2315						
2320						
2325						
2330						
2335						
2340						
2345						
2350						
2355						
2360						
2365						
2370						
2375						
2380						
2385						
2390						
2395						
2400						

Depth	Temp (C)	Sm-Cl
Feet	70	Znol
80X	140	Fe-S
	210	Cal
	280	An/Gy
		Am Si
		X/Qtz
		Epi

30

CATALOG OF SOH 4 CORE																
Depth	BOX	70	Temp (C)	210	280	Sm-CI	Zeol	Fe-S	Cal	Am/Gy	Am/Si	X/Dtz	Epi	ROD	Lithology	Descriptions
Feet																
2400	226														2400	BRECCIA, 7% plagioclase rhombs, blades and laths, 7% olivine-plagioclase intergrowths (altered) and microgabbros in a light gray feldspathic groundmass cemented by a dark gray friable matrix.
	227														2410	PAHOEHOE, 7% plagioclase rhombs, blades & laths, 7% olivine-plagioclase intergrowths (altered) and <1% microgabbros in a light gray feldspathic groundmass
2410															2410	2) DIKE, aphyric, light gray diktytaxitic basalt becoming vesicular last 10% of box.
	228														2420	DIKE, aphyric, light gray diktytaxitic basalt, with 20% vesicularity. 2) Transitional, aphyric, diktytaxitic basalt thermally oxidized to light pinkish gray; SMECTITE-CHLORITE filling fractures.
2420															2420	TRANSITIONAL, aphyric, diktytaxitic basalt. 2) DIKE, 10% plagioclase rhombs, blades and laths, 7% olivine (altered), olivine-plagioclase intergrowths in a gray feldspathic groundmass. Small vesicles in DIKE Filled with SMECTITE-CHLORITE.
	229														2430	DIKE, 10% olivine phenocrysts (altered), 20% plagioclase rhombs, laths and microphenocrysts (altered) in a diktytaxitic groundmass; SMECTITE-CHLORITE vesicle fill.
2430															2430	
	230														2440	DIKE, 15% plagioclase & olivine (altered) microphenocrysts in a sugary diktytaxitic groundmass. 2) Breccia, vesicular (20%) clasts with plagioclase. 3) A.a, 5% plagioclase rhombs, blades & laths in a thermally oxidized pinkish gray diktytaxitic groundmass, 50% of vesicles filled with orange SMECTITE-CHLORITE.
2440															2440	
	231														2450	AA, 20% olivine (altered) phenocrysts and microphenocrysts, 5% plagioclase laths and microphenocrysts in a diktytaxitic dark gray groundmass. 2) Breccia, clasts with 20% vesicles, 5% olivine, 5% plagioclase in a fine grain black and red matrix. SMECTITE-CHLORITE and ANHYDRITE (GYPSUM) present.
2450															2450	
	232														2460	BRECCIA, vesicular clasts with 10% plagioclase laths in a friable gray-red SMECTITE-CHLORITE matrix. 2) A.a, 10% plagioclase laths with <1% olivine-plagioclase intergrowths in a feldspathic groundmass. 3) Breccia, 10% plagioclase laths and olivine-plagioclase intergrowths, 15% olivine (altered) in a SMECTITE-CHLORITE matrix.
2460															2460	4) Pahoehoe, 10% olivine and olivine-plagioclase phenocrysts (altered) in a gray feldspathic groundmass.
	233														2470	TRANSITIONAL, 25% olivine phenocrysts and microphenocrysts in a gray groundmass; large voids filled with ZEOLITES and ANHYDRITE (GYPSUM).
2470															2470	PAHOEHOE, 15% olivine (altered) and olivine-plagioclase phenocrysts, and plagioclase microphenocrysts in a light gray feldspathic groundmass. 2) Breccia, clasts 30% vesicular with 1-3% olivine-plagioclase phenocrysts in a friable, red to dark gray matrix. 3) A.a, clinker, 1-3% plagioclase and olivine-plagioclase microphenocrysts in a light gray feldspathic matrix.
	234														2480	AA, with 3% olivine as phenocrysts, microphenocrysts in a lt gray groundmass. SMECTITE-CHLORITE, light blue powder lining fractures and vesicles.
2480															2480	
	235														2490	AA, 1-3% large (1cm) olivine-plagioclase phenocrysts in a light gray diktytaxitic groundmass. 2) A'a, 5% olivine-plagioclase phenocrysts (altered) in a gray feldspathic groundmass. 3) Breccia, clasts 20% vesicular 4) A'a, 10% olivine-plagioclase (altered) in a light gray feldspathic groundmass
2490															2490	***For lowest unit description see next page.
	236														2500	
2500															2500	
	237															
2500																

CATALOG OF FOR 4 CORE															
Depth	BOX	Temp (C)										ROD	Lithology	Descriptions	
Feet	70	140	210	280	Si-Ci	Zeol	Fe-S	Cal	Am	Al	SiO <sub>2</sub>	Quartz	Epi		
2500															AA, vesicular, 5-7% olivine phenocrysts and microphenocrysts (altered) in a dull gray groundmass. SMECTITE-CHLORITE. A bluish gray mineral coats the vesicles and fractures.
2510															PAHOEHOE, 7% olivine phenocrysts and microphenocrysts, 3% plagioclase laths and microphenocrysts in a gray aphanitic groundmass. 2) Pahoehoe, <1% olivine and plagioclase in an aphanitic gray groundmass. 3) Pahoehoe, 5% olivine phenocrysts and microphenocrysts, 4% plagioclase in a gray aphanitic groundmass.
2520															AA, <1% plagioclase blebs in a light gray feldspathic groundmass.
2530															PAHOEHOE, 3-5% olivine as microphenocrysts and phenocrysts in a light gray diktytaxitic groundmass. Fractures coated with black SMECTITE-CHLORITE. 2) A. a. vesicular, 5-7% olivine phenocrysts and microphenocrysts (altered) in a light gray diktytaxitic groundmass. Bluish coating found on fractures and vesicles.
2540															AA, <1% plagioclase blebs and <1% olivine-plagioclase microphenocrysts in a light gray feldspathic groundmass. 2) Breccia, clasts 40% vesicles with slight thermal oxidation; medium grained, friable, red or black matrix.
2550															PAHOEHOE, All units! 3-5% olivine microphenocrysts, rare phenocrysts in a light gray groundmass. Where dense the groundmass is diktytaxitic. Blue secondary mineral coats 60% of the vesicles, SMECTITE-CHLORITE. Regions of high vesicularity >30% look to be aphyric.
2560															PAHOEHOE, 1-3% olivine microphenocrysts in a light gray diktytaxitic groundmass. Dark blue powder in vesicles, SMECTITE-CHLORITE. 2) Pahoehoe, 2% olivine microphenocrysts, aphanitic groundmass. 3) A. a., 1-3% olivine microphenocrysts in a light gray diktytaxitic groundmass.
2570															PAHOEHOE, 3% olivine in a gray diktytaxitic groundmass. 2) Pahoehoe, 15% olivine (altered) in a dark gray diktytaxitic groundmass. 3) Pahoehoe, 3% olivine phenocrysts and microphenocrysts in a dark gray groundmass. 4) Pahoehoe, <1% olivine in a diktytaxitic groundmass. Fracture fill SMECTITE-CHLORITE.
2580															PAHOEHOE, 1-4% olivine microphenocrysts in a light gray diktytaxitic groundmass. 2) Clinker, 3% plagioclase phenocrysts, blades and laths and 1% olivine phenocrysts and microphenocrysts in a oxidized groundmass. SMECTITE-CHLORITE.
2590															AA, 5% olivine phenocrysts and microphenocrysts, 5% plagioclase laths and microphenocrysts in a gray diktytaxitic groundmass.
2600															AA, 5% olivine (altered) microphenocrysts and phenocrysts, 5% plagioclase rhombs, blades, laths and microphenocrysts in a light gray diktytaxitic groundmass.



CATALOG OF SOH 4 CORE																	
Depth	BOX	70	Temp (C)	140	210	280	Sm-CI	Zeol	Fe-S	Cal	Am/Gy	Am/St	X/Dtz	Lpi	ROD	Lithology	Descriptions
Feet																	
2700																	
262																	PAHOEHOE, Scoria, clasts of varying vesicularity (0-40%) dense ones showing <1% plagioclase and olivine-plagioclase phenocrysts, 5% olivine (altered), groundmass is oxidized to light pinkish gray, 50% of vesicles filled with dark red or gray ashy material all cemented together by airfall agglomeration. 2) Pahoehoe, aphyric light gray feldspathic groundmass. SNECTITE-CHLORITE as vesicle and fracture fill.
2710																	PAHOEHOE, aphyric light gray feldspathic groundmass. 2) Breccia, vesicular clasts, 1-3% plagioclase microphenocrysts in a med. grained dark gray matrix. 3) Pahoehoe, <1% plagioclase microphenocrysts in a light gray feldspathic groundmass.
263																	
2720																	PAHOEHOE, <1% plagioclase microphenocrysts in a light gray diktytaxitic groundmass. 2) Breccia, vesicular clasts, 3% plagioclase laths in a dark reddish-gray friable matrix. 3) Pahoehoe, 1% plagioclase laths in a light gray feldspathic groundmass.
264																	
2730																	PAHOEHOE, 3% olivine phenocrysts and microphenocrysts in a dark gray diktytaxitic groundmass.
265																	
2740																	PAHOEHOE, 10% olivine phenocrysts and microphenocrysts in a light gray diktytaxitic groundmass. 2) Pahoehoe, 3-5% olivine microphenocrysts and phenocrysts in a light gray diktytaxitic groundmass.
266																	
2750																	PAHOEHOE, 1-3% plagioclase and olivine (altered) microphenocrysts in a light gray diktytaxitic feldspathic groundmass. 2) Breccia, clasts with plagioclase and olivine microphenocrysts in a dark red friable med. grained groundmass. 3) Pahoehoe, lithology as above.
267																	
2760																	PAHOEHOE, 4% olivine (altered) microphenocrysts in a feldspathic groundmass. 2) Pahoehoe, 2% olivine microphenocrysts in a light gray diktytaxitic groundmass. 3) Pahoehoe, 1% olivine microphenocrysts, <1% plagioclase microlaths in a feldspathic light gray groundmass. 4) Pahoehoe, 1% olivine microphenocrysts, <1% plagioclase microlaths in a light gray diktytaxitic groundmass.
268																	
2770																	PAHOEHOE, <1% olivine phenocrysts and microphenocrysts in a dark gray diktytaxitic groundmass.
269																	
2780																	PAHOEHOE, Units 1-3) 1% plagioclase and olivine (altered) microphenocrysts in a light gray diktytaxitic groundmass.
270																	
271A																	PAHOEHOE, Units 1-6) 1% plagioclase microlaths in a feld- spathic groundmass. 7) Pahoehoe, 15% olivine phenocrysts and microphenocrysts in a Snectite-Chlorite groundmass. SNECTITE-CHLORITE, CALCITE as vesicle and fracture fill.
2790																	PAHOEHOE, 30% olivine phenocrysts and microphenocrysts in a SNECTITE-CHLORITE groundmass. CALCITE as vesicle and void fill.
271																	
272																	PAHOEHOE, 7% plagioclase and olivine (altered) and 8% olivine-plagioclase phenocrysts in a light gray feldspathic groundmass. SNECTITE-CHLORITE with CALCITE filling vesicles.
2800																	

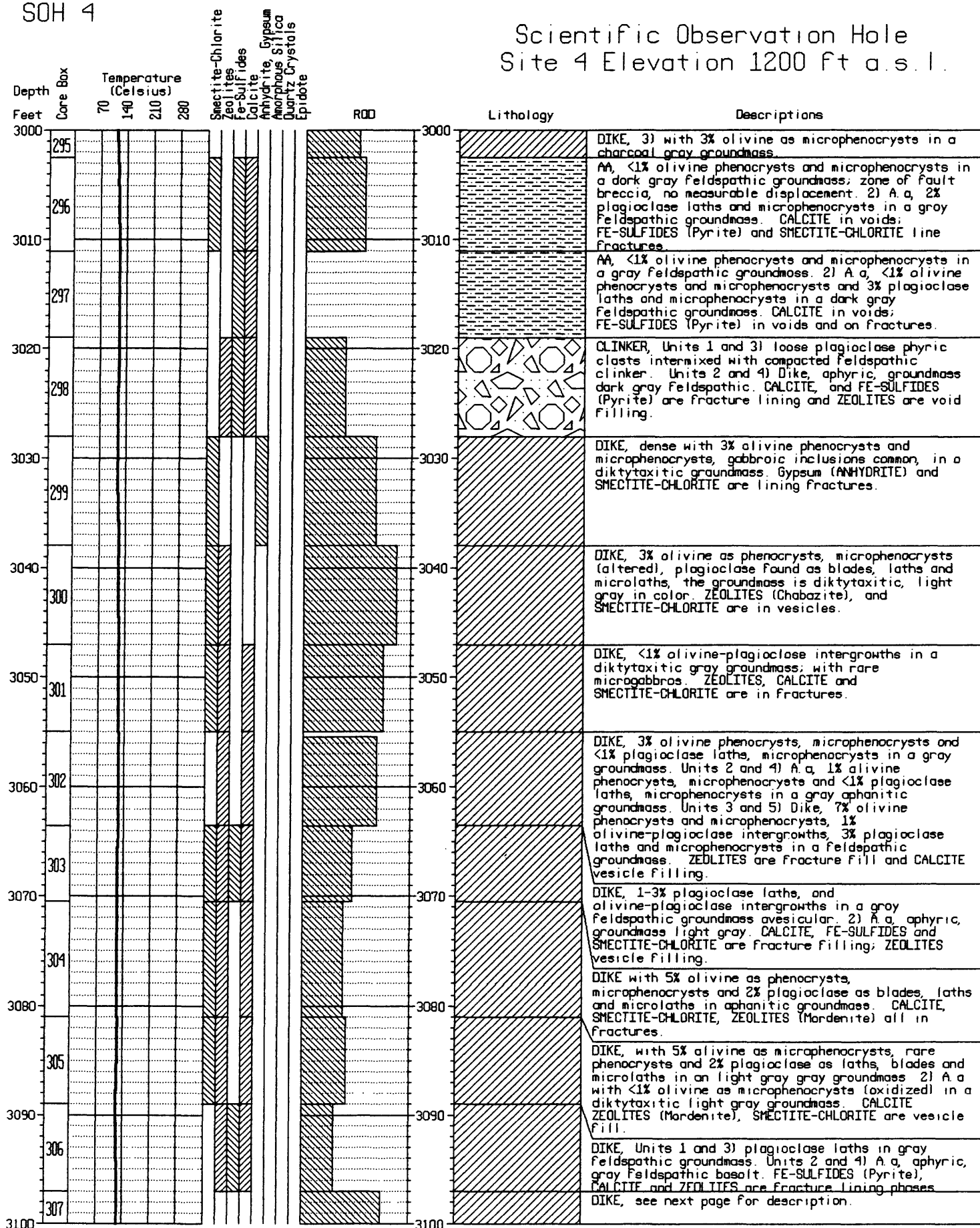
# CATALOG OF SOH 4 CORE

Depth Feet	BOX	70	Temp (C) 140 210 280	Sn-Ci Feo-S	Cal Am/Si	Y/Qtz Ep	ROD	Lithology	Descriptions
2800	272								PAHOEHOE, 2) aphyric, thermally oxidized pinkish-gray feldspathic groundmass.
2810	273								TRANSITIONAL, aphyric, diktytaxitic gray groundmass; SMECTITE-CHLORITE along Fractures.
2820	274								TRANSITIONAL, aphyric diktytaxitic gray groundmass.
2830	275								TRANSITIONAL, aphyric diktytaxitic gray groundmass.
2840	276								Transitional, 1% olivine phenocrysts and microphenocrysts in a diktytaxitic gray groundmass AA, 2) 5% plagioclase laths and microphenocrysts, 1% olivine phenocrysts and microphenocrysts in a gray aphanitic groundmass. 3) Aa, 3% olivine phenocrysts and microphenocrysts in a gray aphanitic groundmass.
2850	277								AA, <1% olivine (altered), 3% plagioclase blades, laths and microlaths with rare micro gabbroic clots in a diktytaxitic light gray groundmass. ZEOLITES and SMECTITE-CHLORITE in fractures and vesicles.
2860	278								BRECCIA, aphyric clasts thermally oxidized in a dark green indurated granular groundmass. 2) Pahoehe, aphyric, light gray groundmass. 3) Transitional, aphyric with a gray groundmass.
2870	279								CLINKER, <1% olivine (oxidized) microphenocrysts, in a light gray feldspathic groundmass. 2) Clinker, pieces both vesiculated and dense 1% plagioclase microlaths, in an fine grained oxidized matrix.
2880	280								CLINKER, 15% vesicular clasts, 1% plagioclase microlaths in an indurated dark gray or red fine grained matrix. 2) Aa, 1% plagioclase microlaths in a light gray feldspathic groundmass.
2890	281								AA, and Clinker, 1% plagioclase blades, laths and rare rhombs, 1% olivine (altered) in a light gray dense feldspathic groundmass. Clinker is thermally oxidized. ZEOLITES in vesicles; CALCITE, FE-SULFIDES (Pyrite) and SMECTITE-CHLORITE as Fracture fill.
2900	282								CLINKER 30% vesicular clasts, aphyric. 2) Aa, no visible phenocrysts, light gray feldspathic groundmass. CALCITE in fractures; ZEOLITES in Fractures and vesicles.
2900	283								AA, and Clinker, <1% olivine phenocrysts and microphenocrysts, 1% plagioclase microlaths and blades in a light gray feldspathic groundmass ZEOLITES in vesicles; CALCITE and FE-SULFIDES line Fractures.

# CATALOG OF SOH 4 CORE

Depth Feet	BOX	70 140 210 280	Temp (C)	Sn-Cl Zeo Fe-S Cal Am/Gy An/Si XQtz Epl.	ROD	Lithology	Descriptions
2900	283						CLINKER, <1% olivine phenocrysts and microphenocrysts, 1% plagioclase microlaths and blades in a light gray feldspathic groundmass. ZEOLITES-vesicle fill; CALCITE and FE-SULFIDES (Pyrite) are fracture fill.
2910	284						CLINKER and A'a core, 2% plagioclase laths and microlaths, 1% olivine phenocrysts and microphenocrysts (altered) in a diktytaxitic light gray groundmass. ZEOLITES and CALCITE are fracture fill.
2920	285						AA, <1% olivine as phenocrysts and microphenocrysts (altered), <1% plagioclase as blades, laths and microphenocrysts in a light gray diktytaxitic groundmass. ZEOLITES are vesicle fill; CALCITE is fracture fill.
2930	286						AA, olivine phenocrysts and microphenocrysts (altered), <1% plagioclase microphenocrysts in a light gray diktytaxitic groundmass.
2940	287						AA, olivine phenocrysts and microphenocrysts (altered), <1% plagioclase microphenocrysts, in a light gray diktytaxitic groundmass. 2) Clinker, vesicular aphyric clasts, thermally oxidized in a dark greenish-gray indurated groundmass. 3) Aa, 1-3% olivine-plagioclase hornblende micro gabbros and olivine-plagioclase phenocrysts and microphenocrysts (altered) in a light gray feldspathic groundmass. CALCITE and SMECTITE-CHLORITE as fracture fill. ZEOLITES as vesicle fill.
2950	288						AA, 1-3% olivine-plagioclase phenocrysts and microphenocrysts in a light gray feldspathic groundmass, micro gabbros common. 2) Clinker, vesicular clasts with 1-3% olivine and olivine-plagioclase microphenocrysts (altered). 3) Aa, 1-3% plagioclase microphenocrysts, <1% olivine-plagioclase microphenocrysts in a light gray diktytaxitic groundmass.
2960	289						A'a, 1-3% plagioclase microphenocrysts and rare olivine-plagioclase microphenocrysts in a light gray diktytaxitic groundmass. 2) CLINKER, with vesicular clasts aphyric, banded at regular 11 cm intervals by a 2-4 cm layer of gray friable ashy matrix. Unit turns to rubble 60% thru box.
2970	290						AA, Units 1, 3 and 5) <1% olivine microphenocrysts in a gray feldspathic groundmass. Units 2 and 4) Clinker, compacted, with vesicular clasts aphyric, groundmass feldspathic. FE-SULFIDES (Pyrite) and CALCITE as fracture fill; ZEOLITES as vesicle fill.
2980	291						AA, with 3% olivine (altered) as microphenocrysts in a light gray diktytaxitic groundmass. 2) A'a with <1% olivine as microphenocrysts in a lt gray and thermally oxidized groundmass. All the core is broken or fractured. CALCITE, FE-SULFIDES (Pyrite), SMECTITE-CHLORITE all are found in voids and fractures.
2990	292						AA, aphyric, light gray diktytaxitic groundmass. 2) Clinker, compacted, with vesicular aphyric clasts. CALCITE and FE-SULFIDES (Pyrite) are found in voids and fractures.
3000	293						Clinker, compacted. AA, 1-3% olivine as microphenocrysts (altered) in a light gray diktytaxitic groundmass with tiny vesicles. Plagioclase at <1% as microlaths. CALCITE in fractures, FE-SULFIDE (Pyrite) in fractures and vesicles.
	294						AA, microvesicular (<1mm), dense; Flow has <1% plagioclase laths, microlaths, rare olivine phenocrysts (altered) in a light gray feldspathic groundmass. CALCITE, FE-SULFIDES (Pyrite) SMECTITE-CHLORITE found in vesicles and fractures.
	295						AA, <1% plagioclase as blades, laths in a light gray groundmass. 2) Aa with <1% olivine as microphenocrysts, plagioclase as <1% blades and laths all in a feldspathic groundmass. FE-SULFIDES

# Scientific Observation Hole Site 4 Elevation 1200 Ft a.s.l.



# CATALOG OF SOH 4 CORE

Depth	Feet	BOX	70	Temp (C)	140	210	280	Sa-CI	Feo-S	Cal	Am/Gy	Am/Si	X/Dtz	Lpi	ROD	Lithology	Descriptions
	3100																Dike, with 5% olivine as microphenocrysts, 2% plagioclase, bladed, microlaths, the groundmass is dense and charcoal gray color. FE-SULFIDES (Pyrite), CALCITE, SMECTITE-CHLORITE and ZEOLITES (Mordenite) are fracture lining phases. CALCITE also in vesicles. AA, 2) with 5-7% olivine (oxidized) as microphenocrysts in a light gray groundmass.
	3110																A/a, 10% olivine microphenocrysts (oxidized) in a light gray feldspathic groundmass. Unit shows crystal settling. 2) Clinker, with aphyric vesicular clasts (20%) compacted into a dark gray unit. Units 3 & 4) PAHOEHOE, <1% olivine microphenocrysts (oxidized) in a light gray feldspathic groundmass. CALCITE and SMECTITE-CHLORITE are fracture lining phases and ZEOLITES are both fracture and void filling.
	3120																PAHOEHOE, with nearly aphyric, regions alternating with dense diktytaxitic regions that have 10% olivine microphenocrysts (oxidized), all in an altered gray feldspathic groundmass. ZEOLITES in vesicles; CALCITE and SMECTITE-CHLORITE on fractures.
	3130																Pahoehoe, <<1% olivine microphenocrysts (oxidized), in a light gray feldspathic groundmass. 2) DIKE, with 1-3% plagioclase laths and olivine-plagioclase intergrowths in a light gray feldspathic groundmass. ZEOLITES and SMECTITE-CHLORITE on fractures.
	3140																DIKE, 1% plagioclase lath and olivine microphenocrysts (oxidized) in a light gray feldspathic groundmass. 2) Dike, 5% olivine microphenocrysts (altered) and 1% plagioclase laths, olivine-plagioclase intergrowths in a dark gray feldspathic groundmass. Dike 2 intrudes unit #1. ZEOLITES and SMECTITE-CHLORITE on fractures.
	3150																DIKE, 5% olivine microphenocrysts (altered) in a gray groundmass. 2) Clinker, with aphyric vesicular clasts thermally oxidized to light pinkish gray, cemented by a dark red-black medium grained friable matrix. 3) Dike, with 5% plagioclase lath, olivine-plagioclase intergrowths in a gray feldspathic groundmass. ZEOLITES and SMECTITE-CHLORITE on fractures.
	3160																DIKE, with 4% olivine as microphenocrysts, phenocrysts and <1% plagioclase as bladed phenocrysts. The groundmass is well crystallized, feldspathic and charcoal gray in color. 2) Aa, 1-3% olivine microphenocrysts, phenocrysts (oxidized) in a light gray diktytaxitic groundmass. SMECTITE-CHLORITE, ZEOLITES (Mordenite), FE-SULFIDES (Pyrite) all are found on fractures.
	3170																DIKE, 1% plagioclase laths, and rare olivine microphenocrysts in a light gray groundmass. ZEOLITE (blue powder) and SMECTITE-CHLORITE on fractures.
	3180																DIKE, with 3% olivine as phenocrysts, microphenocrysts in a fine grained, well-crystallized feldspathic groundmass. Vertical cracks common lined with ZEOLITES (Mordenite), SMECTITE-CHLORITE, GYPSUM (ANHYDRITE).
	3190																DIKE, <1% olivine (altered) in an light gray feldspathic groundmass. 2) Dike, <<1% olivine (altered) in a light gray feldspathic groundmass. Unit 2 intrudes Dike 1. ZEOLITE in vesicles of unit 2.
	3200																DIKE, with <1% olivine microphenocrysts and plagioclase laths, in a gray feldspathic groundmass. ZEOLITES in voids; FE-SULFIDE (Pyrite), AMORPHOUS SILICA and SMECTITE-CHLORITE along fractures.
																	DIKE, 5% microphenocrysts, phenocrysts in a dark charcoal groundmass. 2) Dike, <1% olivine and rare microgabbros in a gray feldspathic groundmass. 3) Dike, 4% olivine in a dark charcoal groundmass. FE-SULFIDES (Pyrite), GYPSUM (ANHYDRITE), and ZEOLITES (Mordenite) found along fractures. **see next page for last unit description.

Depth		Temp (C)											
Feet	BOX	70	140	210	280	Sm-Cl	Zeo.	Fe-S	Cal	An/Gy	Am-Si	X/Dtz	Epi.

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# CATALOG OF SOH 4 CORE

Depth	Feet	Box	Temp (C)	70	140	210	280	Sp-Ci	Feo-S	Cal	Am/Gy	Am-Si	X/Qtz	Ep	ROD	Lithology	Descriptions
	3300																DIKE, microvesicular, <1% olivine (altered) and plagioclase microphenocrysts in a dark gray diktytaxitic groundmass. 2) DiKE, <1% plagioclase laths and rare olivine (altered) microphenocrysts in a light gray feldspathic groundmass. SMECTITE-CHLORITE, AMORPHOUS SILICA, ZEOLITE (Blue powder), FE-SULFIDES (Pyrite) all fracture lining.
	3310																DIKE, 3% olivine as phenocrysts, microphenocrysts and plagioclase at 2% as microlaths in a bluish gray groundmass. 2) DiKE breccia with <1% olivine (altered) as phenocrysts, microphenocrysts and <1% plagioclase as microlaths in a light gray feldspathic groundmass. ZEOLITES (Mordenite), FE-SULFIDES (Pyrite) and SMECTITE-CHLORITE as Fracture Fill.
	3320																DIKE, 10% olivine phenocrysts (altered) in a light gray diktytaxitic groundmass. 2) DiKE, 1% plagioclase rhombs in a golden brown, vitreous groundmass. SMECTITE-CHLORITE and ZEOLITE as Fracture lining.
	3330																DIKE, <1% olivine microphenocrysts in a light gray feldspathic groundmass. 2) DiKE breccia, microvesicular clasts, dark gray and golden brown in color, angular and subrounded in form, aphyric cemented by a soft black granular matrix. SMECTITE-CHLORITE and ZEOLITES as Fracture coatings.
	3340																DIKE, breccia, microvesicular clasts, dark gray and golden brown, angular and subrounded, aphyric, cemented by a soft black granular matrix. 2) DiKE, 1% microgabro and olivine microphenocrysts (altered) in a light gray feldspathic groundmass. SMECTITE-CHLORITE and ZEOLITE as Fracture coatings.
	3350																DIKE, <1% olivine-plagioclase intergrowths and olivine (altered) microphenocrysts in a light gray feldspathic groundmass. 2) DiKE, 1% plagioclase microphenocrysts in a dark gray feldspathic groundmass. SMECTITE-CHLORITE.
	3360																DIKE, 1% plagioclase microphenocrysts in a dark gray feldspathic groundmass. 2) DiKE breccia, microvesicular clasts, dark gray or golden brown, angular to subrounded in form, containing 1% plagioclase microphenocrysts cemented by a soft black or golden brown groundmass. SMECTITE-CHLORITE and ZEOLITES as Fracture coatings.
	3370																DIKE, breccia, vesicular clasts dark gray a golden brown, angular to subrounded, aphyric, cemented by a soft golden brown matrix. 2) DiKE, 1% olivine and olivine-plagioclase phenocrysts (altered), in a light gray feldspathic groundmass. SMECTITE-CHLORITE.
	3380																DIKE, 1% olivine phenocrysts and microphenocrysts and 1% plagioclase laths and microphenocrysts a feldspathic gray groundmass. SMECTITE-CHLORITE and ZEOLITES on Fractures.
	3390																DIKE, 1% olivine phenocrysts (altered) to gray in a light gray feldspathic groundmass. Unit becomes microvesicular and darkens to dark gray near contact. 2) A.a. aphyric, light gray diktytaxitic basalt. SMECTITE-CHLORITE and ZEOLITES as Fracture lining.
	3400																DIKE, <1% olivine (altered), in a dark charcoal gray groundmass. 2) AA <1% olivine (altered) in a light gray diktytaxitic groundmass. ZEOLITES are in Fractures and vesicles; SMECTITE-CHLORITE and FE-SULFIDES (Pyrite) are found in Fractures only.
																	AA, 1% olivine and <1% plagioclase in a thermally oxidized diktytaxitic groundmass. 2) DiKE, 1% olivine and 1% plagioclase in a dark gray groundmass SMECTITE-CHLORITE, CALCITE, ZEOLITES and FE-SULFIDES (Pyrite) all fracture lining. *** see next page for last units description!

# CATALOG OF SOH 4 CORE

Depth Feet	BOX	Temp (C)	70	140	210	280	Sw-CI	Zeol	Fe-S	Cal	Am/Gy	Al-Si	Y/Otz	Cpt	ROD	Lithology	Descriptions
3400																	DIKE, 1% plagioclase laths and olivine microphenocrysts, laths (altered), in a gray feldspathic groundmass. 2) DiKE, <1% plagioclase laths in a dark gray feldspathic groundmass. SMECTITE-CHLORITE and ZEOLITES as fracture coatings.
3410																	DIKE, 1-3% olivine phenocrysts, microphenocrysts (altered). The groundmass is fine grained, crystallized and ranges in color from light gray to black. 2) Clinker, with <1% plagioclase as blades, microphenocrysts in a gray groundmass. ZEOLITES, FE-SULFIDES (Pyrite) and CALCITE as fracture coatings.
3420																	DIKE, 5% olivine phenocrysts, microphenocrysts (altered), and 2% plagioclase blades, laths & rhombs in a light gray feldspathic groundmass. 2) DiKE, <1% plagioclase blebs, in a light gray feldspathic groundmass. 3) DiKE breccia, microvesicular clasts, aphyric, groundmass light gray feldspathic. SMECTITE-CHLORITE, FE-SULFIDES (Pyrite) and CALCITE as fracture coatings.
3430																	DIKE, <1% olivine as phenocrysts (altered) in a lt-bluish gray groundmass. 2) Clinker with 3% olivine as phenocrysts, microphenocrysts in a gray groundmass. SMECTITE-CHLORITE, CALCITE, ZEOLITES (Mordenite) and FE-SULFIDES (Pyrite) all found on fractures.
3440																	CLINKER, Units 1 & 2) with vesicular clasts with 3% plagioclase blades and laths and <1% olivine microphenocrysts (altered), cemented by a granular black matrix. Unit 2 is A'a core with lithology as above and gray feldspathic groundmass. 3) DiKE, <1% plagioclase and olivine microphenocrysts (altered) in a gray feldspathic groundmass. SMECTITE-CHLORITE, CALCITE as fracture coatings only; ZEOLITES also occur in voids.
3450																	DIKE, <1% olivine as phenocrysts in a diktytaxitic groundmass. SMECTITE-CHLORITE.
3460																	DIKE, dense, 1% olivine as phenocrysts, in a gray to light bluish gray diktytaxitic groundmass. ZEOLITES (white), SMECTITE-CHLORITE fracture lining.
3470																	DiKE, <1% olivine as phenocrysts (altered) in a diktytaxitic groundmass. 2) AA, dense, with 1-4% olivine (altered) as microphenocrysts, phenocrysts in a light gray diktytaxitic groundmass. FE-SULFIDES(Pyrite), SMECTITE-CHLORITE, ZEOLITES and CALCITE all found on fractures.
3480																	AA, <1% olivine (altered) as microphenocrysts, phenocrysts in a light gray diktytaxitic groundmass. CALCITE, SMECTITE-CHLORITE and ZEOLITES, FE-SULFIDES (Pyrite) all occur as fracture coatings. Zeolites also found in vesicles.
3490																	AA, <1% olivine microphenocrysts (altered) in a gray feldspathic groundmass. SMECTITE-CHLORITE, FE-SULFIDES (Pyrite) and CALCITE as fracture coatings. ZEOLITES in vesicles.
3500																	A'a, Units 1 & 3) <1% olivine phenocrysts and microphenocrysts in a gray feldspathic groundmass. 2) DIKE, 5% olivine (altered) microphenocrysts and <1% olivine-plagioclase intergrowths in a gray feldspathic groundmass. SMECTITE-CHLORITE on fractures; ZEOLITES in voids.
																	A'a, 10% olivine in a well crystallized groundmass. 2) PANOEHOE, 15% olivine in a fine grained well-crystallized groundmass. SMECTITE-CHLORITE, CALCITE fracture fill and ZEOLITES (Analcime, Thompsonite, Laumontite, Natrolite, Chabazite, Wairakite) as vesicle filling. **see next page for last units description.

# CATALOG OF SOH 4 CORE

Depth Feet	Box	70	Temp (C)	140	210	280	Sw-CI	Zeol	Fe-S	Cal	Am/Gy	As Si	Xrtz	Cp	ROD	Lithology	Descriptions
3500																	Pahoehoe, with <1% olivine microphenocrysts in a well crystallized groundmass. 2) AA, aphanitic, the groundmass is light gray. SMECTITE-CHLORITE and ZEOLITES on fractures.
355																	
3510																	AA, <1% olivine phenocrysts and microphenocrysts (altered) to black in a gray diktytaxitic feldspathic groundmass. ZEOLITE (Analcime) found in fractures and voids.
356																	
3520																	AA, with <1% olivine phenocrysts, microphenocrysts (altered), in a gray diktytaxitic groundmass. 2) Clinker, compacted, vesicular clasts comprise 20%, aphanitic, thermally oxydized to pinkish gray, unit appears to welded or compacted, not loose, friable. SMECTITE-CHLORITE on fractures, ZEOLITES on fractures and in vesicles.
357																	
3530																	Clinker, compacted, vesicular clasts (20%); aphyric, groundmass pinkish gray color. 2) AA, <1% olivine phenocrysts and microphenocrysts (altered), in a gray diktytaxitic groundmass. 3) Dike, aphyric, with a gray feldspathic groundmass. CALCITE, SMECTITE-CHLORITE, and ZEOLITES on fractures.
358																	
3540																	DIKE, <<1% olivine and plagioclase microphenocrysts in a light gray feldspathic groundmass. Fractures lining: SMECTITE-CHLORITE, FE-SULFIDES (Pyrite) and ZEOLITES.
359																	
3550																	DIKE, <<1% olivine and plagioclase microphenocrysts in a light gray feldspathic groundmass. Fractures lining: SMECTITE-CHLORITE, FE-SULFIDES (Pyrite) and ZEOLITES.
360																	
3560																	Dike, <<1% olivine and plagioclase microphenocrysts in a gray feldspathic groundmass. 2) AA, with 1% olivine phenocrysts and microphenocrysts (altered) in a gray diktytaxitic groundmass. SMECTITE-CHLORITE, CALCITE and ZEOLITES on fractures.
361																	
3570																	Dike, aphyric, dark gray feldspathic groundmass. 2) AA, <<1% olivine phenocrysts and microphenocrysts (altered) in a gray diktytaxitic groundmass. SMECTITE-CHLORITE on fractures, ZEOLITES in addition in vesicles.
362																	
3580																	Clinker, compacted, vesicular clasts (20%), <<1% olivine phenocrysts (some altered), groundmass: 50% thermally oxydized. 2) AA, 1% olivine microphenocrysts (altered) in a gray feldspathic groundmass. ZEOLITES and CALCITE in vesicles, in addition Calcite on fractures.
363																	
3590																	A'a <1% olivine (altered) in a dark gray feldspathic groundmass. 2) Ash, fall deposit, clasts thermally oxydized with olivine, plagioclase, some aphyric, black glassy in an ashy matrix. 3) AA, <1% olivine and plagioclase in a gray diktytaxitic groundmass. CALCITE, SMECTITE-CHLORITE, ZEOLITES, FE-SULFIDES (Pyrite) all in vesicles.
364																	
365																	AA, 3% plagioclase, 2% olivine in a gray groundmass. 2) A'a flow, clinker, with 1% plagioclase; <1% olivine (altered), the groundmass is light gray and diktytaxitic. CALCITE, FE-SULFIDES (Pyrite), ZEOLITES, SMECTITE-CHLORITE lines fractures. *** see next page for last units description!
3600																	

# CATALOG OF SOH 4 CORE

CATALOG OF SOH 4 CORE																				
Depth	Feet	BOX	Temp (C)	70	140	210	280	350	420	490	560	630	700	770	840	910	980	ROD	Lithology	Descriptions
3600																				AA, with <1% olivine phenocrysts and microphenocrysts in a light gray feldspathic groundmass. Dike, 2) <1% plagioclase microphenocrysts in a gray feldspathic groundmass. SMECTITE-CHLORITE, CALCITE and ZEDLITES all found on Fractures.
3610	366																			DIKE, olivine at 3% as microphenocrysts (altered) in a gray feldspathic groundmass. SMECTITE-CHLORITE on Fractures.
3620	368																			DIKE, nonvesicular to microvesicular, 3% olivine microphenocrysts and plagioclase as rhombs at <1% in a gray feldspathic groundmass. SMECTITE-CHLORITE on Fractures.
3630	369																			DIKE, 3% plagioclase laths and microphenocrysts, in a gray diktytaxitic groundmass. SMECTITE-CHLORITE altered groundmass.
3640	370																			DIKE, 3% plagioclase laths and microphenocrysts in a gray diktytaxitic groundmass. 2) Aa with 3% olivine phenocrysts and microphenocrysts in a gray feldspathic groundmass. FE-SULFIDES (Pyrite), CALCITE as rhombs and CALCITE all found in voids.
3650	371																			AA, 5% olivine phenocrysts and microphenocrysts and 5% plagioclase laths and microphenocrysts in gray feldspathic groundmass. 2) Dike, dense, <1% vesicularity, 15% olivine phenocrysts and microphenocrysts, 3% plagioclase laths and microphenocrysts in diktytaxitic groundmass. Calcium Carbonate, AMORPHOUS SILICA, Albite.
3660	372																			DIKE, dense, 1% olivine phenocrysts and microphenocrysts and 1% plagioclase as laths and microphenocrysts in a light gray feldspathic groundmass. Units 2-4) Dike, dense, <1% vesicularity, 2% olivine phenocrysts and microphenocrysts and 1% plagioclase laths and microphenocrysts in a dark gray feldspathic groundmass. FE-SULFIDES (Pyrite), Calcium Carbonate, AMORPHOUS SILICA, Albite.
3670	373																			DIKE, plagioclase laths at 3%; olivine phenocrysts and microphenocrysts at <1% (altered) in a dark gray feldspathic groundmass. 2) Dike, <1% olivine phenocrysts in a sugary text. lt. gray feldspathic groundmass. FE-SULFIDES (Pyrite), SMECTITE-CHLORITE on Fractures; ZEDLITES (Analcime) in vesicles/voids.
3680	374																			DIKE, dense, <1% vesicles, 1% olivine phenocrysts and microphenocrysts and 1% plagioclase laths and microphenocrysts in a lt. gray diktytaxitic groundmass. Unit 2 & 3) Dike, dense, <1% vesicles, 2% olivine phenocrysts and microphenocrysts and 2% plagioclase laths microphenocrysts in a dark gray feldspathic groundmass. CALCITE, FE-SULFIDES (Pyrite), and ZEDLITES on Fractures.
3690	376																			DIKE with 1% plagioclase as blades, laths and microlaths and olivine <1% as microphenocrysts in a well crystallized, feldspathic groundmass, light gray in color. 2) Dike with 1% plagioclase as laths and microlaths, olivine-plagioclase intergrowths are also found at 1%. The groundmass is darker than Dike 1 and is also well crystallized. CALCITE, SMECTITE-CHLORITE lines Fractures.
3700	377																			DIKE, <1% plagioclase laths in a dark gray feldspathic groundmass. 2) Dike, <1% plagioclase and olivine microphenocrysts in a light gray sugary, feldspathic groundmass. CALCITE, SMECTITE-CHLORITE lines Fractures.
																				DIKE See next page for units description.

# CATALOG OF SOH 4 CORE

Depth	Feet	Box	Temp (C)	70	140	210	280	Sn-Cl	Fe-S	Ca	Al/Si	Am/St	X/Oz	Epi	ROD	Lithology	Descriptions
3700	377																DIKE with 2% plagioclase as laths, microlaths, <1% as olivine-plagioclase intergrowths. The groundmass is well-crystallized, gray in color. 3) DIKE, <1% olivine as phenocrysts, microphenocrysts and olivine-plagioclase intergrowths, plagioclase is found as microlaths, laths in a light gray diktytaxitic groundmass. CALCITE, SMECTITE-CHLORITE lines fractures.
3710	378																DIKE, 3% olivine microphenocrysts (altered) in a light gray feldspathic groundmass. Size of olivine phenocrysts decreases downward through box. 2) DIKE, 1% plagioclase laths and blebs in a dark gray feldspathic groundmass. SMECTITE-CHLORITE.
3720	379																DIKE, microvesicular, <1% olivine phenocrysts and microphenocrysts and 1% plagioclase as laths microphenocrysts in a dark gray diktytaxitic groundmass. Units 2 & 4) DIKE, dense, <1% olivine phenocrysts and microphenocrysts and <1% plagioclase laths and microphenocrysts in a feldspathic groundmass intruding into A'a. 3) A'a, <1% olivine phenocrysts and microphenocrysts in diktytaxitic groundmass. DIKE 1 intrudes DIKE 2. CALCITE and ZEOLITES in vesicles.
3730	380																DIKE, microvesicular, <1% olivine microphenocrysts (altered) in a light gray feldspathic groundmass.
3740	381																DIKE, with <1% olivine as microphenocrysts, phenocrysts and olivine-plagioclase intergrowths, plagioclase also found as laths and microlaths in a diktytaxitic groundmass. 2) A'a with 2% microphenocrysts of olivine in a light gray diktytaxitic groundmass; ZEOLITES (white) and SMECTITE-CHLORITE on fractures.
3750	382																DIKE, microvesicular, <1% olivine microphenocrysts (altered) and <1% plagioclase rhombs, blades and laths in a light gray feldspathic groundmass. SMECTITE-CHLORITE lines fractures.
3760	383																DIKE with <<1% olivine as microphenocrysts and <1% plagioclase laths and microlaths in a diktytaxitic groundmass. 2) A'a with <1% olivine as microphenocrysts in a diktytaxitic light gray groundmass. SMECTITE-CHLORITE and CALCITE lines fractures, Calcite also found in vesicles.
3770	384																AA, picrite, 10% olivine phenocrysts and microphenocrysts (altered), <1% plagioclase rhombs in a dark gray groundmass altered toward SMECTITE-CHLORITE. 2) DIKE, microvesicular, with <1% olivine microphenocrysts (altered) and plagioclase laths in a light gray feldspathic groundmass. ZEOLITE in vesicles.
3780	385																DIKE, microvesicular, <<1% olivine microphenocrysts (altered) and <1% plagioclase blades and laths in a gray feldspathic groundmass. SMECTITE-CHLORITE and CALCITE on fractures.
3790	386																DIKE, dense, microvesicular, <<1% olivine phenocrysts and microphenocrysts and <1% plagioclase in a diktytaxitic groundmass. SMECTITE-CHLORITE.
3800	387																DIKE, dense, a microvesicular with 1.5% olivine microphenocrysts and <1% plagioclase microphenocrysts in a gray diktytaxitic groundmass. SMECTITE-CHLORITE on fractures.
	388																DIKE, <<1% olivine phenocrysts and microphenocrysts (altered), <1% plagioclase blades and laths in a gray diktytaxitic feldspathic groundmass. SMECTITE-CHLORITE on fractures.
	389																DIKE, <<1% plagioclase laths and blades in a light gray diktytaxitic groundmass. 2) Flow, highly altered gray-green groundmass with dark gray inclusions that may be altered olivine.

# CATALOG OF SOH 4 CORE

Depth Feet	BOX	Temp (C) 70 140 210 280	Sm-Cl Zeol	Fe-S Cal	Am/Sy Am/Si	X/Qtz Epi	ROD	Lithology	Descriptions
3800	389								DIKE, 3) <<1% plagioclase laths and blades in a light gray feldspathic groundmass. SMECTITE-CHLORITE and CALCITE on fractures.
3810	390								DIKE, dense, 1% olivine phenocrysts and microphenocrysts in a microvesicular, diktytaxitic groundmass. SMECTITE-CHLORITE on fractures.
3820	391								DIKE, microvesicular, <1% plagioclase blades and laths, <1% olivine phenocrysts and microphenocrysts in a gray feldspathic groundmass. SMECTITE-CHLORITE and FE-SULFIDES (Pyrite) on fractures.
3830	392								AA <1% olivine phenocrysts and microphenocrysts (altered), <1% plagioclase microphenocrysts in a light gray diktytaxitic groundmass. 2) Clinker, vesicular clasts (30%), with 7% plagioclase blades and laths compacted with a tan ash matrix into a competent unit. 3) A'a 7% plagioclase blades and laths in a light gray diktytaxitic groundmass. FE-SULFIDES (Pyrite) and CALCITE on fractures.
3840	393								AA, with 5% plagioclase as blades, laths, microlaths; 2% olivine phenocrysts, microphenocrysts; the groundmass is light gray, diktytaxitic. 2) Pahoehoe with 5% olivine as phenocrysts, microphenocrysts; plagioclase at 3% as laths, microlaths, the groundmass is light gray and diktytaxitic; both units are intruded by glass from a dike. SMECTITE-CHLORITE, FE-SULFIDES (Pyrite), ZEOLITES (new white) on fractures.
3850	394								A'a 5% plagioclase blades and laths in a light gray diktytaxitic groundmass. Units 2 & 4) Clinker, vesicular clasts (30%), aphyric, compacted with a tan ash matrix. 3) Aa, core lithology as above. 5) DIKE, 10% olivine phenocrysts and microphenocrysts, olivine-plagioclase intergrowths in a gray feldspathic groundmass. SMECTITE-CHLORITE on fractures.
3860	395								DIKE, with 7% olivine as phenocrysts, microphenocrysts (altered) in a light gray groundmass. 2) DiKE, with 2% plagioclase as laths, microlaths, and olivine at <1% as phenocrysts, microphenocrysts in an aphanitic groundmass. SMECTITE-CHLORITE, FE-SULFIDES (Pyrite), CALCITE on fractures.
3870	396								DIKE with 4% plagioclase as laths, microlaths; 1% olivine as phenocrysts, microphenocrysts in a dark charcoal gray groundmass. 2) DiKE, with 3% plagioclase as blades, microlaths and 1% olivine as phenocrysts, microphenocrysts in a diktytaxitic groundmass. 3) DiKE with <1% olivine-plagioclase intergrowths and <1% plagioclase laths, groundmass is aphanitic light gray. CALCITE, FE-SULFIDES (Pyrite), SMECTITE-CHLORITE on fractures.
3880	397								A'a, <<1% plag laths in a light gray feldspathic groundmass. 2) DIKE, <<1% olivine phenocrysts and microphenocrysts and plagioclase blebs in a light gray feldspathic groundmass. SMECTITE-CHLORITE and CALCITE on fractures.
3890	398								DIKE, with 5-10% olivine, increasing with depth in this box; olivine are phenocrysts microphenocrysts in a well crystallized light gray groundmass. SMECTITE-CHLORITE lines fractures, CALCITE in voids.
3900	399								DIKE, with 5-7% olivine as phenocrysts, microphenocrysts, in a well crystallized diktytaxitic groundmass. 2) DiKE with <1% olivine as phenocrysts, microphenocrysts and <1% plagioclase as microlaths in a dark gray groundmass. SMECTITE-CHLORITE lines fractures.
	400								DIKE, <<1% olivine microphenocrysts (altered) in a light gray diktytaxitic groundmass. SMECTITE-CHLORITE on fractures.

# CATALOG OF SOH 4 CORE

Depth Feet	Box	Temp (C) 70 140 210 280	Sm-Ct Zeol Fe-S Cal An/Gy Am/St X/Dtz Epi	ROD	Lithology	Descriptions
3900						DIKE, <<1% olivine microphenocrysts (altered) in a light gray diktytaxitic groundmass. SNECTITE-CHLORITE line fractures.
401						DIKE, with <1% olivine as microphenocrysts, phenocrysts, in a light gray diktytaxitic groundmass. 2) DiKE, with 10% olivine as phenocrysts, microphenocrysts in a well crystallized groundmass. SNECTITE-CHLORITE, ZEOLITES line fractures.
3910						DIKE, First 28 cm of box has 7% olivine phenocrysts and microphenocrysts (altered), and near the chilled margin the olivine content drops to <1%, all in a light gray feldspathic groundmass. SNECTITE-CHLORITE fracture lining.
402						DIKE with 1-3% olivine microphenocrysts in a light gray feldspathic groundmass. SNECTITE-CHLORITE fracture lining.
3920						DIKE, <1% olivine microphenocrysts (altered) in a light gray feldspathic groundmass. SNECTITE-CHLORITE.
403						DIKE, 1-3% olivine microphenocrysts in a light gray feldspathic groundmass. SNECTITE-CHLORITE lining fractures.
3930						DIKE, 7% olivine phenocrysts, microphenocrysts, olivine-plagioclase intergrowths (altered), in a gray feldspathic groundmass. SNECTITE-CHLORITE lining fractures.
404						DIKE, 1% olivine as phenocrysts, microphenocrysts in a light gray feldspathic groundmass. 2) DiKE, with 1% olivine as phenocrysts and microphenocrysts in a light gray feldspathic groundmass. 3) DiKE, with 7% olivine as microphenocrysts, phenocrysts in a dark bluish gray groundmass. SNECTITE-CHLORITE and ANHYDRITE on fractures.
3940						DIKE, <1% olivine phenocrysts and microphenocrysts (altered), in a gray diktytaxitic groundmass. 2) Aa, 3% olivine phenocrysts and microphenocrysts (altered) in a light gray diktytaxitic groundmass. SNECTITE-CHLORITE and CALCITE lining fractures. ZEOLITES in voids.
405						A'a, with 5% olivine as microphenocrysts, phenocrysts in a light gray feldspathic groundmass. 2) PANOEHOE, picritic with 15% olivine as phenocrysts, microphenocrysts in an altered deep gray brown groundmass. FE-SULFIDES (Pyrite), SNECTITE-CHLORITE, ZEOLITES (Fibrous green, analcime) all found on fracture surfaces.
3950						AA, picritic, altered, groundmass is SNECTITE-CHLORITE, 10% olivine phenocrysts and microphenocrysts (altered), vesicles 100% filled with ZEOLITES (hard white or platy green). 2) A'a aphyric, groundmass light gray feldspathic.
406						AA <1% olivine phenocrysts and microphenocrysts (altered) in a light gray diktytaxitic groundmass. 2) Clinker, vesicular clasts (30%), aphyric, compacted with a medium grained ash gray matrix into a competent unit. SNECTITE-CHLORITE and CALCITE on fractures; in addition Calcite in vesicles.
3960						TRANSITIONAL consisting of <1% olivine phenocrysts and microphenocrysts and 3% plagioclase laths and microphenocrysts in a diktytaxitic gray groundmass. CALCITE, ZEOLITES in ves., FE-SULFIDES on fract
407						
3970						
408						
3980						
409						
3990						
410						
411						
412						
4000						

# Scientific Observation Hole Site 4 Elevation 1200 ft a.s.l.

Depth Feet	Core Box	Temperature (Celsius) 70 140 210 280	Smeectite-Chlorite Zeolites Fe-Sulfides Calcite Amorphous Silica Gypsum Anhydrite Quartz Crystals Epidote	R00	Lithology	Descriptions
4000	412					DIKE, 2) 2% olivine phenocrysts and microphenocrysts and 1% laths and microphenocrysts in a dark gray groundmass. CALCITE and ZEOLITES in vesicles, FE-SULFIDES on Fractures.
4010	413					TRANSITIONAL, aphyric, the groundmass is light gray diktytaxitic. 2) Transitional, <1% olivine microphenocrysts (altered) in a light gray diktytaxitic groundmass. CALCITE and ZEOLITES in vesicles and lining fractures.
4020	414					TRANSITIONAL, <<1% olivine microphenocrysts (altered) in a light gray diktytaxitic groundmass. 2) Clinker, vesicular clasts (20%) with <<1% olivine microphenocrysts in a dark gray medium grained ash matrix and compacted into a competent unit. ZEOLITES and FE-SULFIDES line fractures.
4030	415					TRANSITIONAL unit, <1% olivine phenocrysts and microphenocrysts (altered) in a gray diktytaxitic groundmass. SNECTITE-CHLORITE Found in vesicles.
4040	416					TRANSITIONAL, 10% picritic, phenocrysts, microphenocrysts (altered), in a partially altered groundmass. ZEOLITES and SNECTITE-CHLORITE filling all vesicles and diktytaxitic textured voids. 2) DiKE, sparsely vesicular (1%), aphyric, phenocrysts, gray feldspathic basalt.
4050	417					DIKE, microvesicular, 1% olivine phenocrysts and microphenocrysts in a blue gray groundmass. 2) Transitional with <1% olivine phenocrysts and microphenocrysts in a light gray diktytaxitic groundmass. Voids are filled in with SNECTITE-CHLORITE. Units 3 & 4) DiKE, 3% olivine phenocrysts and microphenocrysts and <1% laths and microphenocrysts in a blue gray groundmass. CALCITE, ZEOLITES and AMORPHOUS SILICA are found in vesicles. FE-SULFIDES (Pyrite) and Calcite found lining fractures.
4060	418					DIKE, <1% olivine as microphenocrysts in dull gray groundmass. 2) DiKE, 1% olivine (altered) as phenocrysts, microphenocrysts in a feldspathic groundmass. 3) A'a, aphyric, the groundmass is altered to Smeectite-Chlorite, where fresh consists of a feldspathic groundmass. 4) DiKE, 1% olivine phenocrysts, and olivine-plagioclase intergrowths and 1% plagioclase as laths, microlaths. The groundmass is steel gray. 5) DiKE with 1% olivine as phenocrysts, microphenocrysts in a feldspathic groundmass. SNECTITE-CHLORITE, FE-SULFIDES (Pyrite), QUARTZ CRYSTALS, CALCITE, all on fractures.
4070	419					DIKE, aphyric, dark gray feldspathic basalt. 2) DiKE, lithology as above. 3) Clinker, compacted, vesicular clasts (25%) aphyric, cemented into a competent unit by an ash gray groundmass. SNECTITE-CHLORITE.
4080	420					Clinker, compacted, aphyric, vesicular clasts (25%) cemented into a competent unit by a thin ashy gray groundmass. Units 2-5) DIKE, aphyric, groundmass is gray feldspathic. ZEOLITES and CALCITE on fractures and in vesicles.
4090	421					DIKE, 1% plagioclase as laths, microlaths and <1% olivine as microphenocrysts, groundmass is dark gray in color. 2) DiKE, <1% olivine as phenocrysts, microphenocrysts and <<1% plagioclase rhombs. The groundmass is feldspathic, light gray in color. 3) DiKE, <1% olivine microphenocrysts in a light gray feldspathic groundmass. CALCITE, FE-SULFIDES (Pyrite) are fracture fill.
4100	422					DIKE, microvesicular, <<1% olivine microphenocrysts (altered) in a gray feldspathic groundmass. CALCITE and ZEOLITES are fracture lining.
4100	423					DIKE, 1% olivine as microphenocrysts, <1% plagioclase rhombs all in a feldspathic groundmass.

# CATALOG OF SOH 4 CORE

Depth	Feet	80X	70	Temp (C)	140	210	280	Sp-CI	Feo-S	Cal	Am/Si	X/Otz	Ep	ROD	Lithology	Descriptions
	4100	423														DIKE, 1% olivine as microphenocrysts, <1% plagioclase rhombs all in a feldspathic groundmass.
	4110	424														DIKE, 1% olivine as microphenocrysts, phenocrysts in a diktytaxitic dark to light gray in color. Rare rhombs of plagioclase seen. 2) DiKE, (older) aphanitic, microvesicular, the groundmass is feldspathic light gray in color. CALCITE and SMECTITE-CHLORITE line fractures.
	4120	425														DIKE, <1% olivine as microphenocrysts, phenocrysts in a feldspathic groundmass. 2) DiKE with 1% olivine phenocrysts, microphenocrysts, olivine-plagioclase intergrowths and plagioclase microlaths; the groundmass is feldspathic. 3) DiKE, aphanitic in a light gray with green tinge (SMECTITE-CHLORITE) groundmass.
	4130	426														DIKE, aphyric, groundmass is light gray feldspathic. 2) DiKE, <1% olivine microphenocrysts, in a light gray feldspathic groundmass. 3) DiKE, <1% plagioclase laths and blebs in a gray feldspathic groundmass, sparsely vesicular. Fractures lining: FE-SULFIDES (Pyrite), CALCITE, AMORPHOUS SILICA, SMECTITE-CHLORITE.
	4140	427														DIKE, <<1% olivine microphenocrysts in a light gray feldspathic groundmass. 2) DiKE, 1-3% plagioclase laths and blades in a gray feldspathic groundmass, this unit becomes increasingly vesicular and plagioclase phyrlic with depth. SMECTITE-CHLORITE line fractures.
	4150	428														DIKE, microvesicular (3%), <1% plagioclase laths and blades in a gray feldspathic groundmass. 2) DiKE, lithology as above, vesicularity decreases to 0% at contact.
	4160	429														DIKE, microvesicular (1%), <1% plagioclase laths and blades in a gray feldspathic groundmass, vesicles decrease in size with depth. Vesicles lined with ZEOLITES, SMECTITE-CHLORITE. CALCITE and AMORPHOUS SILICA found on fractures.
	4170	430														DIKE, 1% olivine as phenocrysts, microphenocrysts, olivine-plagioclase intergrowths, 1% plagioclase as blades, laths and microlaths; groundmass is gray to light gray in color. AMORPHOUS SILICA, and SMECTITE-CHLORITE on fractures.
	4180	431														DIKE, microvesicular, <1% plagioclase laths in a gray feldspathic groundmass. 2) DiKE, picritic, 15% olivine phenocrysts, microphenocrysts (altered) and olivine-plagioclase intergrowths in an altered dark gray feldspathic groundmass. 3) DiKE, microvesicular, 5% olivine microphenocrysts in a gray diktytaxitic groundmass. 4) DiKE, <1% plagioclase blades, laths and olivine microphenocrysts in a gray feldspathic groundmass. SMECTITE-CHLORITE and FE-SULFIDES (Pyrite) on fractures. ZEOLITES in vesicles.
	4190	432														DIKE, microvesicular, <1% olivine microphenocrysts, and <1% plagioclase rhombs and laths. The groundmass is light gray. 2) DiKE, with 10% olivine as phenocrysts, microphenocrysts (altered); 1% plagioclase as rhombs, microphenocrysts; groundmass is bluish gray well crystallized. SMECTITE-CHLORITE and FE-SULFIDES (Pyrite) line fractures. CALCITE in vesicles and on fractures.
	4200	433														DIKE, with 10% olivine as microphenocrysts, phenocrysts (altered) and <1% plagioclase as phenocrysts, microphenocrysts, all in a dark gray groundmass. SMECTITE-CHLORITE and FE-SULFIDES (Pyrite) line fractures.
		434														DIKE, 10% olivine phenocrysts and microphenocrysts (altered) in a dark gray feldspathic microvesicular groundmass. 2) DiKE, <1% olivine phenocrysts and microphenocrysts in a light gray groundmass.

# CATALOG OF SOH 4 CORE

Depth	Feet	BOX	Temp (C)	70	140	210	280	Sm-Ct	Feo-S	Cal	Am/Gy	Am/Si	X/Qtz	Ep	ROD	Lithology	Descriptions
	4200																DIKE, 2) <1% olivine phenocrysts and microphenocrysts in a light gray groundmass. CALCITE in voids and on fractures; SMECTITE-CHLORITE and FE-SULFIDES (Pyrite) only on fractures.
	4205																DIKE, <1% olivine microphenocrysts, phenocrysts in light gray, groundmass. 2) DiKE, 1% olivine as phenocrysts, microphenocrysts and <1% plagioclase as laths, microlaths in a greenish gray (SMECTITE-CHLORITE) groundmass. Fractures phases: CALCITE, ZEOLITE and FE-SULFIDES (Pyrite).
	4210																DIKE, <1% olivine phenocrysts and microphenocrysts in an aphanitic groundmass. 2) DiKE, with 5% olivine phenocrysts and microphenocrysts in an aphanitic groundmass. CALCITE on fractures and in vesicles; ZEOLITES and SMECTITE-CHLORITE only line fractures.
	4215																DIKE, 3% olivine phenocrysts and microphenocrysts, in a gray feldspathic groundmass. 2) DiKE, 5% plagioclase blades and laths, blebs in a dark gray Feldspathic groundmass. 3) DiKE, microvesicular, <<1% olivine microphenocrysts in a brecciated diktytaxitic gray groundmass. Box is mostly DiKE 1. CALCITE, ZEOLITES and SMECTITE-CHLORITE, fracture lining.
	4220																Breccia, DiKE, aphyric, with a light gray groundmass; 2) DiKE, <1% olivine as microphenocrysts, phenocrysts(altered), in a light bluish gray groundmass. 3) DIKE, with 3% olivine as microphenocrysts, phenocrysts (rare) in a feldspathic groundmass dark to light gray in color AMORPHOUS SILICA, SMECTITE-CHLORITE, FE-SULFIDES (Pyrite) all fracture fill.
	4225																DIKE, <1% olivine phenocrysts and microphenocrysts, in a light gray feldspathic groundmass which has diktytaxitic patches in the last 20% of box ZEOLITES and SMECTITE-CHLORITE as Fracture lining.
	4230																DIKE with 1% olivine microphenocrysts, rarer phenocrysts in a gray diktytaxitic groundmass; regions of higher vesicularity are present. CALCITE and SMECTITE-CHLORITE found along fractures.
	4235																DIKE, <<1% olivine phenocrysts and microphenocrysts, in a light gray diktytaxitic groundmass.
	4240																DIKE, 3% olivine phenocrysts and microphenocrysts in a light gray splotchy diktytaxitic groundmass. 2) Aq, aphyric with 10% vesicles (CALCITE Filled) in a dark gray aphanitic groundmass. CALCITE and FE-SULFIDES (Pyrite) found along fractures.
	4245																AA, aphyric, with light gray well-crystallized groundmass. 2) DiKE, 5% olivine as microphenocrysts, phenocrysts in a fine grained well-crystallized groundmass. SMECTITE-CHLORITE, CALCITE, FE-SULFIDES (Pyrite), Found along fractures and Calcite in some voids.
	4250																DIKE, <<1% plagioclase rhombs in a light gray diktytaxitic groundmass. SMECTITE-CHLORITE Found along fractures.
	4255																DIKE, 3% olivine as microphenocrysts (altered), in a diktytaxitic groundmass. SMECTITE-CHLORITE and FE-SULFIDES (Pyrite) Found along fractures.
	4260																DIKE, 3% olivine phenos and mphs in a gray groundmass

# CATALOG OF SOH 4 CORE

Depth	Feet	Box	Temp (C)	70	140	210	280	Sm-Ct	Feo-S	Cal	An/Gy	Am/St	X/Gtz	Epi	ROD	Lithology	Descriptions
	4300																DIKE consists of 3% olivine phenocrysts and microphenocrysts in a gray groundmass. CALCITE and FE-SULFIDES (Pyrite) are found along fracture surfaces.
	4310	446															DIKE, with 3% olivine phenocrysts and microphenocrysts in a splotchy diktytaxitic groundmass which grades into an aphanitic groundmass upwards. CALCITE and SMECTITE-CHLORITE line fractures.
	4320	447															DIKE, <1% olivine phenocrysts and microphenocrysts in a gray groundmass which grades downward from a splotchy diktytaxitic texture into an increasingly diktytaxitic texture. CALCITE and SMECTITE-CHLORITE as fracture lining phase.
	4330	448															DIKE, 1% olivine phenocrysts and microphenocrysts in a splotchy diktytaxitic groundmass. CALCITE and SMECTITE-CHLORITE as fracture lining phase.
	4340	449															DIKE, <<1% olivine-plagioclase intergrowths, olivine (some altered) in a light gray feldspathic groundmass. 2) DiKE, 1% plagioclase microphenocrysts at contact with unit 3. 3) DiKE, <1% olivine microphenocrysts (altered) in a light gray feldspathic groundmass. SMECTITE-CHLORITE as fracture fill.
	4350	450															DIKE, <<1% olivine microphenocrysts and olivine-plagioclase intergrowths in a light gray feldspathic groundmass. 2) Clinker, compacted, aphyric, matrix is light gray diktytaxitic basalt. CALCITE, SMECTITE-CHLORITE and FE-SULFIDES (Pyrite) found along fractures.
	4360	451															AA, <1% olivine phenocrysts and microphenocrysts in a gray diktytaxitic groundmass. CALCITE, FE-SULFIDES (Pyrite) found along fractures and in voids; SMECTITE-CHLORITE, QUARTZ CRYSTALS, ZEOLITES found only along fractures.
	4370	452															AA, <1% olivine phenocrysts, microphenocrysts in a light gray groundmass. 2) A.a with <1% olivine phenocrysts, microphenocrysts in a light gray groundmass. 3) DiKE, with 1% olivine phenocrysts, microphenocrysts (altered) in a light gray groundmass. SMECTITE-CHLORITE and FE-SULFIDES (Pyrite) found on fractures. CALCITE found on fractures and in vesicles.
	4380	453															AA, aphyric, groundmass is gray diktytaxitic, black clay (SMECTITE-CHLORITE) fills 75% of vesicles and all diktytaxitic texture. 2) DiKE, <<1% plagioclase microphenocrysts in a dark gray feldspathic groundmass. 3) Clinker, compacted, aphyric, gray diktytaxitic basalt. CALCITE found in vesicles and along fractures; FE-SULFIDES (Pyrite) and SMECTITE-CHLORITE along fractures.
	4390	454															DiKE, Units 1, 4 & 5) <1% olivine and <1% plagioclase in a gray groundmass. Units 2 & 3) AA, <1% olivine in a diktytaxitic groundmass. SMECTITE-CHLORITE and CALCITE in vugs; FE-SULFIDES (Pyrite) on fractures.
	4400	455															DIKE, Units 1, 3 & 4) <<1% plagioclase blebs near chill margins in a gray feldspathic groundmass. 2) A'a, aphyric, groundmass is light gray diktytaxitic. SMECTITE-CHLORITE in vugs; FE-SULFIDES (Pyrite) along fractures; CALCITE found in both
		456															DIKE, see next page for last units core description
		457															

# CATALOG OF SOH 4 CORE

Depth Feet	Box	Temp (C) 70 140 210 280	Gr-CI Geo	Fe-S Geo	Ca Geo	Am/Gy Geo	Si Geo	X/Otz Geo	LP	ROD	Lithology	Descriptions
4400												Dike, <1% olivine as phenocrysts, microphenocrysts in a fine grained groundmass. AA, with 5-10% olivine as phenocrysts, microphenocrysts in a light gray, diktytaxitic groundmass. Crystal settling present here. CALCITE, SMECTITE-CHLORITE, FE-SULFIDES (Pyrite) all found along fractures.
4410	457											AA, very dense with 3-5% olivine phenocrysts and microphenocrysts in a coarse-grained diktytaxitic groundmass. SMECTITE-CHLORITE, FE-SULFIDES (Pyrite), and ZEOLITES found along fractures.
4420	458											AA, <<1% olivine microphenocrysts (altered) in a light gray diktytaxitic groundmass. SMECTITE-CHLORITE and FE-SULFIDES found along fractures.
4430	459											AA, with 3-5% olivine as phenocrysts, microphenocrysts in light gray diktytaxitic groundmass. 2) Dike with <1% olivine as microphenocrysts in a bluish gray groundmass. FE-SULFIDES found only along fractures; CALCITE, and SMECTITE-CHLORITE found along fractures and in vesicles.
4440	460											DIKE, <1% olivine phenocrysts and microphenocrysts and <1% plagioclase laths and microphenocrysts in a medium gray groundmass. 2) A'a with 3% olivine phenocrysts and microphenocrysts in a coarse grained diktytaxitic groundmass. CALCITE fills vesicles, FE-SULFIDES (Pyrite) and SMECTITE-CHLORITE found along fractures.
4450	461											DIKE, rare olivine microphenocrysts in a light gray Feldspathic groundmass. CALCITE as fracture fill
4460	462											DIKE, Units 1 & 3) <<1% plagioclase & olivine microphenocrysts in a light gray feldspathic groundmass. 2) Aa, aphyric, light gray diktytaxitic basalt. 4) A'a, rare olivine microphenocrysts (altered), in a gray diktytaxitic groundmass. Diktytaxitic texture is filled with SMECTITE-CHLORITE and ZEOLITES. CALCITE, FE-SULFIDES (Pyrite) and SMECTITE-CHLORITE found along fractures.
4470	463											AA & compacted Clinker, <1% olivine phenocrysts and microphenocrysts (altered), in a light gray diktytaxitic groundmass. 75% of vugs in Filled with SMECTITE-CHLORITE. 2) Dike, 3% plagioclase laths and blades at upper contact grade to 0% in body of Dike, groundmass is gray and feldspathic. 3) A'a & Clinker, same lithology as Unit 1. SMECTITE-CHLORITE found in vugs and along fractures; FE-SULFIDES only along fractures.
4480	464											AA, <1% olivine phenocrysts and microphenocrysts in a gray diktytaxitic groundmass. 2) Aa and Clinker with <1% olivine phenocrysts and microphenocrysts in a gray groundmass. SMECTITE-CHLORITE FE-SULFIDES (Pyrite) along fractures; CALCITE in vesicles.
4490	465											AA, 1-3% olivine (altered) as phenocrysts, microphenocrysts in a light gray formerly diktytaxitic groundmass. SMECTITE-CHLORITE, CALCITE and ZEOLITES found in fractures and in vesicles
4500	466											AA, & Clinker, 3% olivine phenocrysts (altered) in a light gray feldspathic groundmass. Vesicles filled with a blue SMECTITE-CHLORITE. 2) A'a & Clinker, <1% olivine microphenocrysts (altered) in a light gray feldspathic groundmass. CALCITE in vesicles and along fractures.
	467											AA, 1% olivine in a gray-pink diktytaxitic groundmass. QUARTZ CRYSTALS.
	468											

# CATALOG OF SOH 4 CORE

Depth Feet	Box	Temp (C) 70 140 210 280	Sn-Cl Feol Fe-S Caol	Am/Gy Am/Si Am/St X/Qtz Cpi	ROD	Lithology	Descriptions
4500	468						CLINKER, 2) 2% olivine phenocrysts and microphenocrysts in a splashy red, gray-pink diktytaxitic groundmass. QUARTZ CRYSTALS, CALCITE. Flow units altered to SMECTITE-CHLORITE.
4510	469						AA, 1% olivine as phenocrysts, microphenocrysts (altered) in a light gray diktytaxitic. 2) A'a with 2-4% olivine phenocrysts, microphenocrysts (altered) in a light gray diktytaxitic groundmass. FE-SULFIDES (Pyrite) on fractures, QUARTZ CRYSTALS in vesicles, SMECTITE-CHLORITE and CALCITE in both places.
4520	470						CLINKER and A'a core, 3% olivine phenocrysts and microphenocrysts (altered) in a gray diktytaxitic groundmass. Clinker is compacted into competent unit by groundmass of red ash. 2) Ash, red, indurated. 3) Clinker, compacted, lith as above. SMECTITE-CHLORITE on fractures.
4530	471						CLINKER <1% olivine (altered) as phenocrysts, microphenocrysts in a light gray groundmass. The interclast material is oxidized (red-pink). ZEOLITES as fracture fill, SMECTITE-CHLORITE as both.
4540	472						DIKE, Units 1 & 3) 1.5% olivine microphenocrysts and <1% plagioclase laths & microphenocrysts in a dark gray feldspathic microvesicular groundmass. 2) Clinker, <1% olivine and microphenocrysts in a gray diktytaxitic groundmass. SMECTITE-CHLORITE, CALCITE, ZEOLITE AND FE-SULFIDES (Pyrite) as vesicle fill, Pyrite found on fractures.
4550	473						Dike, microvesicular, <1% olivine phenocrysts and microphenocrysts and <1% plagioclase laths and microphenocrysts in a gray groundmass. 2) AA, 3-5% olivine phenocrysts and microphenocrysts and <1% plagioclase laths and microphenocrysts in a gray microcrystalline groundmass. Unit is thermally altered at Dike contact. CALCITE, SMECTITE-CHLORITE, FE-SULFIDES in vesicles.
4560	474						AA, <1% olivine microphenocrysts (altered), in a light gray diktytaxitic groundmass. 2) Dike, aphyric, dark gray groundmass. SMECTITE-CHLORITE on fractures and in vesicles.
4570	475						A'a, rare olivine microphenocrysts (altered), in a light gray diktytaxitic groundmass. 2) DIKE, aphyric, nonvesicular becomes microvesicular last 60cm of unit, groundmass light gray. 3) Dike, <1% olivine microphenocrysts in a gray groundmass. CALCITE in vesicles. SMECTITE-CHLORITE, in vesicles, on fractures.
4580	476						DIKE, 3% olivine microphenocrysts and olivine plagioclase intergrowths, in a gray groundmass. 2) Dike, vesicular, aphyric, light gray groundmass SMECTITE-CHLORITE, CALCITE, ZEOLITE AND QUARTZ CRYSTALS as vesicle fill, FE-SULFIDES (Pyrite) found on fractures.
4590	477						DIKE, microvesicular, rare olivine microphenocrysts (altered), in a light gray groundmass. 2) Dike, 3% plagioclase blebs and olivine-plagioclase intergrowths in dark gray groundmass. SMECTITE-CHLORITE, CALCITE, AND FE-SULFIDES (Pyrite) as fracture fill, Smectite found in vesicles.
4600	478						DIKE, 3% olivine microphenocrysts and 1% plagioclase laths in a dark gray groundmass. 2) A'a, with <1% olivine microphenocrysts in a gray feldspathic groundmass. SMECTITE-CHLORITE as fracture fill, FE-SULFIDES (Pyrite) as vesicle fill, SMECTITE-CHLORITE found in both places. **For unit description below see next page

# CATALOG OF SOH 4 CORE

Depth	Feet	Box	Temp (C)	70	140	210	280	Sm-Ct	Feo-S	Cal	An/Gy	Am/St	X/Dtz	Ep	ROD	Lithology	Descriptions
	4600																DIKE, 3% plagioclase laths and olivine-plagioclase intergrowths in a gray groundmass. Dike, 2) Dike, microvesicular near contact, aphyric, gray basalt SMECTITE-CHLORITE, CALCITE and FE-SULFIDES are on fractures.
	4609																DIKE, 1% olivine phenocrysts, microphenocrysts, olivine-plagioclase intergrowths (altered), 1% plagioclase laths in a light gray groundmass. SMECTITE-CHLORITE, on fractures.
	4610																DIKE, 1% olivine phenocrysts and microphenocrysts (altered), olivine-plagioclase intergrowths, and 1% plagioclase laths, in a light gray groundmass. 2) Dike, 3% plagioclase laths, blades, in a dark gray groundmass. 3) AA, picritic, 15% olivine phenocrysts and microphenocrysts (some altered), in a feldspathic altered groundmass 90% of vesicles filled with SMECTITE-CHLORITE or ZEOLITES. SMECTITE-CHLORITE, and FE-SULFIDES also are on fractures.
	4620																AA, picritic, 15% olivine phenocrysts and microphenocrysts (altered) in a light gray Feldspathic groundmass. Alteration decreases with depth, groundmass intact, vesicles lined with green SMECTITE-CHLORITE and CALCITE. 2) DIKE, 10% plagioclase laths, rhombs, and blades in a light gray diktytaxitic groundmass. SMECTITE-CHLORITE, CALCITE and QUARTZ CRYSTALS also found on fractures.
	4630																DIKE, aphyric, light gray diktytaxitic basalt. SMECTITE-CHLORITE, ZEOLITES and QUARTZ CRYSTALS are on fractures. Another Zeolite in vesicles.
	4640																DIKE, aphyric, light gray Feldspathic basalt. SMECTITE-CHLORITE, CALCITE, ZEOLITE, QUARTZ CRYSTALS and FE-SULFIDES are on fractures. Another Zeolite in vesicles.
	4650																DIKE, aphyric, light gray Feldspathic groundmass, microcrystalline. SMECTITE-CHLORITE, CALCITE, ZEOLITE, QUARTZ CRYSTALS and FE-SULFIDES are on fractures. Another Zeolite in vesicles.
	4660																DIKE, aphyric, rare vesicles (<1%, 2mm), light gray Feldspathic groundmass, with microcrystalline texture. SMECTITE-CHLORITE, FE-SULFIDES (Pyrite), QUARTZ CRYSTALS and CALCITE.
	4670																DIKE with 1-3% olivine phenocrysts and microphenocrysts in a dark gray Feldspathic groundmass. SMECTITE-CHLORITE, CALCITE, QUARTZ CRYSTALS and FE-SULFIDES are on fractures. Another Zeolite in vesicles.
	4680																DIKE, aphyric, light gray Feldspathic basalt. 2) Dike, 1% plagioclase blades and laths in dark gray groundmass. Numerous hairline fractures filled with white ZEOLITES. SMECTITE-CHLORITE, ZEOLITE, and AMORPHOUS SILICA are on fractures.
	4690																DIKE, <1% olivine and <1% plagioclase laths in a dark gray groundmass. Dike 1 intrudes Dike 2. 2) Dike, 1-3% olivine phenocrysts; <1% plagioclase laths in a Feldspathic groundmass. CALCITE, QUARTZ CRYSTALS and FE-SULFIDES are on fractures. ZEOLITES in vesicles. ***Last unit described on next page.
	4700																

# CATALOG OF SOH 4 CORE

Depth Feet	80X	70	Temp (C)	140	210	280	Sn-Cl	Feo-S	Cal	Am/Gy	Am/St	X/Olz	Epi	ROD	Lithology	Descriptions
4700																Dike, 1% plagioclase blades and laths in a dark gray groundmass. AA, 2) picrite, 15% olivine phenocrysts and microphenocrysts (some altered), in a groundmass completely altered to greenish black SMECTITE-CHLORITE, vesicles filled with white ZEOLITES or black Smectite-Chlorite.
4710																A/a, altered, picritic, with 15-20% olivine phenocrysts and microphenocrysts in a dark gray aphanitic groundmass. Vesicles filled with SMECTITE-CHLORITE. 2) PAHOEHOE, with 5% olivine (altered) in a gray aphanitic groundmass. Vesicles filled with SMECTITE-CHLORITE and CALCITE crystals and FE-SULFIDES (Pyrite); upper 10 cm thermally altered pink.
4720																AA, Flow with upper and lower compacted Clinker, with 3-5% olivine phenocrysts and microphenocrysts in a medium gray feldspathic groundmass. SMECTITE-CHLORITE, CALCITE and FE-SULFIDES (Pyrite) in vesicles.
4730																PAHOEHOE, Units 1 & 2) aphyric, gray diktytaxitic basalt. Vesicles are filled or lined with black SMECTITE-CHLORITE, CALCITE crystals and FE-SULFIDES (Pyrite) in vesicles, Smectite line fractures.
4740																PAHOEHOE, 3-5% olivine phenocrysts and microphenocrysts (altered) in a medium gray Feldspathic groundmass. SMECTITE-CHLORITE, and CALCITE in vesicles.
4750																PAHOEHOE, 1-3% olivine (altered) phenocrysts and microphenocrysts in a highly altered (SMECTITE-CHLORITE) medium green groundmass. 2) Pahoehoe, 1-2% olivine (altered) phenocrysts and microphenocrysts in a altered medium gray Feldspathic groundmass; upper 10cm thermally altered. Brecciated by intruding Dike. 3) Dike, <1% olivine phenocrysts and microphenocrysts (altered) and <1% plagioclase laths microphenocrysts in a dark gray groundmass. CALCITE in vesicles.
4760																PAHOEHOE, 3-5% olivine phenocrysts and microphenocrysts (altered) in a gray feldspathic groundmass; SMECTITE-CHLORITE (filling vesicles) + CALCITE. 2) Dike, <1% olivine phenocrysts and microphenocrysts and <1% plagioclase laths and microphenocrysts in a gray fine diktytaxitic groundmass. 3) Dike, 1-2% olivine phenocrysts and microphenocrysts and <1% plagioclase laths and microphenocrysts and in a dark gray groundmass. Dike 3 intrudes Dike 2. QUARTZ CRYSTALS and FE-SULFIDES (Pyrite) in vesicles. *
4770																DIKE, 3% olivine phenocrysts and microphenocrysts in a slightly altered gray diktytaxitic groundmass. Olivine % increases to 10% and alteration of groundmass to SMECTITE-CHLORITE. Olivine is unaltered at the top, altered at bottom. SMECTITE-CHLORITE, CALCITE, QUARTZ CRYSTALS, AMORPHOUS SILICA and FE-SULFIDES (Pyrite) in vesicles, Smectite line fractures.
4780																DIKE, 1-3% olivine phenocrysts and microphenocrysts (altered) in a dark gray groundmass which is altering to SMECTITE-CHLORITE. CALCITE and QUARTZ CRYSTALS on fractures; Calcite line fractures.
4790																DIKE, 3% olivine phenocrysts and microphenocrysts (altered), in an altered (SMECTITE-CHLORITE) groundmass.
500																DIKE, vesicular, 3% olivine phenocrysts and microphenocrysts(altered) in a groundmass(altered). Vesicles are filled with SMECTITE-CHLORITE.
4800																

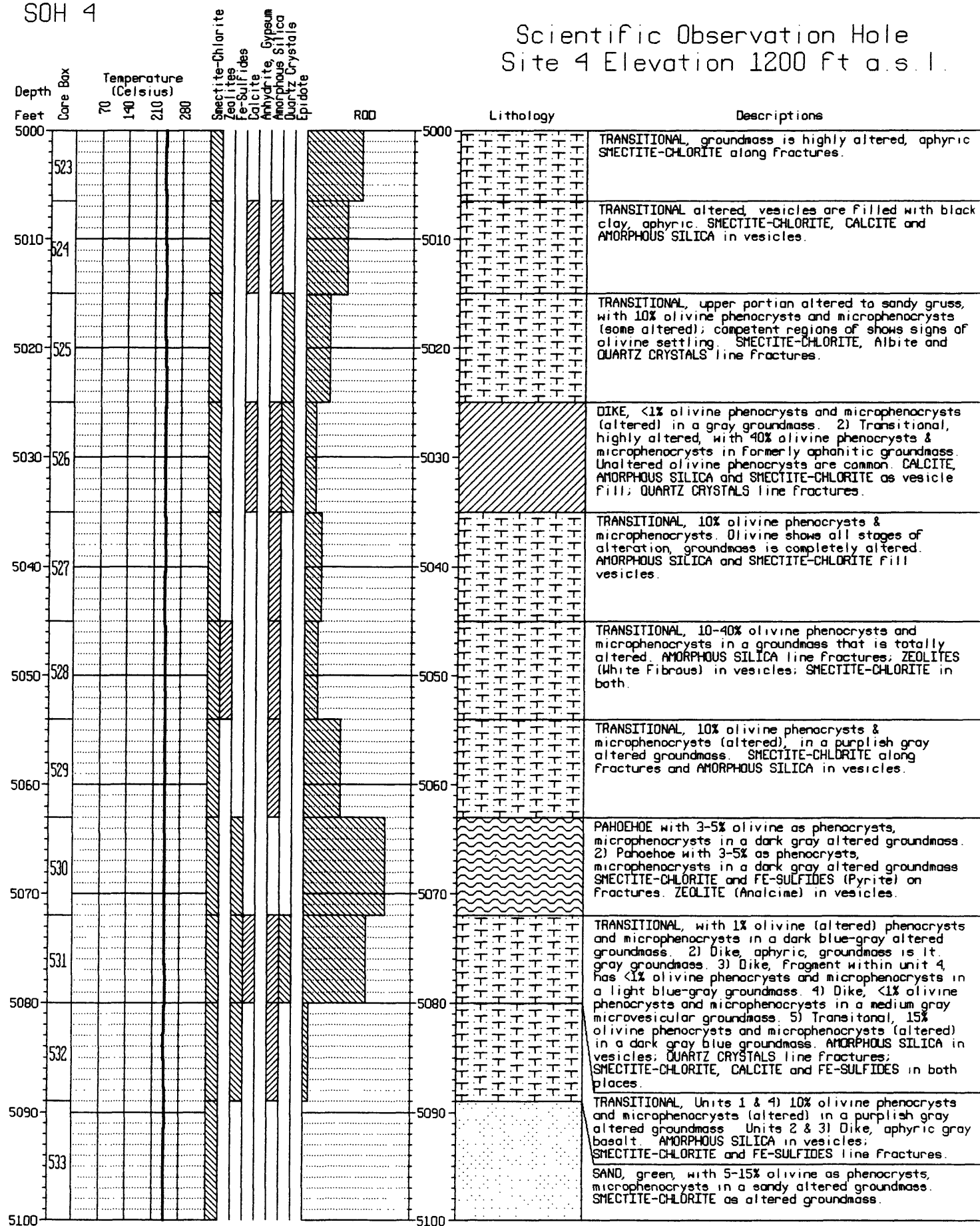
# CATALOG OF SOH 4 CORE

Depth Feet	Box	Temp (C) 70 140 210 280	Sp-Ci Feo-S Cal Am/Si X/Qtz Ep	RDD	Lithology	Descriptions
4800						
501						DIKE, vesicular, 3% olivine phenocrysts and microphenocrysts (altered) in an altered groundmass. SMECTITE-CHLORITE. The last 30cm of the box is unaltered. Vesicles are filled with SMECTITE-CHLORITE and CALCITE.
4810						DIKE, 1st 16cm vesicular, rest nonvesicular, 1% olivine phenocrysts and microphenocrysts (altered) in a gray diktytaxitic groundmass (Smeectite). SMECTITE-CHLORITE and CALCITE in vesicles.
502						
4820						DIKE, <1% olivine microphenocrysts (altered) in a gray diktytaxitic groundmass. 2) DiKE, avascular, 1% plagioclase microphenocrysts in a dark gray groundmass. SMECTITE-CHLORITE and AMORPHOUS SILICA lines fractures; CALCITE and QUARTZ CRYSTALS in vesicles.
503						
4830						DIKE, <1% olivine microphenocrysts (altered) in a gray diktytaxitic groundmass. 2) DiKE, 1% plagioclase microphenocrysts in a dark gray groundmass. CALCITE and QUARTZ CRYSTALS in vesicles. Calcite also on fractures.
504						
4840						DIKE, rare plagioclase microphenocrysts in a gray groundmass. SMECTITE-CHLORITE and CALCITE lines fractures.
505						
4850						DIKE, aphyric, gray groundmass with unfilled hairline fractures. SMECTITE-CHLORITE lines fractures.
506						
4860						DIKE, with <1% olivine phenocrysts and microphenocrysts in a fine dark gray diktytaxitic groundmass altered to SMECTITE-CHLORITE.
507						
4870						DIKE, aphyric, gray groundmass; hairline fractures, filled with SMECTITE-CHLORITE, CALCITE and FE-SULFIDES (Pyrite).
508						
4880						DIKE, with <1% olivine phenocrysts and microphenocrysts in a dark gray feldspathic groundmass. SMECTITE-CHLORITE lines fractures.
509						
4890						DIKE, aphyric, groundmass gray diktytaxitic. 2) DiKE, <1% plagioclase blades and laths near chill margins, groundmass is dark gray; hairline fractures filled with CALCITE, SMECTITE-CHLORITE and FE-SULFIDES (Pyrite), numerous in unit *1, not as numerous in unit 2.
510						
4900						DIKE, <1% olivine phenocrysts and microphenocrysts in a medium gray feldspathic groundmass. 2) DiKE, <1% olivine phenocrysts and microphenocrysts, in a microvesicular dark gray groundmass. CALCITE, QUARTZ CRYSTALS and FE-SULFIDES (Pyrite) along fractures.
511						
4910						DIKE, see next page for description
512						
4900						

						CATALOG OF SOH 4 CORE						
Depth Feet	BOX	Temp (C)				Sr-CI Zeol.	Fe-S Cal	An/Sr Am/St	X/Qtz Epi.	ROD	Lithology	Descriptions
4900												
512												DIKE, microvesicular, 1% olivine phenocrysts and microphenocrysts (altered), 3% plagioclase rhombs, olivine-plagioclase intergrowths in a feldspathic gray groundmass. Phenocryst % decreases, vesicularity decreases. Fractures Filled with SMECTITE-CHLORITE, CALCITE, and QUARTZ CRYSTALS.
4910												DIKE, aphyric, dark gray basalt. 2) DiKE, rare olivine microphenocrysts (altered) in a gray groundmass coarsens to diktytaxitic through box. Fractures are open or filled with SMECTITE-CHLORITE, QUARTZ CRYSTALS, FE-SULFIDES & CALCITE.
513												
4920												DIKE, <1% olivine phenocrysts and microphenocrysts in a light gray diktytaxitic groundmass. 2) DiKE, 1-5% olivine phenocrysts and microphenocrysts in a medium gray, Fine to coarse back to fine diktytaxitic groundmass. DiKE 2 intrudes DiKE 1 and DiKE 3. 3) DiKE, <1% olivine phenocrysts and microphenocrysts in a gray feldspathic groundmass. SMECTITE-CHLORITE, QUARTZ CRYSTALS, AMORPHOUS SILICA & CALCITE line fractures. FE-SULFIDES in vesicles.
514												
4930												DIKE, 3% plagioclase microphenocrysts, aphanitic near contact grades to feldspathic, 0% phenocrysts in first 30cm, 2) A'a, 5% olivine microphenocrysts and phenocrysts (altered), in a groundmass completely altered to SMECTITE-CHLORITE. Vesicles are filled SMECTITE-CHLORITE and ZEOLITE. SMECTITE-CHLORITE and AMORPHOUS SILICA line fractures.
515												
4940												A'a, 5% olivine phenocrysts and microphenocrysts (altered) in an altered red Smectite groundmass. Vesicles are filled with SMECTITE-CHLORITE, ZEOLITES & CALCITE. QUARTZ CRYSTALS line fractures.
516												
4950												A'a with CLINKER, 1% olivine phenocrysts and microphenocrysts (altered) in a gray feldspathic groundmass. SMECTITE-CHLORITE, QUARTZ CRYSTALS, & CALCITE line fractures, Fill vesicles.
517												
4960												A'a, with 1-3% olivine phenocrysts and microphenocrysts (altered) in a light gray Fine to coarse diktytaxitic groundmass. SMECTITE-CHLORITE and QUARTZ CRYSTALS line fractures. CALCITE and Smectite in vesicles.
518												
4970												CLINKER, compacted, rare olivine microphenocrysts (altered) in a gray matrix thermally oxidized. 2) DiKE, rare olivine microphenocrysts (altered) in a gray groundmass. SMECTITE-CHLORITE and QUARTZ CRYSTALS line fractures. CALCITE and Smectite in vesicles.
519												
4980												DIKE, <1% olivine phenocrysts and microphenocrysts (altered) in a dark gray feldspathic groundmass. SMECTITE-CHLORITE, AMORPHOUS SILICA, CALCITE and FE-SULFIDES (Pyrite) line fractures.
520												
4990												DIKE, <1% olivine phenocrysts and microphenocrysts (altered) in a dark gray feldspathic groundmass. Fault gauge is present in upper 55 cm of unit. 2) Transitional, <1% olivine phenocrysts and microphenocrysts (altered) in a dark gray Feldspathic groundmass. FE-SULFIDES (Pyrite) line fractures. QUARTZ CRYSTALS in vesicles; SMECTITE-CHLORITE and CALCITE in both.
521												
5000												TRANSITIONAL, rare olivine microphenocrysts (altered), in a gray diktytaxitic groundmass. 2) Lithology as above or this unit may be an indurated highly altered ash. QUARTZ CRYSTALS on fractures; SMECTITE-CHLORITE in vesicles.
522												
523												TRANSITIONAL, see next page for unit description

SOH 4

# Scientific Observation Hole Site 4 Elevation 1200 Ft a.s.l.



# CATALOG OF SOH 4 CORE

Depth Feet	Box	Temp (C) 70 140 210 280	Sm-Ct Zeol.	Fe-S Cal	An/Gy Am/Si	Y/Qtz Cpi.	RDD	Lithology	Descriptions
5100									Dike with 3% olivine as phenocrysts, microphenocrysts in a diktytaxitic groundmass. PAHOEHOE, 2) with 3% olivine as microphenocrysts in a gray groundmass. 4) Pahoe-hoe, with 10% olivine as phenocrysts, microphenocrysts in a light gray altered groundmass. SMECTITE-CHLORITE and FE-SULFIDES (Pyrite) in vesicles and on fractures.
5110	534								TRANSITIONAL, 10% olivine phenocrysts and microphenocrysts (altered) in a gray altered groundmass. SMECTITE-CHLORITE lines fractures; AMORPHOUS SILICA in vesicles.
5120	535								TRANSITIONAL, 10% olivine phenocrysts and microphenocrysts (altered) in a gray groundmass altered. SMECTITE-CHLORITE lines fractures and in vesicles.
5130	536								PAHOEHOE, altered, with 15% olivine phenocrysts and microphenocrysts (altered) in a dark gray blue groundmass. 2) Pahoe-hoe, unaltered, aphyric, in a light gray diktytaxitic groundmass. 3) Pahoe-hoe, altered, with 20% olivine phenocrysts and microphenocrysts (altered). The groundmass alters to clay and becomes sand. CALCITE on fractures; AMORPHOUS SILICA in voids; SMECTITE-CHLORITE and ZEOLITES (Analcime) found in both places.
5140	537								TRANSITIONAL, 10% olivine phenocrysts and microphenocrysts (altered) in a gray altered groundmass. SMECTITE-CHLORITE and CALCITE line fractures. ZEOLITE in vesicles.
5150	538								PAHOEHOE, with 10% olivine phenocrysts, microphenocrysts (altered) in an aphanitic groundmass. 2) Pahoe-hoe, with 7% olivine phenocrysts (altered) in an aphanitic groundmass. Crystal settling apparent. SMECTITE-CHLORITE, ZEOLITES (Analcime, Chabazite?), CALCITE all on fractures; AMORPHOUS SILICA in vesicles.
5160	539								TRANSITIONAL, 10% olivine phenocrysts & microphenocrysts (altered) in a dark to light gray altered groundmass. ZEOLITES (Pectolite?), and SMECTITE-CHLORITE line fractures.
5170	540								PAHOEHOE, moderately altered with 15% olivine phenocrysts and microphenocrysts (altered) in a gray groundmass. CALCITE and AMORPHOUS SILICA in vesicles; SMECTITE-CHLORITE found in both places.
5180	541								PAHOEHOE, with 15% olivine as phenocrysts, microphenocrysts (altered) in an altered groundmass. 2) Pahoe-hoe, with 15% olivine as phenocrysts, microphenocrysts (altered) in feldspathic groundmass. ZEOLITES (Analcime) and AMORPHOUS SILICA in vesicles; SMECTITE-CHLORITE found in both places.
5190	542								PAHOEHOE moderately altered, with 7% olivine (altered) phenocrysts and microphenocrysts in a dark gray feldspathic groundmass (altered). 2) Pahoe-hoe, with 3-5% olivine phenocrysts and microphenocrysts (altered) in a light gray feldspathic groundmass. 3) Dike with <1% olivine phenocrysts and microphenocrysts in a dark gray aphanitic groundmass. CALCITE on fractures; QUARTZ CRYSTALS and ZEOLITES (Analcime) in vesicles; AMORPHOUS SILICA and SMECTITE-CHLORITE found in both places.
5200	543								DIKE, begins aphyric, diktytaxitic light gray basalt, olivine % increases to 10% phenocrysts and microphenocrysts, (some altered). Alteration of groundmass increases until it is completely altered. SMECTITE-CHLORITE, groundmass
	544								DIKE, see next page.
	545								

# CATALOG OF SOH 4 CORE

Depth	Feet	Box	Temp (C)	70	140	210	280	Sm-Cl	Feo-S	Cal	Am/Gy	Zn	Ep	R00	Lithology	Descriptions
	5200															DIKE, 10% olivine phenocrysts and microphenocrysts in a gray diktytaxitic groundmass almost completely altered. SMECTITE-CHLORITE, Albite, in altered groundmass.
	5205	545														DIKE, with 10-15% olivine phenocrysts and microphenocrysts in a "sandy" groundmass (for first foot), eventually this grades into a lower concentration of olivine at 1% in a competent light gray feldspathic. SMECTITE-CHLORITE and CALCITE along fractures.
	5210	546														Dike with <1% olivine phenocrysts and microphenocrysts in an unaltered dark gray groundmass. 2) PAHOEHOE with 3-7% olivine phenocrysts and microphenocrysts (altered) in a medium gray feldspathic groundmass. ZEOLITE found in vesicles; AMORPHOUS SILICA and CALCITE along fractures; SMECTITE-CHLORITE in both.
	5215	547														TRANSITIONAL, 10% olivine phenocrysts and microphenocrysts, and sparse olivine-plagioclase intergrowths, in a gray altered groundmass. SMECTITE-CHLORITE found lining fractures.
	5220	548														PAHOEHOE with 7% olivine as phenocrysts, microphenocrysts (altered) in a feldspathic groundmass. 2) PAHOEHOE, with 15% olivine as phenocrysts, microphenocrysts in a diktytaxitic groundmass. Portions of the groundmass are thermally oxydized. 3) Dike with <1% olivine and plagioclase as phenocrysts, microphenocrysts in an aphanitic groundmass. SMECTITE-CHLORITE, CALCITE, AMORPHOUS SILICA, all found on fractures.
	5225	549														AA, with 7% olivine as phenocrysts, microphenocrysts (altered) in a diktytaxitic groundmass. The A'a clinker is oxydized and compacted. SMECTITE-CHLORITE and CALCITE are lining fractures.
	5230	550														AA, with 7% olivine as phenocrysts and microphenocrysts (altered) in a diktytaxitic matrix. Clinker found here is compacted and oxydized. CALCITE along fractures; QUARTZ CRYSTALS in vesicles; SMECTITE-CHLORITE in both.
	5235	551														PAHOEHOE, with 7-10% olivine phenocrysts and microphenocrysts (altered) in a medium gray feldspathic groundmass. Fault gouge and breccia in the upper unit; hairline fractures common. QUARTZ CRYSTALS and FE-SULFIDES in vesicles; CALCITE and SMECTITE-CHLORITE in both.
	5240	552														TRANSITIONAL, 7% olivine phenocrysts and microphenocrysts, in a gray groundmass. Large vugs are lined with QUARTZ CRYSTALS, small vugs filled with CALCITE. Bottom 70% of box shows numerous hair line fracts filled with SMECTITE-CHLORITE.
	5245	553														AA, with 7-10 % olivine phenocrysts, microphenocrysts in a light gray feldspathic groundmass. A'a clinker is present, it is fine grained and indurated. SMECTITE-CHLORITE in vesicles, CALCITE and Smeectite along fractures.
	5250	554														CLINKER, compacted and altered, with 1% olivine phenocrysts and microphenocrysts (altered); few vesicles in-filled with CALCITE, SMECTITE-CHLORITE, and AMORPHOUS SILICA; all of this in a dark brown gray feldspathic groundmass.
	5255	555														Start of NO sized drill. Last next 10 Feet of core in the process.
	5260	556														
	5265															
	5270															
	5275															
	5280															
	5285															
	5290															
	5295															
	5300															

# CATALOG OF SOH 4 CORE

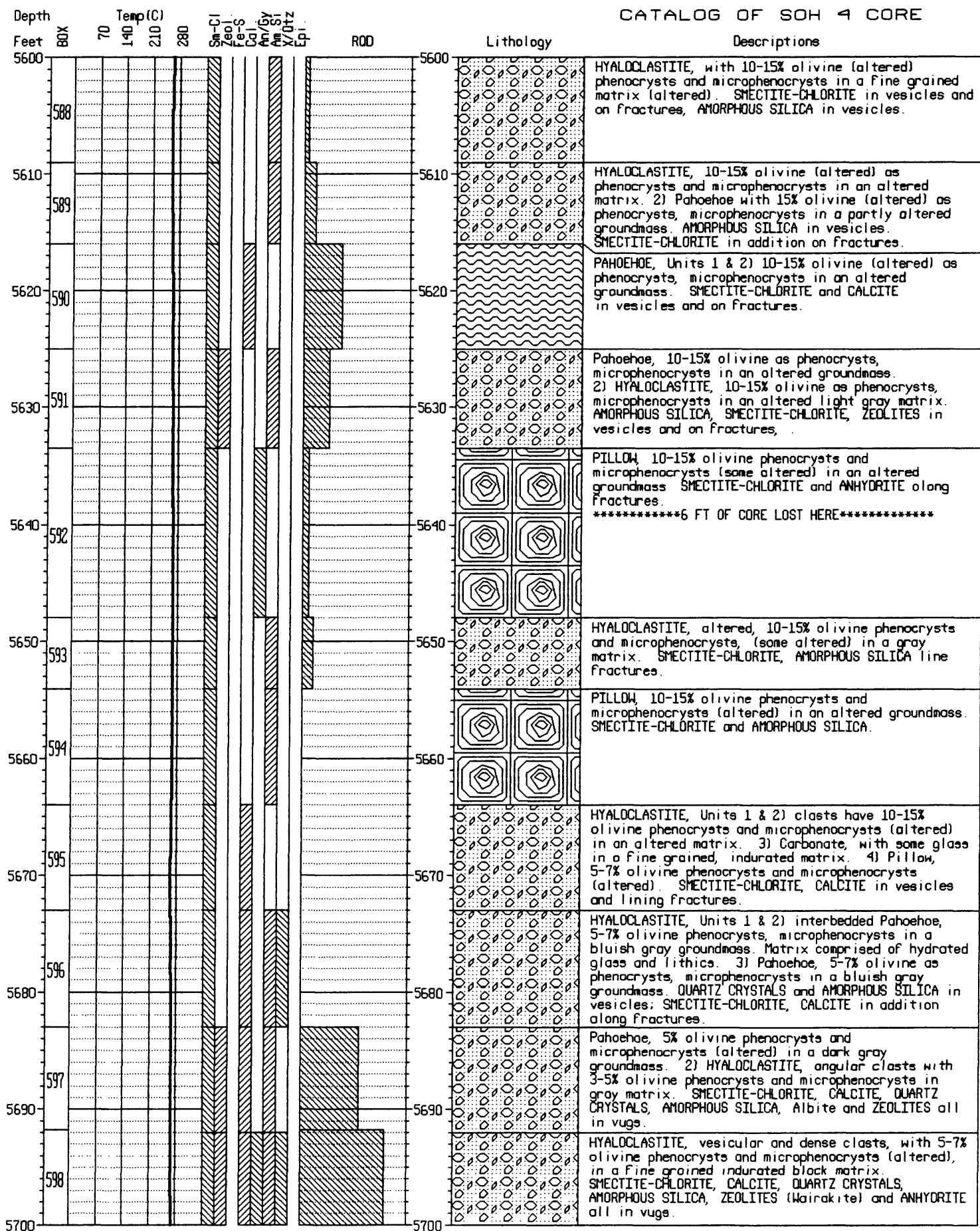
Depth	Feet	BOX	Temp (C)	70	140	210	280	Sm-CI	Zeol	Cal	Am/Sy	Am/Stz	Ep	ROD	Lithology	Descriptions
	5300															CLINKER, compacted, 3% olivine phenocrysts and microphenocrysts (altered) in a dense dark gray altered groundmass. CALCITE and AMORPHOUS SILICA found in vesicles; SMECTITE-CHLORITE also found along fractures.
	5310															CLINKER, Units 1 & 3) compacted, with amygdules, 3% olivine phenocrysts and microphenocrysts (altered) in a dense dark gray groundmass altered toward SMECTITE-CHLORITE. 2) Carbonate, beach hash with shell fragments. Fractures filled with SMECTITE-CHLORITE, vesicles CALCITE. *****First Carbonate here!!!!
	5320															AA, with bottom clinker containing 3% olivine phenocrysts and microphenocrysts (altered) in a dark gray groundmass. Units 2 & 3) Flow, brecciated with <1% olivine phenocrysts and microphenocrysts (altered) with dark gray/black groundmass mixed with fossiliferous CALCITE mud and limestone (coral, echinoderm spines, claws, etc.). CALCITE and SMECTITE-CHLORITE in vesicles.
	5330															Pahoehoe, <1% olivine phenocrysts & microphenocrysts (altered) in a dark gray groundmass. 2) Conglomerate, reworked, with rounded cobbles, and lithic clasts. 3) Pahoehoe, with <1% olivine phenocrysts and microphenocrysts in a dark gray groundmass; breaks down into a crumbly "sand". 4) CONGLOMERATE with carbonaceous mud mixed with lithic clasts with <1% olivine microphenocrysts in a dark gray groundmass. 5) Layered carbonaceous sediments. CALCITE and FE-SULFIDES (Pyrite) along fractures; SMECTITE in vesicles.
	5340															PAHOEHOE, 5% olivine microphenocrysts (altered), vesicle filled with clay in a dark gray green altered groundmass. 2) Dike, <1% plagioclase microphenocrysts in a dark gray unaltered groundmass. 3) Carbonate, no fossils. 4) Clinker, compacted, 7% olivine phenocrysts and microphenocrysts in a light gray altered unit. FE-SULFIDES (Pyrite) on fractures; ANHYDRITE in vesicles; SMECTITE-CHLORITE in both.
	5350															PAHOEHOE, 2-5% olivine as phenocrysts, microphenocrysts in an altered clay groundmass SMECTITE-CHLORITE and CALCITE along fractures and in vesicles.
	5360															AA, compacted Clinker top and bottom, 7% olivine phenocrysts and microphenocrysts (altered) in a dark green altered groundmass to SMECTITE-CHLORITE; last 5 cm are thermally altered. 2) Carbonate, 0.5 cm thick, no fossils. ANHYDRITE in vesicles.
	5370															AA, Clinker, core: 10-15% olivine (altered) in the clinker and 5-10% in the core. Clinker is thermally oxidized. Core has a light gray groundmass in some regions and SMECTITE-CHLORITE in others. CALCITE, ZEOLITES (Analclime) along fractures; ANHYDRITE in vesicles.
	5380															Pahoehoe, altered with 3% olivine phenocrysts and microphenocrysts (altered), in a black groundmass. 2) Ash, thermally oxidized with <1% olivine phenocrysts and microphenocrysts and 3-5% angular glass (altered) 3) CLINKER, groundmass is a red clay. ZEOLITES along fractures, SMECTITE-CHLORITE everywhere.
	5390															AA core, reddish clinker top, 10-12% olivine as phenocrysts, microphenocrysts (98% altered) in a light gray slightly altered groundmass. SMECTITE-CHLORITE and FE-SULFIDES (Pyrite) along fractures, ZEOLITES (Analclime) in vesicles.
	5400															AA, 10% olivine phenocrysts, microphenocrysts (some altered) in a light gray diktytaxitic groundmass SMECTITE-CHLORITE, CALCITE, in vugs, on fractures

# CATALOG OF SOH 4 CORE

Depth Feet	Box	Temp (C) 70 140 210 280	Sw-CI Zeol Fe-S Cal Am/Gy Am/Si X/Dtz Lp	ROD	Lithology	Descriptions
5400	566					AA, with 10% olivine phenocrysts, microphenocrysts (some altered) in a light gray diktytaxitic groundmass. SMECTITE-CHLORITE, CALCITE in vugs and lining fractures.
5410	567					AA, picritic, 7-15% olivine (altered) phenocrysts and microphenocrysts, hairline fractures common; gabbroic inclusions common in a gray feldspathic groundmass. 2) DiKE, with < 1% plagioclase microphenocrysts and laths in a medium gray diktytaxitic groundmass. QUARTZ CRYSTALS in vesicles; SMECTITE-CHLORITE, CALCITE and FE-SULFIDES (Pyrite) lining fractures.
5420	568					DiKE, rare plagioclase microphenocrysts in a gray diktytaxitic groundmass. 2) A'a, 7% olivine phenocrysts and microphenocrysts (altered), groundmass diktytaxitic brecciated near at contact. 3) AA, altered, alteration increases with depth. QUARTZ CRYSTALS and ANHYDRITE in vesicles; SMECTITE-CHLORITE, AMORPHOUS SILICA and FE-SULFIDES (Pyrite) lining fractures. ZEOLITES in both.
5430	569					AA, picritic, 15% olivine as phenocrysts, microphenocrysts (altered) in an altered groundmass SMECTITE-CHLORITE and CALCITE in vesicles and on fractures.
5440	570					AA, altered, olivine (altered) and SMECTITE-CHLORITE filled vesicles 20% at top of box decreases to 10% at bottom, all in a light gray SMECTITE-CHLORITE groundmass. ANHYDRITE on fractures.
5450	571					PAHOEHOE, picritic, partly altered, 15-20% olivine phenocrysts and microphenocrysts (altered), vesicles filled with SMECTITE-CHLORITE, hair line fractures common in a diktytaxitic medium dark gray groundmass. AMORPHOUS SILICA, CALCITE lining fractures. SMECTITE-CHLORITE in both.
5460	572					Pahoehoe, partly altered, picritic, olivine (altered) in a medium dark gray groundmass. 2) DIKE, with <1% olivine phenocrysts and microphenocrysts and <1% plagioclase microlaths and microphenocrysts in a gray diktytaxitic groundmass. Hairline fractures increasing upward; upper half of the unit is brecciated. 3) DiKE, glassy, aphyric, in a golden dark brown groundmass. DiKE 3 intrudes into DiKE 2. QUARTZ CRYSTALS, SMECTITE-CHLORITE, AMORPHOUS SILICA, CALCITE, and FE-SULFIDES (Pyrite) lining fractures.
5470	573					DIKE, brecciated, groundmass gray diktytaxitic. 2) Pahoehoe, altered, 7% olivine phenocrysts and microphenocrysts (altered) in a gray altered groundmass. 3) DiKE, <<1% plagioclase microphenocrysts, groundmass is diktytaxitic gray QUARTZ CRYSTALS and FE-SULFIDES (Pyrite) lining fractures. SMECTITE-CHLORITE in both.
5480	574					DIKE, Units 1 & 3) diktytaxitic, gray colored groundmass altering to SMECTITE-CHLORITE. 2) DiKE, <1% plagioclase microphenocrysts, gray groundmass. 4) DiKE, partly brecciated, aphyric gray basalt. 5) DiKE, aphyric, groundmass is diktytaxitic gray SMECTITE-CHLORITE, AMORPHOUS SILICA and FE-SULFIDES (Pyrite) lining fractures.
5490	575					AA, picritic with 10-15% olivine as phenocrysts, microphenocrysts in a light gray originally diktytaxitic groundmass; now the groundmass is 15-40% altered to SMECTITE-CHLORITE. CALCITE, FE-SULFIDES (Pyrite) along fractures.
5500	576					AA, picritic, 10-15% olivine (altered) in a partially altered feldspathic groundmass. 2) DiKE, with <1% olivine phenocrysts, microphenocrysts and <1% plagioclase as laths in a feldspathic groundmass. SMECTITE-CHLORITE, CALCITE, QUARTZ CRYSTALS, ZEOLITES (green fibrous) all along fractures. FOR DESCRIPTION OF LAST UNIT SEE NEXT PAGE.

# CATALOG OF SOH 4 CORE

Depth Feet	80X	70	Temp (C)	140	210	280	Sp-CI	Feo-S	Cal	Am/Si	X/Otz	Lp1	ROD	Lithology	Descriptions
5500															DIKE with 1-5% augite laths and phenocrysts with which FE-SULFIDES (Pyrite) is associated at 3%; Pyrite occurs with dark halos (looks like a primary mineral, could be altered augite), also 1-3% plagioclase laths and microphenocrysts in a medium gray groundmass. QUARTZ CRYSTAL, AMORPHOUS SILICA and SMECTITE-CHLORITE line fractures.
5510	577														Dike, 5% plagioclase blades and laths, 1-3% augite, FE-SULFIDES (Pyrite) phenocrysts 1%, unit grades to aphyric at contact. 2) PAHOEHOE, altered, 5-7% olivine phenocrysts, microphenocrysts (altered), in a gray altered groundmass. SMECTITE-CHLORITE and AMORPHOUS SILICA on fractures; ANHYDRITE in vesicles.
5520	578														PAHOEHOE, Units 1, 3, 5) 20-25% olivine phenocrysts and microphenocrysts (altered) in a light gray groundmass. 2) Dike, 3-5% FE-SULFIDES (Pyrite), <1% olivine phenocrysts and microphenocrysts, 1-2% plagioclase laths in a medium gray groundmass. 4) Dike, 10% olivine phenocrysts and microphenocrysts, 1% augite in a diktytaxitic groundmass. 6) Hyaloclastite, with 10% olivine phenocrysts and microphenocrysts in a matrix of oxidized ash. SMECTITE-CHLORITE, CALCITE and QUARTZ CRYSTALS line fractures.
5530	579														AA, 1% olivine phenocrysts and microphenocrysts (altered), 1% plagioclase as laths, microlaths in a light gray diktytaxitic groundmass. FE-SULFIDES (Pyrite) on fractures; ZEOLITES, GYPSUM (ANHYDRITE) in vesicles; SMECTITE-CHLORITE, CALCITE and QUARTZ CRYSTALS in both.
5540	580														AA, Units 1 & 2) 1-3% olivine phenocrysts and microphenocrysts (altered) in a gray diktytaxitic groundmass somewhat altered. ZEOLITES, QUARTZ CRYSTALS and ANHYDRITE in vesicles; SMECTITE-CHLORITE found in both places.
5550	581														Clinker, compacted, 1% olivine phenocrysts and microphenocrysts (altered) in a light gray diktytaxitic groundmass, altered. 2) Dike, 1-3% plagioclase blades and laths in a dark gray groundmass. 3) AA, aphanitic, vesicular at contact, grading to nonvesicular, diktytaxitic. QUARTZ CRYSTALS along fractures; SMECTITE-CHLORITE also in vesicles.
5560	582														CLINKER, compacted, aphyric, matrix gray, unaltered, vesicles filled with black SMECTITE-CHLORITE, ANHYDRITE, QUARTZ CRYSTALS. 2) Hyaloclastite, aphyric, angular clasts, some vesicular rounded in an altered groundmass.
5570	583														HYALOCLASTITE, angular clasts, Flow clasts with <1% olivine (altered) phenocrysts and microphenocrysts; large voids filled with SMECTITE-CHLORITE, small voids filled with ANHYDRITE; littoral deposit?
5580	584														HYALOCLASTITE, aphyric, vesicular and nonvesicular angular clasts cemented by a SMECTITE-CHLORITE matrix; colors range from black to greenish brown, small voids filled with ANHYDRITE.
5590	585														VOLCANICLASTIC, normally graded, sandy. 2) Carbonate, coralline material, pink. 3) Pahoehoe, 3-5% olivine in a gray feldspathic groundmass. Units 4 & 6) Carbonate, coralline material (95%), (5%) pebbles of Flow. 5) Pahoehoe, 5% olivine (altered) in a gray feldspathic groundmass. 7) Conglomerate, basalt pebbles (95%) in mud matrix (5%). 8) Hyaloclastite, basaltic clasts, aphyric CALCITE, SMECTITE-CHLORITE, ANHYDRITE, QUARTZ CRYSTALS.
5600	586														VOLCANICLASTIC, Fine grained deposit, matrix is green smectite. Disking has marred all primary features. Unit has 10-15% olivine. SMECTITE-CHLORITE, AMORPHOUS SILICA in vesicles
	587														



# CATALOG OF SOH 4 CORE

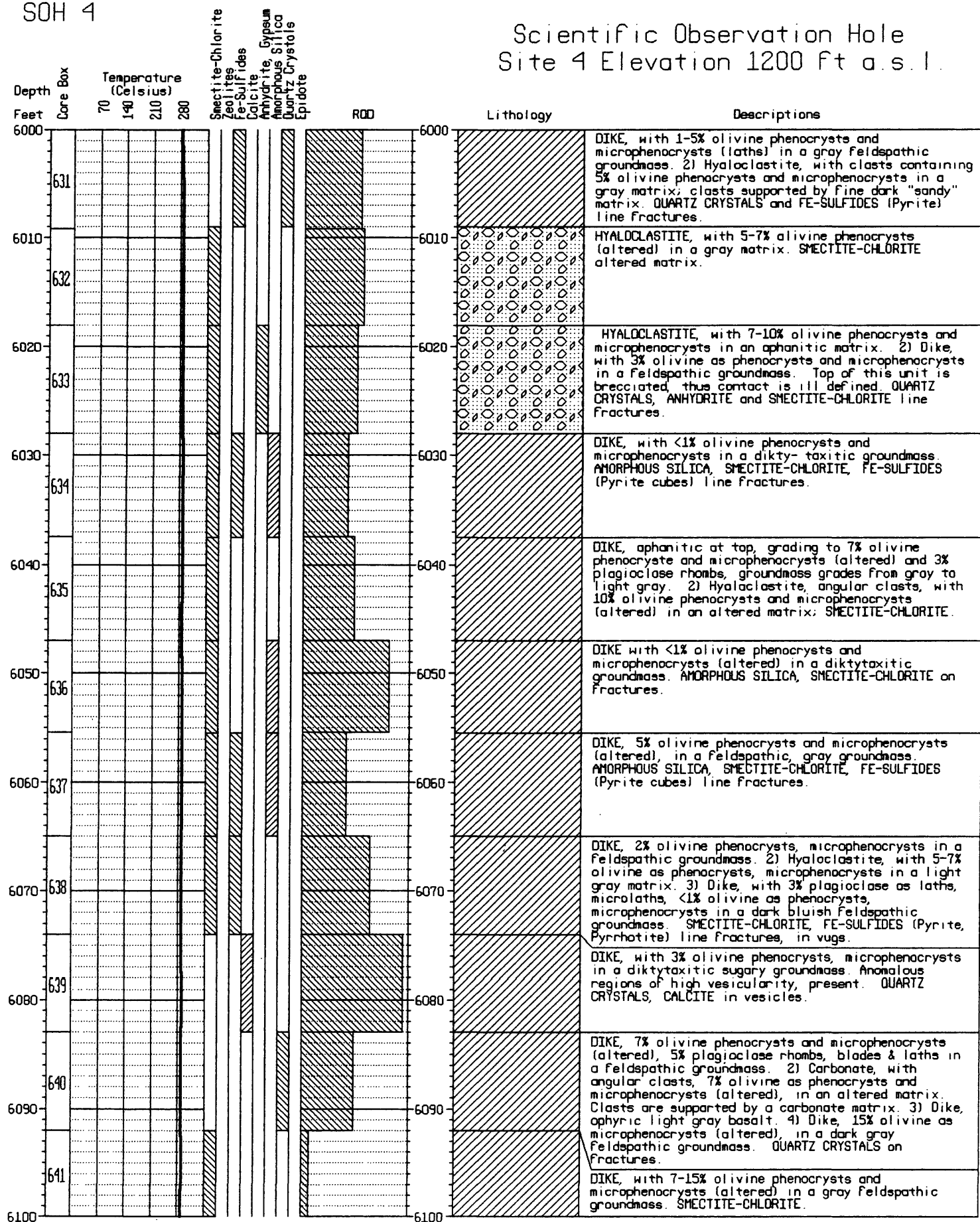
Depth Feet	Box	Temp (C) 70 140 210 280	Sm-Ct Zeol Fe-S Cal Am/Gy An/Si Votz Cpi	ROD	Lithology	Descriptions
5700	598					PILLOW, 2) 5% olivine phenocrysts and microphenocrysts (altered), in a gray slightly altered groundmass. SMECTITE-CHLORITE, CALCITE, AMORPHOUS SILICA, QUARTZ CRYSTALS and ANHYDRITE in vugs.
5710	599					HYALOCLASTITE, clasts with 5-7% olivine phenocrysts, microphenocrysts in a light gray groundmass. SMECTITE-CHLORITE, QUARTZ CRYSTALS, ANHYDRITE, ZEOLITES in vugs, along fractures.
5720	600					Pahoehoe, 3-5% olivine phenocrysts and microphenocrysts (altered) in a dark gray groundmass. 2) HYALOCLASTITE, with angular and vesicular, aphyric basalt, in green matrix. 3) Carbonate, from calcareous to detrital. Calcareous zone 90% coralline fragments, bivalves, echinoderm spines. Detrital zone 80% basalt sand. ANHYDRITE, QUARTZ CRYSTALS, AMORPHOUS SILICA and CALCITE in vugs.
5730	601					CARBONATE, shell fragments and basaltic sand cemented by carbonate; matrix, gray in color. 2) Carbonate, cream white in color. Occasional shell fragments, echinoderm spines, and shell molds.
5740	602					CARBONATE, abundant shell fragments cemented by a fine grained carbonate matrix, cream in color. FE-SULFIDES (Chalcopyrite).
5750	603					CARBONATE, with coral fragments, clam molds, snails, and other organisms remains in a pink to white carbonate mud. Altogether carbonate and fossils comprises 90-95% with 5-10% basalt sands and finer muds. FE-SULFIDES (Pyrite).
5760	604					CARBONATE, fine grained, with corals, coralline algae and shell fragments. 2) Carbonate, large pieces of coral, coralline algae and shell fragments in a matrix of fine calcareous deposits, and fine grained volcaniclastic. 3) Hyaloclastite, dominated by lithic clasts; 10-15% olivine phenocrysts, microphenocrysts the matrix is comprised of volcaniclastics. CALCITE, ANHYDRITE, FE-SULFIDES (pyrrhotite, chalcopyrite), SMECTITE-CHLORITE (Chlorite) in vugs and along fractures.
5770	605					HYALOCLASTITE, with angular pillow clasts in pink-green carbonate sediment. Pillows have 30-40% olivine (fresh) in a medium gray diktytaxitic matrix. 2) Dike, 5-7% olivine phenocrysts and microphenocrysts (fairly fresh) and 1% plagioclase laths and microphenocrysts in a feldspathic groundmass. 3) Pahoehoe, 30-50% olivine phenocrysts and microphenocrysts in a medium gray diktytaxitic groundmass. Zones of unaltered olivine merge with zones of altered. SMECTITE-CHLORITE (Fe-rich) along fractures.
5780	606					PAHOEHOE, 30-40% olivine phenocrysts, microphenocrysts in a diktytaxitic groundmass. The phenocrysts in places are pristine. The groundmass is patchy diktytaxitic in other regions altered. SMECTITE-CHLORITE and ZEOLITES in vugs.
5790	607					PAHOEHOE, 30-40% olivine as phenocrysts, microphenocrysts in a diktytaxitic groundmass. Some of the olivine are still in pristine condition. The groundmass is diktytaxitic to indurated. SMECTITE-CHLORITE and ZEOLITES in vugs.
5800	608					PAHOEHOE, with 25-35% olivine as phenocrysts, microphenocrysts in a mostly altered groundmass. 2) Dike, with <1% olivine as phenocrysts, microphenocrysts and <1% plagioclase laths in a dark gray groundmass. SMECTITE-CHLORITE, ANHYDRITE, CALCITE and ZEOLITES in vugs.
	609					DIKE, <1% olivine in a dark glossy groundmass. Intrudes unit 2.

# CATALOG OF SOH 4 CORE

Depth	Feet	BOX	Temp (C)	70	140	210	280	SO-CI	Le-S	Cal	Am/Gy	Am/Si	X/Dtz	Lpi	ROD	Lithology	Descriptions
	5800																2) Pahoehoe, 30-40% olivine microphenocrysts and phenocrysts (some altered) in a gray groundmass. Hyaloclastite, 3) clasts contain 3% olivine phenocrysts and microphenocrysts in a pale gray-green matrix. 4) CARBONATE, echinoderm spines, clams, coral and lithic clasts, sand. 5) Conglomerate, with 35-60% basalt sand, clasts in carbonaceous mud with 7-15% fossils. SMECTITE-CHLORITE and CALCITE line fractures.
	5810	609															Conglomerate, of basalt sand, fossils, and carbonate. 2) Carbonate, compacted and cemented with carbonate mud and lenses of fine sea green clay. 3) Pillow, 5-10% olivine (altered) phenocrysts and microphenocrysts in a gray groundmass. 4) HYALOCLASTITE, clasts with 7% olivine phenocrysts and microphenocrysts (altered) in a gray matrix. SMECTITE-CHLORITE and CALCITE line fractures.
	5820	610															HYALOCLASTITE, with clasts of 5-7% olivine phenocrysts and microphenocrysts and <1% augite laths in a gray matrix of basalt sand. 2) Pillow, 3-5% olivine phenocrysts and <1% augite laths in a gray groundmass. Between pillow toes is a wedge of angular basalt clasts and sand in carbonate mud. CALCITE, SMECTITE-CHLORITE and ANHYDRITE.
	5830	611															HYALOCLASTITE, with pillow fragments, 7-10% olivine as phenocrysts, microphenocrysts in dense dark bluish gray matrix. CALCITE, SMECTITE-CHLORITE in vugs, line fractures.
	5840	612															PILLOW, 7-10% olivine as phenocrysts, microphenocrysts in a dark bluish gray groundmass. 2) Hyaloclastite, clasts, 7-10% olivine phenocrysts, microphenocrysts in an altered matrix. 3) Pillow, 7-10% olivine as phenocrysts, microphenocrysts in a dark blue gray groundmass. CALCITE, SMECTITE-CHLORITE in vugs.
	5850	613															PILLOW, with 5-10% olivine phenocrysts and microphenocrysts in a medium gray groundmass. 2) Hyaloclastite with 7-10% olivine phenocrysts and microphenocrysts and <1% augite laths in a medium gray matrix. CALCITE, SMECTITE-CHLORITE in vugs.
	5860	614															HYALOCLASTITE, with pillow fragments, 5-7% olivine phenocrysts and microphenocrysts in a medium gray matrix. AMORPHOUS SILICA, CALCITE and SMECTITE-CHLORITE line fractures.
	5870	615															HYALOCLASTITE, Units 1 & 4) angular clasts with 10% olivine phenocrysts and microphenocrysts (altered), compacted into a competent unit. Fractures filled with SMECTITE-CHLORITE, AMORPHOUS SILICA and CALCITE. Units 2 & 4) Pillow, 10% olivine phenocrysts and microphenocrysts (altered), in a gray to grayish-tan groundmass.
	5880	616															HYALOCLASTITE, Units 1, 3, & 5) angular gray clasts with 10% olivine phenocrysts and microphenocrysts (altered), compacted into a competent unit. Units 2 & 4) Pillow, 10% olivine phenocrysts and microphenocrysts (altered) in a gray groundmass. SMECTITE-CHLORITE, CALCITE, AMORPHOUS SILICA and ANHYDRITE line fractures.
	5890	617															HYALOCLASTITE, Units 1-5) Pillow fragments with 7-10% olivine as phenocrysts, microphenocrysts (altered) in a gray matrix. ANHYDRITE, SMECTITE-CHLORITE, and QUARTZ CRYSTALS line fractures.
	5900	618															HYALOCLASTITE, Pillow fragments with 7-10% olivine as phenocrysts, microphenocrysts in a light bluish gray groundmass. ANHYDRITE, SMECTITE-CHLORITE in vugs.
		619															HYALOCLASTITE, See next page for description
		620															

CATALOG OF SOH 4 CORE																		
Depth	Feet	BOX	70	Temp (C)	140	210	280	Sm-Cr	Zeol	Fe-S	Cal	Am/Gy	Am/Stz	X/Dtz	Epi	ROD	Lithology	Descriptions
	5900																	HYALOCLASTITE, and Pillow Fragments with 7-10% olivine as phenocrysts, microphenocrysts in a bluish gray matrix. Some of the clasts are vesicular. ANHYDRITE, SMECTITE-CHLORITE, CALCITE line vugs.
	5910																	HYALOCLASTITE, and Pillow Fragments with 7-10% olivine as phenocrysts, microphenocrysts in a light bluish gray matrix. ANHYDRITE, SMECTITE-CHLORITE, AMORPHOUS SILICA and ZEOLITES line vugs.
	5920																	PILLOW, massive, with 7-10% olivine as phenocrysts, microphenocrysts in a gray groundmass. ANHYDRITE, SMECTITE-CHLORITE.
	5930																	PILLOW, massive, with 5-7% olivine as phenocrysts, microphenocrysts in a gray groundmass. The groundmass is fine grained, sugary in appearance. SMECTITE-CHLORITE, ANHYDRITE line fractures and vugs.
	5940																	PILLOW, massive with 3-5% olivine phenocrysts and microphenocrysts in a gray groundmass. 2) Hyaloclastite with 3% olivine phenocrysts and microphenocrysts in a gray matrix. SMECTITE-CHLORITE, ANHYDRITE on fractures and in vugs.
	5950																	Pillow, Units 1 & 3) 5% olivine phenocrysts and microphenocrysts in a gray groundmass. 2) Hyaloclastite, clasts with 3-5% olivine phenocrysts and microphenocrysts in a gray matrix. The clasts are supported by Carbonate mud. 4) CONGLOMERATE, with clasts of basalt and fossil fragments in a carbonate mud (50:30:20). 5) Conglomerate, with basalt clasts, fossils, and carbonate mud (20:20:60). CALCITE on fractures.
	5960																	HYALOCLASTITE, angular clasts, with 15% olivine as phenocrysts and microphenocrysts (altered) in an altered matrix. Small clasts altered, large remains unaltered, all cemented by a tan carbonate. SMECTITE-CHLORITE, CALCITE and ANHYDRITE along fractures.
	5970																	HYALOCLASTITE, with pillow fragments the fine grained matrix is altered. SMECTITE-CHLORITE, CALCITE, ANHYDRITE line fractures, in vugs.
	5980																	HYALOCLASTITE, with pillow clasts, 10-15% olivine phenocrysts and microphenocrysts, and 1% augite laths in a gray matrix. Clasts supported with fine black sand/ash matrix and carbonate mud (5-10%). CALCITE on fracture surfaces.
	5990																	Hyaloclastite, and pillow fragments, 10% olivine phenocrysts and microphenocrysts (some altered), in an altered matrix. Units 2 & 3) DIKE, aphanitic, gray basalt. 4) Dike, aphanitic at contact grades into 10% olivine (altered) and 7% plagioclase as phenocrysts and microphenocrysts. Groundmass is partially altered in places. SMECTITE-CHLORITE and ANHYDRITE line fractures.
	6000																	DIKE, with regions pristine, others altered to sand. The lithology consist of 10% olivine phenocrysts, microphenocrysts in a diktytaxitic groundmass. Olivines are unaltered. SMECTITE-CHLORITE in matrix.

# Scientific Observation Hole Site 4 Elevation 1200 ft a.s.l.



# CATALOG OF SOH 4 CORE

CATALOG OF SOH 4 CORE																		
Depth	Feet	Box	70	Temp (C)	140	210	280	Sa-CI	Zeol	Fe-S	Cal	Am/Gy	Am/Si	X/Dtz	Lpi	ROD	Lithology	Descriptions
	6100	641																DIKE, with 7-15% olivine phenocrysts and microphenocrysts (altered) in a gray feldspathic groundmass. Progressively becomes granulated into sand and disks. SMCETITE-CHLORITE.
		642																DIKE, 15-20% olivine phenocrysts and microphenocrysts in a gray feldspathic groundmass. 2) DiKE, with <1% olivine phenocrysts and microphenocrysts in a light gray groundmass. 3) Hyaloclastite, with 15% olivine phenocrysts and microphenocrysts in clasts surrounded by dark gray matrix. 4) DiKE, with <1% olivine phenocrysts and microphenocrysts in a light gray groundmass. SMCETITE-CHLORITE and AMORPHOUS SILICA line Fractures. FE-SULFIDES (Pyrite) in vugs.
6110																		DIKE, aphanitic, Feldspathic gray basalt. SMCETITE-CHLORITE, AMORPHOUS SILICA and CALCITE line Fractures.
	6120	643																DIKE with <1% olivine phenocrysts and microphenocrysts in a gray feldspathic groundmass. 2) DiKE, with 1% olivine phenocrysts and microphenocrysts in a brown-gray groundmass. DiKE 2 intrudes dike *1. AMORPHOUS SILICA along Fractures.
	6130	644																DIKE, <1% olivine phenocrysts and microphenocrysts in a medium gray feldspathic groundmass. Units 2 & 3) DiKE, <1% olivine phenocrysts and microphenocrysts in a brown gray groundmass. DiKE is brecciated and diskling occurs. 4) DiKE, composition similar to dike 2 but, it intrudes dike 3. ANHYDRITE, SMCETITE-CHLORITE, AMORPHOUS SILICA and FE-SULFIDES (Pyrite) line Fractures.
	6140	645																DIKE, Units 1 & 3) with <1% olivine phenocrysts and microphenocrysts in a gray groundmass. 2) Hyaloclastite, with clasts of 1-3% olivine phenocrysts and microphenocrysts in a gray matrix. Clasts surrounded by green-brown-black basaltic sand. SMCETITE-CHLORITE, AMORPHOUS SILICA, FE-SULFIDES (Pyrite) and CALCITE line Fractures.
6150		646																DIKE with 1% olivine phenocrysts, microphenocrysts and <1% plag laths in a feldspathic groundmass. SMCETITE-CHLORITE.
	6160	647																DIKE with 1% olivine as phenocrysts, microphenocrysts and <1% plag as microlaths in a feldspathic groundmass. 2) DiKE, with <1% olivine as phenocrysts, microphenocrysts in a feldspathic groundmass. SMCETITE-CHLORITE, CALCITE, QUARTZ CRYSTALS on Fractures, in vugs.
	6170	648																DIKE, with <1% olivine phenocrysts and microphenocrysts in a gray groundmass. Unit 1 intrudes unit *2. 2) Hyaloclastite and Pillow lavas, 3% olivine phenocrysts and microphenocrysts in a gray matrix, suspended by green altered glass and fine basaltic sand. QUARTZ CRYSTALS, CALCITE, SMCETITE-CHLORITE, FE-SULFIDES (Pyrite) lining Fractures.
6180		649																HYALOCLASTITE, and pillow lavas with 3-5% olivine phenocrysts and microphenocrysts (altered) in a gray-green matrix. The matrix is a green colored sand. AMORPHOUS SILICA and SMCETITE-CHLORITE line Fractures.
	6190	650																HYALOCLASTITE, and Pillows, with 3-5% olivine phenocrysts and microphenocrysts (altered) in a gray sandy green matrix. SMCETITE-CHLORITE, QUARTZ CRYSTALS, CALCITE, FE-SULFIDES (Pyrite) line Fractures.
	6200	651																HYALOCLASTITE, Pillows with 3-5% olivine phenocrysts and microphenocrysts in a gray matrix. Clasts suspended by a block, gray, green matrix. QUARTZ CRYSTALS, SMCETITE-CHLORITE and CALCITE in vugs.
	6200	652																

# CATALOG OF SOH 4 CORE

CATALOG OF SOH 4 CORE																
Depth	Feet	BOX	Temp (C)				Sm-CI	Zeol	Fe-S	Cal	Am/Gy	X/Dtz	Lpi	ROD	Lithology	Descriptions
			70	140	210	280										
	6200	652														HYALOCLASTITE, Pillows with 3-5% olivine phenocrysts and microphenocrysts in a gray matrix. Clasts suspended in a grainy black-gray-green matrix. QUARTZ CRYSTALS, SMECTITE-CHLORITE and CALCITE line Fractures.
	6210	653														HYALOCLASTITE, Pillows with 3-5% olivine phenocrysts and microphenocrysts in a gray matrix. Clasts supported by grainy black-green matrix. ANHYDRITE, FE-SULFIDES (pyrite) and QUARTZ CRYSTALS lining Fractures.
	6220	654														HYALOCLASTITE, Pillow fragments with 3-5% olivine phenocrysts and microphenocrysts in a gray matrix. Matrix is fine grained glassy and altered green around clasts, sandy texture. ANHYDRITE and SMECTITE-CHLORITE line Fractures.
	6230	655														HYALOCLASTITE, Pillow lava with 3-5% olivine phenocrysts and microphenocrysts in a gray matrix. Matrix of hyaloclastite altering green. ANHYDRITE and SMECTITE-CHLORITE line Fractures.
	6240	656														HYALOCLASTITE, with pillow fragments, with 3-7% olivine phenocrysts and microphenocrysts in a gray matrix. Matrix dark-light green grainy texture. ANHYDRITE, SMECTITE-CHLORITE line Fractures.
	6250	657														HYALOCLASTITE, with angular clasts, 10% olivine as phenocrysts and microphenocrysts (altered). Small clasts (<1 cm) completely altered. Large ones are still gray, all cemented by a black matrix. 2) Pillow, 10% olivine phenocrysts and microphenocrysts (altered), in a gray groundmass. AMORPHOUS SILICA, ANHYDRITE, SMECTITE-CHLORITE line Fractures.
	6260	658														HYALOCLASTITE, Pillows, 10% olivine phenocrysts and microphenocrysts (altered). Small clasts completely altered, large ones still gray basalt, all cemented by black matrix. 2) Pillow, 10% olivine phenocrysts and microphenocrysts (altered) in a gray groundmass. 3) Dike, aphyric, dark gray groundmass. Intrudes into pillow. SMECTITE-CHLORITE and ANHYDRITE line Fractures.
	6270	659														PILLOW, Units 1 & 3) 10% olivine phenocrysts and microphenocrysts (altered), in a gray groundmass. Units 2 & 4) Hyaloclastite, Pillows, 10% olivine phenocrysts and microphenocrysts (altered), in a gray groundmass cemented by black clay. SMECTITE-CHLORITE, AMORPHOUS SILICA line Fractures.
	6280	660														HYALOCLASTITE, clasts with 5% olivine phenocrysts and microphenocrysts in a lt gray matrix. The clasts are suspended in a green fine grained altered matrix. 2) Dike with 1-3% olivine phenocrysts and microphenocrysts in a gray feldspathic groundmass. ZEOLITE, QUARTZ CRYSTALS, SMECTITE-CHLORITE line Fractures.
	6290	661														DIKE, with 1-2% augite laths, in a gray feldspathic groundmass. 2) Dike with <<1% olivine phenocrysts and microphenocrysts in a medium gray groundmass. FE-SULFIDES and SMECTITE-CHLORITE line Fractures.
	6300	662														DIKE with 1% olivine as phenocrysts, microphenocrysts, 1% plagioclase as Rhombs, laths, and microphenocrysts plus 1% augite as elongated phenocrysts, in a well crystallized groundmass. 2) Hyaloclastite with <1% olivine as phenocrysts, microphenocrysts and plagioclase as microlaths in gray groundmass. SMECTITE-CHLORITE.
	6300	663														DIKE with 15% olivine phenocrysts, microphenocrysts in a feldspathic groundmass. Lower portion= sand.

# CATALOG OF SOH 4 CORE

Depth Feet	BOX	70 Temp (C)	140 Temp (C)	210 Temp (C)	280 Temp (C)	Sp-Cl Feol	Cal Fels	Am Gy Am Si	X/Dtz Epi	ROD	Lithology	Descriptions
6300	663											DIKE with 15% phenocrysts, microphenocrysts in a feldspathic groundmass. The lower portion of the core is sand consistency. Some olivine still fresh. SNECTITE-CHLORITE.
6310	664											DIKE, reduced to a sand-like consistency with 15% olivine as phenocrysts, microphenocrysts in a formerly feldspathic and coherent matrix. SNECTITE-CHLORITE altered groundmass.
6320	665											DIKE with 15%-20% olivine as phenocrysts, microphenocrysts in a sandy matrix (formerly feldspathic and competent). SNECTITE-CHLORITE altered groundmass.
6330	666											DIKE with 25% olivine as phenocrysts microphenocrysts in a well crystallized groundmass. Some olivine still fresh. SNECTITE-CHLORITE in groundmass.
6340	667											DIKE with 15-20% olivine phenocrysts, microphenocrysts in a feldspathic groundmass. The dike margins are much less phyric than the dikes core. SNECTITE-CHLORITE, minor amounts.
6350	668											HYALOCLASTITE, clasts have 1-5% olivine phenocrysts and microphenocrysts in a medium gray matrix. Large clasts are supported by glassy fine grain "sand" ANHYDRITE and SNECTITE-CHLORITE line fractures.
6360	669											Hyaloclastite, clasts with 3% olivine phenocrysts and microphenocrysts in a gray matrix. 2) DIKE, with 1-3% olivine phenocrysts and microphenocrysts in a grey groundmass. FE-SULFIDES (Pyrite), ANHYDRITE, QUARTZ CRYSTALS and AMORPHOUS SILICA line fractures.
6370	670											DIKE, with 5-7% olivine phenocrysts and microphenocrysts in a medium gray groundmass SNECTITE-CHLORITE, ZEOLITES (Fibrous) on fracture surfaces and in vugs
6380	671											DIKE, 15% olivine phenocrysts, microphenocrysts, and olivine-plagioclase intergrowths in a diktytaxitic, light gray groundmass. SNECTITE-CHLORITE line fractures.
6390	672											DIKE, 15% olivine phenocrysts, microphenocrysts (altered), and olivine-plag intergrowths, in a diktytaxitic, light gray groundmass. SNECTITE-CHLORITE line fractures.
6400	673											DIKE, with 5-15% phenocrysts and microphenocrysts (altered) in a medium gray feldspathic groundmass. SNECTITE-CHLORITE (80% layered chlorite) line fractures.
6400	674											DIKE, 15% olivine phenocrysts, (altered), and olivine-plagioclase intergrowths, in a diktytaxitic light gray groundmass. SNECTITE-CHLORITE.

# CATALOG OF SOH 4 CORE

Depth	Feet	Box	70	Temp (C)	140	210	280	Ca-CI	Fe-S	CaI	Am/Gy	Am/Si	X/Qtz	Ep	ROD	Lithology	Descriptions
	6400																DIKE, 15% olivine phenocrysts, microphenocrysts (altered), and olivine-plagioclase intergrowths, in a diktytaxitic, light gray groundmass. SMECTITE-CHLORITE lines fractures.
	6410																DIKE, 15% olivine as phenocrysts, microphenocrysts (altered) in a well crystallized charcoal gray Feldspathic groundmass. SMECTITE-CHLORITE lines fractures.
	6420																DIKE, with 10-15% olivine phenocrysts and microphenocrysts (altered) in a medium gray Feldspathic groundmass. 2) Hyaloclastite and pillow fragments with 3-5% olivine phenocrysts and microphenocrysts (altered) in a medium gray matrix. SMECTITE-CHLORITE, ZEOLITES, QUARTZ CRYSTALS and FE-SULFIDES (Chalcopyrite, Pyrite) lines fractures.
	6430																HYALOCLASTITE, with pillows with 5% olivine as phenocrysts, microphenocrysts in a dark gray matrix. SMECTITE-CHLORITE, QUARTZ CRYSTALS, ANHYDRITE, FE-SULFIDES (Pyrite), and Albite lines fractures.
	6440																HYALOCLASTITE, with pillows containing 5% olivine phenocrysts, microphenocrysts (altered) in an aphanitic matrix. The hyaloclastite is altered. SMECTITE-CHLORITE, QUARTZ CRYSTALS, EPIDOTE, ZEOLITES (Natrolite) lines fractures, in vugs.
	6450																HYALOCLASTITE and pillows with 5-7% olivine as phenocrysts, microphenocrysts (altered) in a dark gray matrix. Hyaloclastite is altered to light green. QUARTZ CRYSTALS, SMECTITE-CHLORITE, CALCITE, EPIDOTE and FE-SULFIDES (Chalcopyrite) lines fractures, in vugs.
	6460																HYALOCLASTITE, and pillow fragments, with 5-7% olivine phenocrysts and microphenocrysts in a gray aphanitic matrix. Hyaloclastite matrix and clasts altering green. QUARTZ CRYSTALS, SMECTITE-CHLORITE, ANHYDRITE, FE-SULFIDES (Pyrite, Pyrrhotite) lining fractures.
	6470																HYALOCLASTITE, and pillow lava with 3-5% olivine (altered) phenocrysts and microphenocrysts in a medium gray-pale sea green matrix. QUARTZ CRYSTALS, FE-SULFIDES (Pyrite), ANHYDRITE, SMECTITE-CHLORITE, EPIDOTE lining fractures.
	6480																HYALOCLASTITE and pillows with 5-7% olivine phenocrysts, microphenocrysts (altered) in an aphanitic matrix. Hyaloclastite is lt. green in color, altered. QUARTZ CRYSTALS, EPIDOTE, SMECTITE-CHLORITE, ANHYDRITE, FE-SULFIDES (Chalcopyrite) lining fractures, and vugs.
	6490																HYALOCLASTITE and pillows with 5-7% olivine as phenocrysts, microphenocrysts in an aphanitic matrix. QUARTZ CRYSTALS, EPIDOTE, SMECTITE-CHLORITE, FE-SULFIDES (Pyrite) lining fractures, in vugs.
	6500																HYALOCLASTITE and pillows with 5-7% olivine (altered) as phenocrysts microphenocrysts in a dark gray aphanitic matrix. Matrix altered to smectite-chlorite. SMECTITE-CHLORITE, QUARTZ CRYSTALS, ANHYDRITE, FE-SULFIDES (Pyrite) lining fractures, in vugs.
	6500																HYALOCLASTITE, see next page for description.

SOH 4

# Scientific Observation Hole Site 4 Elevation 1200 ft a.s.l.

