

**SUSITNA
HYDROELECTRIC PROJECT**

FEDERAL ENERGY REGULATORY COMMISSION
PROJECT No. 7114

**1984 GEOTECHNICAL
EXPLORATION PROGRAM
WATANA DAMSITE**

**APPENDIX A
BOREHOLE LOGS**

FINAL REPORT

HARZA-EBASCO
SUSITNA JOINT VENTURE

**JULY 1984
DOCUMENT NO. 1735**

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

**1984 GEOTECHNICAL EXPLORATION PROGRAM
WATANA DAMSITE**

**APPENDIX A
BOREHOLE LOGS**

Report by
Harza-Ebasco Susitna Joint Venture

Prepared for
Alaska Power Authority

Final Report
July 1984

NOTICE

**ANY QUESTIONS OR COMMENTS CONCERNING
THIS REPORT SHOULD BE DIRECTED TO
THE ALASKA POWER AUTHORITY
SUSITNA PROJECT OFFICE**

APPENDIX A

BORING LOG NOMENCLATURE

Notes

1. Data Summary table of the 1984 Watana Drilling Program boreholes is presented on page A-9.
2. Soil classification in the field using the Unified Soil Classification is listed under the "Graphic Log" column of the Soil Boring Log.
3. All soil gradation graphics presented in the "Remarks" column of the logs are based on laboratory testing and the gradation curves for each are presented in Appendix E.
4. Point load test data summaries are presented in Appendix G.
5. Permability and hydraulic pressure test data summaries are presented in Appendix B and C, respectively.
6. Instrumentation details and groundwater observations are presented in Appendix F.
7. The descriptive terminology which was used for classifying and describing the soil and rock are presented below.
8. Changes in rock lithology are presented graphically if greater than 2 feet in width. If a change in rock lithology is greater than 4 feet it is shown graphically and as a line break in the boring logs.

Soils

Grain Size: Unified Soil Classification System

Boulders	> 1 foot	Silt	0.0039-0.074mm
Cobbles	3 in - 1 ft.	Clay	< 0.0039mm

Gravel

Coarse	16-64mm
Fine	2-16mm

Sand

Coarse	0.5-2mm
Medium	0.25-0.5mm
Fine	0.074-0.25mm

Density:		<u>N Values</u> (Blows/Foot)
	Very Dense	> 50
	Dense	30-50
	Medium Dense	10-30
	Loose	4-10
	Very Loose	0-4

Consistency:		<u>N Values</u> (Blows/Foot)
	Hard	> 30
	Very Stiff	15-30
	Stiff	8-15
	Medium	4-8
	Soft	2-4
	Very Soft	0-2

Moisture:	<u>%</u>	<u>Comments</u>	
	Saturated	100	voids filled with water
	Wet	76-99	visible signs of water
	Moist	51-75	varying degrees of wetness
	Damp	1-50	
	Dry	0	

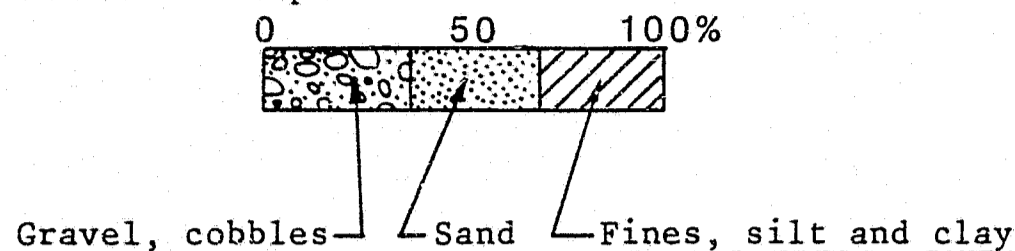
Color.

Munsell Color Chart (wet condition)

Particle Shape:

Angular	Subrounded
Subangular	Rounded

Gradation Graphics:



Rock

DESCRIPTIVE TERMINOLOGY FOR WEATHERING/ALTERATION

- Fresh:** Rock fresh; crystals or grains bright; a few joints may show slight staining; crystalline rocks ring if struck with a hammer.
- Slight:** Rock generally fresh; joints stained and may show clay filling if open; staining may extend into rock fabric adjacent to weathered planes; if present, feldspars may be dull and discolored; crystalline rocks ring if struck with hammer.
- Moderate:** Except for quartz, most of the rock mass shows discoloration and weathering; most feldspar is dull and discolored and kaolinitization (alteration to clay minerals) is common; rock gives a dull sound if struck with hammer; rock shows overall loss of strength; portions may be "excavated" with a geologist's pick.
- Severe:** All minerals, except quartz, discolored or stained; rock fabric still discernible; intergranular or intercrystalline disassociation virtually complete; internal structure essentially that of soil; fragments of strong rock may remain, may be called saprolite.

Complete: Rock is decomposed to a soil; fabric not discernible or only rarely discernible; quartz may remain as dikes or stringers

Occasionally, weathering due to solution (in carbonate rocks) or alteration (in hydrothermally attached rocks of any composition) may be encountered. The following terms are used to describe any voids which result from such action:

Solid: Contains no voids.

Pitted: Small voids generally restricted to joint surfaces, bedding planes, or other surfaces which provide access for attacking fluids.

Vuggy: Use restricted to solution voids in carbonate rocks and hydrothermally altered rocks; voids may be found throughout the rock mass; voids up to 4 inch average diameter.

Vesicular: Use restricted to voids in igneous (occasionally metamorphic) rocks, void origin usually due to gas bubbles; voids up to 4 inch average diameter.

Cavernous: Applicable to any rock; voids and channels greater than 4 inches in average diameter, voids large enough to cause serious leakage and/or structural problems.

DESCRIPTIVE TERMINOLOGY FOR HARDNESS

Very Hard: Cannot be scratched with knife; metal powder left on sample.

Hard: Scratched with knife with difficulty; trace of metal powder left on sample; scratch faintly visible.

Moderately Hard: Readily scratched with knife; scratch leaves heavy trace of dust and is readily visible.

Low Hardness: Gouged or grooved to 1/16 inch by firm pressure on knife; scratches with penny.

Soft: Gouged or grooved readily with knife; small thin pieces can be broken by finger pressure.

Very Soft: Carves with knife; scratched by fingernail.

DESCRIPTIVE TERMINOLOGY FOR DISCONTINUITY SPACING

Discontinuity	Spacing		
	Bedding, Cleavage, Foliation	English	Metric
Joint			
Very Close	Very Thin	Less than 2 inches	Less than 5cm
Close	Thin	2 inches to 1 foot	5 cm to 30 cm
Moderately Close	Medium	1 foot to 3 feet	30 cm to 1 m
Wide	Thick	3 feet to 10 feet	1 m to 3 m
Very Wide	Very Thick	Greater than 10 feet	Greater than 3

DESCRIPTIVE TERMINOLOGY FOR ROCK STRENGTH

- Very Strong - resists breakage from hammer blows, will yield dust and small chips
- Strong - withstand a few hammer blows but will yield large fragments
- Moderately Strong - withstand a few firm hammer blows
- Weak - crumbles with light hammer blows

DESCRIPTIVE TERMINOLOGY FOR ROUGHNESS

CLASSIFICATION	DESCRIPTION
Smooth	Appears smooth and is essentially smooth to the touch. May be slickensided.
Slightly Rough	Asperities on the fracture surfaces are visible and can be distinctly felt
Medium Rough	Asperities are clearly visible and fracture surface feels abrasive.
Rough	Large angular asperities can be seen. Some ridge and high side angle steps evident.
Very Rough	Near vertical steps and ridges occur on the fracture surface.

BORHOLE LOG ABBREVIATIONS

Geological Abbreviations

AND	-	Andesite	weath	-	Weathered
DIO	-	Diorite	unweath	-	Unweathered
plag	-	Plagioclase	alter	-	Altered
bio	-	Biotite	unstd	-	Unstained
qtz	-	Quartz	hrd	-	Hard
kspar	-	Potassium Feldspar	mass	-	Massive
hbl	-	Hornblende	strg	-	Strong
Fe	-	Iron	xyln,xln	-	Crystalline
Mg	-	Magnesium	mins	-	Minerals
PY	-	Pyrite	pseudo	-	Pseudomorphs
kaolin	-	Kaolinite	reheal	-	Rehealed
chlor	-	Chlorite	jt	-	Joint
CaCo ³	-	Calcium Carbonate	coat	-	coating
frac	-	Fracture	F	-	Fine Grained
kaolin.	-	Kaolinization	C	-	Coarse Crained
chlor.	-	Chloritization	ksp	-	Potassium Feldspar
fsp.	-	Feldspar			

General Abbreviations

frzn	-	Frozen	lt	-	Light
v	-	Very	drk	-	Dark
dcrs	-	Decreases	mod	-	Moderate
prbly	-	Probably	occ	-	Occasional
fr	-	Fresh	pcs.	-	Pieces
mech	-	Mechanical	sl,sli	-	Slight
brkg	-	Breaking	med	-	Medium
rtn	-	Return	max	-	Maximum
			min	-	Minimum

Drilling Abbreviations

<u>Type</u>		<u>Sample</u>	
COR	-	Rock Coring	SS - Split Spoon
HSA	-	Hollow Stem Augers	Ts - Shelby Tube
HAM	-	Hammer	Db - Dennison Barrel
CSR	-	Center Stem Rotary	Pb - Pitcher Barrel
DDH	-	Down Hole Hammer	Cb - Churn Drill Barrel
LY38	-	Longyear 38	Cs - Single Tube Core Barrel
			Cd - Double Tube Core Barrel
			Ct - Triple Tube Core Barrel
			Ws - Wash Sample

Engineering Abbreviations

M/C	-	Moisture Content
LL	-	Liquid Limit
PL	-	Plastic Limit
PI	-	Plastic Index
NP	-	Nonplastic
Gs	-	Specific Gravity
K	-	Permeability
σ_c	-	Uniaxial Compressive Strength

50613/A

1984 WATANA DRILLING PROGRAM BOREHOLE SUMMARY

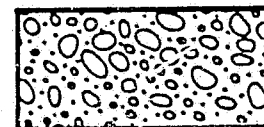
BOREHOLE NUMBER	DEPTH (FT)	INCLINATION (from vertical)	BEARING	COORDINATES		GROUND SURFACE ELEVATION
				NORTH	EAST	
DH84-1	848.5	56°	230°	3,229,555.7	746,594.1	2143.1
DH84-2	765.0	30°	025°	3,227,809.0	743,942.5	2024.2
DH84-3	132.2	30°	025°	3,227,210.7	742,971.6	1503.3
DH84-4	378.0	35°	050°	3,229,235.1	745,813.6	2161.4
DH84-4A	698.5	35°	050°	3,229,193.0	745,774.1	2167.8
DH84-5	265.0	30°	010°	3,227,530.8	742,278.8	1725.6
DH84-6	167.8	30°	025°	3,227,183.5	743,173.8	1521.4
DH84-7	263.5	30°	025°	3,227,402.8	742,558.4	1625.3
DH84-8	100.0	30°	012°	3,227,433.3	743,112.9	1677.1
DH84-9	497.5	35°	230°	3,229,560.2	745,860.5	2161.5
DH84-10	254.0	35°	230°	3,229,232.7	745,813.2	2161.5

A-9

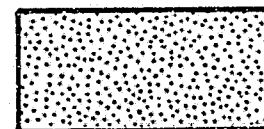
GRAPHIC LEGEND

SOIL:

Gravel, Cobbles



Sand



Fines, Silt and Clay



ROCK:

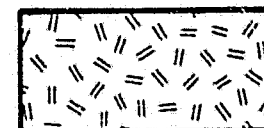
Diorite Suite, Diorite, Quartz Diorite, Granodiorite



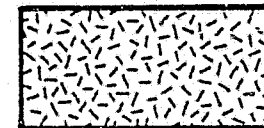
Diorite Suite, severely weathered



Altered Diorite, moderate to severely altered



Monzonite to Granite



Andesite Porphyry



Felsic



STRUCTURE:

Fracture Zone


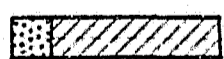


Shear Zone



Boring No Example Angle (from Horizontal) _____ Ground Elevation _____
 Feature _____ Bearing _____ Rock Elevation _____
 Coordinates: N _____ Date Started _____ Total Depth _____
 E _____ Date Completed _____ Ground-Water Elevation _____

Logged by _____

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Instrumentation	Remarks
						USCS	Coarse Grained: Texture, prefix for > 25% coarse or > 12% fines: density, moisture, particle shape, particle distribution, organics, geologic characteristics, color		-more than 50% visible or retained on # 200 sieve
4									
			Ct 1		1.0'	GM	Silty, sandy, GRAVEL, med. dense, moist, subrounded-subangular, fine to coarse, w/tr. organics, lt. grey silt and clay clumps, olive gray		 Organic 4%
6									
						USCS	Fine Grained: Texture, plasticity, density, consistency, moisture, structure, organics, geologic characteristics, color, texture		- more than 50% not visible or passing # 200 sieve
10									
			Ct 2		0.6'	CL	Silty CLAY, low plasticity, v. dense, stiff, moist, frozen, clay layers 6" thick, ice lenses, olive grey, < 5% gravel, occ. cobbles		 LL 31 PL 20 PI 11 CL M/C 75%
12									

Boring No. Example Angle (from Horizontal) _____ Ground Elevation _____
 Feature _____ Bearing _____ Rock Elevation _____
 Coordinates: N _____ Date Started _____ Overburden Thickness _____
 E _____ Date Completed _____ Ground-Water Elevation _____
 Core Sizes _____ Total Depth _____ Logged by _____

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
				Depth, ROCK TYPE, weathering/ alteration, hardness, strength, texture, color, mineralogical composition, alteration products Degree of fracturing, spacing, filling or stain, separation, roughness, angle of fractures L to core axis, size of pieces					
208				207.8-213.5 ALTERED DIORITE, sl. altered; mod. hard to hard; strong, med. xyn; greenish gray; plag; kaolin., hbl, chlor	100/50	BOX 15			Night shift 5/13/84 Run 45, 212.0'-217.0' Drill rate ~ 0.33'/min ~ 100% return water lt. gray
210				208.0-210.0 widely frac. 210.0-212.0 closely frac; sl. weath. and friable along frac. surfs; pcs. 0.1'-0.4'					
212									
214				213.5-205.0 DIORITE; fresh; hard; strong; med. xyn; greenish gray; plag, hbl, tr. qtz. and Fe mineralization mod. close frac; occ. Fe stain; tight to part open; sl. rough to rough; 0-30°, 80°-90°; pcs. 0.2'-2.0' numerous rehealed frags, w/hematite mineralization along most frac. surfs, and in places disseminated through the core	100/80	BOX 16			Run 46, 217.0'-222.0' Drill rate 0.42'/min. Return water changed to reddish brown ~ 218' TC = 13,093 PST
216									
218									
220									

00173

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 1 of 43
Date 29 April '84

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
0				0.0 - 0.6 PEAT, frozen, roots, dk. brown					Run 1, 0.0'-2.3' Wash water brn. 0-2.3' Increasingly more gray w/depth. to ±17' cuttings mostly poorly graded med sand (most fines washed out)
2				0.6 - 15.0 Gravel, Cobbles, max. 4", min. <0.5", most 0.5"-2"; recovered pieces hetero lithologic composed of granodiorite, andesite, and felsic volcanics, mod. to heavy Fe staining on exposed surfaces; strongest weath. 0'-2.3', sli. less below; frag. hard - v. hard, strong - v. strong, subrounded - rounded, finer xln. rock types often smooth (Outwash?)					Run 2, 2.3'-5.3'
4									Run 3, 5.3'-7.3'
6									Run 4, 7.3'-11.3'
8									G.W.L. at 5.5' after 1/2 hr. with casing @ 11' and hole @ 11.3'
10							Box 1		Run 5, 11.3'-16.3'
12									
14									
16				15.0 - 16.3 Boulder highly fractured, sli.-mod. weath. to 1/2" from jts, tr. lt. green-brn. clay on frags.					K = 5 x 10 ⁻⁴ cm/sec (15.2'-19.7')
18				TOP OF ROCK @ 18.5 Ft.					Run 6, 16.3'-20.0' Wash water grn.-brn. 17'-20' Cave at top of run from reaming casing
20				18.5 - 60.0 ANDESITE PORPHYRY, sli. to mod. weath; hard; strong; fine xln. groundmass; SEE SHT. 2 FOR CONT.					K = 2 x 10 ⁻⁴ cm/sec (15.7'-28.6')

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ~~3~~
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 348.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
20	<<< <<<	<<< 30°	X X X	w/plag and hbl phenocrysts; dk. green-gray; andesitic groundmass. v. closely frac.; Fe stained, mod. weath. along joints; pcs. < 0.2'		60/0			Day shift 4/30/84 Run 7, 20.0'-22.2' 100% water return water level @ depth of 8.1' @ 7:15 am 4/30
22	<<< <<<	<<< 45°	X X X	ANDESITE PORPHYRY cont.; sli. to mod. weath., hard, strong; close to v. close frac; Fe staining; rough; 45° to 60°; mod. pcs. < 0.2'		100/0	Box 1		Run 8, 22.2'-24.7'
24	<<< <<<	<<< 45°	X X X	18.5-32.3 v. closely frac; Fe staining, core badly broken; pcs. < 0.2'		100/0			K = 7 x 10 ⁻⁵ cm/sec (22.3'-91.0')
26	<<< <<<	<<< 45°	X X X	24.6 clay filling along frac.					Run 9, 24.7'-30.0'
28	<<< <<<	<<< 45°	X X X			85/0			Casing @ 27.2'
30	<<< <<<	<<< 45°	X X X						Run 10, 30.0'-34.9' Falling head perm. tests @ 34.9' w/ casing @ 15.2, 19.2
32	<<< <<<	<<< 30°	X X X	32.6-38.6 close to mod. frac, sli. Fe staining, part open; sli. rough; 30° to 60°, pcs. 0.2'-1.5', ave. 0.3'-0.5'		95/10	Box 2		Run 11, 34.9'-39.9'
34	<<< <<<	<<< 60°	X X X						σ _c = 23,805 PSI
36	<<< <<<	<<< 20°	X X X						
38	<<< <<<	<<< 60°	X X X	38.5 clay filling along frac. 38.8-39.9		90/00			
40	<<< <<<	<<< 60°	X X X	v. closely frac., Fe staining, core badly broken; pcs. < 0.1'					

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature FINS Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
40				ANDESITE PORPHYRY cont, sli. weath. jts otherwise fresh, strong, aphanitic ground mass w/ plag and. nbl phenocrysts, green-gray closely frac; Fe staining, calcite coating; generally tight, some part open to open, sli. to med. rough, 40°-70°, pcs. 0.1' to 0.9'	76/28		Box 3		Run 12, 39.9'-44.9'
42									
44									
46									
48				rock is fresh w/ sli. weath.	96/40	Box 3		Run 13, 44.9'-49.9'	
50									
52				53.5 healed frac., calcite coating, 65° 53.0-57.0 v. close frac., Fe staining, tr. calcite coatings, tr. kaolin.; sli. rough; 70°-90°, pcs. < 0.2'; heavier Fe staining than above	100/68			Run 14, 49.9'-53.7'	
54									
56									
58				56.7-60.0 ANDESITE BRECCIA; sli. weath; mod. hard; mod. strong, aphanitic with plag (?) phenocrysts and aphanitic tuffaceous (?) fragments, angular, lt. green-gray	83/0	Box 4		Run 15, 53.7'-56.7' Core barrel blocked	
60									
					81/0				Run 16, 56.7'-58.8' Core barrel blocked
									Run 17, 58.8'-64.0'

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft.
 E 746,594.1 Date Completed 7 May, 1984 Ground-Water Elevation 2070.9 Ft. / 1884
 Core Sizes HQ Total Depth 348.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																								
	Lithology	Structure	Fracture Log 3 6 9 12																														
60	[Dotted pattern]	[X marks]	[Vertical lines]	60.0-115.0 DIORITE; mod. weath; mod. hard; mod. strong; med. xln, grn.: gray close frac; Fe staining; tight to open; sl. rough to rough; 10° is most common; 40°, 50°, 80°; pcs. up to 0.4", ave. 0.2" rock has shattered appearance, light hairline fracs. throughout; in places texture of rock is a diorite breccia.	100/8	Box 4			Run 17, cont.																								
62				62.0-64.0 andesitic veins w/ fragments of the diorite, lithified.					100/9	Box 4		Run 18, 64.0'-68.7'																					
64												100/10	Box 4		Run 19, 68.7'-73.0'																		
66															70/0	Box 5		CL at bottom of run (?)															
68																		47/7	Box 5		Run 20, 73.0'-78.5'												
70																								Run 21, 78.5'-82.0'									
72																																	
74																																	
76																																	
78																																	
80																																	

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7184
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks				
	Lithology	Structure	Fracture Log 3 6 9 12										
80	[Dotted pattern]	x x	[Step fracture log]	DIORITE cont, mod. weath, mod. hard, mod. strong, med. xln, gray-green (distinct grn. color, more than rock above 82'), hbl; 50% feld; weath. to grn. chloritic and yellow-white kaolinitic material. core surfs. v. pitted.	[Black bar]	86/0	Box 5		Run 21, cont.				
82				v. close to closely frac, max. pc. 0.5', min. crushed, most 0.1-0.3'; most surfs. chlor. coated w/sli. Fe staining, surfs. sli. mod. rough, sli. tr. clay/si. calcite on few jts.						Night shift 4/30/84 Run 22, 82.0'-85.5' Wash water lt. green-gray, v. clayey.			
84													
86													
88													
90													
92										91.2-95.5 severely weathered, weak, soft, med. xln, friable; Fe staining, mostly chlor. & kaolin. w/some calcite v. pitted core surfaces; possible shearing (?); Core loss 94.0-96.0; close.-v. close. frac., max. 0.7, min. crushed, mostly 0.1'-0.4'; chlor. & Fe stained jts, clayey, sli. sheared	76/0		Run 23, 85.5'-88.5'
94											60/0		Run 24, 88.5'-91.0'
96										96.0 sli. weath; hard; strong; med. xln, green-gray; tr. chlor. & kaolin.; closely frac; max. 0.4'	20/0		Run 25, 91.0'-93.5' Attempted water pres. test Falling head perm. test @ 91.0'
98										96.5-98.5 v. closely frac; high angle jts, 60°-90°, jts healed w/calcite, up to 0.02'	92/10		Run 26, 93.5'-96.0'
100			97.2-99.0, 99.8-100.7 sli. chlor, tr. clay, sli. Fe staining on jts.	100/52		Run 27, 96.0'-98.5'							
						Run 28, 98.5'-101.0'							

00173

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 6 of 43
Date 30 April '84

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. #
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7 88A
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 5 9 12						
100				DIORITE cont; sli. weath; hard, strong, most mod. frac; closely frac. 102.2-102.4, 104.1-104.5; sli. mod. weath; sli.-mod. Fe stained; sli. calcite healing of jts; tight to open; sli. rough to rough; 20°-40°, 50°, 60°; pcs. 0.2'-3.9'	100/76		Box 6		Run: 28, cont.:
102			102.2 weath. sandy clay jt.						
106				rock generally fresh except as noted	98/72		Box 7		Run 30, 106.0'-111.0'
108			108.0-109.0 closely frac; sli.-mod. weath, sli. pitted surface of core, sli. discolor. & Fe staining, calcite; jts. sli. rough						
112				mod. close frac, w/ local intervals of close. frac; pcs. mostly 0.8'-1.2', min. 0.4'	98/86				
114									
116				115.0-123.3 ANDESITE PORPHYRY fresh, hard, strong, aphanitic groundmass, fine grained mafic and plag phenocrysts; banding. 40°; lt. gray	100/43	90/50	Box 8		Run 32, 115.9'-117.9'
118				close frac., calcite, tight to open, sli. rough, 10° to 30°, pcs. generally 0.25'-0.6' with some smaller					
120									

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature FINS Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
120				ANDESITE PORPHYRY, con't; fresh, hard, strong, plag and hbl phenocrysts, green-gray close frac, thin calcite coatings; sli. rough; 10° to 70°; pcs. generally 0.2' to 0.3' with some 1.0' to 1.5'					Run 33, cont.
122	20° / 60°								Run 34, 121.9' - 126.9'
124	45° / 10°			close frac, thin calcite filling at some jts, 0° to 45°; pcs. generally 1.0' or greater	100/84	Box 8			
126	60°								126.0 - 128.4 MONZONITE (?) fresh, hard, str. med. grained, approx. 10% mafics, hbl, gray, change in rock texture
128	20° / 60°			ANDESITE PORPHYRY, con't.. fresh, hard, strong, hbl and plag phenocrysts, med. to ca. xylr green-gray mod. close frac, calcite filling, trace chloritization, 30° to 50°; generally ≥ 1.0', v. few < 1.0'	95/88				
130	30°								131.0 inclusion of angular fragment of monzonite/diorite; oil
132	78°				100/88				
134	60° / 100°								
136	20° / 45°			135.9 - 136.2 healed v. closely frac, chlor, soft; weak; 0°-22°; silty sand filling of jts	100/78	Box 9			Run 37, 135.9' - 140.9'
138	10°								
140									TC = 19,909 PSI

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ± 34
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
140		20°		ANDESITE PORPHYRY, cont. fresh, hard, strong, hb and plag phenocrysts close to wide frags, mostly mod. close, some calcite filling (thin), 100 to 500 pcs. generally 1' or more, some 0.1-0.6'	98/84	Box 9			Run 37, cont.
142		60°							Run 38, 140.9'-145.9'
144		45°							
146		10°							Run 39, 145.9'-150.6'
148		70°							
150		70°							
152		68°		150.2-151.0 andesite, fresh, hard, strong, aphanitic, med. gray, bordered by thin irregular pattern of diorite (?) material, occ. small pods of hb. rich material, up to 0.05'	98/91				Run 40, 151.7'-156.7'
154		100°							
156		20°							
158		45°							Run 41, 156.7'-159.9'
160					100/100	Box 11			

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. *
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
160				ANDESITE PORPHYRY, cont, fresh, hard, strong, mafic, gray	100/100	Box 11			Run 42, 159.9' - 165.1'
162				mod. close to wide frac, some calcite filling (thin) at jts; tight, smooth to sll. rough, angle of frac. 30° to 50°, pcs. generally > 1.0; up to 1.5'					
164				61.0' heated fractures 163.4' - 165.6'					med. xylh., fragment of monzonite (?)
166									
168									
170									
172									
174									
176									
178									
180					100/96	Box 12			Run 43, 165.1' - 169.9'
									Run 44, 169.9' - 174.9'
									Run 45, 174.9' - 178.5'
									Run 46, 178.5' - 183.5'

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature FMS Bearing 294° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ~~X~~
 E 746,594.1 Date Completed 1 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84. &
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
180				ANDESITE PORPHYRY cont, fresh, hard, strong,					Run 46, cont.
182				182.3-189.9 v. closely frac.	98/80				
184				183.3-323.2 QUARTZ DIORITE, fresh v. hard, v. strong, med. xln, white gray, ± 20% hbl, 50% plag, ~10% Qtz. mod. close to widely frac, tr. Fe staining, chlor., calcite filling, tight to p. open, generally rough to sh. rough, 10°-35°, 50° pcs. 0.1'-5.0', generally >1.0'	100/92		Box 12		Run 47, 183.5'-188.5'
186									
188							Box 13		Run 48, 188.5'-193.5'
190				190.1-196.2 fragments of fine xln diorite, upto 0.1'	100/90				
192									
194									Run 49, 193.5'-198.5'
196							Box 14		
198				jt. sh. weath, Fe stained, rough	100/88				Run 50, 198.5'-203.5'
200									σc = 17,313 PSI

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature FINS Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 May, 1984 Overburden Thickness 18.5' Ft. ±
 E 746,594.1 Date Completed 1 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks					
	Lithology	Structure	Fracture Log 3 6 9 12											
200	[Dotted pattern]	[Vertical line]	[Vertical line]	QUARTZ DIORITE, cont, fresh, v. hard, v. strong, with occ. inclusions of fine xln. andesite to diorite, white-gray	100/100	100/100	Box 14		Run 50, cont.					
202				mod. frac; tr. Fe staining, chlorite calcite; tight, sli. rough; 25°-40° 75°; pcs. 0.5'-3.0'										
204														Run 51, 203.5'-208.5'
206										frac's. v. sli. weath.				
208														Run 52, 208.5'-213.5'
210														
212														
214														Run 53, 213.5'-218.5'
216										frac., chlor., calcite, v. sli. Fe stain.				
218														Run 54, 218.5'-223.5'
220			218.8-219.7 fine xln. rock, v. hard, v. str.; irreg; rough; chlor, calc, sli. weath. Fe stained, lt. gray											

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fns Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 13.5 Ft. ±
 E 746,594.1 Date Completed 1 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84 4
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
220	[Dotted pattern]	[Vertical line]	[Vertical line]	QUARTZ DIORITE cont. fresh, v. hard, v. strong, white-gray mod. to widely frac, sli. Fe staining, calcite, chloritic, tight to part open, sli. to med. rough, 10°, 40°-50°, 85°, pcs. 0.3-7.6" aver. > 3.0"	100/94	100/81	Box 16		Run 54, cont.
222				219.0-221.0 high angle jt, sli. Fe staining, penetrative, v. little brkg, v. hard, v. strong, chlor. and calcite on jt. surf; rough, irreg, 65°					Run 55, 223.5'-228.5'
224				224.2-226.1 frac, Fe staining, penetrative, calcite, sli. weath, 65°					
226				frac, sli. Fe stain					Run 56, 228.5'-233.5'
228									
230									
232									
234									
236									
238									
240									Run 57, 233.5'-238.5' core came out in two pieces
									Run 58, 238.5'-243.5'

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft.
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																								
	Lithology	Structure	Fracture Log 3 8 9 12																														
240	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	QUARTZ DIORITE cont; fresh; v. hard; v. strong; med. xln; white-gray, as above w/ inclusions mod. close to widely frac; sli. Fe staining, chlor., calcite; p. open to open; sli. rough to rough; 100 to 70%; mostly 30°-40°; PCS: 0.6' - 4.0'	100/84	100/84	Box 17		Run 58, cont																								
242				frac., chlor, open (?)					100/100	100/100	Box 18	Run 59, 243.5'-248.5' Lost 70% of water circulation in top 3' of run																					
244												100/76	100/76	Box 18	Day shift 5/2/84 Run 60, 248.5'-253.5'																		
246															100/76	100/76	Box 18	Run 61, 253.5'-258.5'															
248																		100/76	100/76	Box 18	Tc = 13,417 PSI												
250																					100/76	100/76	Box 18	Run 62, 258.5'-263.5'									
252																								100/76	100/76	Box 18							
254																											100/76	100/76	Box 18				
256																														100/76	100/76	Box 18	
258																																	100/76
260		100/76	100/76	Box 18																													

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log 3 6 9 12												
260	[Dotted pattern]			QUARTZ DIORITE cont; fresh; v. hard; v. strong; med. xln; white-gray close to mod. close frac. thin calcite filling, Fe staining; tight to open; sli. rough; 5 to 15; pcs. 0.6' to 1.5'	100/100	100/100	Box 19		Run 62, cont.						
262															
264															Run 63, 263.5'-268.5'
266										pcs. 1.0' to 1.5' several 0.3'					
268															Run 64, 268.5'-270.5'
270										calcite coating and Fe staining along jcs.		85/55			Bit Changed.
272															Run 65, 270.5'-275.1'
274												100/98			
276															Run 66, 275.1'-279.6'
278												100/89		Box 20	
280								Run 67, 279.6'-284.7'							

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature FINS Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																								
	Lithology	Structure	Fracture Log 3 6 9 12																														
280	[Dashed pattern]	[Diagonal lines]	[Vertical lines]	QUARTZ DIORITE, cont; fresh, v. hard, strong, med. xln, grn-gray close frac, Fe staining, calcite filling, tight to part open jts, sli. rough; 10°-45°; pcs. 0.1'-1.2' mostly >0.5'	100/67	100/67	Box 20		Run 67, cont.																								
282				283.1-296.3 close to v. close in places; Fe staining, ch. or; calcite; tight to part open; sli. rough, 30° to 70°; pcs. mostly 0.1'-0.5'					100/30	100/30	Box 21	Run 68, 284.7'-289.3'																					
284				286.5 clay filling along frac., thin								100/63	100/63	Box 21	Run 69, 289.5'-294.9'																		
286				286.5-288.8 porphyry, fresh, hard, strong aphanitic groundmass w/ med. gr. phenocrysts, plag, frac. have mod. Fe staining, calcite, good flow structure											100/69	100/69	Box 21	Run 70, 294.9'-297.5'															
288				289.3-289.0 fine xylm														100/69	100/69	Box 21	Run 71, 297.5'-302.5' Water pres test between 46.0 to 297.5 Ft.												
290																					100/69	100/69	Box 21										
292																								100/69	100/69	Box 21							
294																											100/69	100/69	Box 21				
296																														100/69	100/69	Box 21	
298																																	100/69
298		100/69	100/69	Box 21																													
300					100/69	100/69	Box 21																										

00173

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature FINS Bearing 244 Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ~~±~~
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84 ~~±~~
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks					
	Lithology	Structure	Fracture Log 3 6 9 12											
300	[Dotted pattern]	56°		QUARTZ DIORITE cont; fresh; v. hard, v. strong; med. xln; grn-gray close to mod. close frac; chlors; calcite; tight to part open; sli. to med. rough; 100-300, 600, pcs; 0.4'-2.5'	100/100	100/100	Box 22		Run 71, cont.					
302				303.0-304.5 felsic, fresh, v. hard, v. strong, fine to med. xln; <10% mafics, lt. gray welded contacts									Run 72, 302.5'-307.5'	
304		20°												
306		10°												
308		30°							core; badly broken by drilling.					DAY SHIFT 5/3/84
310														Run 73, 307.5'-308.5'
312		10°												Run 74, 308.5'-313.6' 100% water return
314		30°							311.3-314.5 FELSIC; fresh, v. hard, v. strong, mostly fine xln, lt. gray; welded contacts, 55°-90°; 55° dike offsets the 90° dike					Run 75, 313.6'-318.5'
316														
318														
320				317.5-318.5 fract, 30° to 80° nearly longitudinal 319.0 calcite and clay filling on frac., 65°			Box 23		Run 76, 318.5'-323.6'					

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature FINS Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks		
	Lithology	Structure	Fracture Log 3 8 9 12								
320	[Dashed pattern]	[Structure]	[Fracture Log]	QUARTZ DIORITE cont., fresh, v. hard, v. strong, med. xln, green-gray	100/76	100/76	Box 23		Run 76, cont.		
322				close to mod. close frac, calcite coating, tr. Fe staining, tight jts, sli. to med. rough, 30° to 70°; p.c.s. 0.2' - 1.2' ave. 0.5'							
324				323.0 - 415.4 DIORITE; fresh, v. hard; v. strong; med. xln, green-gray; appears to be less quartz, more mafics; close to mod. close frac, cont.						Run 77, 323.6' - 328.5' water pres. test conducted with hole at 328.5' bit at 294.0"	
326				323.6 begin to get Fe stain along frac, 10° to 45°							
328											
330				328.5 - 335.8 closely frac., mod. Fe staining, calcite, 50° to 60°, p.c.s. 0.1' - 0.3' up to 0.5'						Run 78, 328.5' - 333.5'	
332											
334											Run 79, 333.5' - 339.5'
336											
338											Run 80, 338.5' - 343.6
340											

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature F1N5 Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey/Pulley 7

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
340	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	DIORITE cont, fresh, v. hard, v. strong, med. xln, green-gray	100/39	Box 24			Run 80, cont
342				closely frac, calcite; Fe staining, tight to part open, sli. rough; 30° to 70°, pcs. 0.1' - 1.5', aver 0.6' ab					
344				341.6 - 347.0 v. closely frac, Fe staining, calcite part open; sli. rough; 10° - 40°					
346				345.1 Andesitic(?) fine grained, calcite, 0.05'; 60°					
348									
350									
352				352.0 - 353.0 v. closely frac, Fe staining, chlor, part open to open, sli. rough, 10° - 50°					
354									
356									
358									
360	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	358.9 - 360.4 altered diorite, severely alt, sli. hard to soft, weak, kaolin; friable in places, 60° frac.	100/88	Box 26			Night shift 5/3/84 Run 84, 358.5' - 363.5'

Boring No DH 84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 348.5 Ft. Logged by Frey

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.H. RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
360		60°		<p>DIORITE cont; fresh; v. hard; v. strong; med. xln, green-gray closely frac. w/ zones of mod. close and v. close frac.; calcite; chloritic; tight to open, sli. to med. rough; 20°-50°; pcs. 0.05'-1.5'</p>	100/64	Box 26			Run 84, cont.
362		60°							
364		20°							Run 85, 363.5'-368.5'
366		20°							Hard drilling; pulled rods to change bit. Hit cave at 183'± in frac. interval
368		20°							
370		10°							Run 86, 368.5'-373.0'
372		30°							Andesite cave at top of run; v. slow drilling (hard rock)
374		20°							
376		30°							Run 87, 373.0'-377.7'
378		30°							Prbly. some mech brkg.
380				374.4-387.5		Box 27			Run 88, 377.7'-378.5'
				close to v. clos. frac; calcite; chlor. tight to part open; sli. rough to rough; 10°-30°, 50°; pcs. 0.05'-0.3'; healed and tight fractures give core a shattered appearance; core broken along many of these fracs.	100/34				Day shift 5/4/84
					100/98				Run 89, 378.5'-383.6'

Boring No DH 84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks					
	Lithology	Structure	Fracture Log											
360	[Dotted pattern]	60°		<p>DIORITE cont; fresh; v. hard; v. strong; med. xln, green-gray closely frac. w/ zones of mod. close and v. close frac.; calcite; chloritic; tight to open, sli. to med. rough; 20°-50°; pcs. 0.25'-1.5'</p>	100/64	Box 26			Run B4, cont.					
362		60°												
364		20°												Run B5, 363.5'-368.5' Hard drilling; pulled rods to change bit. Hit cave at 183'± in frac. interval
366		20°												
368		30°												
370		20°												Run B6, 368.5'-373.0' Andesite cave at top of run; v. slow drilling (hard rock)
372		10°												
374		30°												
376		30°												Run B7, 373.0'-377.7' Prbly. some mech brkg.
378		30°												
380									Run B8, 377.7'-378.5' Day shift 5/4/84 Run B9, 378.5'-383.6'					

Boring No DH 84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature FINS Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks			
	Lithology	Structure	Fracture Log 3 8 9 12									
380	[Dotted pattern]	[Vertical line]	[Vertical line]	DIORITE cont., fresh, v. hard, v. strong, med. xln, grn.-gray	100/8	Box 27			Run 89, cont.			
382				fine xln. inclusion from 381.0 to 382.0 close to v. close frac. zone cont, calcite, chlor; part open to open; rough to sli. rough, 30° to 60°; pas. 60.4'								
384				380.0-381.2 Andesite (?); fresh; mod. hard; mod. strong; aphanitic; lt. gray; healed frac., shattered appearance, calcite filling						Run 90, 383.6'-388.5'		
386												
388				387.5-409.7 close to mod. close frac, calcite, chlor; tight to part open; sli. rough to rough; 20° to 60°; pas. 0.2'-3.0'						100/16	Run 91, 388.5'-393.6'	
390				387.5-391.2 veins of andesite (?) interspersed throughout the diorite; hard, strong, lt. gray					20'			
392				391.9-392.4 v. closely frac, core is shattered, brittle; 50° and 75°					20'	100/76	Box 28	Run 92, 393.6'-398.5'
394												
396									40°	100/85		
398												Run 93, 398.5'-403.6'
400					Box 29							

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ~~X~~
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. ~~X~~
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log 3 6 9 12												
400				DIORITE cont, fresh, v. hard, v. str., med. xln, grn-gray close to mod. close frac, tight to open, rough to sli. rough, 30°-75°, pcs. 0.2'-1.4'	100/65		BOX 29		Run 93, cont.						
402				thin calcite coating on frac. 300 to 600, pcs. generally 0.5' to 1.0' a few smaller 0.1'-0.3'									Run 94, 403.6' - 408.5'		
404															
406															
408															Water pres. test w/ bit at 354.5' and hole at 408.5' Water level at 18.0' Run 95, 408.5'-413.4'
410											calcite coating of fractures 409.7-412.5 v. closely frac, carbonate, calcite; sli. rough; pcs. < 0.2'; core badly broken	98/61			
412											410.2-412.1 Andesite (?) vein; fine xyn intrusive, lt. gray	100/37			
414											close to mod. close frac., cont. 414.4-415.4 Andesite (?) Porhyry; fine grained; sli. hard; flow structure; lt. to med. gray				Run 96, 413.4'-418.5'
416											415.4-425.3 ALTERED DIORITE; sli. to severely altered; hard to v. soft; med strong to weak; med. xln; yellow to white gray; kaolin. closely frac. altered; carbonate, kaolin; open; rough; 20°-40°	98/29		BOX 30	
418															Run 97, 418.5'-423.5'
420															

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 10.5 Ft. X
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
420				ALTERED DIORITE, cont; sli. to severely altered, hard to v. soft; strong to weak, med. xln, friable. In places; gray to chalky white		100/24	Box 30		Run 97, cont.
422				closely frac; calcite; carbonate open; rough; 50 to 45°; pcs. 0.13' - 0.8'					
424				421.5 - 425.3 severely altered clay and breccia; dry; friable; soft; weak; gray to white gray; planar seams of clay; 60°					Run 98, 423.5' - 428.5'
426				425.3 - 433.5 QUARTZ DIORITE, sli. altered; mod. hard; mod. strong fine to med. xln, hbl rich; gray closely frac; chlor.; tight; rough to sli. rough.		96/48			TC = 0 PSI
428				427.0 - 427.2 severely altered adjacent to calcite vein; friable; 45°					Run 99, 428.5' - 433.5'
430				428.2 - 429.3; 430.1 - 431.1 severely altered; clay and breccia; dry; friable; soft; weak; gray to chalky white; 50° - 60° calcite vein; 0.02'		100/44	Box 31		
432									
434				433.5 - 599.5 DIORITE, fresh, hard, strong; med. xln; green-gray; numerous healed frac. throughout mod. close to closely frac; calcite; high degree chlor; tight to part. open; smooth to sli. rough; 30° - 60°; pcs. 0.25' - 1.5'		100/92			Run 100, 433.5' - 438.5'
436									
438									
440				438.9 - 439.7 v. closely frac; several jts. 40° - 50°					Run 101, 438.5' - 443.5'

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rod Elevation 2124.6 Ft.
 Coordinates: N 3,279,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. *
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R./Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
440		200		DIORITE, cont., fresh, v. hard; v. strong; med. xln; grn.-gray; closely frac., chlor. and calcite; tight to part open; rough to sli. rough jts, 60° to 70°, some 5°; 0.3' to 0.6', acc. 0.1' or less.	100/70				Run 101, cont.
442		30°							
444		70°		high angle jts, 0.2'-0.3' spacing; rough, calcite; chlorite, max. pcs. 1.0', min. 0.1', most 0.5'-0.7'	100/52	Box 32			Run 102, 443.5'-448.5' low RQD due to high angle jts.
446		70°							
448		70°		high angle; 70°; chlor; calcite; sli. rough; slicken sides.	100/64				Start night shift 5/4/84 Run 103, 448.5'-453.5'
450		30°							
452		10°		455.6 - 456.4 Andesite (?) fresh; hard; strong; porphyritic; gray 456.4 - 457.0 v. closely frac; calcite; part open; sli. rough; 0°-15°; tr. kaolin. 457.8 healed frac; calcite filling; 75°	100/68	Box 33			Mech. brkg. at bottom Run 104, 453.5'-458.5'
454		70°							
456		130°		Fe = 0 PSE Run 105, 458.5'-463.5' Water pres. test at 458.5' GWL at 45' on 5/4/84					
458		20°							
460		10°							

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. X
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84 36
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
460				DIORITE cont, fresh, v. hard, strg. to v. strg., med. xln, grn-gray					Run 105, cont.
462				mod. close to v. closely frac; calcite, chlor.; tight to open; sl. rough to rough; 10°-20°, 45°-60°; pcs. 0.05'-1.7'		100/94	Box 33		
464				464.6-465.0 sl. altered around a calcite healed frac; friable; kaolin; 50°					Run 106, 463.5'-468.5' Altered zone core intact.
466				465.7 calcite; 10°; 0.05 wide 466.5 probable core loss 466.3-475.5 close to v. closely frac; pcs. < 0.5'		90/32			Brkg. due to high jtg. at end of run
468				466.3-467.1 v. closely frac, sl. altered(?), clay filled, frac. 20°-30°, core loss 0.5' 467.9 frac, chlor. coating; 70°-90°					Run 107, 468.5'-473.5' Mech. brkg. of core
470				469.8-470.2 sl. altered; kaolin. soft to hard; 40°-60°; chalky white					
472						98/22			Lost 80% of drill water in last 2' of drilling w/ v. little pres. on water gauge
474							Box 34		Run 108, 473.5'-475.5' Last all water, then recovered Mech. brkg. of core
476				475.0-476.5 sl. altered; kaolin. pitted, friable in places; soft to med. hard		100/50			Run 109, 475.5'-478.5'
478						100/83			start day shift 5/12/84
480				479.0-479.6 mod. to severely altered; kaolin; pitted; soft to hard; frac. 50°-70°					Run 110, 478.5'-483.5' ~ 25% water return

Boring No DH 84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.0 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ~~X~~
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log 3 6 9 12												
480				DIORITE cont; fresh to sl. weath; mod. hard to hard, mod. strong to strong, med. xylm; grn.-gray closely frac; calcite, chlor; part open to open; rough to sl. rough; 5° to 70°; pcs. 0.1'-1.7' core appears to be brittle to 492.8 due to numerous healed frac.	100/54	100/54	Box 35		Run 110, cont. Water return ~ 25%						
482				482.8-483.8 v. closely frac. due to high angle fracs.					100/72	Box 35	Run 111, 483.5'-488.5' Water return increased to 50%				
484				484.7-486.6 sl. altered; kaolin, pitted, soft to hard; several calcite veins up to 0.05', 70° 484.8 severely altered along frac, soft, 70°, 0.1'							100/32	Box 35	Run 112, 483.5'-493.5' 100% water return.		
486				488.3-490.6 core appears to be brittle due to numerous healed or tight frac.; pcs < 0.3'					100/80	Box 36			Run 113, 493.5'-498.5'		
488				493.5 rock is mostly fresh;							100/80	Box 36	Run 114, 498.5'-503.5'		
490															
492															
494															
496															
498															
500															

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84 ±
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log 3 6 9 12												
500	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	DIORITE: cont, fresh, mod. hard to hard; mod. strong to strong; med. xyl, grn-gray. closely frac; calcite, chlor; tight to open; rough to sl. rough; 0°-10°, 40°-50°, 70°-90°; pcs. 0.05"-2.0"	100/52	100/52	Box 36		Run 114, cont.						
502															
504															Run 115, 503.5'-508.5' Water pres. test w/ hole to 508.5' and bit at 455.0'
506										506.1-506.5 mod. altered, kaolin, calcite vein; soft; weak; numerous tight frac; 60°					
508										507.1 thin filled frac; trace clay (?), calcite vein, soft, weak; 60°					Run 116, 508.5'-513.6'
510										510.6-560.0 numerous healed or tight frac throughout, planes of weakness.					
512															TC = 3,463 PSI
514															Run 117, 513.6'-518.6' 100% Water Return cont.
516										514.9-522.0 close to v. closely frac. mostly due to high angle frac; chlor, calcite; tight to part open; sl. rough, 0°-90°, pcs. 2.0-5' core badly broken					
518															Run 118, 518.6'-523.7'
520															

Boring No DH 84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
520	[Dotted pattern]	[Symbol]		DIORITE cont, fresh, mod. hard to hard; mod. strong to strong; med. xyn, grn-gray closely frac, chlor, calcite, tight to part open, rough to sl. rough; 100° to 70°, pcs. 0.1'-1.6' aver. 0.3'-0.5' 525.8 sl. altered along calcite vein; soft, weak, kaolin; 40°; 0.1' 525.8-530.0 core broke along numerous healed frac.; pcs. < 0.4' 532.7-533.0 calcite veins up to 0.05'; 60°	100/22	98/47	Box 38		Run 118, cont.
522		[Symbol]							Run 119, 523.7'-528.5'
524		30°							Run 120, 528.5'-533.4'
526		[Symbol]							Run 121, 533.4'-538.5'
528		60°							Run 122, 538.5'-543.6'
530		20°							~20% water return
532		60°							
534		30°							
536		40°							
538		[Symbol]							
540		[Symbol]							

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. X
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes _____ Total Depth 248.5 Ft Logged by Pulley/Frey

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
540	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	DIORITE cont, fresh; hard to v. hard, strong to v. strong, med. xyl, grn-gray closely frac, calcite, chlor.; tight to part open; rough to sl. rough, 5° to 50°, pcs. 0.05' - 1.5', occ. smaller pcs.	[Vertical bar]	100/73	Box 39	[Vertical bar]	Run 122, cont. 20% Water Return
542									Run 123, 543.6' - 548.5'
544									
546									
548									Start Night Shift 5/5/84 Run 124, 548.5' - 553.5' Mech. brkg. along vert. jt. ~10% water return
550									549.6 - 551.6 core badly broken along high angle frac; 80°; pcs. 0.05' to 0.4
552									
554									Run 125, 553.5' - 558.5'
556									
558									
560			558.5 - 560.2 v. closely frac; fresh, unweath, calcite filled jts, some brkg. along high angle jts.				Vc = 1,298 PSI Run 126, 558.5' - 563.5' Drill rate 0.08'/min.		

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.0 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.2 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks				
	Lithology	Structure	Fracture Log 3 6 9 12										
560				DIORITE cont; fresh, hard, v. strong; med. xyln; med. grn-gray closely frac; chlor; calcite; tight to open; rough to sl. rough; 10°, 30°-50°; pcs. 0.05'-0.8' some mech. brkg. along high angle jts.	100/62	100/62	Box 41		Run 126, cont.				
562		20°											
564		75°							564.0-570.4 frac. and mech. brks; pcs. < 0.3'				Run 127, 563.5'-568.5' ~ 75% water return in top 2' of run
566		70°		566.5-568.7 and 570.1-570.7 FELSIC, fresh, hard to v. hard; strong, aphanite w/matte phenocrysts; fine xyln, numerous tight and healed frac. throughout	100/10	100/10	Box 41						
568		10°											v. hard drilling last 2' Run 128, 568.5'-573.5'
570		20°			100/40	100/40							
572		20°											
574		30°			100/52	100/52	Box 42		Run 129, 573.5'-578.5' Drill rate 0.03'/min. Ground water level 32' on 5/5/84				
576		30°		576.0-576.7 v. closely frac; chlor; calcite; tight to open; rough, 50°-60°									
578					100/52	100/52	Box 42		Start day shift 5/11/84 Run 130, 576.5'-583.5' ~ 75% water return				
580		70°		579.7-580.5 v. closely frac, 30° and 60°									

Boring No DH 84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. #
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84 18
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																																						
	Lithology	Structure	Fracture Log 3 5 9 12																																												
580	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	DIORITE cont.; fresh; hard; strong to v. strong; med. xylh; green-gray close to mod. close frac. chlon, calcite; tight, rough to sl. rough, 0°-30°, 60°, 70°	100/44	100/44	Box 42		Run 130, cont. 75% Water Return																																						
582				581.3'-582.4' and 582.9'-583.6'					100/62	100/62	Box 42		Run 131, 583.5'-588.5' Drill rate 0.05'/min.																																		
584				584.2-585.1									100/62	100/62	Box 42																																
586				v. closely frac. and broken; core is brittle, breaks along tight frac.														100/62	100/62	Box 42																											
588																							100/62	100/62	Box 42																						
590																												100/67	100/67	Box 43																	
592																																	100/67	100/67	Box 43												
594																																						100/92	100/92	Box 43							
596																																											100/92	100/92	Box 43		
598																																															
600		100/92	100/92	Box 43																																											
	599.5-617.0 QUARTZ DIORITE; fresh; v. hard, v. strong; med. xylh, bld, plag, ~10% qtz; green-gray						100/92	100/92	Box 43			Run 134, 598.6'-603.8'																																			

00173

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. X
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
600	[Dotted pattern]	15°		QUARTZ DIORITE, cont, fresh, hard; strong to v. strong, med. xyn, green-gray close to mod. close frac; calcite; chlor; tight; rough to sl. rough; 10°-60°, pcs. 0.3'-2.0'	100/81	Box 43			Run 134, cont.
602		30°							
604	[Dotted pattern]	20°		606.2-606.5 coarse xyn; plag; qtz.	100/100				Run 135, 603.8'-608.5' Core came out in 3 pcs. Water pres. test w/bit at 555.0' and hole to 608.5'; tight
606		15°							
608	[Dotted pattern]	20°		610.8-612.5 fine xyn rock; v. hard, v. strong; high quartz content; < 10% mafics 614.0-615.1 clay filled frac; sl. to severely altered; slickensides; soft; friable; weak; kaolin; lt. gray, 30° 615.5-617.4 calcite veins throughout; irreg, core broke along contact between the calcite and diorite; up to 0.1' thick; weak contact 615.5-621.0 v. close to close frac; calcite; chlor; clayey sand; rough; part open to open; pcs. < 0.4' 616.3 clay filled frac; thin; soft; friable; weak; 50° 617.0-622.4 DIORITE; fresh, hard, strong; med. xyn, green-gray 618.1-618.6 sandy clay filling along frac, thin, friable, v. closely frac. and broken 619.4 slickensides and silty sand coating along frac; 40°	100/84	Box 44			Run 136, 608.5'-613.5'
610		45°							
612	[Dotted pattern]	40°		617.0-622.4 DIORITE; fresh, hard, strong; med. xyn, green-gray 618.1-618.6 sandy clay filling along frac, thin, friable, v. closely frac. and broken 619.4 slickensides and silty sand coating along frac; 40°	100/20	Box 45			Run 137, 613.5'-618.6'
614		30°							
616	[Dotted pattern]	45°		617.0-622.4 DIORITE; fresh, hard, strong; med. xyn, green-gray 618.1-618.6 sandy clay filling along frac, thin, friable, v. closely frac. and broken 619.4 slickensides and silty sand coating along frac; 40°	100/20	Box 45			Run 138, 618.6'-623.5'
618		45°							
620	[Dotted pattern]			617.0-622.4 DIORITE; fresh, hard, strong; med. xyn, green-gray 618.1-618.6 sandy clay filling along frac, thin, friable, v. closely frac. and broken 619.4 slickensides and silty sand coating along frac; 40°					

Boring No DH 84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature FINS Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. *
 E 746,594.1 Data Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft 7/84
 Core Sizes HQ Total Depth 348.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																								
	Lithology	Structure	Fracture Log 3 8 9 12																														
620	[Dotted pattern]	30°		DIORITE cont., fresh, v. hard; strong to strong, med. xyl, green-gray close to mostly med. close frac., calcite; chlor. tight to open; rough to sl. rough, 10° to 60°; pcs. 0.2-3.0'	100/39	100/39	Box 45		Run 138, cont.																								
622									100/96	100/96	Box 45	TC = 10,604 PSI																					
624												100/90	100/90	Box 45	Run 139, 623.5'-628.5'																		
626															100/75	100/75	Box 40	Core came out in three pcs.															
628																		100/75	100/75	Box 40	Run 140, 628.5'-633.7'												
630																					100/75	100/75	Box 40										
632																								100/75	100/75	Box 40							
634																											100/75	100/75	Box 40	Run 141, 633.7'-638.5'			
636																														100/75	100/75	Box 40	
638																																	100/75
640	100/75	100/75	Box 40	Start night shift 5/6/84																													
				100/75	100/75	Box 40	Run 142, 638.5'-643.5'																										

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft.
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
640	[Dotted pattern]	60°		DIORITE cont, fresh, hard; v. strong, med. xyl, gray-green close to mod. close frac; calcite chlorite; tight to part open; sl. rough to rough; 10°-30°, 60°-75°; pcs. 0.6'-2.0'	100/94	Box 46			Run 142, cont.
642		20°							
644	[Dotted pattern]	70°		647.7-666.9 closely frac; calcite, chlor; carbonate; tight to part open; sl. rough to rough; 10°-30°, 60°-75°; pcs. 0.25'-0.5', generally < 0.4'	100/90	Box 47			Run 143, 643.5'-648.5' Drill rate 0.07'/min.
646		70°							
648	[Dotted pattern]	70°		647.7-666.9 closely frac; calcite, chlor; carbonate; tight to part open; sl. rough to rough; 10°-30°, 60°-75°; pcs. 0.25'-0.5', generally < 0.4'	100/64	Box 47			Run 144, 648.5'-653.5'
650									
652	[Dotted pattern]	80°		655.6-662.4 FELSIC DIKE; fresh; hard; strong; fine xyl; < 10% mafics. lt. gray; shattered appearance due to numerous healed or tight frac. throughout	100/63				Run 145, 653.5'-656.2'
654									
656	[Vertical lines]	20°		655.6-662.4 FELSIC DIKE; fresh; hard; strong; fine xyl; < 10% mafics. lt. gray; shattered appearance due to numerous healed or tight frac. throughout	100/51				Start day shift 5/7/84 Run 146, 656.2'-660.5' v. slow drilling; Pulled rods to change bit, water pres. test and survey. Hole caved at 450' during changing of the bit
658									
660									

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84 4
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
660				FELSIC DIKE cont; fresh; hard; strong; fine xyln; <10% mafics; lt. gray					Run 147, 660.5'-665.5'
662									
664				662.4-706.0 DIORITE, fresh, v. hard, strong to v. strong, med. xyln, green-gray close to med. close frac; chlor, calcite; tight; rough to sl. rough; 20°-40°; 60°-70°; pcs. 0.5'-1.5', aver. 0.5'; numerous healed or tight frac, chlor w/ sheen, brittle, core breaks along fracs.		100/46	Box 48		Run 148, 665.5'-676.5'
666		700							
668						100/86			
670		600		pcs. 0.6' to 1.0'; 20° to 70°, some calcite healed fracs.					Run 149, 670.5'-675.5'
672									
674				674.0-675.3 v. closely frac; chlor; med. rough; pcs < 0.1'; core badly brkn.		100/42			
676		150					Box 49		Run 150, 675.5'-680.5'
678		50							
680						96/62			

Boring No DH 84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley/Frey

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
680	[Dotted pattern]	[Vertical line]	[Small squares]	DIORITE cont, fresh, hard, strong, med. xln, green-gray close to mod. close frac, calcite; chlor; tight; sl. rough to rough; 20°-40°; 60°-70°; pcs. 0.2'-2.0'; numerous healed and tight frac. throughout	100/56	100/56	Box 49		Run 151, 680.5'-685.5'
682									
684									
686									
688									
690									
692									
694									
696									
698									
700	[Dotted pattern]	[Vertical line]	[Small squares]	691.9-692.8 v. closely frac; chlor; tight; sl. rough; parallel frac. at 50° pcs. 2.0'	100/76	100/100	Box 50		Run 152, 685.5'-690.5' Core came out in 3' pcs.
692									
694	[Dotted pattern]	[Vertical line]	[Small squares]	698.7-699.5 v. closely frac; chlor. intersecting jts; tight; sl. rough	100/77	100/77			Night shift 5/7/84 Run 154, 695.5'-698.5'
696									
698									
700									

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft.
 E 749,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Frey/Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
700				700.4-706.0 GRANODIORITE (?), rock grades to; fresh; v. hard; v. strong; med. to coarse xyln; white-gray; gtz; hbl; less matrics; variation in melt (?)	100/62	Box 51			Run 155, cont.
702		50°							
704		45°		DIORITE cont, fresh; hard to v. hard; strong to v. strong; med. xyln; green-gray close to mod. close frac. calcite, chlor; tight to part open; sl. to med. rough; 20-50° 70°; pcs. 0.1 to 2.5, mostly 0.8-1.2'	100/72	Box 51			Run 156, 703.5'-708.5' v. hard drilling Water pres. test at 708.5' Ground water level at 58' w/rods at 657' 5/7/84
706		20°							
708		10°		711.0-714.4 closely to v. closely frac; chlor; calcite; tight to part open; sl. to med. rough; in part due to high angle jt; pcs. 0.1 to 0.4'	94/46				Run 157, 708.5'-715.5' Drill rate 0.04'/min.
710		30°							
712		78°		717.1-717.7 Andesite Porphyry and med. to coarse xyln. fresh; v. hard; v. strong; welded contact 717.7-758.1 QUARTZ DIORITE, fresh; v. hard; strong to v. strong; med. xyln; green-gray	100/45	Box 52			Run 158, 713.5'-715.5' Drill rate 0.03'/min.
714		20°							
716		10°		717.1-717.7 Andesite Porphyry and med. to coarse xyln. fresh; v. hard; v. strong; welded contact 717.7-758.1 QUARTZ DIORITE, fresh; v. hard; strong to v. strong; med. xyln; green-gray	100/100	Box 52			Day Shift 5/7/84 Run 159, 715.5'-719.6'
718		40°							
720									Run 160, 719.6'-724.7

Boring No DH 84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature FMS Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
720	[Lithology pattern: irregular dashes]	[Structure: vertical lines]	[Fracture Log: 3 6 9 12]	QUARTZ DIORITE cont, fresh, v. hard, strong to v. strong, med. xln, green-gray; close to mod. close frac; chlor; calcite; tight; rough to sl. rough; 20° to 60°, pcs. 0.2' to 1.5', mostly 0.5' - 1.2'	100/83	100/83	Box 52		Run 160, 719.6' - 724.7'
722									Drill rate = 0.04'/min.
724									
726									
728									
730									
732									
734									
736									
738									
740									
									Run 161, 724.7' - 728.5'
									~ 10% Water Return
									Run 162, 728.5' - 733.6'
									Run 163, 733.6' - 738.5'
									Run 164, 738.5' - 743.7'

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84 34
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks					
	Lithology	Structure	Fracture Log											
740	[Dotted pattern]			QUARTZ DIORITE cont. fresh, hard, strong to v. strong; med. xyn, green-gray; qtz, plag, hbl. close to mod. close frac; tr. calcite and chlor; tight to part open; rough to sl. rough; 100 to 600; pcs. 0.4'-5.0'; mostly ~1.0'	100/100	100/98	Box 54		Run 104, cont. No water return					
742		60°												
744		50°												Run 105, 743.7'-748.7'
746		100°												
748		80°												
750		30°												Run 106, 748.7'-753.7' σc = 19,477 PSI
752		25°												
754		50°												Run 107, 753.7'-758.5' Water pres. test interval 707.5'-758.5'; Water take ~2 gpm
756		10°							fracs, mod. close, generally 1.0' or more in length					
758									758.1-764.9 GRANITIC; fresh; hard; strong; qtz. rich, <10% mafics; welded contacts well defined at top, gradational at bottom; 200; sulfide mineralization; lt. gray					
760														

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ~~X~~
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log												
760				GRANITIC cont., fresh; hard; strong; fine xyn. siliceous at borders; med. xyn. interior; lt. grey; ± 10% mafics, mostly Qtz. and Kspar; mod. fld, most pieces 1'-2'	100/100	100/100	Box 55		Run 168, cont.						
762															
764															Run 169, 763.5'-766.2' Add. revert
766											764.9-848.5 QUARTZ DIORITE; fresh; v. hard; v. strong; med. xyn, med. grn.-gray; ± 25% hbl, 50% feld mod. frac; light, med. rough to rough; 10°-30°; pcs. 0.2'-2.5' mostly < 1.0'				σ _c = 7,512 PSI
768															Run 170, 766.2'-768.2'
770															Run 171, 768.2'-773.1'
772															
774											with local intervals < 1.0' where closely fractured				Run 172, 773.1'-778.2'
776															
778											core broken by drilling				
780					90/42	100/100	Box 56								

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84 34
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley/Frey

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
780		10°		QUARTZ DIORITE, fresh, hard to v. hard, v. strong, med. xln, green-gray					Run 173, cont.
782		X		close to mod. close frac; calcite; chlor; tight to part open; sl. rough; 20°-40°; 70°-80°; pcs. 0.05'-1.2'	90/42				
784		X		781.1-782.9 v. closely frac; calcite; tight to part open; sl. rough, pcs. 40.1'			100/80		Run 174, 783.2'-783.7' Day Shift 5/8/84 Run 175, 783.7'-788.5' Add revert to stabilize hole
786		50°		some calcite coated/filled jts, several pcs. 0.6' to 1.0', 30°-70°	100/77				
788		70°					Box 57		Run 176, 788.5'-793.5'
790		30°							
792		25°		790.8-794.8 close to v. closely frac; along high angle jts, calcite, chlor; tight; sl. rough; 10°-40°; 70°-80°; pcs. 0.1'-0.4'	96/62				
794		80°		calcite filled/healed frac, close to mod. close frac.					Run 177, 793.5'-798.5'
796		25°							
798		30°		797.7-798.3 v. closely frac; tr. calcite; pcs. < 0.15'					
800		60°		799.0-811.3 closely to v. closely frac; chlor; calcite; tight to p. open; sl. rough to rough; 20°-45°; 65°-75°; pcs. 0.05'-0.5' aver. 0.2'-0.3'	100/52		Box 58		Run 178, 798.5'-803.2'

000173

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 41 of 43
Date 8 May '84

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.4 Ft. ~~7~~
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
800	[Dotted pattern]	25°		QUARTZ DIORITE, cont; fresh; hard to v. hard; strong to v. strong med. xlyn, grn-gray.	100/19	100/19	Box 58		Run 178, cont.
802				mod. close to v. close frac; calcite; chlor; tight to part open; rough to sl. rough; 10°-40°; 70°-80°; pcs. 0.05'-2.5'					
804	[Dotted pattern]	30°		799.0-811.3 closely to v. closely frac's, cont; chlor, calcite; tight to part open; sl. rough to rough; 20°-45°, 65°-75°; pcs. 0.05' to 0.5'	100/25	100/25	Box 58		
806									
808	[Dotted pattern]	40°			100/39	100/39	Box 59		Run 180, 808.0'-813.2'
810				809.3-811.3 v. close frac, along high angle jts.					
812	[Dotted pattern]	45°			100/87	100/87	Box 59		Run 181, 813.2'-818.4'
814									
816	[Dotted pattern]	70°		close to mod. close frac; pcs; generally 10' or more, max. 2.4'	100/87	100/87	Box 59		
818									
820	[Dotted pattern]								Run 182, 818.4'-823.5'

Boring No DH84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. #
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84 24
 Core Sizes HQ Total Depth 848.5 Ft. Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks	
	Lithology	Structure	Fracture Log 3 6 9 12							
820	[Dashed pattern]	[Vertical lines]	[Vertical lines]	QUARTZ DIORITE con't; fresh, hard to v. hard, strong to v. strong, med. xln, grn-gray close to mod. close frac. calcite, chlor; tight; rough to sl. rough; 5° to 70°; pcs. 0.2'-2.0' mostly 1.0'-2.0'	[Solid black bar]	100/80	Box 59		Run 182, cont.	
822									70°	Run 183, 823.5'-828.5'
824									50°	
826										Run 184, 828.5'-833.5' Drill rate 0.07'/min. Harder drilling
828									20°	
830									50°	Run 185, 833.5'-838.5'
832										
834										Run 186, 838.5'-843.6'
836									70°	
838										
840										

Boring No DH 84-1 Angle (from Horizontal) 56° Ground Elevation 2143.1 Ft.
 Feature Fins Bearing 244° Rock Elevation 2124.6 Ft.
 Coordinates: N 3,229,555.7 Date Started 29 April, 1984 Overburden Thickness 18.5 Ft. ±
 E 746,594.1 Date Completed 9 May, 1984 Ground-Water Elevation 2070.9 Ft. 7/84
 Core Sizes HQ Total Depth 848.5 Ft Logged by Pulley

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
840		30°		<p>QUARTZ DIORITE cont; fresh, hard, strong to v. strong, med. xyn, green-gray</p> <p>close to mod. close frac; calcite, chlor; tight to part open; rough to sl. rough; 10°-70°; pcs. generally 0.3' to 0.6' w/ several 1.0' or greater</p> <p>842.0-843.3 ft. gray, higher qtz. and sodic plag content; 842.2 thin qtz. rich vein; sl. coarser xyn, clay filled frac, slickensides, 0.1' thick</p> <p>846.0-848.5 ft. gray, higher qtz. content sl. coarser xyn.</p> <p>847.2-847.3 sl. altered, soft - sl. hard; weak; white-gray; sulfide mineralization.</p>	100/66	Box 61		<p>Run 186, cont.</p> <p>Run 187, 843.6'-848.5'</p> <p>Washed revert from hole for 8 hrs w/ 4800 gals. of water;</p> <p>Water pres. test conducted between 805.5' - 848.5'</p>	
842									
844		70°							
846		50°							
848									
				T.D. 848.5 FT.					
850									

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 *P.39
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Hansen/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks	
	Lithology	Structure	Fracture Log 3 8 9 12							
0				ORGANICS; tree roots to 0.4'; rock fragment, 0.3', andesite, fresh					LY38-COR, HQ RUN 1, 0.0-5.0' Night shift 5/6/84 2400 hrs	
2										
4										
6				Rock fragments; Diorite, some Andesite porphyry; fresh to sl. weath, hard, strong; pcs. 50.7 no matrix recovered					RUN 2, 5.0'-10.0'	
8										
10										
12										
14				TOP OF ROCK = 14.7 FT.						
16				14.7-49.4: DIORITE, sl. weath. to fresh, sl. to mod. weath. along jts.; hard; mod. strong; med. xyn; blue gray, penetrative Fe stain around jts, plag 75%, hb1 15%, qtz 10%, chlorite minor closely to v. closely frac. Fe stain, clay, chlorite; partly open; st. to med. rough, pcs. 0.05'-0.6						RUN 3, 10.0'-14.7' 1:53 am - stopped pump down Day shift 5/7/84 Drill rate = 0.25/min. 80% water loss brown-gray
18				18.5 feldspar? phenocryst, up to 3/4", mod. weath,						
20				19.0-19.5 v. closely frac; mod to sev. weath.						RUN 4, 14.7-19.0
										RUN 5, 19.7-24.0 No water return

00173

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 2 of 397
Date 7 May '84

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. & 2
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/87
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
20				DIORITE cont., fresh; hard to v. hard; strong; med. xln; green-gray; plag, hbl, epidote, Qtz(?), chlor, kaolin					Run 5, con't.
22				close to v. closely frac; calcite; tight to p. open; smooth to sl. rough; 10°-50°; PCS: 0.05' to 2.5'		100/54	Box 1		
24				21.0-26.0 mod. close frac; numerous minor reheated frac. in a shattered pattern.					Run 6, 24.0'-28.8'
26				26.5 clay filled frac.; 0.05'		100/69			TC = 22,192 PSI
28				28.7 felsic vein, 0.1' wide; clay and calcite along frac.					Run 7, 28.8'-34.0'
30				29.0-30.0 v. closely frac; calcite					Drill rate 0.26/min.
32				31.6-35.5 sl. altered; sl. to mod. hard; mod. strong to strong; lt. green gray; chlor, kaolin		100/31	Box 2		TC = 13,966 PSI
34									Run 8, 34.0'-39.0'
36						92/22			
38				38.1-39.0 v. closely frac; pcs. ca. 1' core loss 0.5'					
40							Box 3		Run 9, 39.0'-44.0'

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft., 1/8
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks											
	Lithology	Structure	Fracture Log 3 6 9 12																	
40				DIORITE con't.; fresh; mod. hard to v. hard; strong to weak; med. xylm; occ. felsic stringers up to 0.2' green gray; plag (some kaolin), hb1 (some chlorite) close to v. close frac, calcite, clay; tight to part. open; sl. to mod. rough; 0°-40°, 60°; pcs. 0.05'-0.7'	98/24		Box 3		Run 9, con't. No water return 6:10 pm stop to ream casing to 15'											
42				44.3-45.5 Altered/mineralized zone, sulfides, epidote(?), qtz. xtls/veins up to 0.05' wide, hard to v. hard					100/50	Box 3	Tc = 14,304 PSI Run 10, 44.0'-49.0' Begin Night shift 5/7/84 Drill rate 0.33/min. Return water: lt. gray to white - added 6' of casing at start of shift - casing down to 22' - Return water comes up inside casing, then flows back down hole outside the casing									
44				45.5-47.0 sl. alt. diorite, kabl; chlor, plag.							100/67	Box 3	Run 11, 49.0-53.9 Drill rate 0.33/min Mismatch - pulled rods to recover core							
46				49.4-71.7 ALTERED DIORITE, mod. hard, mod. strong, med. xylm; lt. green; fsp to kaolin, chlorite, epidote, hb1(?), tr. sulfide									100/100	Box 4	Run 12, 53.9-55.5' 0.2' cave in @ top of run Tc = 4,438 PSI					
48				55.5 clay on end of core run 12 and beginning of run 13											90/87	Box 4	Run 13, 55.5'-58.5' Drill rate 0.25/min. Possible clayey seam ~ 55.5-55.8, causing core loss			
50				58.5-60.0 severely weath. and altered, soft to mod. hard, mod. strong to weak; clayey - contains weath. diorite, fragments in clay seams up to 0.1' wide													89/38		Run 14, 58.5-63.0 Drill rate 0.16/min	
52				59.0-60.0 frac; 90°																
54																				
56																				
58																				
60																				

Boring No DHB4-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 704
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																								
	Lithology	Structure	Fracture Log 3 5 9 12																														
60				ALTERED DIORITE cont.; mod. hard, mod. strong to strong, med. xyln, lt. greenish-gray, plag (almost all altered to kaolin chlorite, epidote, hb(?) , tr. sulfides	89/38	Box 4			Run 14, cont. Lt. gray to white return water ~ 100% return, water no longer flows down around casing																								
62				62.0-63.0 v. closely frac.					100/72	Box 5		Run 15, 63.0-68.0 Drill rate 0.19'/min																					
64				65.3-66.2 severely weath, soft, weak, clayey								100/82	Box 5		Run 16, 68.0'-73.0' ~ 100% return water lt. gray-white Drill rate 0.17'/min.																		
66				67.5-68.0 mod. to severely weath, soft, weak, clayey											100/101	Box 5		Tc = 9,903 PSI															
68				71.7-74.5 DIORITE, fresh, hard, strong, med. xyln, greenish gray, plag, hb, tr, ksp, etc.														100/101	Box 5		Run 17, 73.0'-77.0' Drill rate 0.27'/min.												
70				74.0-76.0 mod. to med. closely frac, Fe stain; tight to part open; med. rough to rough, 0-10°, 30°-50°; pcs. 0.1'-2.5'; numerous minor rehealed fracs																	100/101	Box 5		Run 18, 77.0'-82.0' Drill rate 0.5'/min.									
72																								100/86	Box 5		Tc = 19,805 PSI						
74																											100/86	Box 5					
76																														100/86	Box 5		
78																																	100/86
80		100/86	Box 5																														

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,309.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/84
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
80				DIORITE cont, fresh, hard, strong, med. xyln, greenish gray, plag, hbl, qtz. (10%), tr. kspar(?)					Run 18, cont. ~100% return water - lt. gray to white
82				close to mod. closely frac, tight to part open, mod. rough to rough, 0-10°, 30-50° pcs. 0.1' to 2.5'; numerous minor reheated frags.					Run 19, 82.0'-87.0' Drill rate 0.45'/min.
84				80.0-82.0 tr. biotite		100/98			
86				83.3-85.5 Quartz (?) xenoliths w/ hematite (?) stain, up to oil!			Box 6		
88									Run 20, 87.0'-92.0' Drill rate 0.42'/min. TC = 5,232 PSI
90				90.0-94.5 sl. (5%) kaolinization of feldspars		100/70			
92									Run 21, 92.0'-97.0' Drill rate 0.38'/min ~100% return water - lt. gray to white
94						80/8			
96				94.5-99.5 ALTERED DIORITE, med. hard, mod. strong to strong, med. xyln., lt. gray, plag (kaolinized), chlorite					
98				95.7-97.1 (Approx.) Brecciated, poss. shear surface; mod. to severely weath; soft; weak; clayey (alt. dio frag, see in clay matrix)			Box 7		Run 22, 97.0'-102.0' Drill rate 0.42'/min.
100				99.5-192.2 DIORITE, fresh, hard, strong		100/88			

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 1/8"
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R. RQD %	Box Number	Instrumentation	Remarks							
	Lithology	Structure	Fracture Log 3 8 9 12													
100				99.5-102.2 DIORITE, fresh, hard, strong, med. xln; greenish gray, plag, hbl, tr. qtz and Kspar (?)	100/88	100/88	Box 7		Run 22, cont.							
102				closely to mod. closely frac; tight to part open, occ. Fe stain or calcite; mod. rough to rough, 0-100, 30-50°, pcs. 0.1' to 2.5', numerous minor healed frags.					100/96	Run 23, 102.0-107.0						
104				101.2-102.0 v. closely to closely frac., pcs. 0.02'-0.2'						100/90	TC = 13, 530 PSI					
106				107.0-107.7 v. closely frac; sl. weath; clay							100/50	Run 24, 107.0-112.0 Drill rate 0.36/min.				
108				111.0-112.0 frac. 90°								100/50	Run 25, 112.0-117.0 Drill rate 0.5/min. Return water milky			
110				113.5-114.5 v. closely frac; sl. weath. along frags; calcite									100/50	Box 8		
112				115.2-115.5 v. closely frac.; calcite; minor kaolin												
114				116.0-116.8 v. closely frac; clayey; shattered when moved												
116				117.0-118.0 Fe stain, clay, calcite, filled frac; part open; sl. rough											100/82	Run 26, 117.0-122.0
118																TC = 19, 973 PSI
120																

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. &
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 1/1
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R. RGD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
120				DIORITE cont; fresh; hard; strong; med. xyn; green-gray; plag; bbl; little qtz; tr. sulfides and kspart; mottled w/ disseminated red mineral (hematite?)					Run 26, cont.
122				mod. close to closely frac; calcite, Fe stain; minor clay; tight to part open, sl. rough to rough; 30°-60°; pcs. 0.1'-2.5'; occ. minor reheated frags.					Run 27, 122.0-127.0 Pink return water
124				123.5 core sl. ground along red stained frac.		100/40			
126				124.2-128.1 closely to v. closely frac; parallel to core axis, 1/4" wide calcite vein; clayey, red mottles frac; mod. alt. and weath, chlorite, part open, med. rough			Box 9		
128				127.0-136.0 mottled w/red, mineral (hematite?)					Run 28, 127.0-132.0 Drill rate 0.38'/min.
130						100/68			σc = 20,559 PSI
132									Run 29, 132.0'-137.2'
134				133.0-141.5 rock appears brecciated - xenoliths of med. xyn. diorite up to 0.3' diam, set in a matrix of fine xyn. diorite; fresh; v. hard; v. strong; close to mod. closely frac; numerous minor reheated frags. pcs. 0.2'-2.0'; red stain		96/60			
136									
138				138.0-141.0 clay and calcite filled frac; part open, 40°-65°, 75°		96/75	Box 10		Run 30, 137.2-142.0 Return water milky
140									

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. & 8
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/8
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks	
	Lithology	Structure	Fracture Log 3 6 9 12							
140	[Dotted pattern]			DIORITE cont; fresh, hard, v. strong, med. xyl, dk. greenish gray to reddish gray; plag; kspar?; hpl, little qtz, chlor. mod-close to widely frac, some calcite, clay; tight to part open; sl. to mod. rough, 30°-75°; pcs. 0.3' to 5'-5', generally > 0.8'	96/88		Box 10		Run 30, cont. Harder drilling	
142				142.0 - 143.2					Return water lt. gray milky	
144				143.2 - 150.5 no frags.					End of run mech. break and loss due to being stuck in core catcher	
146										
148									fresh, hard, v. strong, widely frac, with mottled red-gray color (disseminated hematite?)	Run 32, 147.0' - 152.0' Drill rate 0.14'/min.
150										
152									152.0 mod-close frac; tr. clay, calcite on frac; pcs. 0.6 to 1.5'; numerous rehealed frac.	Run 33, 152.0' - 157.0' Drill rate 0.33'/min
154										
156										
158										
160				TC = 12,002 PSI						

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. ±
 Core Sizes H2 Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks					
	Lithology	Structure	Fracture Log 3 6 9 12											
160				DIORITE cont; fresh; hard; v. strong; med. xyl; dk. greenish gray to reddish gray; plag, hbl. little qtz; ksp. chlor, calcite	100/62	100/62	Box 11		Run 34, cont.					
162				mod. close to closely frac; calcite; tr. clay; tight to part open; sl. rough to rough					100/32	Box 12	Run 35, 162.0'-167.0'			
164				160.5-165.5 dk; reddish gray 164.2-164.8 v. closely frac; 10°-20°, 45°-65°, 75°-85°							100/92	Box 13	Lt. gray milky return water Drill rate 0.26'/min.	
166													vc = 22,723 PSI	
168													Run 36, 167.0'-172.0'	
170				169.4-173.0 close to v. closely frac; calcite; tr. sulfides; tight to part open; sl. to med. rough; pcs. 0.1'-0.4' numerous; minor rehealed frags										
172				172.1-174.0 and 175.8-177.0 mottled red-gray color, (disseminated hematite?)										Run 37, 172.0'-177.0'
174														Drill rate 0.26'/min.
176				175.9 healed, frac; clay; 3/4" plag, hematite; chlorite ?; hbl. med. close to closely frac, pcs. 0.2' - 2.3' most > 0.6'										vc = 19,909 PSI
178														Run 38, 177.0'-181.5'
180														

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/84
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
180	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	DIORITE cont; fresh; hard, v. strong; med. xyn; dk. greenish gray; plag; hbl; tr. etc, hematite calcite; sulfides	98/82		Box 13		Run 38, cont; Milky lt. gray return water
182				mod. close to closely frac; calcite; clay; v. tight to part open, sl. to med rough; 45°-60°; PCS. 0.3' - 2.5'					3:40 pm. change bit
184				184.7-185.7 Andesite, fresh, hard, v. strong; fine-grained aphanitic					Run 39, 181.5'-186.5'
186									Drill rate 0.23'/min.
188									
190									
192				192.0-192.4 v. closely frac.					
194				192.2-213.5 ALTERED DIORITE, mod. altered, hard, mod. strong to strong; med. to fine xyn; lt. green; plag, kaolin, hbl, chlorite, epidote					
196				mod. close to closely frac; calcite; tight to part open, sl. to med. rough, 0-10°, 45°-60°; PCS. 0.1' - 1.2'					
198				mod. to sl. hard					
200									
				199.4-200.2 v. closely frac; PCS. 0.05' - 0.2'	100/58				Run 40, 186.5'-191.5'
					100/72				Drill rate 0.42'/min.
					97/61		Box 14		Run 41, 191.5'-196.5'
									Run 42, 196.5'-201.75'

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. &
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/84
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
200				ALTERED DIORITE cont; mod. altered; mod. to sl. hard;					Run 42, cont.
202				mod. strong; med. xlyn, lt. green plaq (kaolin), hbl (chlor.), epidote ? , qtz.					Run 43, 201.75-206.8
204				mod. close to v. closely frac, calcite, tight to part open; sl. to med. rough, 0-100; 45°; pcs. 0.1'-1.2'					Tc = 3,928 PSI
206				204.0 Fe sil; 1/2" wide, white 204.2-207.8 ANDESITE PORPHYRY; fresh; hard; mod. strong; fine xlyn; gray; plaq, pheno. 10%, aphanitic matrix		100/69			Tc = 14,084 PSI
208				mod. close frac; calcite, tight to part. open, sl. rough 100, 400, 600, pcs. 0.8-1.5'					Run 44, 206.8'-212.0'
210				207.8-213.5 ALTERED DIORITE; sl. altered; mod. hard to hard; strong, med. xlyn; greenish gray; plaq, kaolin., hbl, chlor		100/50			
212				208.0-210.0 widely frac, 210.0-212.0 closely frac, sl. weath. and friable along frac, surfs, pcs. 0.1'-0.4'					Night shift 5/8/84 Run 45, 212.0'-217.0' Drill rate 20.33'/min ~ 100% return water lt. gray
214				213.5-765.0 DIORITE; fresh; hard; strong; med xlyn; greenish gray, plaq, hbl, tr. qtz. and Fe mineralization		100/80			
216				mod. close frac; occ. Fe stain; tight to part open; sl. rough to rough, 0-300, 800-900; pcs. 0.2'-2.0'					
218				numerous healed frags, w/hematite mineralization along most frac; surfs, and in places disseminated through the core					Run 46, 217.0-222.0' Drill rate 0.42'/min. Return water changed to reddish brown ~ 218'
220						100/100	Box 16		Tc = 13,093 PSI

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 201.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. & 8
 E 743,942.3 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/71
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./R.O. %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 5 9 12						
220				DIORITE: cont; fresh; hard; strong; med. xln; greenish gray to reddish gray; plag hb, Fe mineralization (hematite) tr. Qtz.	100/100		Box 16		Run 46, cont. 100% return water reddish brown
222				mod. close frac; hematite mineralization; tight to part open; sl. rough to rough; numerous minor rehealed frags					Run 47, 222.0'-227.0' Drill rate 0.42/min
224									
226				225.9-226.0 closely frac; sl. clayey; weath. and friable on frac. surfs.					
228				mod. close to closely frac, ps. 0.2' to 1.5'					
230									
232									
234									
236				236.1-236.3 altered zone - mod soft weak, plag/kaolin, mafics					
238				237.1-237.2 ANDESITE, fresh v. hard; strong; lt. greenish gray aphanitic					
240	237.2-240.0 Mod Altered, mod. hard to soft; mod. strong to weak; lt. grn. - gray; kaolin, chlorite v. closely to closely frac, 0.01-0.8								
			238.6-239.1 clay matrix w/rock frag.	100/47		Box 17		Run 48, 227.0'-232.0' Return water lt. reddish gray to lt. gray - changed @ ~229.0' Drill rate 0.5/min.	
				100/68				Run 49, 232.0'-237.0' Drill rate 0.39'/min. Return water lt. gray Artesian water flowing from hole at end of run - flow initially ~5 gpm, however it diminished and stopped after ~10 min.	
				100/72				Run 50, 237.0-238.9	
				25/32				Run 51, 238.9-243.0	

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. &
 E 743,942.5 Date Completed May, 1984 Ground-Water Elevation 2021.6 Ft. 7/8
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks									
	Lithology	Structure	Fracture Log 3 8 9 12															
240				DIORITE cont; fresh; mod. hard to hard; mod. strong, med. xln, greenish gray; plag (freq. alt. to kaolin) hbl.		93/32	Box 17		Run 51, cont. Drill rate 0.24'/min.									
242				mod. close to closely frac, occ. Fe stain, calcite; part open, med. rough to rough					100/98	Box 18	Run 52, 243.0'-247.0' Drill rate 0.27'/min. ≈ 100% return water, lt. gray Tc = 16,304 PSI							
244				240.0-240.5 and 244.0-244.5 sl. altered (kaolin); 245.0-247.0 few minor fractures healed by quartz (?)							100/96	Box 18	Run 53, 247.0'-252.0' Drill rate 0.33'/min.					
246													100/76	Box 19	Run 54, 252.0'-257.0' Drill rate 0.28'/min.			
248															100/72	Box 19	Run 55, 257.0'-262.0' Drill rate 0.21'/min. Tc = 18,549 PSI	
250																		
252				251.1-251.2 Felsic, with quartz and plag														
254																		
256																		
258				257.0-258.0 Biotite														
260																		

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ± 2
 E 743,942.5 Date Completed May, 1984 Ground-Water Elevation 2021.6 Ft. 7/77
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks	
	Lithology	Structure	Fracture Log							
260				DIORITE cont; fresh; hard; strong; greenish gray; med. xln; plag, hbl, mafics	100/72	100/72	Box 19		Run 55, cont... ~100% water return, lt. gray	
262				mod. close to closely frac. ; occ. Fe stain, calcite; part open to tight, med. rough to rough; 0-30°, 80°-90°; pcs. 0.1'-2.0'					Run 56, 262.0-267.0' Drill rate 0.28'/min.	
264				262.0-269.0 tr. of hematite mineralization (?) 262.3 Quartz, 0.03' wide						
266				266.3 mod. weath. and clayey; on irregular fracture					TC = 12,002 PSI	
268				267.6-268.1 numerous fracs healed with quartz and hematite					Run 57, 267.0'-272.0' Drill rate 0.28'/min, lt. gray return water - 100%	
270										
272										
274										Run 58, 272.0'-277.0' Drill rate 0.33'/min ~50% water loss ~273', regained by ~276'
276				275.5-276.5 v. closely frac, plag altered to kaolin, weath. and sl. clayey along fracs, pcs. 0.05'-0.1'						Box 20
278										100/28
280										

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/8
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
280				DIORITE. conit; fresh; hard; strong; med. xyl; greenish gray, plag, hbl, mafics	100/58	100/58	Box 20		Run 59, cont. ~100% return, lt. gray water
282				mod. close to closely fractured, acc. Fe stain, calcite; part open to tight; med. rough to rough, 0-30°, 80°-90°; pcs. 0.1' to 2.0', generally 0.5'-1.0'					Run 60, 281.0'-286.0' Drill rate 0.31/min TC = 22,446 PSI
284				281.3-281.4 Alt. Diorite in clayey matrix					
286				282.0-287.5 frequent minor rehealed fracs					
288				288.0-301.0 tr. of hematite(?) mineralization					
290									
292				292.0-293.5 high angle frac. rehealed by calcite					
294									
296									
298									
300					100/100		Box 21		Run 61, 286.0'-291.0' Drill rate 0.56/min, ~100% water return
									Run 62, 291.0'-296.0' Drill rate 0.38/min TC = 24,207 PSI
									Run 63, 296.0'-301.0' Drill rate 0.63/min

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 1/8"
 Core Sizes HQ Total Depth 705.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
300				DIORITE cont; fresh, hard, strong; med. xln; greenish gray; plag; hbl; tr. to little qtz, calc, sulfides			Box 22		Run 63, cont. 5/9/84 Day shift
302				mod. close to closely frac, occ. calc; mafics. or Fe stain; part. open to tight; sl. rough; pcs. 0.1-2.0'					Run 64, 301.0'-306.2'
304				301.3-303.0 calcite healed frac; 1/8"					Drill rate 0.35'/min.
306									Return water lt. gray
308				307.7-310.0 sl. weath. and clayey along frac.					Run 65, 306.2'-310.0'
310									σc = 4,328 PSI
312									
314				313.0-313.7 v. closely frac; mod. hard, mod. strong calcite, clay, plag. alt. to kaolin, pcs. 0.1-0.2'					Run 66, 310.0'-315.1'
316				314.3-316.3 tr. biotite					Drill rate 0.32'/min.
318				317.2-321.0 ALTERED DIORITE, sl. to mod. alter.; mod. hard, mod. strong; med to coarse xln; green gray; plag (mostly kaolin), hbl, chlor closely fractured; clay, some reheated by calcite; tight to part open, rough, 10°-40°, pcs. 0.2-1.2'					Run 67, 315.1'-320.0'
320									

Boring No DHB4-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. &
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/84
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
320				ALTERED DIORITE cont; sl. to mod. altered; mod. hard to hard; mod. strong to strong, med. xym; green gray; plag, sl. to mod. kaolin; hbl, chlorite					Run 68, 320.0'-325.0' Milky-gray return water
322				close to v. close frac; clayey, 45°		100/66			TC = 5,502 PSI
324				321.0-324.9 DIORITE cont, fresh, v. hard to hard, v. strong to strong, med. xym, dk. greenish gray, plag, minor kaolin, hbl, little to gr. quartz, soft, chlor, calcite, calcite healed; frac; mod. close to closely frac; calcite; tight to part open; sl. rough; 10-30°; 60°-70°, PCS. 0.3'-2.5' mostly 1.2'-2.5'			Box 23		Run 69, 325.0'-330.0'
326									
328				325.3-327.8 numerous rehealed frags, calcite, rock appears sl. brecciated, w/fragments of med. xym. diorite set in a fine xym. matrix, fresh, v. hard, v. strong		100/78			Run 70, 330.0'-335.0'
330				clay coatings on frac					
332						100/62			
334				333.5'-333.6' quartz/calcite vein, 0.04' wide			Box 24		
336							Box		Run 71, 335.0'-340.0' Drill rate 0.24'/min
338						100/100			
340									

00173

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. & X
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/8/8
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./QD %	Box Number	Instrumentation	Remarks				
	Lithology	Structure	Fracture Log 3 9 9 12										
340				DIORITE cont; fresh; occ. sl. altered; v. hard to hard; v. strong to strong; med. xln; green gray; plag, tr. kadin, hb, little to tr. qtz, calc, sulf, chlor. mod. close to closely frac; 0.1' to 1.4'; calcite; clay; part open to tight; sl. rough, 0-10°, 45°, 65°-90°	100/85	Box 24			Run 72, 340.0-344.0 Drill rate 0.19'/min. Milky to lt. gray return water Bit change/340.0-344.0 core ground along 0° frac. some calc. washed out. $T_c = 6,983$ PSI				
342													Run 73, 344.0-348.75 Drill rate 0.37'/min.
344													
346					97/40								
348													
350				348.75-349.5 v. closely frac, sl. weath, low hard, weak; clayey; pgs. 0.01' - 0.1'		Box 25			Run 74, 348.75'-354.0				
352				351.0-352.5 sl. altered Diorite; sl. weath; mod. hard to soft; weak; med. xln; grn;	100/50								
354				352.1-352.3 v. close frac, calcite and clay fillings, part open; sl. mylonitic; sl. rough					Run 75, 354.0-359.0				
356					100/66								
358						Box 26			Drilling halted 24pm 5/9/84, rig moved drilling resumed 5/25/84				
360									Run 76, 359.0-364.0				

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/84
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./QD %	Box Number	Instrumentation	Remarks					
	Lithology	Structure	Fracture Log 3 8 9 12											
360	[Dotted pattern]	[Vertical lines]	[Vertical lines]	DIORITE cont; fresh; hard to v. hard; strong; med to coarse xlyn; green gray, hbl, plag, bio mod. close frag; calcite coated; tight, sl. rough; 10°-30°, 50°, 60°, pcs. 0.3' - 4.2' generally 1'-2'; several healed frag, calcite	100/82	100/100	Box 27		Run 76, cont.					
362														
364														
366	[Vertical lines]	[Vertical lines]	[Vertical lines]	364.9-369.5 FELSIC; fresh, hard to v. hard; strong; fine to med. xlyn; plag, Qtz, tr. mafics	100/100	100/100	Box 27							
368				367.0 calcite and clay filling, friable; 70°										
370	[Dotted pattern]	[Vertical lines]	[Vertical lines]	369.5-765.0 DIORITE; fresh, hard to v. hard; strong; med xlyn; plag; hbl, bio mod. close frag. cont.	100/100	100/100	Box 27		Run 78, 369.2'-370.3' Night shift					
372														Run 79, 370.3'-375.2' Added Mindrill, polymer mud
374														
376	[Dotted pattern]	[Vertical lines]	[Vertical lines]	374.6 v. hard, v. strong; irregular shaped calcite fillings scattered throughout	100/100	100/100	Box 28		Run 80, 375.2'-380.1' Return water 90% Drill rate 0.10'/min					
378														
380														

Boring No DHB4-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/84 1/8
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks							
	Lithology	Structure	Fracture Log 3 8 9 12													
380	[Dotted pattern]	[Vertical line]	[Vertical line]	DIORITE cont; fresh; hard to v. hard; v. strong, med. xyl, plag, hbl, tr; bib where fine xyl mod; close to widely frac; calcite, tight, sl. to med; rough; 10°-40°, 60°; pcs. 1.1'-4.2'	[Vertical line]	100/100	Box 28	[Vertical line]	Run 81, 380.1-385.0							
382																
384											381.4-381.5 felsic vein; fine xyl; lt. gray; sharp; welded contacts					
386										41°						Run 82, 385.0-390.0
388										15°	387.6-395.7 deep reddish stain through core and healed frac scratches easily w/knife to a powder; occurs in bands and streaks		100/100			
390																Run 83, 390.0-395.3'
392										23°						
394																
396																Run 84, 395.0-400.0'
398											398.3-398.6 v. closely frac; clay filled; wet; lt. green gray					
400			398.3-402.2 closely frac; pcs. 0.2' to 0.4'		100/78											

Boring No DHB4-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/84
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks	
	Lithology	Structure	Fracture Log 3 6 9 12							
400	[Dotted pattern]	[Diagonal lines]	[Empty]	DIORITE cont; fresh; hard to v. hard; strong; med. xln; grn. - gray.	100/44	100/44	Box 30		Run 85, 400.0'-405.0' v. diff. to unscrew inner barrel tip. had to break core	
402				mod. close to widely frac; calcite; tight to part open; sl. rough to rough, 50-450 pcs. 0.2' to 5.0'; numerous irregular calcite fillings throughout						
404				398.3-402.2: closely frac. cont. 404.2 calcite vein, welded irregular contacts						
406										
408										
410				410.0-415.0 healed frac; 90°; thin calcite filling, welded contacts						
412										
414				413.6-416.7 frac. parallel to core axis, 80°-90°, calcite and clay; core broken along in pcs. 0.3'-0.6'						
416										
418										
420			418.7-419.7 frac, 75°-90°; deep red stain, hematite (?), chlor.	100/72	100/01	Box 31		Run 86, 405.0'-410.0' Drill rate 0.29'/min	Run 87, 410.0'-415.0'	Run 88, 415.0'-420.0' Inner barrel v. difficult to screw; had to break core

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. &
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/89/8
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks		
	Lithology	Structure	Fracture Log								
420				DIORITE cont; fresh; hard, strong med. xyn; green-gray, occ. reddish stain, numerous calcite healed fillings throughout closely to widely frac; mostly mod. close; calcite and hematite part open to open, rough, 50-80° pcs. 0.5" to 5" 423.3 hematite coating, faint, slickensides (?), rough, 75° 428.5 healed frac; calcite and clay filling; thin; hematite staining adjacent to; 75°-80° 430.0-440.0 increase in healed frags. and decrease in its; calcite	100/100	Box 31		Run 89, 420.0-425.1'			
422											
424											
426											
428											
430											
432											
434											
436											
438											
440											

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 23 of 39
Date 26 May '84

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.3 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/84
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks	
	Lithology	Structure	Fracture, Log, 3 8 9 12							
440	[Dotted pattern]	[Dotted pattern]		DIORITE; conit; fresh; hard; strong; med. xln; green-gray; numerous irregular shaped calcite fillings close to mod. close frac; calcite, tr. clay; many healed calcite veins, part open; sl. rough to rough, 30°-80°; 0.1' to 6.0'	100/84		Box 33		Run 93, 440.0'-445.0' Difficult to twist inner barrel + tip. Core fractured and fell apart upon placing in core box	
442				441.0 - 413.3 - Calcite vein; healed; up to 0.5", 70°-90°; welded contacts					Run 94, 445.0' - 450.0'	
444				444.4 - 446.3 v. closely frac; calcite and clay fillings, tight to part open; sl. to med. rough, 60°-90°, pcs. < 0.3'						
446										
448										
450				449.5 - 449.8 clay and calcite filled fracs; rough; filling 0.25" thick; 75°, tr. hematite					Run 95, 450.0' - 455.0'	
452				449.5 - 460.0 color changes to green-red gray; tr. of pyrite, calcite, white to mostly red						
454										
456										Run 96, 455.0' - 460.0' 2 pcs; difficult to get out of tip of catcher; had to break core
458										
460										

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. & s
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/87/1
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
460	[Dotted pattern]	[Vertical line]	[Vertical line]	DIORITE cont; fresh to sl; alter; mod. hard to hard, mod. strong; med. to coarse xyn; grn. gray to lt. grn. gray; discoloration of feld spars; tr. pyrite usually on fracs; kaolin; numerous irregular calcite fillings up to 0.1" thick	100/100	100/100	Box 34		Run 97, 460.0-461.5 Blocked off pulled rods and changed bit. had to ream from 359 to 461
462				460.5 Clay and calcite filled frac. sl. to mod. plasticity; soft; moist; lt. green gray; 0.1' wide 80°					Run 98, 461.5-466.5
464				470.4-472.3 Calcite and clay along 70° frac.					Tc = 11,566 PSI
466				470.8-471.7 closely frac; calcite; tr. clay; part. open to open; sl. rough to rough; mostly 10°-30°, 70°-80°, pcs. 0.1'-0.8' generally 0.15'-0.4'					Run 99, 466.5-470.0
468									
470									
472									
474									
476				475.4 fresh; hard to v. hard; strong; fewer calcite fillings					Run 100, 470.0-475.0 Night shift Drill rate 0.25/min
478									
480			Tc = 4,328 PSI						

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 25 of 39

Date 26 May '84

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/8"
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks							
	Lithology	Structure	Fracture Log 3 6 9 12													
480	[Dotted pattern]	/		DIORITE cont. fresh, hard to v. hard; strong to v. strong, fine to med; xyl; green-gray; plag, hbl, bio, tr. pyrite mod. close frac; calcite; tight; sl. rough; 10°-30°, 60°-70° PCS: 0.8'-2.2'	100/100	100/100	Box 35		Run 102, 480.0-485.0							
482																
484																
486																
488																
490									490.3 healed frac; calcite, tr. pyrite, sl. rough	100/100	Box 36	Run 103, 485.0-490.0 Drill rate 0.09'/min				
492									492.1 healed frac; calcite, clay, soft, moist; sl. rough; 1/8"			TC = 23,805 PSI				
494									/			100/100	100/96	Box 37		Run 104, 490.0-495.0
496																
498																Run 105, 495.0-500.0
500																

00173

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 26 of 39
Date 26 May '84

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft. ±
 Feature Underground Powerhouse Bearing 0°19' Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.3 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. ±
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
500	[Dotted pattern]		3 0 9 12	DIORITE cont, fresh; hard to v. hard; v. strong, med. xlm; green gray; plag. hb1, bio; tr. pyrite	100/100	100/100	Box 37		Run 106, 500.0' - 505.0' Drill rate 0.8'/min.
502				mod. close to wide frac; calcite, tight; sl. rough; 100-300; pcs. 0.2' - 4.0'					
504									
506				occ. thin calcite veins, < 1/16"					
508									
510				13°					
512									
514									
516									
518									
520									Run 107, 505.0' - 510.0' in
									Begin day shift 5/27/84
									Run 108, 510.0' - 515.0'
									Run 109, 515.0' - 520.0'
									TC = 21,822 PSI

Boring No DH34-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. &
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7'
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks			
	Lithology	Structure	Fracture Log 3 6 9 12									
520	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	DIORITE; cont; fresh; v. hard; v. strong; med. xln; green-gray plag, h. bi, h. o. mod. close frac, calcite; chlor; tight to part open; med. rough; 0°-87°, pcs. 0.4' to 3.0'	100/100	100/100	Box 38		Run 110, 520.0-525.0 Drill rate: 0.19'/min.			
522												
524												
526				Run 111, 525.0-530.0 Drill rate 0.23'/min.								
528												
530				528.8-532.4 frac parallel to core axis, near 90°; w/ several cross frac's. (or breaks?); chlor, calcite; tight; med. rough					100/100	100/100	Box 39	Run 112; 530.0-535.2
532												
534												
536				Run 113, 535.2'-540.0 Drill rate 0.21'/min.								
538				100/100								100/100
540												

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.3 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/87
 Core Sizes H3 Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks			
	Lithology	Structure	Fracture Log 3 8 9 12									
540	[Dotted pattern]	[Vertical line]	[Vertical line]	DIORITE cont; fresh; v. hard, v. strong; med. xln; green-gray mod. close to widely frac; calcite; chlor; tight to part open; med. rough, 30°-40° (several 0° mech. brks), pcs. 0.2' to 5.0'	100/100	100/100	Box 40	[Vertical line]	Run 114, 540.0-545.0 Tc = 21,822 PSI			
542												
544												
546												
548												
550												
552												
554												
556									555.5 healed frac; calcite, welded contacts, 80° 1/4" wide	100/94	Box 41	Run 115, 545.0-550.0 Drill rate 0.25'/min
558												
560		100/100	Box 41	Run 116, 550.0-555.1								
				Run 117, 555.1-559.8								
				Run 118, see next sht								

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. &
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7 1/2'
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
560	[Dotted pattern]		3 6 9 12	DIORITE cont; fresh; v. hard; v. strong; med. xyn; green-gray; plag, hbl, bio	100/94	100/94	Box 41		Run 118, 559.8'-562.0'
562				mod. close to widely frac, calcite, chlor, tight to part open; med. rough; 10°-20°; pcs. 0.1'-3.0', generally 3.0' or greater.					Drill chatter and bounce, difficulty drilling at 562.2'
564				many calcite healed frags w/ some chlorite, occ. local areas of sl. color change to a lt. green					
566				561.7-561.9 sl. color change bordering frags; weath?					TC = 28,369 PSI
568				562.7-563.4 lt. green-gray					Run 119, 5650'-5700'
570				567.1-567.2 felsic vein; fresh; hard; strong; welded contacts; 65°					Difficult to unscrew inner barrel tip.
572									Had to break rock
574				570.0-572.0 several irregular calcite fillings, up to 1/2 in.					Drill rate 0.25'/min.
576				573.0-576.5 lt. green-gray					Run 120, 570.0-575.0
578									
580			Run 121, 575.0'-580.0'						

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/8/8
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
580	[Dotted pattern]	[Vertical line]	[Vertical line]	DIORITE cont, fresh; v. hard; v. strong; med. xyls; green-gray widely frac; calcite healed frags; tight to p. open; rough; 0° to 30°; pcs. 0.2-2.0	100/44	100/100	Box 43	[Vertical line]	Run 122, 580.0'-581.8'
582				580.9-582.4 closely frac; tr. Fe stain; calcite; p. open; med. rough; pcs. < 0.3'					Difficult drilling. bit blocked at frags.
584									Run 123, 581.8-586.8
586									Drill rate 0.19'/min, TC = 0 PSI
588									
590									
592									
594									
596									
598									
600			Drill rate 0.25'/min. Had trouble drilling at ~489.0'						
									Run 125, 591.9-597.0
									Run 126, 597.0-599.9

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. ± 1/84
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
600	[Dotted pattern]	[Vertical line]	3 6 9 12	DIORITE cont; fresh, hard to v. hard; v. strong; med. xln; 30% bio and hbl; 50% fsp; green-gray	100/96	100/96	Box 44		Run 127, 599.9-604.9 Drill rate 0.11'/min. Night shift New bit, had to ream down from 2" to 1 1/2"
602				widely frac, tight; sl. rough; 0.2-2.0; pcs. 0.3 to 7.5; general 4 = 3.0'					
604									
606									
608									
610									
612									
614									
616									
618									
620									

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Features Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.1 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/84
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
620				DIORITE cont; fresh, v. hard, v. strong; med. to fine xln, green-gray	100/90	100/90	Box 45		Run 131, 620.0'-625.0'
622				mod. close to widely frac; calcite, tight to p. open; sl. rough to med. rough; 300-500; pcs 0.4" to 5.5"					
624				620.3-621.2 v. closely frac; broken along calcite healed frags; 1-2 mm, 400-700					
626									
628									
630									
632				630.3-630.5 and 631.1-631.3 Felsic, fresh; v. hard; v. strong; fine xln; tr. mafics; welded contacts					
634				631.2-632.5 Coarse xln.					
636									
638									
640				100/100	100/100	Box 46		Run 132, 625.0'-630.0' Drill rate: 0.33/min.	
				100/100	100/100	Box 47		Run 133, 630.0'-635.0'	
								Run 134, 635.0'-640.1' Drill rate: 0.27/min Tc = 29,731 PSI	

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/8
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks		
	Lithology	Structure	Fracture Log								
640	[Dotted pattern]			DIORITE con't, fresh, v. hard, v. strong; med. xyl'n; green-gray mod. closely frac.; chlor.; calcite; tight to part open; med. rough, 35°-55°; pes. 1.0' to 4.0'; many healed calcite frags.	100/100	100/100	Box 47		Run 135, 640.1-644.9		
642				640.4 slickensides on calcite and chlor. coated frac. surface							
644											
646											Run 136, 644.9-650.0 Drill rate 0.35'/min Pres. test from 600.0-650.0
648											
650										Run 137, 650.0-655.0 Drill rate 0.35'/min	
652										TC = 18,045 PSI	
654											
656							655.0-660.0 increase in calcite healed frags. 655.0-656.5 Inclusions of Andesite Porphyry, up to 0.2'			Box 48	Run 138, 655.0-660.0 Drill rate 0.35'/min
658							657.3 calcite healed frac; 45°, 1/4"				
660											

Boring No DHB4-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. & 2
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/0/
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log												
660	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	DIORITE cont, fresh; v. hard; v. strong; 50% plaq; green-gray mod. close frac; calcite; tight; sl. rough; 200-300, 500-750 pcs. 0.5"-2.5"; numerous rehealed frags; calcite; acc. red to reddish-brown streaks or stain	[Vertical lines]	100/100	Box 48	[Vertical lines]	Run 139, 660.0-664.8 Night shift						
662															
664															
666															Run 140, 664.8-670.0
668															
670											668.0-669.2 Andesite Porphyry; fresh; hard; mod. strong; v. closely frac. 669.0 Clay filled frac; lt. green-gray to med. gray; moist				Run 141, 670.0-675.0 Drill rate 0.11'/min.
672											671.9-671.9 med; to coarse xln.				
674															
676											674.5-677.0 sl. alter; discoloration of fsp's; tr. pyrite in veins w/ reddish-brown stain; tr. kaolin. rehealed material is hard				Run 142, 675.0-680.0 TC = 6,162 PSI
678											677.0-677.1 Calcite and clay filled frac.				
680															

Boring No DH84-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. &
 E' 743,942.3 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/84
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks					
	Lithology	Structure	Fracture Log 3 6 9 12											
680	[Dotted pattern]	65°		DIORITE cont; fresh; v. hard; v. strong; med. xln; ~ 50% plag; tr. pyrite; green-gray mod. close fracs; calcite; tight; med. rough; 40°-70°; PCS. 1.0'-3.6'	100/100	100/100	Box 50		Run 143, 680.0-685.0					
682														
684														
686														
688														
690														
692														
694														
696									28°	698.0-698.6 Andesite Porphyry; irregular, welded contacts; fresh; hard; strong; 65°	100/96	100/96	Box 51	Run 144, 685.0-690.0
698														
700														

Boring No DHB4-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/1/84
 Core Sizes HQ Total Depth 705.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./QD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
700	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	DIORITE cont; fresh; v. hard; v. strong; med. xyl; green-gray	100/40	100/40	Box 51		Run 147, 700.0-705.0
702				close to mod. close frac; calcite; chlor; tight to part open; smooth to med. rough; 100-500; 70°; pcs. 0.1' to 1.6'					
704				700.2-707.1 v. closely to closely frac; calcite; tight; sl. rough; pcs. 0.05' to 0.5', generally < 0.3'					
706				703.5-704.8 red stain on core calcite (?)					
708				707.3-710.1 fresh to sl. altered; feldspars discolored; numerous calcite vein, white to deep red					
710									
712									
714									
716				714.2-714.8 v. closely frac; core broken up					
718									
720			718.1-719.3 irregular felsic inclusions; fresh; hard; strong; fine xyl; tr. mafics; lt. gray	100/94		Box 52		Run 150, 715.0-720.0 Begin day shift 5/29/84	

00173

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 37 of 39
Date 29 May '84

Boring No DHA4-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/84
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks				
	Lithology	Structure	Fracture Log 3 8 9 12										
720				DIORITE cont; fresh; v. hard, u strong; fine to med. xls; green-gray to lt. gray closely frac; calcite, p. open; med. rough to smooth; 37° to 20°; pcs. 0.1' to 1.75'	100/70	100/70	Box S3		Run 151, 720.0-725.0				
722													TC = 27,507 PSI
724													
726				721.0-724.0 v. closely frac; intersecting joint sets; p. open; rough to smooth; 20°, 50°, 20°; pcs. < 0.3'					Run 152, 725.0-730.0 Drill rate 0.23/min.				
728													
730													
732				730.5-743.5 st. discoloration of feldspars; lt. green gray; increase in calcite inclusions					Run 153, 730.0-735.0 Drill rate 0.23/min, core lifter malfunction: Pulled rods, recovered 2.9 ft. tripped rods. After run 154, overshot blocked: core fell from inner tube recovered rest of core but badly disturbed, mech. breaks				
734				733.0 calcite healed frac; 65°, 3 mm									
736									Run 154, 735.0-740.0				
738									TC = 20,906 PSI				
740													

Boring No DHB4-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. ±
 E 743,942.3 Date Completed May, 1984 Ground-Water Elevation 2021.6 Ft. 7/84
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
740				DIORITE cont; fresh; hard; strong; fine to med. xyn;	100/74				Run 155, 740.0-745.0
742				green-gray; sulfide mineralization closely frac; chlor, calcite, p. open to open; sl. to med. rough; 10° to 80°; pzs. 0.2 to 3.4.0'					
744				743.1-745.0 sl. altered, mod. hard to hard; mod. strong; med. xyn, bleached, chalky white; kaolin.					
746				744.3 clay, calcite and carbonate along a healed frac; 0.05' wide; 60°					
748				746.4 high angle jt; calcite coating; tr. sulfides; med. rough; 80°					
750				750.2-760.0 red stain scattered throughout					
752				752.5-755.1 Andesite Porphyry aphanitic; Diorite xenoliths; fresh; hard; strong; welded contacts					
754				755.1-755.3 clay filled frac; healed; p. open; calcite and clay filling; mod. alteration each side of frac; 0.2' on both sides					
756									
758									
760			759.0-760.0 mod. altered, sl. hard to soft; weak; friable; kaolin; clay filling, 0.1" wide along frac; sl. plasticity; wet.	100/100				Run 156, 745.0-750.0	
					100/98				Run 157, 750.0-755.0 Difficult to unscrew litter case, crushed core
					100/100				Run 158, 755.0-760.0 Drill rate 0.21/min
					100/60				

Boring No DHB4-2 Angle (from Horizontal) 60° Ground Elevation 2024.2 Ft.
 Feature Underground Powerhouse Bearing 019° Rock Elevation 2011.5 Ft.
 Coordinates: N 3,227,809.0 Date Started 6 May, 1984 Overburden Thickness 14.7 Ft. &
 E 743,942.5 Date Completed 29 May, 1984 Ground-Water Elevation 2021.6 Ft. 7/84
 Core Sizes HQ Total Depth 765.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
760	[Dotted pattern]	[Blank]	[Blank]	DIORITE cont; fresh; hard; strong med. to coarse xln; lt green gray many calcite healed frags; closely frac; calcite; p. open; med. rough; to rough; 10-30°; pcs. 0.1 to 3.2'	100/78	[Blank]	Box 55	[Blank]	Run 159, 760.0-765.0 Drill rate 0.19/min. Wire line broke pulled rods to retrieve P=2, 201 PSI
762							Box 56		
764							Box 56		
760	[Blank]	[Blank]	[Blank]	T. D. = 765.0 Ft.	[Blank]	[Blank]	[Blank]	[Blank]	*also artesian flow from deeper piezometer

Boring No DH84-3 Angle (from Horizontal) 60° Ground Elevation 1503.3 FT.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1494.8 FT.
 Coordinates: N 3,227,210.7 Date Started 28 April, 1984 Overburden Thickness 8.5' FT. ±
 E 742,971.6 Date Completed 1 May, 1984 Ground-Water Elevation 1481.6 FT. ± 7/84
 Core Sizes HQ Total Depth 132.2 Ft. Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
0				0.0-0.7 ICE 0.7-1.7 SILT, soft, washed away					LY38-COR, HQ Began spudding in at 1655 hrs Run 1, 0.0'-4.6'
2				1.7-3.9 ORGANIC, silt, fibrous w/ roots, frozen, dark brown					
4				3.9-8.5 GRAVEL, granodiorite and andesite, fresh, hard, strong, pcs. to 0.25'. granodiorite is angular, andesite is subrounded silty sand in frac's. or cave from above, subrd to subangl, fine w/ tr. medium and coarse, brown					Run 2, 4.6'-6.6'
6									Night shift 4/29/84 Run 3, 6.6'-8.5'
8				TOP OF ROCK @ 8.5 Ft.					Day shift 4/29/84 Run 4, 8.5'-13.0'
10				8.5-132.2 QUARTZ DIORITE, mod. to severely weath, granular decrepitation, hard w/ local v. soft zones in deeply weathered fractures mod. strong, med. xln, grey to reddish brown close to v. closely fractured, Fe staining, many frac's. ice filled; pcs: 0.2'-0.3'		100/0			Ice lenses in fractures from 8.0' to 14.0'
12									
14				13.0 closely frac, Fe staining, part open to open, rough, 45°-90°		100/0			Run 5, 13.0'-15.0'
16				16.0-27.3 sandy, Fe stained fractures		85/20			Run 6, 15.0'-17.0'
18				18.0 ice lenses to 0.06' thick		100/30			Run 7, 17.0'-20.0'
20									

Boring No DH84-3 Angle (from Horizontal) 60° Ground Elevation 1503.3 FT.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1494.8 FT.
 Coordinates: N 3,227,210.7 Date Started 28 April, 1984 Overburden Thickness 8.5 FT. ±
 E 742,971.6 Date Completed 1 May, 1984 Ground-Water Elevation 1481.6 Ft. 7/8424
 Core Sizes HQ Total Depth 132.2 Ft. Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
20				QUARTZ DIORITE, cont, sli. to mod. weath, hard, strong to mod. strong, med. xln, gray to reddish-brown, tr. kaolin,					Run 8, 20.0'-25.0' No water return.
22				v. close w/ some close fracturing, kaolin, Fe staining, coarse sand filling, occ. ice lenses, traces of healed frac's, 5° to 75°		100/18			
24									
26						90/55	Box 2		Run 9, 25.0'-27.9'
28				QUARTZ DIORITE, fresh, hard, strong, fine to med. xln, gray, close to mod. close, Fe stain along frac, tight to part-open, sl. to mod. rough; 0°-10°, 60°-70° pcs. 0.2'-2.8'		100/100			Night shift 4/30/84 Run 10, 27.9'-30.1' Drill rate 0.17/min. Sl. water return at times
30									Run 11, 30.1'-34.8' Drill rate 0.08/min.
32						100/94			
34									σ _c = 17,745 PSI
36				35.7 and 35.9 thin calcite coating on fractures					Run 12, 34.8'-38.4'
38						100/100	Box 3		Changed bit; had to ream out hole @ 19' to 23' ft.
40									Run 13, 38.4'-43.7' Drill rate 0.08/min. No water return.

Boring No DH84-3 Angle (from Horizontal) 60° Ground Elevation 1503.3 FT
 Feature D/S Portals Area Bearing 025° Rock Elevation 1494.8 FT
 Coordinates: N 3,227,210.7 Date Started 28 April, 1984 Overburden Thickness 8.5 FT. ±
 E 742,971.6 Date Completed 1 May, 1984 Ground-Water Elevation 1481.6 Ft. 7/84
 Core Sizes HQ Total Depth 132.2 Ft. Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log 3 6 9 12												
40	[Dashed pattern]	10°		QUARTZ DIORITE, cont; fresh, v. hard, strong, med.-coarse xls, gray close to mod. close frac, sl. Fe staining on some jts. w/ sl. penetration, some frags were healed w/ Fe and/or calcite	100/96	100/96	Box 3		Run 13, 38.4'-43.7' cont.						
42															
44															Run 14, 43.7'-48.5'
46									45°		45.0 - mod. close to wide fra. 0.25'-5.0' spacing, sl. weath, med. rough, 10°-45°		100/92		
48															Begin day shift 4/30/84 Run 15, 48.5'-49.9'
50													100/100		Run 16, 49.9'-54.7'
52									10°		51.9-52.4 felsic, fresh, v. hard, strong, white-gray, < 10% mafics		100/94	Box 4	Core bit changed; hole reamed from casing bottom to 54.7'
54															Run 17, 54.7'-59.6' Drill rate 0.25'/min. P ₀ = 18,397 PSI
56									45°						Recovery problems; pulled out all rods to retrieve core barrel
58													98/92		
60				59.0-59.2 diorite fragment, fine xln, rounded, green-gray 59.9-60.1 felsic dike, fresh, hard, strong, lt. gray, < 10% mafics, 60°				Run 18, 59.6'-64.3'							

Boring No DH84-3 Angle (from Horizontal) 60° Ground Elevation 1503.3 FT.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1494.8 FT.
 Coordinates: N 3,227,210.7 Date Started 28 April, 1984 Overburden Thickness 8.5 FT. ±
 E 742,971.6 Date Completed 1 May, 1984 Ground-Water Elevation 1481.6 Ft. 7/84 34
 Core Sizes HQ Total Depth 132.2 Ft. Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
60	[Dashed pattern]	60°		<p>QUARTZ DIORITE, cont., fresh, v. hard, v. strong, fine-med. xln, gray, CI=20 mod. close frac, sl. Fe stain on some jts., some jts. healed w/ Fe and/or calcite, generally tight, some open, sl. rough, 20° and 60° pcs. 0.4'-2.6'</p> <p>occ. feldspar concentration but contact is v. hard and v. strong</p> <p>67.3 talc, calcite filling, white, open, med. rough, 60° jt. spacing is increasing with depth, wide</p> <p>71.6-71.85 felsic vein, fresh, hard, strong, fine xln, lt. gray, <10% mafics, 65</p> <p>72.0-72.8 sl. alteration, xln. to kaolin</p> <p>72.4 healed fracture, calcite filling, tight, sl. rough, 75°</p> <p>76.7-77.6 sl. alteration, some feldspar. xls. beginning to break down to kaolin</p>	100/91	Box 5		Run 18, cont.	
62								Tc = 24,004 PSI	
64								Run 19, 64.3'-69.5'	
66									
68		60°							
70								Run 20, 69.5'-74.7'	
72									
74								Run 21, 74.7'-80.0'	
76		58°						Tc = 18,395 PSI	
78		60°							
80									

Boring No DH84-3 Angle (from Horizontal) 60° Ground Elevation 1503.3 FT.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1494.8 FT.
 Coordinates: N 3,227,210.7 Date Started 28 April, 1984 Overburden Thickness 8.5 FT. ±
 E 742,971.6 Date Completed 1 May, 1984 Ground-Water Elevation 1481.6 Ft. 7/84
 Core Sizes HQ Total Depth 132.2 Ft. Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log 3 6 9 12												
80	[Dotted pattern]	[Vertical lines]	[Vertical lines]	QUARTZ DIORITE, cont. fresh, v. hard, strong, med. xln. mod. close to wide frac, sl. Fe staining on some jt's and frac's, tight to part open, sl. to med. rough; 35°, 70°; pcs. 0.7'-6.0'	100/100	100/100	Box 6		Run 22, 80.0'-84.1'						
82															
84															Night shift 5/1/84
86										85.4-87.9 Sl to mod. altered along jt's, kaolin in some areas, generally small pieces are hard closely frac, open, sl. to med. rough, core loss(?)	94/78				Run 23, 84.1'-88.9' Had to break off 0.1' from bottom to get it out of the shoe No water return
88										86.3 sandy clay filling along jt, open, sl. rough, 40°					Run 24, 88.9'-93.8'
90															Tc = 27,700 PSI
92															
94														Box 7	Run 25, 93.8'-95.5' Bit pulled and sharpened
96										96.9 joint, chlorite coating, sulfide mineralization					Run 26, 95.5'-100.0' Caving; partially filled tube causing core to crowd and crumble; lost 0.3' (98.2-99.3)
98															?
100															

Boring No DH84-3 Angle (from Horizontal) 60° Ground Elevation 1503.3 FT.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1494.8 FT.
 Coordinates: N 3,227,210.7 Date Started 28 April, 1984 Overburden Thickness 8.5 FT. ±
 E 742,971.6 Date Completed 1 May, 1984 Ground-Water Elevation 1481.6 FT. 7/84 ±
 Core Sizes HQ Total Depth 132.2 Ft. Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
100	[Lithology: Dotted pattern]	[Structure: 1/6, 1/8, 8/5, 10]	[Fracture Log: 3 8 9 12]	QUARTZ DIORITE, cont. fresh, v. hard, strong, med. xln, gray	100/100	100/100	Box 7		Run 27, 100.0'-104.9'
102				mod. close to wide, sl. Fe staining on some surfaces, calcite filling, part open to open, generally sl. rough, 10°-30°					
104				101.6 calcite coating on joint					
106									
108				107.8 and 109.8 calcite coating on jts, healed					
110									
112									
114				114.5 healed jt., 0.1" calcite filling ≈ 75°			Box 8		Tc = 23,822 PSI
116									Start day shift 5/1/84
118				117.8-119.4 sl. alteration, tr. kaolin, and discoloration					Run 29, 110.0'-112.8'
120				118.5 healed joint, calcite filling, 0.2" tr. pyrite and clay, 85°			Box 9		Bit cleaned & sharpened before run 30, 112.8'-117.5'
									cave below casing in interval ± 17.7'-26'
									Run 30, 112.8'-117.5'
									Run 31, 117.5'-119.9'
			Tc = 14,184 PSI						

Boring No DH84-3 Angle (from Horizontal) 60° Ground Elevation 1503.3 FT.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1494.8 FT.
 Coordinates: N 3,227,210.7 Date Started 28 April, 1984 Overburden Thickness 8.5 FT. ±
 E 742,971.6 Date Completed 1 May, 1984 Ground-Water Elevation 1481.6 FT. ± 4
 Core Sizes HG Total Depth 132.2 FT. Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks				
	Lithology	Structure	Fracture Log 3 6 9 12										
120	[Dotted pattern]			QUARTZ DIORITE, cont, fresh, v. hard, v. strong, med. xln, gray	100/100	100/100	Box 9		Run 32, 119.9'-124.9' Drill rate 0.13'/min				
122				v. wide frags, healed frags w/ calcite filling and traces of pyrite, 10° to 85°, healed frags. to 0.03'									
124													
126													
128				127.7' healed calcite fracture, 80°									
130													T _c = 18,611 PSI
132													Run 34, 129.8'-132.2' Drill rate 0.03'/min. Pulled rods and cleaned bit at end of hole
				T.D. = 132.2 FT.									
134													

HARZA-EBASCO

SUSITNA JOINT VENTURE

SOIL BORING LOG

Sheet 1 of 20
Date 4 May '84

Boring No. DH84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.6 Ft.
 Coordinates: N 3, 229, 235.1 Date Started 4 May, 1984 Total Depth 378.0 Ft.
 E 745, 813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Logged by Wright/Rurka

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Instrumentation	Remarks
0							0.0-0.5 ORGANICS; moss, roots, undecomposed material		LY 38- CAR, HQ
0.5							return water was v. dark appears to be frozen to 0.5'-0.7'		Run 1, 0.0-11.5
1.0							0.5-1.0 Silty SAND; cuttings; subrounded gravel and cobbles. Diorite to Andesite gravel		Little to no down pressure needed
1.5							return water was grayish-brown (outwash?)		
2.0			Ct 1		0.8'				
3.0									
4.0									
5.0									
6.0									
7.0									
8.0									
9.0									
10.0									
11.0									
12.0						ML			Run 2, 11.5-18.2
13.0							Clayey silt; tr. gravel; subrd; tr. fine to coarse sand; yellow-brown		
14.0			Ct 2		0.5'				K = 3 x 10 ⁻⁴ cm/sec (14.7'-17.2')
15.0									Color of return water changed to lt brown at ~17'
16.0									Bit blocked at 18.5' by clay seam
17.0							17.0-18.9: Sandy CLAY, little gravel and cobbles; subrounded; tr. fine to coarse sand; mod. to high plasticity; dense; stiff; olive brn. sl. Fe stain of sandy silt pockets; (Till); holds water in hole		Run 3, 18.2-21.0
18.0			Ct 3		2.0'	ML-SM			LL 30; PI 19.8; F ₁₅ 11.2; ML-SM
19.0									
20.0									

Boring No. DH84-4 Sheet 1 of 20

00173

Boring No. DH84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.6 Ft.
 Coordinates: N 3,229,235.1 Date Started 4 May, 1984 Total Depth 378.0 Ft.
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft.
 Logged by Wright/Rurka

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Instrumentation	Remarks
20									Intermittent water return 19.0' - 19.5'
21									Full return from 19.5'
22									Jar samples 20.5' and 20.6'
23			Ws 4		0.0'				Falling head at 21.0'
24									Run 4, 21.0-28.0
25									Casing at 18.0'
26									$K = 1 \times 10^{-4}$ cm/sec (14.7' - 22.9')
27									$K = 1 \times 10^{-4}$ cm/sec (14.7' - 27.0')
28									Runs 5, 28.0-33.0
29									Constant head at 28.0'
30			Ws 5		0.0'				$K = 1 \times 10^{-4}$ cm/sec (23.8' - 31.1')
31									$K = 6 \times 10^{-5}$ cm/sec (23.8' - 39.3')
32									Run 6, 33.0-38.0
33									Constant head at 33.0'
34									Advance casing to 29.0'
35			Ct 6		0.0'				
36									
37									
38							Silty SAND, fine to coarse sand, mod. brown w/pcs. porphyritic andesite cobbles		Run 7, 38.0-43.2
39			Ct 7		0.2'				Constant head at 38.0'
40									

Box 1

Boring No. DH84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.6 Ft.
 Coordinates: N 3,229,235.1 Date Started 4 May, 1984 Total Depth 378.0 Ft.
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84

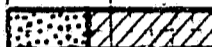
Logged by Wright/Rurka

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Instrumentation	Remarks
40									Run 7, cont.
42			Ct 7		0.2'				
44									Run 8, 43.2 - 48.0 Drill wash color change from dark grey to brown at 45' Constant head at 48.0'
46			Ws 8		0.0'				Advance casing to 39.0'
48									Run 9, 48.0 - 53.2
50			Ws 9		0.0				
52									
54									Run 10, 53.2 - 58.0
56			Ct 10		0.5'		pcs. (2) of porphyritic andesite, fresh, v. hard, v. strong, fine-med. xyn, fines were washed away		
58									Night shift, 5/4/84 Run 11, 58.0 - 64.5 Greenish-gray return water
60			Ct 11		2.1'		Cobbles; Porphyritic Andesite; sub-rounded to sub-angular 0.6' resting in top of tube. some are striated and polished (TILL?)		

Box 1

Boring No. DH84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.6 Ft.
 Coordinates: N 3,229,235.1 Date Started 4 May, 1984 Total Depth 378.0 Ft.
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 1/8"

Logged by Wright/Rurka

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Instrumentation	Remarks
60									Run 11, cont.
62			Ct 11		2.1'	ML	62.4 - 64.5 Clayey, sandy SILT dense; moist; sub-rounded to subangular, gravel, polish; fine to coarse sand (~25%); clay; sl. plasticity; olive gray; (fill)		 LL 21 PL 17 PI 4 ML
64									Run 12, 64.5-68.0 Greenish-gray water returns
66			Ws 12		0.0'				
68									Run 13, 68.0-75.0
70			Ws 13		0.0'				$K = 3 \times 10^{-5}$ cm/sec (63.1' - 88.5')
72									
74									Run 14, 73.0-78.0 Water return was brown from ~75' to 72'
76			Ws 14		0.0'				
78									Run 15, 78.0-83.0
80			Ws 15		0.0'				

Boring No. DH84-4 Angle (from Horizontal) 55° Ground Elevation -2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.6 Ft.
 Coordinates: N 3,229,235.1 Date Started 4 May, 1984 Total Depth 378.0 Ft.
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Logged by Wright/Rurka

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Instrumentation	Remarks
80									Run 15, cont.
82			Ws 15		0.0'				Run 16, 83.0-88.0
84									
86			Ct 16		0.0				
88									Run 17, 88.0-93.0
90			Ct 17		4.0'	ML	Clayey, sandy SILT, v. dense, stiff, saturated, sub-rounded to angular, fine to coarse, max. 1" low plasticity, gray (Till)	Box 1	Begin day shift 5/5/84 Water color same Jar sample 92.3-92.4
92									
94							Clayey sand; increase in gravel; gravel less than 3/4"; sub-rounded; tr. of Diorite fragments; polish, striations		Run 18, 93.0-98.0 Drill rate 0.06/min 1st gear drill reverse water
96			Ct 18		1.7'	SC			K = 6×10^{-5} CM/SEC (95.8'-137.6')
98							97.5-98.0 sl. oxidation		Run 19, 98.0-103.0 Drill wash 98.0-103.0'
100			Ct 19		2.0'			Box 2	

Boring No. DH84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.6 Ft.
 Coordinates: N 3,229,235.1 Date Started 4 May, 1984 Total Depth 378.0 Ft.
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Logged by Wright/Rurka

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Instrumentation	Remarks
100							Clayey sandy SILT, v. dense; stiff, saturated, sub-rounded to angular, polished; striated; occ. cobble; fine to coarse; low plasticity, gray; (Till)		Run 19, cont.
102			Ct 19		2.0'				
104							103.0 - 104.5 Andesite Porphyry boulder.		Run 20, 103.8-108.0 Constant head test
106			Ct 20		2.5'		106.0 - 107.0 matrix washed away; cobbles and gravel.		
108									Run 21, 108.0-113.0
110			Ct 21		0.4'				
112							112.5 - 113.0 broken diorite fragments.		Run 22, 113.0-118.0
114			Ct 22		2.0'				
116							washed gravel, sub-rounded to angular; striated		
118							TOP OF ROCK 116.9 Ft.		
120							SEE GEOLOGIC LOG		

Box 2

Boring No. DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.6 Ft.
 Coordinates: N 3,229,235.1 Date Started 4 May, 1984 Overburden Thickness 116.9 Ft.
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Core Sizes HQ Total Depth 378.0 Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
100									
102									
104									
106									
108									
110									
112									
114				SEE SOIL LOG					Run 22, 113.0-118.0
116				TOP OF ROCK 116.9 Ft.					
118				116.9-175.5 QUARTZ DIORITE(?) severely weathered; v. soft; weak; fine to med. xln; gray kaolin; rock strength precludes any determination of fracturing and RQD = 0		55/0	Box 2		Run 23, 118.0-123.0
120									

Boring No. DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.6 Ft.
 Coordinates: N 3229,235.1 Date Started 4 May, 1984 Overburden Thickness 116.9 Ft. x
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Core Sizes HQ Total Depth 378.0 Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks					
	Lithology	Structure	Fracture Log 3 6 9 12											
120	[Patterned]			QUARTZ DIORITE cont. severely weathered, v. soft; weak; fine to med. xln; green gray; kaolin. rock strength precludes any determination of fracturing and RQD = 0	[Shaded]	55%	Box 2		Run 23, cont.;					
122													Drill water color change to reddish Drill rate 0.5/min.	
124														Run 24, 123.0-128.0 No recovery. Severely weathered rock, therefore RQD does not apply.
126														
128														start day shift 5/6/84 Run 25, 128.0-128.5 Bit blocked-off Run 26, 128.5-133.0
130														
132														
134														start night shift Run 27, 133.0-138.0 ~135' - return water changed from greenish-gray to olive-brown.
136														
138														
140									Run 28, 138.0-143.0					

Boring No. DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° For. Elevation 2065.6 Ft.
 Coordinates: N 3229,235.1 Date Started 4 May, 1984 Overburden Thickness 116.9 Ft. x
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Core Sizes HQ Total Depth 378.0 Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
140				No recovery; 134.5 to 147.2 Ft.		0%			Run 28, cont. 140' drill water color greenish-gray, collected jar sample
142						0%			
144						0%			Run 29, 143.0-148.0 Previous runs Night shift Drill in 2nd gear 3-400 rpm, only rod weight for down pressure
146						0%			
148						0%	3		Run 30, 148.0-153.0 Tried throttling down pump to get recovery but it did not help. Large amounts of greenish-gray sand returning through casing.
150						0%			
152						0%			
154						0%			Run 31, 153.0-158.0
156						0%			
158						0%			Run 32, 158.0-163.0
160									

Boring No. DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.6 Ft.
 Coordinates: N 3229,235.1 Date Started 4 May, 1984 Overburden Thickness 116.9 Ft. ±
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Core Sizes HQ Total Depth 378.0 Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
160									Run 32, cont.
162						0/0			
164				GRANODIORITE (?) p.c.s. sl. to mod. alter.; low hardness; mod. strong to weak; x'tals can be pulled apart; friable		16/0			Run 33, 163.0-168.0 Constant head Test: 1 gal/min Water level at 8.4'
166									
168				167.2-168.0; 171.2-175.85 QUARTZ DIORITE; mod. weath; mod. hard; mod. strong; med. x'lin; gray; brittle; mostly mech. weathering					Run 34, 168.0-173.0 Sand on top of run
170				170.2-171.2 severely weath; brittle; friable; little to no texture visible		54/0	Box 3		
172									
174						72/0			Run 35, 173.0-175.5 Begin day shift 5/7/84
176				175.5-186.1 ALTERED DIORITE; mod. to severely altered; sl. to mod. hard; mod. strong; med. x'lin; chalky white; kaolin					Run 36, 175.5-178.0
178				close to med. rough; 20°-60°; p.c.s. to 0.3'; faint slickensides on clay coated frac.		100/0			Run 37, 178.0-183.0
180									

Boring No DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.6 Ft.
 Coordinates: N 3229,235.1 Date Started 4 May, 1984 Overburden Thickness 116.9 Ft. ±
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Core Sizes HQ Total Depth 378.0 Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks	
	Lithology	Structure	Fracture Log 3 8 9 12							
180	[Hand-drawn lithology symbols: vertical dashes, horizontal dashes, and irregular patterns]	[Hand-drawn structure symbols: vertical lines, horizontal lines, and irregular patterns]	[Hand-drawn fracture log symbols: vertical lines, horizontal lines, and irregular patterns]	ALTERED DIORITE; cont.; mod. to severely altered; sl. hard; mod. strong to weak; med. to fine xlyn; chalky white; kaolin close to v. closely frac; calcite; part open; sl. rough; 300-600; pls. < 0.5; calcite healed; fracs.; tight to 1/2"	[Vertical bar]	100/0	Box 3		Run 37, cont.	
182				183.0-186.1 severely altered; clay coatings with faint slickensides; kaolin; soft; weak; calcite, Fe stain; close to v. closely frac; 65°					Run 38, 183.0-186.0 RQD determination begins at 186.1	
184				186.1-216.4 QUARTZ DIORITE; mod. weath; mod. hard; mod. strong; fine to med. xlyn; gray; tr. of kaolin.					181.6' core can be pulled apart by hand. The rock structure crumbles.	
186				v. closely frac; chlor; calcite; part open; med. rough; 15°-75°; pls. < 0.3					Run 39, 188.0-193.0	
188				190.2-190.3 and 197.2-197.3 mod. to severely weath; v. soft; weak; friable; mostly mech. weath;						
190										Run 40, 193.0-198.0
192										
194										
196										
198										
200										

00173

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 12 of 20
Date 7 May '84

Boring No. DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.6 Ft.
 Coordinates: N 3229, 235.1 Date Started 4 May, 1984 Overburden Thickness 116.9 Ft.
 E 745, 813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Core Sizes HQ Total Depth 378.0 Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log												
200	[Lithology pattern: diagonal dashes]	[Structure: 15°]	[Fracture Log: 3 8 9 12]	200.0 - 202.0 QUARTZ DIORITE cont; mod. weath; mod. hard; mod. strong; fine to med. xylm; green-gray; tr. of kaolin.	[C.R.-Graphic: solid black]	50/0	[Box Number: Box 5]	[Instrumentation: none]	Run 41, cont.						
202				202.0 - 204.0 v. closely frac; calcite; part open; med. rough; 15°-75°; pes. & a. 3'					Run 42, 203.0-208.0						
204															
206															
208															Run 43, 208.0-213.0
210															
212															
214											212.8 - 213.0 closely to v. closely frac.				Run 44, 213.0-217.0
216															
218											216.4 - 223.2 ALTERED DIORITE; severely altered; kaolin; slicken-sides; on olive gray, planar; clay seams; calcite; v. soft; weak; 20°, 40°, 60°; plastic in places				Run 45, 217.0-222.3
220															

Boring No DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.6 Ft.
 Coordinates: N 3,229,235.1 Date Started 4 May, 1984 Overburden Thickness 116.9 Ft. ±
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Core Sizes HQ Total Depth 378.0 Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks			
	Lithology	Structure	Fracture Log 3 6 9 12									
220	[Lithology pattern: vertical dashes]	[Structure: vertical lines]	[Fracture Log: empty]	ALTERED DIORITE cont; severely altered; kaolin; slickensides on olive gray planar seams; v. soft weak; med. xylm; chalky white.	[C.R.-Graphic: solid black]	98/0	[Box Number: empty]	[Instrumentation: empty]	Run 45, cont.			
222				Run 46, 222.3-227.6								
224				45°					223.2-228.9 QUARTZ DIORITE; fresh; hard; strong; med. xylm; gray; closely frac; calcite; chlor; part open, sl. rough to rough; 35°-60°; p.c.s. 0.1 to 0.4	100/32	Box 6	Tc = 22,886 PSI
226				35°					223.2-225.2 fresh; hard; strong; med. xylm; gray; biotite rich			
228				55°					225.2-227.7 sl. to mod. altered; soft to mod. hard; weak to mod. strong; chalky white; kaolin; many incipient frac; friable, brittle			Run 47, 227.6-232.7
230				45°					227.7 fresh; hard; strong; med. xylm; gray closely frac; calcite; chlor; p. open; med. rough; 100, 300, 70°			
232				55°								
234				65°								Run 48, 232.7-237.8
236				70°								
238				70°								Run 49, 237.8-243.0
240	70°		238.8-241.8 sl. to mod. altered; slickensides along frac; soft; weak; chalky white	100/38	Box 7							

Boring No. DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.6 Ft.
 Coordinates: N 3,229,235.1 Date Started 4 May, 1984 Overburden Thickness 116.9 Ft.
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 217.7 Ft. 1984
 Core Sizes HQ Total Depth 378.0 Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
240				QUARTZ DIORITE, cont. fresh, hard, strong; med. kyln; hbl; No plag. etc; mafics are chlor. closely to v. closely frac.		100/38	Box 7		Run 49, cont.
242		X		calcite, chlor; p. open to open, sl. to med. rough; 10°-20°, 50°-80°; pcs. 0.05' - 0.8'; numerous tight and healed fracs throughout					Run 50, 243.0-248.2 Had difficulty transferring core to box
244				245.9-251.9 Fe stain as well as calcite and chlor. on joints		100/8			
246				246.1-247.8 core badly broken along high angle jts; pcs. < 0.3'					
248				247.8 sl. reddish stain on core					Run 51, 248.2-253.0
250									Tc = 27,278 PSI.
252						100/13			
254				253.2-253.4 Silty sand filling, little gravel, subangular; fine to coarse, green-gray		84/0	Box 8		Run 52, 255.0-255.5 Bit was blocking.
256				253.2-263.5 v. closely frac; chlor; sl. rough to rough; pcs. < 0.2'					Run 53, 255.5-258.0
258						72/0			
260						72/8			Run 54, 258.0-263.0

Boring No. DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.0 Ft.
 Coordinates: N 3,229,235.1 Date Started 4 May, 1984 Overburden Thickness 116.2 Ft. &
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Core Sizes HQ Total Depth 378.0 Logged by Wright/Rurkin

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
260	[Dotted pattern]	[X marks]	[]	QUARTZ DIORITE cont.; fresh; hard to v. hard; strong; fine to med. xylm; lt. gray	72/8	72/8	Box 9		Run 54, 258.17-263.0 CL = 1.4'; assume lost throughout
262				v. close to closely frac; calcite, chlor; tight to part open; sl. to med. rough, 15°-75°; pcs. 0.25'-0.5'; slickensides in places					Run 55, 263.0-268.0 CL = 1.4'; lost throughout run
264	[Dotted pattern]	[X marks]	[]		72/6	72/6	Box 9		stopped for press. test
266									Run 56, 268.0-271.3 Night shift 5/8/84
268	[Dotted pattern]	[X marks]	[]		100/18	100/18			
270									
272	[Dotted pattern]	[X marks]	[]	272.2-274.3 mod. close frac.	94/42	94/42			Run 57, 271.5-276.3
274				274.3-275.8 v. closely frac; parallel frac. @ 30°-50°					CL = 0.3'
276	[Dotted pattern]	[X marks]	[]		94/56	94/56	Box 10		Run 58, 276.3-281.3
278				278.2-278.7 tight frags; core broken along during drilling; 40°-50°					
280	[Dotted pattern]	[X marks]	[]						

00173

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 16 of 20
Date 8 May '84

Boring No DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.0 Ft.
 Coordinates: N 3229,235.1 Date Started 4 May, 1984 Overburden Thickness 116.9 Ft. X 2
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. [84]
 Core Sizes HQ Total Depth 378.0 Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
280	[Dotted pattern]	55°	[Fracture symbols]	QUARTZ DIORITE cont; fresh; hard to v. hard; strong; med. xyl; hbl, Na plg, qtz; lt. gray closely to mod. close frac calcite, chlor; tight to p. open; sl. to med. rough; 100-60°; pcs. 0.1-1.3'	[Dotted pattern]	100/68	Box 10	[Dotted pattern]	Tc = 18,611 PSI Run 59, 280.3-286.0
282				285.8 calcite coating, Fe stain, and slickensides on frac; 55°					
284	[Dotted pattern]	45°	[Fracture symbols]	286.6 Andesite Porphyry, 0.05" 25°; healed frac; calcite, 60°	[Dotted pattern]	100/90	Box 10	[Dotted pattern]	Run 60, 286.0-288.0
286	[Dotted pattern]	42°	[Fracture symbols]		[Dotted pattern]	100/90	Box 10	[Dotted pattern]	Run 61, 288.0-293.0
288	[Dotted pattern]	25°	[Fracture symbols]	288.9-294.6 ANDESITE PORPHYRY, fresh; hard; med; strong; aphanitic to fine xyl; ground mass; fine to med. grained, plg, phenocrysts co. grained argillite? and diorite reholths, lt. gray; sharp contacts.	[Dotted pattern]	100/74	Box 10	[Dotted pattern]	Run 62, 293.0-298.2 Drill rate 0.17/min.
290	[Dotted pattern]	46°	[Fracture symbols]	291.9-292.4 Quartz Diorite	[Dotted pattern]	100/71	Box 11	[Dotted pattern]	
292	[Dotted pattern]	46°	[Fracture symbols]	294.6-378.0 QUARTZ DIORITE, fresh; hard to v. hard; strong; med. xyl; 295.9-296.4 Andesite Porphyry; fresh; mod. hard to hard; mod. strong; plg; phenocrysts; lt. gray; welded; sharp contact	[Dotted pattern]	100/83	Box 11	[Dotted pattern]	Run 63, 298.2-303.0
294	[Dotted pattern]	27°	[Fracture symbols]		[Dotted pattern]			[Dotted pattern]	
296	[Dotted pattern]	14°	[Fracture symbols]		[Dotted pattern]			[Dotted pattern]	
298	[Dotted pattern]	20°	[Fracture symbols]		[Dotted pattern]			[Dotted pattern]	
300	[Dotted pattern]		[Fracture symbols]		[Dotted pattern]			[Dotted pattern]	

Boring No DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.0 Ft.
 Coordinates: N 3229, 235.1 Date Started 4 May, 1984 Overburden Thickness 116.9 Ft. 4
 E 745, 813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Core Sizes HQ/NQ Total Depth 378.0 Logged by Wright/Burka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
300	[Dotted pattern]	70°		QUARTZ DIORITE cont.; fresh; v. hard; v. strong; fine to med. x4; lvy. lt. gray; hbl; Na plagi; Qtz	100/83	100/83	Box 11		Run 63, cont.
302				15-20% mod. close to wide frac; calcite, ch. lon; part open to tight; sl. to med. rough; 45°					Run 64, 3030-3080
304	[Dotted pattern]	45°		304.5-306.5 calcite healed fracs; hard, strong; hairline to 0.05"; 75°-90°, welded contacts	100/100	100/100			
306									
308	[Dotted pattern]				100/100	100/100			Run 65, 3080-313.0
310									
312	[Dotted pattern]			310.7-311.2 calcite healed frac. w/ Fe staining; 65°	100/100	100/100			
314									
316	[Dotted pattern]	45°			100/100	100/100	Box 12		TC = 25, 969 PSI
318									
319	[Dotted pattern]	60°		317.5-324.4 tr. Fe stain along frac.	72/45	72/45			Run 67, 318.0-322.0
320				318.0-320.0 intersecting jts.					At 318.0 reduced hole; HQ to NQ

Boring No DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.0 Ft.
 Coordinates: N 3229,235.1 Date Started 4 May, 1984 Overburden Thickness 116.9 Ft. x 4
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Core Sizes NQ Total Depth 378.0 Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
320	[Lithology pattern]	[Structure pattern]	[Fracture Log pattern]	QUARTZ DIORITE cont.; fresh, v. hard; v. strong; med. cyl. nbl., Na plag; Qtz = 15%, lt. gray mod. close to v. closely frac; calcite, chlor, tr. Fe stain, p. open; sl. rough to rough; 0°-40°, 60°-80°; PCS. 0.05-2.5	100/100	100/100	Box 13		Run 67 cont.; Core loss due to mech. problems w/ filter and tube
322				322.4 calcite healed jt. 1/8" thick; 60°					Run 68, 322.0-323.1 Night shift
324				324.4 calcite, healed frac. 1/8" thick w/ coating of clay material 1/16" chlor. present					Run 69, 323.1-324.0
326									Run 70, 324.0-325.9 Bit blocked
328									Run 71, 325.9-327.2 Bit blocked
330									Run 72, 327.2-328.0 Bit blocked
332									Run 73, 328.0-330.5 Drill rate 0.05/min Bit blocked
334									Run 74, 330.5-334.0 Bit blocked
336									Run 75, 334.0-337.3 Bit blocked CL = 0.6
338									Run 76, 337.3-341.9
340						Box 14			

Boring No DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2065.0 Ft.
 Coordinates: N 3229,235.1 Date Started 4 May, 1984 Overburden Thickness 116.9 Ft. x
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/8
 Core Sizes NQ Total Depth 378.0 Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
340				QUARTZ DIORITE cont. Fresh, hard, strong, med. xyl; lt. gray, att, hbl.					Run 76, cont.
342				closely to v. closely frac; chlor, calcite, tr. Fe stain; p. open; sl. to med rough; 100-200; 70°; pcs. 0.05' + 0.8'					Run 77, 341.9-346.0 Start day shift 5/11/84
344				340.0-341.7 v. closely frac; chlor, calcite; med. rough; 70°; pcs. < 0.15'		93/71	Box 14		Sand in drill water, 100% return; casing backed off; cave
346									Run 78, 346.0-351.0
348						94/28			
350				349.5-350.8 several high angle frac; 65°-85°					
352									Run 79, 351.0-355.0 CL = 2.5
354						38/33			
356				355.0-355.4 v. closely frac; pcs. < 0.1'			Box 15		Run 80, 355.0-358.0
358				357.4-378.0 closely to widely frac; pcs. generally 0.5'-4.2'		67/20			Run 81, 358.0-362.9
360						100/88			

Boring No DH 84-4 Angle (from Horizontal) 55° Ground Elevation 2161.4 Ft.
 Feature "Fins" Downstream Bearing 050° Rock Elevation 2095.0 Ft.
 Coordinates: N 3229,235.1 Date Started 4 May, 1984 Overburden Thickness 116.9 Ft. X
 E 745,813.6 Date Completed 13 May, 1984 Ground-Water Elevation 2129.7 Ft. 7/84
 Core Sizes NQ Total Depth 378.0 Logged by Wright/Rurka

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 5 9 12						
360	[Dotted pattern]			QUARTZ DIORITE cont. Fresh, hard, strong, med. xtn; lt. gray, qtz. and hornblende closely to widely fract. chlorite, calcite; tight to part open; sl. to med. rough. 350-550 0.2" - 4.2"	100/80		Box 15		Run 81, cont.
362				Run 82, 362.9-367.8					
364									
366				T2 = 13,881 PSI					
368				366.1-370.0 core broken along an 80° frac.					
370									
372									
374									
376									
378									T.D. = 378.0 Ft.
380									

Boring No DH04-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature Fins Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Total Depth 698.5 Ft. 4
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/8
 Logged by Pulley/Wilkinson

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Box Number	Remarks
0.0							0.0-30.4 Silty SAND, med. dense to dense, moist, 5-20% gravel subrounded to subangular, occ. cobbles, 15% fines, nonplastic, fine to coarse, gray brown, (outwash)	Box 1	LY38 - COR, HQ Using a thick mud to stabilize hole and improve recovery Run 1, 0.0'-7.0'
2.0									
4.0			Ct 1		2.0	SM			Grey brown in color
6.0									
8.0			Ct 2		1.0'	SM			Run 2, 7.0'-11.0'
10.0									
12.0									Run 3, 11.0'-18.0'
14.0			Ct 3		1.1		most fines washed away, gravel 1.5 subrounded,		Mismatch
16.0									
18.0							18.0 color change from gray brown to moderate brown, oxidation, in places deep orange brown		Run 4, 18.0'-21.0'
20.0			Ct 4		2.4				

Boring No DHB4-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Total Depth 698.5 Ft. 4
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/8
 Logged by Pulley/Wilkinson

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Box Number	Remarks
20						SM	Silty SAND cont., dense, moist, subangular to subrounded gravel, fine to coarse, mostly fine; 20% fines, sl. plastic, med. brown to orange brown.	Box 1	Lost 1.5' somewhere w/ change of drillers Run 5, 21.0'-22.5'
22			Ct 5	0.0					Run 6, 22.5'-27.5'
24						SM/ML			LL 26.4 PL 24.0 PI 2.4 SM-ML
26					5.0	SM			Checked hole depth at 27.5' Run 7, 27.5'-32.5'
28									
30					5.0	SM			
32						ML	30.4-31.5 Sandy SILT, dense, moist; fine to med. sand, mostly fine, ~25% tr. clay; low to sl. plasticity, laminated; olive gray; (lacustrine)		Lacustrine (?) Unit G (?)
34						SM	31.5-32.8 Silty SAND, dense, moist; subangular to subrounded gravel; fine to coarse, mostly fine to med. 15-25% fines; light med. brown (outwash)		Run 8, 32.5'-37.5'
36					5.0	SM	33.8-38.4 Silty SAND cont, olive gray (outwash, till transition)		Basal till Unit G (?)
38					0.0				Run 9, 37.5'-38.5'
40					5.0	CM	38.4-58.5 Silty SAND, dense to v. dense; moist; subrounded to subangular gravel ~20%, up to 0.05'; fine to med. 25-30% fines, tr. clay; sl. plasticity; olive gray (till)		Run 10, 38.5'-43.5'


Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature Fins Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Total Depth 698.5 Ft. 4
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Logged by Pulley/Wilkinson

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Box Number	Remarks
40							Silty SAND cont; v. dense, moist, ang. to subround, fine to med. fines ~30%, tr. clay; fine to coarse gvl.; occ. cobbles up to 1.0'; rock frag. - miss. incl. and porph. diorite, felsite; some completely weath. olive gray; much of coarse traction is Fe stained and med. to severely weathered; (Till)	Box 2	Run 10, cont. Return water is lt. gray
42		Ct 10		5.0	SM				
44									Run 11, 43.5 - 48.5
46			Ct 11		5.0		46.2 - 47.5 Diorite Boulder, severely weathered; soft; weak		
48									Run 12, 48.5 - 53.5
50									SW - SM
52			Ct 12		5.0				
54									Run 13, 53.5 - 58.5
56			Ct 13		5.0	SM	54.2 - 54.9 Andesite Porphyry Cobble sl. weath, hard, strong		
58							56.3 Silty Sand cont; light med. brown oxidized		
60			Ct 14			SP-SM	58.5 - 60.2 SAND; dense; moist; fine to med. sand, tr. gravel; olive gray	Box 4	Run 14, 58.5 - 63.5 SP - SM

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature Fins' Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Total Depth 698.5 Ft. 4
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 FT 7/84
 Logged by Pulley/Wilkinson

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Box Number	Remarks
60					5.0'		60.2-63.5 Sandy SILT, sl. plasticity; v. dense; stiff; moist; little gravel; subrounded to subangular, striated, polished, fine to medium sand ~ 25%; cr. to little clay; olive gray (T11) fine to coarse gvl. max 0.3 ft slits to mod. weath; hetero. lithic frag.	Box 4	Run 14, cont.
62		Ct 14				ML			
64							63.5-71.1 Silty CLAY, mod. to high plasticity; v. dense; v. stiff; moist; subrounded, fine gvl. up to 0.1; tr. polish and striations; olive gray (T11)		Run 15, 63.5-68.5 lt. gray return water/mud
66		Ct 15			5.0'	CH			
68									
70									
72		Ct 16			5.0'		71.1-71.9 Diorite Cobble, severely weath; soft; weak; med. xln; kaolin prominent; mottled lt. brown to lt. gray.		Run 16, 68.5-73.5
74							71.9-72.4 Silty CLAY; as above		
76							TOP OF ROCK 72.4 Ft.		
78							SEE GEOLOGIC LOG		
80									

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
60									
62									
64									
66									
68				SEE SOIL LOG					
70									
72				TOP OF ROCK, 72.4 ft.					
74				72.4-128.4 DIORITE, severely weathered, soft, v. weak, med. xlns. lt. mod. brown to white; kaolin. of feldspars, hb, weather. chlorite, some to tr. residual qtz; rock strength precludes any determination of fracturing and RQD=0 no fract's apparent due to quality of rock	100%		Box 5		Run 16, cont. Run 17, 73.5'-78.5'
76					100%				
78									SW-SM Run 18, 78.5'-83.5'
80									

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2109.5 Ft.
 Coordinates: N 3, 229, 192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745, 774.1 Date Completed 21 May, 1984 Ground-Water Elevation 2132 Ft. 7/848
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
80	[Patterned]			DIORITE cont. severe weath; soft; v. weak; med. xln. white to light mod. brown, to kaolin. of feldspars; hal weath to chlorite, rock strength precludes any determination of fracturing and RQD = 0; oxidation no frags. apparent due to the quality of the rock	100/0	100/0	Box 5		Run 18, cont. Can be cut apart w/ knife easily
82									
84									
86									
88									
90									
92									
94									
96									
98									
100				100/0	90/0	Box 6		Run 19, 83.5'-88.5' Core 1 sample.	
									Run 20, 88.5'-93.5'
									Run 21, 93.5'-98.5'
									Run 22, 98.5'-103.5'

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/8"
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks	
	Lithology	Structure	Fracture Log							
100				DIORITE cont; severely weath, soft to v. soft; v. weak; med. xyl in; lt. mod. brown to white; tr. kaolin of feldspars; rock strength precludes determination of fracturing and RQD = 0; oxidation; no frags apparent due to rock quality		100/0	Box 7		Run 22, cont.: PW casing at 8' ± HW casing at 30' ± SW Core came out in one piece	
102									Run 23, 103.5' - 108.5'	
104										
106										
108										Run 24, 108.5' - 111.5'
110										
112					core disintegrated while removing shoe; friable; 112.0 - 120.5 severely weath; cont; soft; weak; friable; sl. improvement in the quality of the rock			100/0		Night shift 5/16/84 Run 25, 111.5' - 112.0' changed bit, put on used bit
114										Run 26, 112.0' - 117.0'
116					116.0 beginning to see fracturing			100/0		
118										Run 27, 117.0' - 118.5'
120										Run 28, 118.5' - 123.5'

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/8±
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
120				120.5-123.5 DIORITE cont, severely weath; v. soft; v. weak; friable; med. xyn; green-gray; tr. oxidation; relict mafic (?) veins, gray, now clay 1/2" thick		100/0			Run 28, cont.
122				123.6-128.4 DIORITE, mod. weath; soft to sl. hard; weak to mod. strong; med. xyn; lt. gray; kaolin of plag, hbl; chlor.		96/0	Box 8		Run 29, 123.5'-128.5'
124				128.4-131.7 felsic; fresh to sl. weath; mod. hard; mod. strong; fine to med xyn; lt. gray; gte; plag, < 10% mafic; v. closely frac; brittle		86/0			Run 30, 128.5'-133.5'
126				131.7-134.1 severely weath; v. soft; v. weak; friable sand size particles		100/0	Box 9		Run 31, 133.5'-138.5'
128				134.1 mod. to severely weath; soft to sl. hardness; weak; friable; med. xyn; lt. gray; kaolin of plag and hbl		100/0			Run 32, 138.5'-143.5'
130				135.5 thin clay coating on frac.					

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
140				DIORITE cont.; sev. to mod. weath. soft to sl. hard; weak; friable; plagi. and hb. alt. to kaolin and chlor. med. xylite; lt. gray		100/0			Run 32, cont.
142				closely frac. clay chlor. tight to sl. open, sl. rough, 90°, 0-15°; pos. a.l. = a.B.		100/0			
144				141.5-142.6 high angle jts; chlor. clay coating slickensides, 75°-80°		100/0			Run 33, 143.5'-146.8'
146				141.9-149.3 mod. weath; sl. hard; mod. strong		100/0			
148						100/0			
150				149.3-157.2 mod. to severely weath; soft to sl. hard; weak		97/0	Box 10		Run 34, 148.5'-152.2' core blocked ring stuck at top of run.
152				149.5-150.5 v. soft; v. weak; friable; sand size particles; hi mafic content chlorite and clay on frac. surf.		97/0	Box 10		
154						100/0			Run 35, 152.2'-157.2'
156				157.2-219.2 QUARTZ DIORITE; mod. weath; mod. hard; mod. strong; plagi. kaolin, hb; chlor. pink/green/gray		100/0			
158				closely frac; clay; also red on cores; tight to open, sl. to med. rough, 90°-70°, -30°		100/0			Run 36, 157.2'-158.5'
160				158.5-161.7 mod. weath; soft; weak to mod. strong		100/0	Box 11		Run 37, 158.5'-161.5'

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 1/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./QD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
160				QUARTZ DIORITE cont; mod. weath; mod. hard to soft; weak to mod. strong; med. xyn; greenish red, lt. gray; plag/kal; hbl./chlor; close frac; chlor; hematite; carbonate; clay; tight to part open; st. rough; 60°-90°; pes. 0.1 to 1.2; friable along frac.		97/0	Box 11		Run 37, cont. Core block off-oring at top of core Run 38, 161.5'-166.7'
162				158.5-161.7 mod. weath; soft; weak to mod. strong		100/24			
164				161.7-163.7 high angle jts, parallel; 75°		100/65			Run 39, 166.7'-168.7'
166						100/65			Run 40, 168.7'-173.8'
168						100/42			
170				170.7-174.7 sl. weath; mod. hard; mod. strong; med. xyn; green-gray; plag; hbl; chlor; tr. to little hematite; some kal; of plag		100/36	Box 12		Day shift 5/17/84 Run 41, 173.8'-178.5'
172						100/36			
174				174.7-177.2 mod. to severely weath; soft; mod. strong		100/36			Gouges with knife breaks apart in fingers (thin pieces)
176						100/36			Run 42, 178.5'-183.5'
178				178.5-180.8 core badly broken along high angle jts; 90°; sl. to mod. hard; weak to mod. strong; friable					
180									

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 4
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log 3 8 9 12												
180				QUARTZ DIORITE cont; mod. to sl. weath; sl. to mod. hard; mod. strong; med. xyl; green-gray; closely frac; hematite, chlor, kaolin/carb; friable; sand size particles; part open; rough to sl. rough; 40°-90°; pcs. 20.95 to 0.6'	100/32	100/32	Box 12		Run 42, cont.						
185				185.5 chlor. frac. slickensides 75° 185.7-188.5 hi angle frac (?), physical disintegration of core, friable, slickensides on some surfaces					TC = 0 PSI						
184															Run 43, 185.5'-188.5'
188															Run 44, 188.5'-193.5'
190															
192															
194															Run 45, 193.5'-198.5'
196											mod. hard to hard; mod. strong; med. xyl; green-gray				
198															
200															Run 46, 198.5'-203.7'
															TC = 4,761 PSI

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks			
	Lithology	Structure	Fracture Log									
200				<p>QUARTZ DIORITE, fresh to sl. weath, hard, strong, med. xyl, grn-gray; hbl. 23, no diag. close to mod. close frag. hematite chlor; calcite; friable, sand size particles along most frags, tight to part open sl. rough to rough; 10°-50°, 70°-80°, 45, 0.2"-1.4", generally 0.5"-1.0"</p> <p>200.3-209.0 core brittle along triangle jts.</p>	100/100	Box 14		Run 46, 198.5'-203.7'				
202												
204												Run 47, 203.7'-208.5'
206												
208												Run 48, 208.5'-213.5'
210												
212												
214												Run 49, 213.5'-218.5' First run 1 was able to pick up and place in box.
216												γc = 6,492 PSI
218								<p>219.2-235.7 ALTERED DIORITE, mod. to severely altered, soft to sl. hard; weak; med. xyl, apparent in places; ksp in of feld. and mafics; chalky white; sulfide mineralization.</p>	100/74	Box 15		Run 50, 218.5'-223.5'
220												

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 693.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
220				ALTERED DIORITE, cont.; soft to sl. hard; weak; med. xyn; kaolin. of feldspars and mafics; chalky white		100/10	Box 15		Run 50, cont. Can be picked apart w/ knife
222				closely frac, some calcite; rough to sl. rough, 150 to 70°; pes. 0.3 to 0.5'					
224				220.8-221.2 clay filling, sh. green, slickensides, mylonitic, lt. gray					Run 51, 223.5-228.5'
224.9				224.9-227.4 fresh to sl. altered; mod. hard; weak to mod. strong		100/10	Box 16		
225.9				225.9 clay coatings along frac; faint slickensides					
228									
228.5						100/10	Box 16		Run 52, 228.5'-233.5'
229				231.6-234.3 several clay coated; frac; slickensides or clay filling					First 1.0' v. crumbly Unaltered rock at last 1.0' of run
232.5				232.5-234.2 fresh to sl. altered; hard; strong; med. xyn; gray-green/red; lt. gray					TC = 17,313 PSI
234						100/10	Box 16		Run 53, 233.5'-238.5'
235.7				235.7-238.3 QUARTZ DIORITE; fresh; hard; med. strong to strong; fine to med. xyn; plag, hbl, bio, etc; green/red; lt. gray					
238				close to v. closely frac; chlor; part open; sl. rough to rough; friable along some frac; 300-600°; pes. 40.2'					Run 54, 238.5'-243.5'
240									

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ± 2132 Ft. 7/84[#]
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
240				QUARTZ DIORITE cont. fresh to sl. weath; hard; mod. strong to strong med. xlm; green/red-t. gray closely to v. closely frac; chlor. clay, calcite, carb; tight to part open; sl. rough, 5° to 90°, pcs. generally 0.2' - 0.3'	100/0				Run 54, cont.
242									
244				240.2 - 240.8 clay fillings, sl. to mod. plasticity; mylonitic, slickensides; clay up to 0.2" thick			Box 17		Run 55, 243.7' - 244.5' Mech. brkg. along previously healed frags.
246					100/0				
248				247.5 calcite vein, 0.25', 50° 247.5 - 253.5 closely to v. closely frac; brittle rock along hinge frac; part open; sl. rough to roughs 60° - 90°; pcs. 0.4', friable along frac.					Run 56, 248.5' - 253.5'
250					100/0				
252									
254				253.5 - 256.5 closely frac. along hinge frac.					Run 57, 253.5' - 258.5'
256					100/0				
258				256.5 - 265.4 closely to v. closely frac; carb, chlor. and clay; tight to part open; med. rough to roughs, 50° - 90°; pcs. 0.4' numerous tight and healed frac. rock is brittle, friable along frac.			Box 18		Run 58, 258.5' - 261.5'
260									

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ± 2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
260				QUARTZ DIORITE cont.; fresh to sl. weather, hard, mod. strong, med. xyl, qtz, 0.3-0.4	100/17	Box 18		Run 59, cont.	
262			v. close to closely frac; carb, chlor, clay, or calcite; tight to part open; rough to sl. rough; 10° to 90°; pcs. 0.3' or less	100/20	Run 59, 261.5' - 266.5'				
264			263.2 clay filling 1/4" thick; green gray; 80°	100/20					
266			265.4 fresh, hard to v. hard, strong; med. xyl, plag, hbl, qtz	100/20					
268			close frac; calcite, chlor, clay; tight to part open; sl. rough to rough, 20° to 60°; pcs. 0.1' - 0.9'	100/20	Run 60, 266.5' - 271.5'				
270				100/20					
272				100/20					
274				100/35	Box 19		TC = 9,089 PSI		
276			275.8 - 277.8 close to v. closely frac, Ca 1/8" on some pts; healed/tight Ca and clay filled frac tight to sl. open	52/100	Run 62, 274.6' - 278.6' Night shift 5/17/84 GWL at 32.2'				
278			278.9 clay filling along frac, hi plasticity, chalky white, 1" thick or rock frag.		Run 63, 278.5' - 282.5'				
280					TC = 22,500 PSI				

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
280				QUARTZ DIORITE cont; sl. weathered fresh; hard to mod. hard; strong; med. xyn; grn-gray; plag; hb; hb; qtz		100/35			Run 63; cont. Core blocked off
282				closely frac; clay, calc, or Fe stain; tight to part open; med. sl. rough; 45°-70°; pes. oil-td		100/33			Run 64; 282.5-284.0 Core blocked off
284				282.3-282.5 1/2" clay filled frac. v. soft		100/33			Run 65; 284.0-288.5
286				283.4 chlor, calcite, Fe stain, slickensided frac.; 40°		100/17	Box 20		
288				283.5-284.5 plag. altered to kaolin		100/10			
290				284.0-284.5 clay filling along frac; clay up to 1/2", slickensides, soft; chlor.		100/10			
292				286.0-286.1 clay filling along frac; 1/2" wide; clay and crushed diorite; soft		100/10			
294				287.2 slickensides on chlor frac.		100/10			
296				288.3-293.9 ALTERED DIORITE; sl. to mod. altered, mod. hard to soft; mod. str. to weak; fine to med. xyn; red stain; red/or-n-gray		100/10			Run 66; 288.5"-293.5
298				abundant clayey veinlets 1/8"; kaolin; RQD=0; due to rock quality		100/10			
300				288.5 thin clay filling along frac.		100/10			
302				289.8 clay filling, 1/2" thick, pale yellow to olive green		100/10			
304				288.9-290.1 mod. alter; kaolin; soft; v. weak		100/10			
306				293.0 calcite vein truncated at a clay filled jt.		100/10			Run 67; 293.5-298.5 Drill rate 0.12/min.
308				293.9-300.4 QUARTZ DIORITE; fresh; hard; str; med. xyn; grn-gray		100/10	Box 21		
310				closely frac; calcite; chlor; clay; tight to part open; sl. rough to rough; 30°; 50°-60°; 80°; pes. oil to 0.4		100/10			
312				294.0-295.0 numerous thin clay filled frac.		100/10			
314				295.0 calcite vein; 0.1" thick		100/10			Run 68; 298.5-301.1 Core blocked off Drill rate 0.15/min.
316						100/42			
318									
320									

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.6 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																
	Lithology	Structure	Fracture Log 3 8 9 12																						
300				300.4-305.2 ALTERED DIORITE, sl. to severely altered, soft to mod. hard; weak to v. weak; fine-med. xyn; mostly kaolin; grn=white; rock texture difficult to discern	100/42		Box 21		Run 68; cont.																
302				301.1-303.4 severely altered, v. soft, v. weak; clay					100/0	Box 21	Run 69, 301.1-306.2														
304				303.4-305.9 numerous hairline frac. throughout; soft; weak							100/0	Box 21													
306				305.2-307.7 sl. altered; sl. hard; weak - mod. strong; fine to med. xyn; grn=gray; closely frac.; clay coatings; light, some calcite									100/0	Box 21	Run 70, 306.2-308.5										
308				307.7-311.3 ALTERED DIORITE, mod. altered, soft to sl. hard; weak; med. xyn; kaolin; of feldspars; calcite veins											100/1	Box 21	Run 71, 308.5-313.5 Day shift 5/19/84								
310				close to v. closely frac.; clay; light; sl. rough, 200-500 p.p.s. ± 0.3													100/1	Box 22							
312				309.5 Clay fillings 1/2" thick; lt. green-gray															100/1	Box 22					
314				311.3-316.3 QUARTZ DIORITE; fresh; to sl. altered; mod. hard; mod. strong; med. xyn; green-gray; close to very closely frac.; chlar; clay; calcite; part open; med. rough; 100-500; p.p.s. 40.3																	100/1	Box 22	Run 72; 313.5-318.5 The altered diorite can be picked apart w/a knife		
316																							100/1	Box 22	
318				316.3-321.5 ALTERED DIORITE; sl. to severely altered, soft to sl. hard; weak to mod. strong; med. xyn; chalky-white gray; kaolin; rock texture difficult to discern in places																					100/1
320	close to v. closely frac.; light; sl. rough; 30.2	100/1	Box 22																						
	317.0-317.3 v. closely frac.; friable			100/1	Box 22																				

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,197.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
320				ALTERED DIORITE cont; mod altered; soft to st. hard; weak; med. xyl; chalky white-gray					Run 73, cont. Last 2' of run was fine grained rock-dike? 321.5-323.5
322				321.5-323.5 FELSIC; st. altered (?); mod. hard, med. strong, fine xyl; 5% matrix; lt. gray		100/22			
324				323.5-328.4 DIORITE, fresh, hard, strong, med. xyl; grn-gray, plagioclase to v. closely frag. calcite, chlor, clay, tr. Fe staining, v. rough to open; st. rough; 20°-60°; pes. 0.05" to 2.0"		100/44	Box 23		Run 74, 323.5-328.5
326				324.5-328.3 v. closely frag. pes. 0.02" generally					
328				326.7-326.9 core badly broken, friable; sand size particles					Run 75, 328.5'-333.5'
330						100/50			
332				332.5 calcite and clay filling; chlor. at 70°					Run 76, 333.5'-338.5'
334									
336				336.2-338.2 v. closely frag; clay filling; green gray along most frag. up to 1/8"		100/54	Box 24		
338				338.5-339.5 core badly broken, friable along hinge frag; 90°					Run 77, 338.5'-343.5'
340									

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 FT. 7/8
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./QD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
340				DIORITE cont.; fresh to sl. weath; hard, strong to mod. strong; grn- gray, plaq, hbl close to v. closely frac; chlor, Fe stain, clay filling, along some its; tight to part open; sl. rough; 10° to 60°; pcs. generally 0.3 to 0.6	100/40	100/26	Box 24		Run 77, cont.
342				342.1-343.0 v. closely frac; chlor, calcite, hematite, Fe stain					Run 78, 343.5-347.0 TCS 0 PSI
344				clay filling of fractures					Run 79, 347.0-352.2
346									
348									
350									
352				351.8-354.7 v. closely frac; chlor; clay, Fr. Fe stain, numerous tight frac; sl. rough; friable along some frac; 30°; 60°-70°					Run 80, 352.2-357.3
354				352.7-354.0 mod. weath; soft to mod. hard; weak to mod. strong					
356				353.6-353.8 severely weath; kaolin; soft; weak					
358									
360				100/87			Run 81, 357.3-362.2		

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. ±
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84 ±
 Core Sizes HQ Total Depth 678.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 0 0 12						
360				DIORITE cont; fresh, hard to v. hard, strong, med. xylm, lt. gray close to mod. closely frac; calcite, chlon; tight; sl. rough; 10°-30°, 60°-80° pps. 0.5-1.5'		100/89			Run 81, 20ht.
362									Run 82, 362.2-367.3
364						100/78	Box 26		
366									
368				367.1-368.8 hi-angle frac; parallel 70°-80°; closely frac. along					Run 83, 367.3-372.3
370						100/44			
372				371.5-373.7 v. closely frac; mod. weath; friable along frac, clay filling					Run 84, 372.3-377.4
374				373.2 gray, clayey granular disintegrating, diorite; friable, 0.5' thick 373.4-376.0 hi-angle frac; clay filling, ex Fe stain, friable along frac; 1/2-1/4" green clay fillings					
376				373.7 closely frac; sl. weath; clay filling along most frac; tight, med. rough		100/9	Box 27		
378									Run 85, 377.4-382.7
380						98/12			

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. Δ
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log 3 6 9 12												
380	[Dotted pattern]	[Vertical lines]	[Vertical lines]	DIORITE cont; sil. weather; hard, strong; med. xyn; grn-gray close to mod. close frac; clay, calcite; tight to part open; sh. to med. rough; 10°-40°; 60°; pcs. 0.1-1.2	100/10	100/10	Box 27		Run 85, cont.						
382				382.2-384.3 v. closely frac; part open; med. rough; 10°-20°; friable along frac; pcs 20.1					Run 86, 382.7-387.8'						
384				384.3-388.4 closely frac; clay filling along some frac; friable; tight to part open; sh. rough											
386															
388															
390				388.4-388.5 QUARTZ DIORITE; fresh; hard to v. hard; strong; fine to med. xyn; hpl, plag, qtz (3); appears to have graded to qtz. Dio. close to mod. close frac;											Run 87, 387.8-392.9'
392				389.0-389.2 Clay-filled frac; lt. grn.											
				390.0-391.0 Clay-filled frac; 1/8" at 30° dip											
				391.5 pink fsp xtls 0.5" long											Run 88, 392.9-398.2'
394				393.8 Calcite coating and filling along frac.											
396															
398															
400									Run 89, 398.2-403.2' Night shift 5/18/84 σ _c = 13,850 PSI						

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
400				QUARTZ DIORITE cont.; fresh, v. hard, v. strong, med. xln; green gray, red stain in places		100/88	Box 28		Run 89, cont.
402				close to mod. close fresh, clay, calcite; light; sl. to med. rough; 200-400, 600-700; pcs. 0.3-2A, generally >0.6"					
403				403.8-404.0 Andesite Porphyry; fresh; hard; strong; aphanitic; green-gray, 4sp.					Run 90, 403.2-408.4' Core around at top
406						100/81			
408				408.9-409.0 Calcite vein, mod. hard; 70°					Run 91, 408.4'-413.5'
410				409.0-409.6 Andesite Porphyry; fresh; hard; strong; aphanitic w/ Diorite xenoliths to 0.1; grn-gray clay filling between calcite veins and dikes; 70°		100/100	Box 29		
412									Run 92, 413.5'-418.5'
414									
416				415.2-416.3 sl. weath.; mod. hard; mod. strong to weak; tri. kaolin; of plag.		100/90			
418							Box 30		Run 93, 418.5'-423.5'
420									

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. A
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
420	[Dashed pattern]	[Symbol]	[Symbol]	QUARTZ DIORITE cont; fresh, hard to v. hard; strong; med. xlm; green-gray; plagioclase, hbl, qtz, Kspars, chlorite, tr. kaolins.	100/86	100/86	Box 30		Run 93, 418.5' - 423.5'
422				close to mod. close frac; calcite, tr. clay; tight, sl. to med. rough; 30°-40°, 80°; part. oil to 3.0"; generally 7 t.s'					Run 94, 423.5' - 428.5'
424	[Dashed pattern]	[Symbol]	[Symbol]	427.1 Calcite vein, v. as; white to rose	100/88	100/88	Box 30		
426				429.2-430.6 close to v. closely frac. calc. and clay on tight jts.					Run 95, 428.5' - 433.5'
428	[Dashed pattern]	[Symbol]	[Symbol]		100/74	100/74	Box 31		Drill rate 0.1/min.
430				433.3-435.0 Andesite Porphyry; to mafic (?), fresh; hard; strong; aphanitic, dk. green-gray; with Diorite xenoliths.					Run 96, 433.5' - 438.5'
432	[Dashed pattern]	[Symbol]	[Symbol]	435.7-437.0 v. closely frac.; calcite, clay; part. open; sl. rough; 30°	100/74	100/74	Box 31		Vc = 6,110 PSI
434									Run 97, 438.5' - 443.0
436	[Dashed pattern]	[Symbol]	[Symbol]						
438									
440	[Dashed pattern]	[Symbol]	[Symbol]						

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. A
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84 A
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks	
	Lithology	Structure	Fracture Log							
442	[Lithology pattern]	[Structure pattern]	[Fracture Log pattern]	QUARTZ DIO RITE cont; fresh, hard to v. hard; strong; med. v. lns; green-gray; tr. chlor.	100/24	100/24	Box 31		Run 97, cont	
442				close to mod. close frac; calcite, chlor; clay; part open; sl. to med. rough; 10° 45°-65°; pes. 0.1 to 1.5'						
444				441.8-442.4 v. closely frac; chlor, calcite; friable along frac; part open; pes. 0.2'						Run 98, 443.6-448.5'
446				443.6 frac. spacing 0.7'-1.5'						
446				445.1 red stain in core						
448	[Lithology pattern]	[Structure pattern]	[Fracture Log pattern]		96/90	100/100	Box 32		Run 99, 448.5'-453.5'	
450										Drill rate 0.11/min.
452										VC = 21,822 PSI
454										Run 100, 453.5'-458.5'
456										
458	[Lithology pattern]	[Structure pattern]	[Fracture Log pattern]		100/76				Run 101, 458.5'-463.5'	
460										

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R. RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
460				QUARTZ DIORITE cont.; fresh, hard to v. hard; strong; med. syn, green-gray; hb, plagiote, chlor. close to mod. chlorite frac. calcite, clay chlor. faint to part open; sl. to med. rough; 10° 30° 60°; pec. 0.4" - 3.1" aver. 1.0"		100/84	Box 33		Run 101, cont. Crew - repaired mud overflow pipes
461				460.0-461.2 med. hard; mod. strong; numerous calcite healed frac, chlor. of hb to clay					Run 102, 463.5-468.5
462						100/96			
463									
464									
465									
466									
467									
468									
469									
470						100/78			
471									
472				471.7-472.5 mod. hard; mod. strong; numerous calcite healed frac, chlor. of hb to clay					End of run had to be beaten out
473									
474									Run 104, 473.6-478.3
475									
476						100/94	Box 34		
477									
478									
479									
480									Run 105, 478.3-483.5

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/842
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
480				QUARTZ DIORITE cont; fresh; hard; v. strong; med. xyl; grn-gray; close to mod close frac; calcite; clay filling; chlr; tight to part open; sl. to med. rough; 15°-25°; 50°-60°; pcs. 0.2-2.5; many healed frac.		100/90	Box 34		Run 105, cont. Clay material=white, low-mod. plast.
482									
484									Run 106, 483.5'-488.5'
486						98/92			
488									Run 107, 488.5'-493.5'
490									
492				492.0-493.0 Calcite and clay filling, 1/8"; along 60°-70° fracs. tri pleg. altered to epidote; mech. brkg. along tight, clayey fracs.		98/78			Run 108, 493.5'-495.6'
494							Box 35		TC=30, 513 PSI Run 109, 495.6'-498.5' Hard drilling Drill rate 0.1'/min.
496						100/100			
498				499.0 Andesite (?); 1/2"; fine xyl; green; calcite, clay, tight, hard.		100/100			Run 110, 498.5'-503.5'
500									

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. ±
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 695.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
500				QUARTZ DIORITE cont; fresh; hard; strong; med. xyn; grn-gray; red in part; plaq, mbl, tr. qtz. mod. close to closely frac; chlor, calcite; part open; sl. to med. rough; 20°-40°, 70°; pgs. 0.3'-3.1", generally > 0.6" clay/calcite along tight (healed) fractures		100/98			Run 110, cont.
502									
504									Run 111, 503.5'-508.5' Mech. breaks at base due to very tight core catcher
506				500.5-508.4 Core badly broken along high angle frac, calcite; rock may have graded to a granodiorite		100/72			
508							Box 36		Run 112, 508.5'-513.6'
510				510.0 Felsic vein; 1/2"					
512						100/96			
514				513.1-514.7 close to v. closely frac.					Run 113, 513.6'-518.5' Drill rate 0.14/min
516									
518						100/82	Box 37		Run 114, 518.5'-523.5'
520									

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. A
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks					
	Lithology	Structure	Fracture Log											
520				QUARTZ DIORITE: cont. fresh, hard, strong; med. xyls; green-gray, occ. pink; plag. hbl, little Qtz, K spar; occ. fine gr. xenoliths (0.2"-0.02")	100/84		Box 37		Run 114, cont.					
522				mod. close to closely frac.; calcite, clay, chlorite, patches or coatings up to 1/8", tight; sl. rough; 90°, 45°-60°					Run 115, 523.5'-528.5'					
524														
526														
528										528.0'-528.5' brittle core, crumbled when hammered out of core catcher				Run 116, 528.5'-533.5'
530														Drill rate 0.16/min.
532														
534														Run 117, 533.5'-538.5'
536										539.4'-535.2' felsic xenoliths, hard; strong; fine xyls; lt. gray				Base of run badly broken due to mech. twisting
538										537.3'-538.5' closely to v. closely frac.; clay; calcite coatings; probable mech. break along "healed" frac.				Run 118, 538.5'-543.5'
540							Day Shift 5/20/84							

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Eins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks							
	Lithology	Structure	Fracture Log 3 6 9 12													
540	[Dotted pattern]			QUARTZ DIORITE cont. fresh, hard, strong; med. xln; green-gray, occ. pinkish gray; plag. hb; qtz, epidote; tr. ksp; chlor.	100/100	100/100	Box 38		Run 118, cont. ~100% return - Lt. gray, drilling w/ polymer mud							
542				mod. close to closely frac; chlorite, calcite, tight, st. rough, 0-10°, 45°, pr. 0.1-2.0'												
544				540.0-654.0 grades in places into GRANODIORITE phase, zones up to 0.5' long						Run 119, 543.5-548.5						
546																
548											Run 120, 548.5-553.5					
550																
552																
554												Run 121, 553.5-558.5 Drill rate 0.2/min.				
556										555.1-555.8 tr. kaolin of psp.; numerous thin calcite healed frag. 555.5 clay and calcite healed frag; approx 1/4" thick; 60°		100/92				
558																
560										559.1-559.9 clay filled frac; slicken sides; greasy; chlor; talc; surface; up to 0.3' thick, mineralized		100/30		Box 40		Run 122, 558.5-563.6 Drill rate 0.2/min.

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.5 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ± 2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
560				QUARTZ DIORITE, cont.; fresh, hard, strong; med. xyls; green-gray; occ. reddish gray; plag. hbl; quartz, tr. epidote and kspars; tr. hematite		100/36	Box 40		Run 123, cont. 100% H ₂ O gray return water, drilling w/ polymer mud
562				Closely frac. chlor. calcite; tight; sil. rough; 0°-10°, 45°, 80°-90°; pos. d.i.as to 1.0					
564				561.9-563.0 clay fillings along frac.; friable; core broken up along hinge frac. in places into graded oritic zones up to 0.5' long, yellow-green mineralization common; occ. hematite mineralization on frac. or disseminated through core		100/72			Run 123, 563.5'-568.5'
566				564.6 closely to mod. closely frac. 0.2' to 2.5'					VC=20,775 PSI
568									Run 124, 568.5'-573.5'
570									Drill rate 0.7/min.
572				570.9-571.5 core badly broken along hinge frac.		100/78			
574									Run 125, 573.5'-578.5'
576				574.8-576.6 increase in hematite; core is reddish gray; hematite occurs on frac. surfaces and disseminated in core		100/96	Box 41		Drill rate 0.6/min.
578									
580				579.4-588.5 tr. limonite staining		100/100			Run 126, 578.5'-583.5'
									Drill rate 0.8/min.

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/81
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./QD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 2 12						
580	[Lithology pattern: diagonal lines]	[Structure pattern: wavy lines]	[Fracture Log pattern: grid]	QUARTZ DIORITE cont; fresh, hard to v. hard; strong; med. xyn, green-gray to yellow-green; plag; epidote, hb; chlor; tr. kspar and hematite	100/100	100/100	Box 41		Run 126, cont. ~100% return water, lt. gray, drilling w/ polymer mud
582				close to mod. closely frac, calcite, tight, sl. rough, 0-30°; pcs. 0.2'-3.5'					Run 127, 583.5'-588.5'
584									
586									
588									
589.2-589.5				close to mod. closely frac, 0.05'-0.1'					Run 128, 588.5'-593.5'
590									
592									
592.8-593.5				v. closely frac; 0.03'-0.2'					Run 129, 593.5'-598.5'
594									
596									
598									
600					100/61			Run 130, 598.5'-603.7'	

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
600	[Dashed pattern]	[Diagonal lines]	[Vertical lines]	QUARTZ DIORITE cont. fresh, hard to hard, strong; med. xln; gray to yellow-green, plag, epidote hb, quartz, ksp, tr. kaol and chlor.	100/81	100/81	Box 43		Run 130, cont. 2100 ft. return water, 1. gray, drilling w/ polymer mod
602				closely to mod. closely frac, calcite, tight, occ. part open sl. rough, 20°-45°; pcs. 0.2-2.5' qtz diorite grades to granodiorite phase (?) in places					Run 131, 603.7-608.6 Drill rate 0.16/min.
604	[Dashed pattern]	[Diagonal lines]	[Vertical lines]	602.0-603.6 Andesite Porphyry; fresh; hard; strong; aphanitic to fine xln; gray green, w/ plag phenocrysts, and xenoliths of diorite up to 0.1' diameter.	100/51	100/51	Box 43		
606				606.9-610.3 closely frac. and broken along high angle. Its pcs. < 0.25'					
608	[Dashed pattern]	[Diagonal lines]	[Vertical lines]		100/84	100/84	Box 44		Run 132, 608.6-613.6
610									
612	[Dashed pattern]	[Diagonal lines]	[Vertical lines]		100/100	100/100	Box 44		Run 133, 613.6-618.5 Night shift 5/20/84
614				alteration of plag xtal's to epidote (?)					
616	[Dashed pattern]	[Diagonal lines]	[Vertical lines]		100/100	100/100	Box 44		
618									
620	[Dashed pattern]	[Diagonal lines]	[Vertical lines]						

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Eins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2137 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R. IRQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
620				QUARTZ DIORITE cont; fresh; hard to v. hard; strong med. xyls; green-gray to yellow green. plag, hb, tr ksp, etc; plag to epidote, hb to chlor. closely to mod. closely frz; calcite, occ. clay; tight, tr. part open, 45°-75°, 0.2"-3.0"	100/94	Box 44			Run 134; cont.
625									
628					100/100	Box 44			Run 136; 628.5'-633.5'
629									
632					100/88	Box 45			Run 137, 633.5'-638.7'
634									
638				635.6-638.7 v. close to closely frz; chlor, calcite; part open to open; sl. to med. rough; pas. < 0.3" clay filling, 1/2"	100/63	Box 45			Run 138, 638.7'-643.8'
640									

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ±2132 Ft. 7/84
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
640				QUARTZ DIORITE cont; fresh, hard to v. hard; strong; med. x lons; green-gray to yellow-green; plag, hbl, tr. ksp, Qtz, tr. pyrite and red mineral; plag to epidote (?), hbl to chlor		100/90			Run 138, cont.
642				close to mod. closely frac; chlorite, calcite; tight; sl. rough, 15°-25°, 45°, pos. 0.3"-3.5"					Run 139, 643.0'-643.9'
644				644.4-645.6 Andesite Porphyry; fresh, hard, strong, aphanitic; plag and hbl phenocrysts; diorite xenoliths					Care blocked off
646				644.4-644.5 calcite and clay filling along frac; soft; weak		100/100	Box 46		Run 140, 643.9'-648.4'
648									Run 141, 648.4'-653.5'
650						100/100			Water pres. var. from high to low but rock all the same
652									
654				653.6-653.7 clay filling along frac; soft; weak					Run 142, 653.5'-653.7'
656				653.6-654.4 Andesite Porphyry; fresh, hard, strong; greenish-gray					Run 143, 653.7'-658.6'
658				654.8-657.0 v. close to closely frac; calcite, chlor, clay, tight to part open, sl. to med. rough, pos. < 0.2"		100/57	Box 47		Test 9, 522 PSI
660						100/84			Run 144, 658.6'-658.8'
									Day shift 5/21/84
									Care blocked off
									Run 145, 658.8'-6638'

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation ± 2132 Ft. 7/8
 Core Sizes HQ Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
660	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	QUARTZ DIORITE cont. fresh, hard, v. strong, med. v. fine, greenish-gray to yellow green, plagioclase, tr. K-feldspar, quartz disseminated hematite, plagioclase epidote, and to chlorite, grades to granodiorite (?)	100/82	100/100	Box 47		Run 145, cont. ~100% return water, lt. gray, drilling w/polymer mud
662				mod. close to closely frac, calcite, tight, st. rough, 30°-45°, pcs. 0.2' - 1.4'					Run 146, 663.8' - 668.5'
664				660.7-660.8 Andesite, fresh, hard, strong, porphyritic, aphanitic welded contact					
666									
668				668.5-695.1 wide to v. widely frac.				Run 147, 668.5' - 673.5' Drill rate 0.27/min	
670									
672									
674									
676									
678									
680									Run 149, 678.5' - 683.5' Drill rate 0.23/min

Boring No DH84-4A Angle (from Horizontal) 55° Ground Elevation 2167.8 Ft.
 Feature "Fins" Area Bearing 040° Rock Elevation 2108.5 Ft.
 Coordinates: N 3,229,192.9 Date Started 14 May, 1984 Overburden Thickness 72.4 Ft. 2
 E 745,774.1 Date Completed 21 May, 1984 Ground-Water Elevation +2132 Ft. 7/8"
 Core Sizes HQ. Total Depth 698.5 Ft. Logged by Pulley/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log												
680	[Dashed pattern]	[Blank]	[Blank]	QUARTZ DIORITE cont. fresh, hard; v. strong; med. xvln; greenish-gray to yellow green; plags, hbl, tr. k-spar and Qtz; acc. tr. of disseminated hematitic plag to epidote, hbl to chlor; acc. granite to granite diorite widely frac, calcite; tight; sh. rough; 30°-45°; pcs. 0.4-11.5'	100/94				Run 149, cont. 100% water return, lt. gray, drilling w/ polymer mud						
683				683.6-698.5 no breaks in core other than mechanical, lithol. primary QUARTZ DIORITE, only to granite diorite					Run 150, 683.5-688.5 Drill rate 0.2/min.						
684															
686															
688															
689															
690															
692															TC = 18, 17.8 PSI
694															Run 152, 693.6'-698.5' Drill rate 0.18/min.
696											695.2-696.3 close y. frac, pcs. 0.1-0.3	100/84			
698				T.D. 698.5 FT.				Finished hole 0200, 5/21/84							
700															

001734

—
—
—
—



—
—
—
—



Boring No DH84-5 Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft.
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft.
 Coordinates: N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 Ft. ±
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.9 Ft. 7/84
 Core Sizes HQ Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
0				DIORITE FRAGMENTS and GRAVEL, fresh, sl. Fe stained, 0.07'-0.15' diameter, assumed soil matrix removed (talus?)					LY 38-COR, HQ Run 1, 0.0-3.0' Drill rate 0.13/min. No water return Rec = 0.7'
2									
4				gravel grades out					Run 2, 3.0'-10.0' Drill rate 0.20/min. Ream 11' casing Rec. = 1.1
6									
8									
10									Run 3, 10.0'-12.6' Rec = 0
12				DIORITE FRAGMENTS; TALUS; angular to subangular in orange-brn. silty sand matrix; highly weath. soil					Run 4, 12.6'-15.1' Drill rate 0.06/min. Tan return water at ± 12' Rec = 1.8' Start night shift 5/3/84 Lost circ. at 14.0', regained brown to tan return water at 14.2'
14				TOP OF ROCK at 15.1 Ft.					Run 5, 15.1-20.0 Drill rate 0.16/min.
16				15.1-74.3 DIORITE, severely to mod. weath; mod. hard; mod. strong; fine to med. xln; orange-brown to lt. gray, penetrative Fe staining, severely weath. in upper 1.5' closely to v. closely frac.; heavy Fe staining, limonite, trace calcite; part open to open, med. rough to rough; 10°-30°-70°-80°; pcs. 0.05' to 0.2'					
18									
20				19.4-25.3 v. closely frac.		100/38			

Boring No DH84-5 Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft.
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft.
 Coordinates: N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 Ft. ±
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.9 Ft. 7/84
 Core Sizes HQ Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
20				DIORITE; cont., sl. to mod. weath. mod. hard, mod. strong, med. to fine xln, brown to green-gray closely to v. closely frac., limonite, calcite; sl. open to open, med. rough to rough; 10°-30°, 50°-70°, pcs mostly 0.1' to 0.2'	76/0	76/0	Box 1		Run 6, 20.0'-22.5' Partial water loss @ 22.5'
22									Run 7, 22.5'-25.0' Drill rate 0.10/min.
24				25.3 - 27.0 closely frac. Fe staining, limonite mod. hard; mod strong, med. rough, part open 27.0 - 35.5 v. closely frac, heavy Fe staining, limonite	66/0				Run 8, 25.0'-25.3' Core barrel blocked; Return water lt. brown, amount fluctuates
26									Run 9, 25.3'-30.0' Drill rate 0.16/min. Set casing to 25' Driller reports squeezing @ 22.5', preventing all wash water from returning to surface
28				28.3 - 30.0 and 32.0 - 33.3 core loss	65/0				Run 10, 30.0'-33.3' Drill rate 0.47/min. Lt. brown return water minor cave above run
30									Run 11, 33.3'-36.0' Drill rate 0.27/min. Partial water loss at ~ 33.5'
32				35.3 - 39.0 ALTERED DIORITE, mod. to severely weath. and alt., mod. hard to v. soft, weak, med. xln, lt. gray-brown, fsp, hbl, kaolin. closely frac., calcite veins, Fe staining, clay, open, sl. rough, 60° to 90°, pcs. 0.05' - 0.5' DIORITE cont.; sl. weath, hard, strong, fine to med. xln., green-gray	100/0				Run 12, 36.0'-40.0' Drill rate 0.40/min. 50% water return
34									Tc = 24,206 PSI
36					100/20		Box 3		
38									
40									

Boring No DH84-5 Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft.
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft.
 Coordinates: N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 Ft. ±
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.9 Ft. 7/84
 Core Sizes HQ Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																				
	Lithology	Structure	Fracture Log 3 6 9 12																										
40				DIORITE, cont., fresh to sl. weath., hard, strong, fine to med. xln., plag, hbl., bio rich closely frac. Fe staining, limonite; trace calcite; tight to part open, mod. rough, 0°-45° pcs. 0.1' to 0.8'	100/56	100/56	Box 3		Run 13, 40.0'-45.0' Drill rate 0.20'/min. 50-75% water return																				
42				43.4-45.8 closely to v. closely frac, pcs. 0.2'					100/13	100/13	Box 3	Run 14, 45.0'-48.1' Drill rate 0.25'/min. Lost return water @ ~45.5; gradually regained																	
44				45.3-46.0 Altered Diorite, plag, hbl, kaolin, bio (?), calcite veins, clayey along frac, Fe stained, lt. gray-brown								100/21	100/21	Box 3	Run 15, 48.1'-50.0' Drill rate 0.22'/min. Lt. brown return water (25% return)														
46				45.8 numerous healed jts; 50°-70°											100/0	100/0	Box 4	Run 16, 50.0'-53.2' Drill rate 0.24'/min. No water return, then ~25% return											
48				48.3-48.9 Altered Diorite, in narrow zone along fracture, similar to above, heavy limonite filling														83/17	83/17	Box 4	Run 17, 53.2'-55.6' Drill rate 0.2'/min. No water return								
50				54.2-54.9 Altered Diorite, severely altered and weath.; soft, weak, brown, clay filling; 0.3' thick																	92/16	92/16	Box 4	Run 18, 55.6'-58.1' Drill rate 0.25'/min. No water return					
52																								100/31	100/31	Box 4	Run 19, 58.1'-61.0' Drill rate 0.2'/min. No water return		
54																													
56																													
58																													
60																													

Boring No DH84-5 Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft.
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft.
 Coordinates: N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 Ft. ±
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.9 Ft. 7/84
 Core Sizes HQ Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks																								
	Lithology	Structure	Fracture Log 3 6 9 12																														
60				DIORITE, cont., fresh to sl. weath. along frac., hard, strong, fine to med. xln, plag, hbl, bio closely frac., sl. Fe staining, calcite, limonite; tight to part open, med. rough, most frac. 30°-70°, pcs. 0.1'-1.2', mostly 0.4'-0.6'	100/56	100/56	Box 4		Run 19, cont.																								
62				61.0-66.0 med. to fine xln,					100/79	100/79	Box 5	Run 20, 61.0'-66.2' Drill rate 0.16'/min. Minor cave above run No water return																					
64				64.7 felsic, 0.03 wide, 5° welded, sharp contact								100/38	100/38	Box 9	Run 21, 66.2'-71.0' Drill rate 0.16'/min. No water return TC = 13,996 PSI																		
66				66.4-67.8 calcite veins, up to 0.01' wide											100/38	100/38	Box 9	Run 22, 71.0'-76.0' Drill rate 0.16'/min. No water return															
68																		100/38	100/38	Box 9	Run 23, 76.0'-81.0' No water return												
70																					100/38	100/38	Box 9										
72																								100/38	100/38	Box 9							
74				73.4-93.3 GRANITIC; fresh to sl. weath. along frac., hard to v. hard, v. strong, med. to fine xln, lt. green-gray, high quartz content, <10% mafics, plag (20%), epidote (?), tr. sulfides closely frac, Fe staining, limonite, tr. calcite, tight to sl. open, med. rough; 0°-60°, 25°-60°; pcs 0.1'-1.0', ave. < 0.4'																							100/38	100/38	Box 9				
76				73.4-75.2 and 79.0-81.3 closely to v. closely frac., pcs. < 0.2'																										100/38	100/38	Box 9	
78																																	100/38
80		100/38	100/38	Box 9																													

00173

Boring No DH84-5 Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft.
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft.
 Coordinates: N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 Ft. 2
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.9 Ft. 7/84
 Core Sizes HQ Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
80				GRANITIC, cont, fresh to sl. weath. along jts; hard to v. hard, strong, med. - fine xln, lt. green gray, feld, qtz., chlor, epidote, 5% hbl? close - mod. close frac, local zones of v. close frac; Fe staining, ilmenite, tr. calcite; tight to partopen, med. rough; 0°-20°, 45°-70°; pcs. 0.05"-1.5"					Run 23, cont.
82					94/37				Run 24, 81.0'-84.5' Begin day shift 5/4/84 Drill rate 0.12'/min Core ground at top No water return
84				81.3-91.1 penetrative Fe stain and sl. alteration along frac; tr. kaolin.					Run 25, 84.5'-89.2'
86				82.7-83.8 v. closely frac, pcs < 0.2' 85.3-86.3 v. closely frac, due to high angle jts. 85.5-88.4 close frac, sl. weath, med. to v. rough	100/68		Box 6		
88				88.2-89.0 sl. altered, sl. hard, weak, crumbles, kaolin.					TC = 9,165 PSI
90					94/94				Run 26, 89.2'-92.7' 1.5' of v. weath. and compacted Diorite/overburden in top of core barrel, cave Set casing to 30.5'; Water level > 80'
92									Run 27, 92.7'-97.0' 1' cave from setting casing
94				93.3-125.5 QUARTZ DIORITE, fresh, hard to v. hard, strong, fine to med. xln; higher mafic content, less quartz closely frac; tight to p. open; med. rough; 0-30°, 70°; pcs. 0.4"-1.4"	100/77				
96									
98					98/86		Box 7		Run 28, 97.0'-102.0' Rods grinding; lub. with Minex No water return
100									

Boring No DH84-5 Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft
 Coordinates: N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 Ft
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.9 Ft. 7/84
 Core Sizes HQ Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
100				QUARTZ DIORITE, con't, fresh, v. hard, v. strong, med. xln, lt. gray mod. close to closely frac; Fe staining, calcite; part open to open, med. rough to rough; 10°-30°, 60°-70°; pcs. 0.05'-1.5'	97/70	100/68	Box 7		Run 28, cont. Stop for water pres. test
102				100.0-104.5 mod. frac, fresh w/ Fe, tr. kaolin, feld. to clay, tight to sl. open, sl. rough; 10°, 70°					Run 29, 102.0'-105.3' Drill rate 0.13'/min. No water return Tc = 25,095 PSI
104				104.5-105.0 v. close frac, some mech. break, Fe staining, 10°-30°, 80°-85°					Run 30, 105.3'-110.0'
106									
108									
110				109.5 core sl. ground, mod. weath, 45° frac. w/ Fe stain					Run 31, 110.0'-114.3' Drill rate 0.19'/min. No water return
112				110.0-111.2 sl. weath, mod. hard, sl. to mod. weath. along jts., close to v. close frac, Fe and clay on slightly open, sl. rough jts.					
114				112.2-113.3 v. closely frac, sl. weath.					Run 32, 114.3'-118.7' Core ground @ 116.0'
116									
118				116.7-117.2 v. closely frac., sl. weath.					
120				118.0-118.7 v. closely frac, pcs. < 0.1'					Run 33, 118.7'-121.5' Tc = 18,331 PSI

Boring No DH 84-5 Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft.
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft.
 Coordinates: N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 Ft. ±
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.9 Ft. 7/84
 Core Sizes HQ Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
120				QUARTZ DIORITE, cont, sl. weath. to fresh, hard to v. hard, mod. strong to strong, med. xln, gray close to v. close frac, Fe stain, tr. clay, calcite, part open, sl. rough to rough, 15°-30°, 60°-70°; pcs. 0.05'-1.0'	100/39	Box 8			Run 33, cont.
122									Run 34, 121.5'-125.5' Cave material, 0.5'
124				121.0-130.0 v. closely frac, sl. to severely weath, penetrative Fe staining, hematite, silty sand along frac kaolin, open(?), rough, 10°-40°, 70°; pcs. mostly < 0.2'; CL=3.0'	62/0				Run 35, 125.5'-127.0' Redrilling thru broken core loss from prev. run in top 1' Night shift 5/4/84
126				125.5-125.7 DIORITE, sl. weath, mod. weath. along fracs, sl. alter in places, mod. hard to hard, mod. strong to strong, med. xln; plag, hbl. kaolin; it. green-gray closely frac, Fe staining, limonite, sl. open to partly open, med. rough to rough, 30° to 45°; pcs. 0.1'-0.9'	100/100				Run 36, 127.0'-130.0 0.4' cave at top of run
128				127.5-123.5 closely to v. closely frac, mod. weath, extensive staining, some clay on frac. surfs.	50/17	Box 9			TC=0 PSI
130				128.5-130.0 core loss					Run 37, 130.0'-135.0' Drill rate 0.33'/min. No water return, Driller estimates water level at bottom of hole
132				134.0-134.3 open fracture - drill rods dropped 0.3', heavy Fe stain, hematite, rough, 60°	100/70				Run 38, 135.0'-140.0' No water return
134									
136					88/82	Box 10			
138									
140									

Boring No DH 84-5 Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft.
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft.
 Coordinates: N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 Ft. ±
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.9 Ft. 7/84
 Core Sizes HQ Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
140				DIORITE; cont, fresh, occ sl. altered (kaolin); mod. hard to hard, strong, med. xln, lt. green-gray; plag, hbl, kaolin, closely to mod. frac, Fe staining, tr. calcite; part. open, med rough to rough; 00-35% pcs 0.2'-2.5'	81/67	100/59	Box 10		Run 39, 140.0'-145.2' Drill rate 0.13'/min.
142			140.4'-142.9' Unbroken core						
144									
146				149.3-150.9 closely to v. closely frac, pcs < 0.3' 149.8 kaolin. less common - core fresh and unaltered	100/53			Run 40, 145.2'-149.3' Drill rate 0.27'/min.	
148									
150				154.9-160.8 closely frac; PCS < 0.3', core loss 0.7'	100/81			Run 41, 149.3'-154.0' Drill rate 0.12'/min. No water return TC = 24,877 PSI	
152									
154					73/0		Box 11	TC = 18,045 PSI Run 42, 154.0'-156.1' Drill rate = 0.12'/min.	
156									
158					77/0			Run 43, 156.1'-157.6' Drill rate 0.16'/min.	
160									
160				160.0 sl. kaolin. along a fracture					Run 44, 157.6'-160.6' Drill rate 0.15'/min.

Boring No DH84-S Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft.
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft.
 Coordinates. N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 Ft. ±
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.9 Ft. 7/84
 Core Sizes HQ Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
160				DIORITE, con't, fresh, hard, strong, med. xln, green-gray, plag, hbl, close to mod. close frac, Fe stained, calcite, sl. open, mod. rough; 0°-30°; 80°-90°	90/64	Box 11			New drill bit installed Run 45, 160.6'-165.6' Drill rate 0.17'/min. 0.3' cave at top of run No water return
162									
164									
166									
168				170.0 - 170.2 clay, high plasticity, dense, sticky, dry, dark gray layer, contorted 40°-60° and 75°-90°, mod. to closely frac.	98/89	Box 11			Run 46, 165.6'-170.0' Drill rate 0.22'/min. 0.1' cave at top of run No water return
170									
172				171.2 - 171.9 v. closely frac, fcs < 0.1', parallel frac, 50°	100/62	Box 12			Run 47, 170.0'-174.5' Drill rate 0.15'/min
174				174.9 - 185.8 high angle frac, spacing mod. close, calcite, Fe staining, tight, med. rough to rough, 75°-90°, core badly broken in places due to high angle frac.	100/50	Box 12			Start day shift 5/5/84 Run 48, 174.5'-179.5'
176									
178				175.7 - 184.3 QUARTZ DIORITE, fresh, hard, strong, med. xln, lt. gray, ~10% quartz, 20% mafics	100/50	Box 13			TC = 22,259 PSI
180									
									Run 49, 179.5'-182.5'

Boring No DH 84-5 Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft.
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft.
 Coordinates: N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 Ft. &
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.9 Ft. 7/84 2
 Core Sizes HA Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
180				QUARTZ DIORITE, cont, fresh, hard, strong, med. xln, green-gray, plag to hbl. 10-20%, Qtz. 5-15%, tr. sulf.		100/67			Run 49, cont.
182				closely frac, fresh to sl. weath, tr. Fe staining, calcite, tr. kaolin, tight to part open, mod. rough; 250, 700-850; pcs. 0.2'-1.2'					Run 50, 182.5'-187.5'
184				184.3-201.1 DIORITE, fresh, hard, strong, med. xln, green-gray, less quartz content, more mafics, most jts. approx. parallel to core axis		100/76			
186							Box 13		
188				1/2" calc. veins					Run 51, 187.5'-192.5' Drill rate 0.14'/min. Some cave at top of run
190						100/80			
192				191.7-193.0 Andesite Porphyry, fresh, hard, strong, aphanitic, dk. gray w/ white plag. phenocrysts					Run 52, 192.5'-197.5'
194				193.0- DIORITE cont, fresh, hard, strong, med. xln, green-gray, close to mod. close frac, calcite, tr. carbonate and Fe staining, tight to part open, sl. rough to rough, 20° to 40°, 60° to 90°		98/72			
196				193.1 high angle jts, calcite, heavy. limonite coatings, 80°			Box 14		
198				193.1-194.0 FELSIC, fresh, hard, strong, 5% mafics, lt. gray					Run 53, 197.5'-202.5'
200						94/74			

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 11 of 14
Date 5 May '84

Boring No DH84-5 Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft.
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft.
 Coordinates: N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 FEET
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.9 Ft. 7/84
 Core Sizes HQ Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
200				DIORITE, cont. fresh, hard; strong, med. xln, green-gray, st. kaolin, feld.					Run 53, cont 11:15 AM - stop for water pres. test; water level at 119'
201.1				201.1-222.6 ALTERED DIORITE, sl. to mod. alt, mod. hard, strong to mod. strong, med. xln, green-gray feld. pitted and kaolin, etc. increasing w/ depth; Ca veins, mafics concentrated along healed jts; epidote, chlorite(?), mod. frac	94/74				Run 54, 202.5'-206.5' Drill rate 0.17/min. TC = 13,424 PSI
204				close to v. closely frac, calcite, chlor, tr Fe staining, part open to open, sl. rough to rough; 10°-40°, 70°; pcs. 0.15 to 2.0'	95/75		Box 14		
205.7				205.7-219.4 Clay fillings, along many fracs, dickensides, severely altered, closely to very closely frac, mod. hard to soft, mod. strong to weak					Run 55, 206.5'-209.0'
209				close to v. closely frac, st. plasticity, chalky-white to lt. gray w/ dark grt; planar clay seams, kaolin	96/13				Run 56, 209.0'-213.3'
205.7				205.7-213.3 numerous shears throughout					
212				core loss 1.6'	74/0				Run 57, 213.3'-218.6'
214							Box 15		
216					94/40				
218									Run 58, 218.6'-223.8'
220									

Boring No DH84.5 Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft.
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft.
 Coordinates: N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 ft. ±
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.9 Ft. 7/84
 Core Sizes HQ Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
220				ALTERED DIORITE, cont, sl. altered, hard, strong, med. xln, green-gray					Run 58, cont. Tc = 3,873 PSI
222				222.6-229.0 DIORITE, fresh, v. hard, strong, med. xln, green-gray, plag. ~70% hb. ~20% quartz, some kaolin, plagioclase, epidote, chlorite, sulfides mod. close to wide frac, tr. calcite chlorite, epidote (?), tight to part open; sl. rough; 200-45°; pcs 0.6-3.5'	100/101		Box 16		Run 59, 223.8'-229.0'
224									No water return.
226									
228				229.0-237.3 ALTERED DIORITE, sl. altered, hard, strong, med. xln, lt. green-gray, plag/kaolin, mafics occ. sl. leached, mod. frac, occ. calcite coatings, med. rough, 30°-70°, pcs 0.6-3.5'	92/92			Run 60; 229.0'-234.3'	
230									
232				232.8-233.2 Clay filling, sl. altered; heavy sulfide mineralization	100/101			Start night shift 5/5/84	
234								Run 61, 234.3'-239.5'	
236				236.7 calcite vein, 70°, 0.02' wide	96/96			Drill rate 0.17'/min. No water return	
238									
240				237.3-237.4 DIORITE; fresh, hard, to v. hard; strong; fine xln; dk. gray	100/101	Box 17		Run 62, 239.5'-244.5'	
				239.5-240.0 sl. altered, tr. kaolin					

Boring No DH84-5 Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft.
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft.
 Coordinates: N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 Ft. &
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.7 Ft. 7/84
 Core Sizes HQ Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																												
	Lithology	Structure	Fracture Log																																		
240				DIORITE cont; fresh, hard to v. hard, strong, fine xln to almost aphanitic, w/med. xln fsp phenocrysts, dk. gray, plag, hbl, mafics closely to mod. close frac, calcite, tight, med. rough; 10°, 40°-70°; pcs. 0.1'-1.6'	100/80	100/80	Box 17		Run 62, 239.5'-244.5' Drill rate 0.12'/min. No water return																												
242				244.5-247.0 no fractures					100/100	100/100	Box 17	Run 63, 244.5'-249.4' Drill rate 0.14'/min.																									
244				245.5 sealed frac, calcite, 0.01' wide								100/100	100/100	Box 17	Run 64, 249.4'-253.5' Drill rate 0.11'/min.																						
246				252.2 core broken along high angle jts.											100/100	100/100	Box 17	Run 65, 252.5'-258.7' Drill rate 0.13'/min. No water return																			
248				254.2-255.9 v. closely frac, tr. calcite, part open, si. rough, pcs. < 0.2'														100/100	100/100	Box 17	TC = 15,023 PSI																
250				257.4-265.0 QUARTZ DIORITE, fresh, v. hard, v. strong, med. xln, lt. gray, Qtz. 20%, mafics 20% closely frac; tight to part open; med. rough																		100/100	100/100	Box 17	Run 66, 258.7'-262.7' Drill rate 0.09'/min.												
252																										100/100	100/100	Box 17									
254																														100/100	100/100	Box 17					
256																																		100/100	100/100	Box 17	
258																																					
260		100/100	100/100	Box 17																																	

Boring No DH84-5 Angle (from Horizontal) 60° Ground Elevation 1725.6 Ft.
 Feature D/S Portals Area Bearing 010° Rock Elevation 1712.5 Ft.
 Coordinates: N 3,227,530.8 Date Started 3 May, 1984 Overburden Thickness 15.1 Ft. &
 E 742,278.8 Date Completed 6 May, 1984 Ground-Water Elevation 1643.9 Ft. 7/84
 Core Sizes HQ Total Depth 265.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
260				QUARTZ DIORITE, cont, fresh; v. hard, v. strong, med. xln, gray; to green - gray, plag, hbl; closely to mod. close frac, tr. calcite, tight to p. open, med. rough, 10 ^a -40 ^a	9/74	Box 18			Run 66, cont.
262			Run 67, 262.7'-265.0'						
264			263.5-265.0 sl. alteration, lt. gray, kaolin						
266			T.D. = 265.0 FT.						S/6/84 0200 hrs.

Boring No DH84-6 Angle (from Horizontal) 60° Ground Elevation 1521.414 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1512.414 Ft.
 Coordinates: N 3,227,183.465 Date Started 10 May, 1984 Overburden Thickness 9.0 Ft &
 E 743,173.820 Date Completed 11 May, 1984 Ground-Water Elevation ice @ 1377.7 Ft.
 Core Sizes HQ Total Depth 167.8 ft. Logged by Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
0			3 6 9 12	0.0-0.8" ORGANICS, soil and roots; rock frag. 0.05'-0.3'; diorite; altered diorite, sil; weath. to mod. weath.; angular to sub rounded.					LY 38, -COR, HQ Run 1, 0.0-7.5' 5/10/84, day, began. 1350 hrs. Lost water @ ~2'
2									
4									No matrix recovered; psby. washed away during drilling
6									
8				7.5-8.5 recovered alt. and weath. diorite fragments; prbly. cave					Run 2, 7.5'-8.5' Drill rate 0.04'/min. No water return
				TOP OF ROCK at 9.0 ft.					Run 3, 8.5'-9.0' Drill rate 0.04'/min.
10				9.0-46.0 ALTERED DIORITE mod. weath.; mod. alt., sl. hard, mod. str. to weak, lt. gray to lt. brown, fine to med. xln., plag, hbl., Qtz, Fe and CO ₃ stain					Run 4, 9.0'-15.0' Cave material at top of tube
12				v. close frac. 0.03'-0.2', part open to open 0.05', ice in jts, extensive penetrative Fe staining on joints, sil. to mod. rough, 0°-30°, 90°					
14									
16									Run 5, 15.0'-19.5'
18									
20									Run 6, 19.5'-24.3'

Boring No DH 84-6 Angle (from Horizontal) 60° Ground Elevation 1521.414 Ft
 Feature D/S Portals Area Bearing 025° Rock Elevation 1512.414 Ft
 Coordinates: N 3,227,183.465 Date Started 10 May, 1984 Overburden Thickness 9.0 Ft ±
 E 743,173.820 Date Completed 11 May, 1984 Ground-Water Elevation 1377.7 Ft. 7/84 2
 Core Sizes HQ Total Depth 167.8 ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
20				ALTERED DIORITE, con't, mod. weath.; mod. to low hard, mod. strong to weak, fine xln, lt. brown where weath, lt. green-gray where slt. weath away from frac. plag, hdd. qtz. v. closely to closely frac. 0.03'- 0.4', Fe, red clay on frac, open, slt. rough; 90°; 0°-30°; max. 0.5', min. 0.03'	94/0	100/11	Box 2		Run 6, cont. Drill rate 0.2'/min. No water return
22				Run 7, 24.3'-27.5' Harder drilling					
24				Run 8, 27.5'-30.0'					
26				Run 9, 30.0'-31.0' Cave at top of run					
28				Run 10, 31.0'-36.2' Drill rate 0.37'/min. No water return					
30				Run 10, 36.2'-38.3' Drill rate 0.21'/min.					
32				Run 11, 38.3'-42.3' Drill rate 0.22'/min. No water return					
34									
36									
38									
40									

Boring No DH84-6 Angle (from Horizontal) 60° Ground Elevation 1521.414 Ft
 Feature D/S Portals Area Bearing 025° Rock Elevation 1512.414 Ft.
 Coordinates: N 3,227,183.465 Date Started 10 May, 1984 Overburden Thickness 9.0 Ft. ±
 E 743,173.820 Date Completed 11 May, 1984 Ground-Water Elevation 1377.7 Ft. 7/84
 Core Sizes HQ Total Depth 167.8 ft. Logged by Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks		
	Lithology	Structure	Fracture Log 3 6 9 12								
40		?		ALTERED DIORITE, con't., sli. weath. med. hard, mod. str. to weak, med. xln., lt. gray, plag, kaolin, chlorite, hbl; mafics, v. close to closely frac.; 0.05'- 0.3', frags stained, tight to part. open, med. rough to rough, most fracs 0°-40° or 80°-90°, max. 0.6', min. 0.05'	75/9	Box 3			Core bit blocked; pulled rods to recover		
42				45.0 - 47.0 gradational contact	98/34					Run 12, 42.3' - 46.4' Drill rate 0.21'/min. Approx. 1.0' of cave at top of run	
44											
46						46.0 - 167.8 DIORITE, fresh, hard, strong, med. xln., lt. gray, plag, hbl. closely frac., 0.1' - 1.0', occ., sli. staining on frac. surfs, tight, med. rough, 0°-30° dip angles, max. 2.5', min. 0.1'	100/46	Box 4			Run 13, 46.4' - 51.4'
48											
50											
52			51.4 - 52.4 sli. to mod. altered diorite, hard, strong, lt. gray, plag/kaolin, hbl/chlorite closely frac. stained	100/40				Run 14, 51.4' - 56.4' Drill rate 0.20'/min. No water return			
54											
56									Run 15, 56.4' - 61.0' Drill rate 0.17'/min.		
58					100/65						
60									TC = 24,411 PSI		

Boring No DH 84-6 Angle (from Horizontal) 60° Ground Elevation 1521.414 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1512.414 Ft.
 Coordinates: N 3,227,183.465 Date Started 10 May, 1984 Overburden Thickness 9.0 Ft. A
 E 743,173.820 Date Completed 11 May, 1984 Ground-Water Elevation 1377.7 Ft. 7/84
 Core Sizes HQ Total Depth 167.8 ft. Logged by Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
60				<p>DIORITE, cont, fresh, hard, strong, med. xln, lt. gray, plag, hbl. closely to mod. closely frac., 0.1'-1.5', occ. sli. staining on frac. surfaces; tight, med. rough, 0°-30° dip angles on most frags, occ. 30°-70°, max. 2.5', min. 0.1'</p> <p>70.0-71.0 Felsic; 0.04' wide, 80°</p>	100/44	100/76	Box 5		Run 15, cont.
62									Run 16, 61.0'-66.0' Drill rate 0.14'/min. No water return
64									
66									water supply pump frozen 1/4 hr. spent thawing
68									Run 17, 66.0'-71.0' Drill rate 0.25'/min.
70									$\nabla c = 14,647$ PSI
72									$\nabla c = 16,725$ PSI
74									Run 18, 71.0'-76.0' Drill rate 0.25'/min. No water return
76									Run 19, 76.0'-81.0' Drill rate 0.21'/min. $\nabla c = 11,686$ PSI
78									
80									

Boring No. DH84-6 Angle (from Horizontal) 60° Ground Elevation 1521.414 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1512.414 Ft.
 Coordinates: N 3,227,483.465 Date Started 10 May, 1984 Overburden Thickness 9.0 Ft. &
 E 743,473.820 Date Completed 11 May, 1984 Ground-Water Elevation 1377.7 Ft. 1/84
 Core Sizes HQ Total Depth 167.8 ft. Logged by Hansen/Bruen/Yacko

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																																	
	Lithology	Structure	Fracture Log 3 6 9 12																																							
80				DIORITE; con't., fresh, hard, str., med. xln. lt. green-gray, plag, hbl. closely to mod closely frac., 0.1'-1.5', occ. sli. stain on frac. surfaces, tight, med. rough, 0°-30° dip angles on most frac, occ. 30°-70°, max. 2.5', min 0.1'	100/74	100/74	Box 6		Run 19, con't.																																	
82				81.5-82.7					frac. at 90°, part. open; Fe stain, calcite	100/64	85/64	Box 7		Run 20, 81.0'-86.0'																												
84				83.0					frac; chlor, trace clay; slickensides; part open; sli. rough; 70°					100/66	100/66	Box 7		No water return																								
86				86.4-88.1					closely frac., tight, sli. rough									100/95	100/95	Box 7		Te = 25,968 PSI																				
88																						100/44	100/44	Box 7		start day shift 5/11/84																
90																										100/44	100/44	Box 7		Run 21, 86.0-89.9												
92																														100/44	100/44	Box 7		0.6' clay at bottom; hard drilling; drill casing down; water pres. test 59.5'-89.9'								
94																																		100/44	100/44	Box 7		Run 22, 89.9'-93.8'				
96																																						100/44	100/44	Box 7		Water return < 5%
98																																										100/44
100			100/44	100/44	Box 7		Te = 25,967 PSI																																			
							100/44	100/44	Box 7		Te = 13,644 PSI																															
											100/44	100/44	Box 7		Run 24, 98.0'-102.0'																											
															100/44	100/44	Box 7		Pulled rods to change bit																							

Boring No DH84-6 Angle (from Horizontal) 60° Ground Elevation 1521.414 Ft
 Feature D/S Portals Area Bearing 025° Rock Elevation 1512.414 Ft.
 Coordinates: N 3,227,183,465 Date Started 10 May, 1984 Overburden Thickness 9.0' Ft &
 E 743,173,820 Date Completed 11 May, 1984 Ground-Water Elevation 1377.7 Ft. 7/844
 Core Sizes HQ Total Depth 107.8 ft. Logged by Bruen/Yacko

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
100				DIORITE, cont, fresh, hard, v. strong to strong, med. xln, green-gray, plaq, hbl.			Box 7		Run 24, cont. Blocked; pulled core barrel to clean
102				closely frac. 0.1' - 1.0' Fe staining calcite, clay, part open, med rough to rough, 0°-10° 60°-80° pcs. 0.1' - 2.0' generally < 0.7'					Run 25, 102.0'-106.0' Drill rate 0.17'/min.
104						90/69			
106				106.5-109.7 sl. to mod. altered, trace clay on frac., calcite; mod. hard to soft, mod strong, white gray, kaolin, plaq, hbl, chlorite.					Run 26, 106.0'-110.0' Tc = 19,973 PSI
108				107.0-109.1 v. closely frac. and badly broken		100/60			
110				109.7-115.0 progressively less alteration with depth			Box 8		Start night shift 5/11/84 Run 27, 110.0'-115.0' Tc = 9,765 PSI
112				DIORITE, cont, fresh, hard to v. hard, strong to v. strong, closely frac., calcite, chlor., med. rough to rough; tight		100/86			
114									Run 28, 115.0'-120.0'
116									
118						100/76	Box 9		Tc = 6,492 PSI
120									

Boring No DH84-6 Angle (from Horizontal) 60° Ground Elevation 1521.414 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1512.414 Ft.
 Coordinates: N 3,227,183.465 Date Started 10 May, 1984 Overburden Thickness 9.0 Ft. ±
 E 743,173.820 Date Completed 11 May, 1984 Ground-Water Elevation 1377.7 Ft. 7/84
 Core Sizes HQ Total Depth 167.8 ft. Logged by Scarlett/Bruen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
120				DIORITE, cont., fresh, v. hard, v. strong, med. xln., green-gray, plag, hb1, chlor.					Run 29, 120.0'-125.2'
122				closely frac., 0.1'-1.0', Fe staining calcite, tight to part open, med. rough to rough, 10°-20°, 60°, 80°, pcs 0.2'-0.7'		100/62			
124				121.7-122.7 with trace epidote (?)			Box 9		
126									Run 30, 125.2'-130.0'
128						100/79			Vc = 13,644 PSI
130									Run 31, 130.0'-134.8'
132						100/63			
134									
136				136.0-138.3 v. closely frac., 0.05'-0.2', Fe staining, calcite, chlorite, trace of gray clay, part open, sli. to med. rough, 10°-60°, tr. slickensides on 45°-60° frac.			Box 10		Run 32, 134.8'-140.0' Vc = 0 PSI Vc = 23,131 PSI Vc = 11,096 PSI
138						100/62			
140									

Boring No DH84-6 Angle (from Horizontal) 60° Ground Elevation 1521.414 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1512.414 Ft.
 Coordinates: N 3,227,183.465 Date Started 10 May, 1984 Overburden Thickness 9.0 Ft. &
 E 743,173.820 Date Completed 11 May, 1984 Ground-Water Elevation 1377.7 Ft. 7/84
 Core Sizes HQ Total Depth 167.8 ft. Logged by Scarlett

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
140	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	DIORITE, cont. sili. weath. to fresh, hard, v. strong to strong, med. xln, green-gray, plag, hbl, chlorite, close to v. closely frac., 0.1'-1.0', Fe staining, calcite, chlorite, part open, med. rough to rough, 30°-45°, 80°-90°, pcs < 0.1'-1.0'	[Solid black]	87/0	Box 10		Run 33, 140.0'-143.0' Water pres. test 88.5'-143.0'
142				140.5-142.0 fractured and broken					Run 34, 143.0'-146.0'
144				146.0-146.4 v. close frac., calcite					Run 35, 146.0'-151.0' Evidence of caving in top of run
146				146.4-153.6 close frac., calcite, chlorite, part open; smooth to sli. rough; 10°-20°, 60°-70°, pcs 0.2'-0.9'					TC = 18,331 PSI
148				153.6-156.3 v. close to close frac., calcite, part open to open, pcs. .05'-.4'					Run 36, 151.0'-155.8' TC = 12,002 PSI
150				156.3-159.5 close frac., calcite, chlorite, part open, pcs. to 0.5'					Run 37, 155.8'-157.8'
152									Run 38, 157.8'-162.8'
154									
156									
158									
160									

Boring No DH84-6 Angle (from Horizontal) 60° Ground Elevation 1521.414 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1512.414 Ft.
 Coordinates: N 3,227,183.405 Date Started 10 May, 1984 Overburden Thickness 20 Ft. 2
 E 743,173.820 Date Completed 11 May, 1984 Ground-Water Elevation 1377.7 Ft. 7/84
 Core Sizes HQ Total Depth 167.8 ft. Logged by Scarlett

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
160				DIORITE, cont., sli. weath. to fresh, hard, v. strong to strong, med. xln, green-gray close to v. close frac. 0.1'-0.7' calcite, chlorite, part open, sli. to mod. rough; 100-200, 70-80°; pcs. < 0.05 to .5'	100/22	100/38	Box 12		Run 38, cont.
162									Run 39, 162.8-167.8
164									TC = 11,883 PSI
166									TC = 16,284 PSI
168									T.D. = 167.8 Ft.
170									

Boring No DH 84-7 Angle (from Horizontal) 60° Ground Elevation 1625.300 Ft
 Feature D/S Portals Area Bearing 025° Rock Elevation 1621.100 Ft.
 Coordinates: N 3,227,402.849 Date Started 28 April, 1984 Overburden Thickness 4.2 Ft ±
 E 742,558.414 Date Completed 1 May, 1984 Ground-Water Elevation 1567.5 Ft./84
 Core Sizes HQ Total Depth 263.5 ft. Logged by Temchin/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
0				ORGANIC MAT, dark brown frozen, primarily root material in silt lattice.					LY 38 - COR. HQ Run 1, 0.0 to 2.0
2				GRAVEL and COBBLE size pieces of Diorite/Andesite in silt lattice, green-mottled					Run 2, 2.0 to 4.0
4				TOP OF ROCK @ 4.2 ft.					Run 3, 4.0 to 5.5 Night shift started 28 April, 84
6				4.2' - 148.0' QUARTZ DIORITE, sli. weathered, mod. hard to hard strong, med. xln, lt. green closely frac., 0.1' - 0.5' Fe stained, gen. tight, med. rough to rough, 30° - 45°, min. 0.1', max. 0.7', penetrative staining along fractures		100/22	Box 1		Run 4, 5.5 to 7.5
8									Run 5, 7.5 to 12.5 100% water loss @ 8.0 ft.
10						100/30			
12				12.5 - 17.6' closely to v. closely frac., 0.1 to 0.2 frac. angles up to 70°					Run 6, 12.5 to 17.1
14									
16						80/9	Box 2		Run 7, 17.1 to 20.0 Drill rate 0.5/min.
18									
20				19.5' healed fractures, quartz filling		97/26			No water return

Boring No DH 84-7 Angle (from Horizontal) 60° Ground Elevation 1625.300 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1621.100 Ft.
 Coordinates: N 3,227,402.849 Date Started 28 April, 1984 Overburden Thickness 4.2 Ft. X
 E 742,558.414 Date Completed 1 May, 1984 Ground-Water Elevation 1567.5 Ft. 7/84/8
 Core Sizes HQ Total Depth 263.5 ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 5 9 12						
20				QUARTZ DIORITE, con't.; silt. to mod. weath. (mod. along jts. and from 24.7-25.1) hard to mod. hard along jts., strong, med. Xln., gray.					Began 4/29/84 day @ 10:00 Run 8, 20.0-25.1 No water return Tried falling head test could not fill casing, rate > 30 gpm (HW casing to 9').
22				closely spaced jts. locally v. close, penetrative Fe staining, part open to open, rough, weath. feld. along surfaces, 20° to 90°; many 45° - 60°		100/47	Box 2		
24				23.0-23.9 jts. very closely spaced; 45°-60° pcs. < 0.2'					Run 9, 25.1-28.8 Drill rate 0.1'/min.
26						97/76			
28				28.0 little to no penetrative Fe staining adjacent to jts.					TC = 23,178 PSI Run 10, 28.8-33.7 No water return ~ 32' rods. vibr. and grinding, added Minex to circ. water.
30						90/57			
32									
34				33.2-33.7 core ground 33.7-34.0 Diorite, sli. altered hard strong, med. Xln., gray closely spaced healed jts.; Fe stained; 60°; discoloration and trace kaolinite.			Box 3		Run 11, 33.7-38.7 Drill rate 0.2'/min. No water return.
36				36.6 jt. with thin calcite filling, Fe stained, 50°		94/72			
38				37.7-39.9 core badly broken, weath., mod. hard; mod. strong, med. Xln., v. closely spaced jts., pcs. generally < 0.15'					Run 12, 38.7-41.5 Drill rate 0.1'/min.
40						100/30			

Boring No DH 84-7 Angle (from Horizontal) 60° Ground Elevation 1625.300 Ft
 Feature D/S Portals Area Bearing 025° Rock Elevation 1621.100 Ft
 Coordinates: N 3,227,402.849 Date Started 28 April, 1984 Overburden Thickness 4.2 Ft. ±
 E 742,558.414 Date Completed 1 May, 1984 Ground-Water Elevation 1567.5 Ft. 7/84
 Core Sizes HQ Total Depth 263.5 ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
40				QUARTZ DIORITE, cont. sli. weath., hard, strong, med. xln, gray core badly broken 41.5-45.0 pc's. < 0.1', sli. weath. and altered, hard, strong, sli. discoloration and trace kaolin.	89/37		Box 4		Run 13, 41.5-45.0 No water return Tc = 15,364 PSI
42				45.0-49.8 jt'g. v. close to close, Fe stained, tight to partly open, sli. rough, most 45°-60°, few 0°-80°					Run 14, 45.0-49.8 Drill rate 0.2'/min. No water return
44				49.8-71.3 jt'g. mod. close to close, 0.1' to 1.1', sli. stained on frac. surface, tight to sli. open, med. rough to rough, 40° to 90°, max. 1.1', min. 0.1'					Run 15, 49.8-55.0 No water return
46				51.5-52.0 v. closely jtd, pcs. < 0.15'					
48				55.2-55.8 jt'g. v. close, Fe stained, part open, sh. rough, 0°-40°, 0.05'- 0.15'					Begin night shift 4/29/84 Run 16, 55.0-59.9 Driller reports getting some water pressure in hole but still no water return Tc = 15,304 PSI
50									
52									
54									
56									
58									
60									

Boring No DH 84-7 Angle (from Horizontal) 60° Ground Elevation 1625.300 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1621.100 Ft.
 Coordinates: N 3,227,402.849 Date Started 28 April, 1984 Overburden Thickness 4.2 Ft. &
 E 742,558.414 Date Completed 1 May, 1984 Ground-Water Elevation 1567.5 Ft. 7/84
 Core Sizes HQ Total Depth 263.5 ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RGD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
60				QUARTZ DIORITE, cont., fresh, hard, strong, med. xln, greenish gray, plag, hbl.					Run 17, 59.9-65.0 Drill rate 0.21' /min. No water return
62				mod. close to close frac. 0.1'-1.0' occasional slight stain on or near frac. surfs., tight to part open, med. rough to rough, 35°-90°, max 1.0', min. 0.1'		100/60			
64							Box 5		
66				65.5-67.0 closely fractured; Fe staining, trace carbonate; part open to open; sli. rough; 20°, 60°, 70°; 0.15'-0.35'		94/48			Run 18, 65.0-70.0 Drill rate 0.1' /min. Lost all water pres. at 67.0' (had been getting some pres. in hole but no return) 67.0-70.0 pres. in hole variable, no water return
68									
70									Run 19, 70.0-75.0 Drill rate 0.14' /min. Collar broke; pulled rods to rec. core; rods went back down hole w/o difficulty
72				72.2-73.9 close to v. closely fractured; Fe staining, trace calcite; tight to open; sli. rough to rough; 10°, 30°, 50°-60°; 0.05'-0.2'; core badly broken 72.5-73.3		100/48			
74				74.7, fine xln.					
76				76.1-84.2 closely frac., Fe stained, trace carbonate; generally part open to open, occasionally tight, sli. to med. rough; 15°-60°; 0.1'-0.5'		100/60	Box 6		Run 20, 75.0-79.7 Drill rate 0.12' /min. No water return 0.4' cave material at top of run
78									
80									TC = 24,036 PSI

Boring No DH 84-7 Angle (from Horizontal) 60° Ground Elevation 1625.300 Ft.
 Feature D's Portals Area Bearing 025° Rock Elevation 1621.100 Ft.
 Coordinates: N 3,227,402.849 Date Started 28 April, 1984 Overburden Thickness 4.2 Ft. 4
 E 742,558.414 Date Completed 1 May, 1984 Ground-Water Elevation 1567.5 Ft. 7/84
 Core Sizes HQ Total Depth 263.5 ft. Logged by Wilkinson/Hansen

Depth (Elevatic.)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
80				QUARTZ DIORITE, cont., fresh, hard, strong, med. xln, greenish gray, plag, hbl.			Box 6		Run 21, 79.7-84.3 No water return
82				closely frac., occasional mod. frac., 0.1'-1.0', occasional sli. stain on or near frac. surfs., tight to sli. open; med. rough to rough, 30° to 90°, max. 0.6', min. 0.1'	95/40				
84				81.5 heated jt., 65°, 0.01' calcite vein					Run 22, 84.3-89.4 Drill rate 0.17'/min. No water return; some pres. in hole, but variable TC = 20,991 PSI
86				83.8-84.2 sli. alteration of feldspars to kalin, closely frac., sli. friable along fracs., sli. to mod. weath., mod. hard.					
88				86.5-89.4 closely frac., sli. weath., Fe stained, tight to part open, sli. to med. rough, mostly 45°-60°, pc's. 0.2'-0.3'	100/53				
90				89.3-91.0 no fracs. 89.5 0.05' wide hbl rich vein			Box 7		Run 23, 89.4-94.4 Drill rate 0.17'/min. No water return; driller feels water table prob. @ 67.0-70.0
92				91.0-98.0 closely frac., Fe stained, trace carbonate, part open, med. rough, 20°-40°, 80°, pc's. 0.1'-0.5'	100/46				
94									
96									Run 24, 94.4-99.4 Drill rate 0.25'/min. No water return; variable water pres. in hole
98				97.3-98.7 sli. more xln. 98.0-103.1 sli. weath. to fresh; close to very closely frac.; Fe stained carbonate, mod. hard to soft, sli. friable, core badly broken, 10°-70°, pc's. <0.25'	100/32				TC = 14,283 PSI
100									

Boring No DH 84-7 Angle (from Horizontal) 60° Ground Elevation 1625.300 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1621.100 Ft.
 Coordinates: N 3, 227, 402.849 Date Started 28 April, 1984 Overburden Thickness 4.2 Ft. 4
 E 742, 558.414 Date Completed 1 May, 1984 Ground-Water Elevation 1567.5 Ft. 7/84-34
 Core Sizes HQ Total Depth 263.5 ft. Logged by P. Hansen/S. Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks																				
	Lithology	Structure	Fracture Log 3 6 9 12																										
100				QUARTZ DIORITE, con't., fresh to sli. weath. along frac., hard, strong, med. xln. greenish grey, plag, hbl. closely frac., occ. mod. frac.	87/0		Box 8		Run 25, 99.4-101.7 short run, tube blocked																				
102				101.0-102.1 feldspars sli. altered, trace kaolin, psbly. clay present					100/21		Run 26, 101.7-106.0 Drill rate 0.18'/min. No water return; some water pres. in hole																		
104				101.7-106.0 core angles gen. either 10°-30° or 70°-90°							86/17		Run 27, 106.8-110.3 No water return; variable water pres. in hole																
106				107.2-108.0 closely frac., sli. weath. along frac.									100/0		Run 28, 110.3-112.0 Drill rate 0.08'/min. No water return														
108				110.2-114.0 Trace, clayey sand filling along frac., mod. weath., v. closely frac. 0-30°, 65°-85°, pc's. < 0.15'											100/0		Run 29, 112.0-114.3 Drill rate 0.1'/min. mech. br.												
110				114.3-116.2 closely frac, pc's. 0.3'-0.7'													100/70	Box 9	Run 30, 114.3-119.5 Drill rate 0.26'/min										
112				116.2-117.3 v. closely frac., clay on 75% of jt. surfs, part. open to open, sli. rough, 40°-60°, some 0°-30°																	Approx. w.l. at 100' TC = 15, 148 PSI								
114				118.1-119.6 closely to v. closely frac																			Run 31, 119.5-121.8						
116				119.6-122.2 Clay fillings along some frac., fresh, close to v. close frac., gray sandy clay highly plastic																									
118				119.7-120.1 gray sandy clay filling																									
120																													

Boring No DH84-7 Angle (from Horizontal) 60° Ground Elevation 1625.300 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1621.100 Ft.
 Coordinates: N 3,227,402.849 Date Started 28 April, 1984 Overburden Thickness 4.2 Ft. ±
 E 749,558.414 Date Completed 1 May, 1984 Ground-Water Elevation 1567.5 Ft. 7/84
 Core Sizes HQ Total Depth 263.5 ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
120									Run 31, con't. Rods rattling, core ground 19.6-19.8
122				121.5 gray sandy clay filling, 0.04' QUARTZ DIORITE, con't, fresh, hard, strong, med. xln, gray, plag, hbl, pyrite and chlorite along some frac. closely frac. trace calcite, carbonate, clay and pyrite, tight to part open, sli. to med. rough, 20°-80°, pcs 0.05'-0.8'	9/17	100/12	Box 9		Run 32, 121.8-126.8 Mech. breaks at top
124				124.6-125.0 jt'g v. close, most are healed; tight, sli. rough, 40°-70°					
126									Run 33, 126.8-131.5 Mech. breaks at top
128									
130					100/17		Box 10		
132				131.6-134.8 closely to mod. close frac., trace carbonate and calcite filling, sli. to med rough, 10°-20°, 45°-75°					Run 34, 131.5-136.5 Mech. breaks at top and bottom. No water return
134				132.6 felsic vein, 0.07', 60°	100/50				
136				135.7-136.7 felsic vein, up to 0.05', 60°					Run 35, 136.5-141.5 Drill rate 0.4'/min. VC = 20,775 PSI
138					96/48		Box 11		
140									

Boring No DH 84-7 Angle (from Horizontal) 60° Ground Elevation 1025.300 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1021.100 Ft.
 Coordinates: N 3,227,402.849 Date Started 28 April, 1984 Overburden Thickness 4.2 Ft. 2
 E 742,558.414 Date Completed 1 May, 1984 Ground-Water Elevation 1567.5 Ft. 7/84 34
 Core Sizes HQ Total Depth 263.5 ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
140				QUARTZ DIORITE, cont. fresh, hard, strong, med. xln., gray qtz., plag, hbl., chlor. epidote, tr. pyrite					Run 35, cont. Mech. breaks at base
142				mod. to close frac, few v. close, 0.05'-1.3', sli. rough, some clay patches, some fresh					Run 36, 141.5-146.2 TC = 25,103 PSI
144				141.5 some kaolin.		100/74			
146				145.0-145.5 sli. altered, discolored, minor kaolin.			Box 11		
148				146.2-151.0 lt. green-gray, more felsic, less mafics. ~ 10%					Run 37, 146.2-150.0 Drill rate 0.07/min.
150				148.0-151.0 sli. altered, hard, strong, med. xln., kaolin, mafic phenocrysts, hbl. to 148.2'		100/79			
152				151.0-160.5 QUARTZ DIORITE, cont. fresh, v. hard, strong, med. xln., gray					Run 38, 150.0-155.0
154						100/59			Pulled rods to change bit at 1450 hrs; w.l. at 63'
156							Box 12		Run 39, 155.0-159.7 Drill rate 0.19/min.
158						100/28			
160									

Boring No DH 84-7 Angle (from Horizontal) 60° Ground Elevation 1625.300 Ft.
 Feature DIS Portals Area Bearing 025° Rock Elevation 1621.100 Ft.
 Coordinates: N 3,227,402.849 Date Started 28 April, 1984 Overburden Thickness 4.2 Ft.
 E 742,558.414 Date Completed 1 May, 1984 Ground-Water Elevation 1567.5 Ft. 7/84
 Core Sizes HQ Total Depth 263.5 ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
160				160.5 - 176.9 ALTERED QUARTZ DIORITE, st. to mod. altered and weath. mod. hard, mod. strong to weak, med. xln., some kaolin, chlor. epid., hbl., lt. green-gray		100/37	Box 12		Run 40, 159.7-164.5 Mech. break at top
162				close frac, numerous high angle jts, clay filling along some jts, carbonate, sti. to med. rough, 10°-25° and 70°-90°					picked up rest of run 40 next run
164				165.2-166.8 Clay filling; foliated, 70° angle, soft weak crumbly, high plasticity, pale green to white, dark green-gray clay layer, slickensides in clay; 50°-60° w/ core axis		100/20			Run 41, 164.5-169.5 Drilling faster because of new bit, pressure constant TC=0 PSI
166				167.5-171.0 CALCITE VEIN, ocular struc. bordered by sulfides, bounded by clay and altered qtz. diorite, mod. hard, mod. strg., irreg. pattern					
168				167.7-168.3 joint w/ calcite filling, 20°					Run 42, 169.5-174.6 Faster drilling;
170				169.2-174.0 QUARTZ DIORITE, cont mod. alt. weak, friable in part, few mafics, clayey			Box 13		
172				169.6 - 1/2" QUARTZ VEIN, hard, with sulfide zoning		100/41			
174				170.6-170.9 gray clay-filling bordering calcite vein, jts are infilled w/ soft clay or qtz., lt. grn.					
176				174.6-176.0 healed joints; at 70° thin clay fillings along fractures, weak to mod; hard					Run 43, 174.6-179.6 Faster drilling to 177.5 then slower
178				176.9-205.2 QUARTZ DIORITE, fresh, hard, strong, med. xln., green-gray, plag, hbl., tr chlor. on jts., closely frac. fresh, sti. rough to smooth, 30°-70°		96/44			Run 44, 179.6-184.8
180									

Boring No DH84-7 Angle (from Horizontal) 60° Ground Elevation 1625.300 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1621.100 Ft.
 Coordinates: N 3,227,402.849 Date Started 28 April, 1984 Overburden Thickness 4.2 Ft. ±
 E 742,558.414 Date Completed 1 May, 1984 Ground-Water Elevation 1567.5 Ft. 7/84
 Core Sizes HQ Total Depth 263.5 ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks	
	Lithology	Structure	Fracture Log							
180			3 6 9 12	QUARTZ DIORITE, con't. fresh, hard, strong, med xln., green-gray	100/77	100/77	Box 14		Run 44, con't.	
182				mod. close to closely frac., carbonate coating and chlorite along frac., tight to part open, sli. rough, 0°-75°, mostly 0°-30° and 60° - 70°, max. 1.5', min. 0.5'						
184										
186										
188										
190										
192										
194				193.0 QUARTZ VEIN, up to 0.01' thick						Tc = 3,710 PSI
196				195.3-208.7 v. closely frac., trace clay and calcite filling on some jts., core badly broken, size range gen. coarse sand to 0.2'						Run 47, 194.8-197.0
198										Run 48, 197.0-200.0 Drill rate 0.15'/min.
200										

Boring No DH84-7 Angle (from Horizontal) 60° Ground Elevation 1625.300 Ft.
 Feature DIS Portals Area Bearing 025° Rock Elevation 1621.100 Ft.
 Coordinates: N 3,227,402.849 Date Started 28 April, 1984 Overburden Thickness 4.2 Ft. A
 E 742,558.414 Date Completed 1 May, 1984 Ground-Water Elevation 1567.5 Ft. 7/84
 Core Sizes HQ Total Depth 263.5 ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
200				QUARTZ DIORITE, cont., fresh to sli. weath. along fracs., hard, mod. strong, med. xln., green-gray, plag, hbl.		81/0			Run 49, 200.0-202.6 Drill rate 0.17/min No water return
202				v. closely frac., 0.05'-0.2' occasionally quartz coatings on fracs., occ. sli. clayey along fracs., med. rough to rough, core angles 60°-90° (most fracs. sub parallel to core); max. 0.3', min. 0.05'		87/0	Box 15		Run 50, 202.6-204.2
204				204.2-205.2 closely frac.					Run 51, 204.2-208.7 Drill rate 0.25'/min. No water return
206				205.2-213.0 ALTERED QUARTZ DIORITE, sli. to sever. alter., mod. weath, mod. hard, mod. strong to weak, lt. green-gray, kaolin. closely to v. closely frac., calcite coating common, clay filling along a few fracs., mod. rough, 10°-40°, pc's 0.05'-0.2'		100/9			Run 52, 208.7-213.7 Drill rate 0.25'/min. No water return
208				205.9-206.2 mod. to severely weath, weak, clay filling					
210				210.3-211.0 severely weath., weak, clayey along fracs., quartz veined, 50°-60°, dark gray to white		100/12			
212									
214				213.0-218.7 QUARTZ DIORITE, fresh, occ. sli. altered along fracs., hard, strong, med xln., green-gray, plag, hbl, trace kaolin, discoloration of feld spars, less altered than above closely frac., med. rough to rough tight to p. open, core angles gen. 0°-30°, pc's 0.1'-0.5'			Box 16		Run 53, 213.7-218.7 Drill rate 0.21'/min. No water return
216						100/36			TC = 20,603 PSI
218				217.7 0.2' wide zone of feldspar alteration along frac.					
220				218.7-221.5, st. alteration, trace kaolin, lt. green-gray, jts. gen. part. open					Run 54, 218.7-223.7 Drill rate 0.20'/min.

Boring No DH84-7 Angle (from Horizontal) 60° Ground Elevation 1625.300 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1621.100 Ft.
 Coordinates: N 3, 227, 402.849 Date Started 28 April, 1984 Overburden Thickness 4.2 Ft. ±
 E 742, 558.414 Date Completed 1 May, 1984 Ground-Water Elevation 1567.5 Ft. 7/84 4
 Core Sizes HQ Total Depth 263.5 Logged by Hansen/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
220				sl. alteration, cont. 220.3					Run 54, cont. No water return.
222				calcite coated frac. surf. QUARTZ DIORITE; fresh, hard, strong, med xln, sulfide mineralization; closely frac.; tight to p. open; med. rough, most frags. 0°-20°	100/44				
224				222.5-225.8 core badly broken due to jts. oriented 75°-90°, pcs < 0.3', ave. 0.1', chloritic stain and a silt coating, blue gray.					Run 55, 223.7-228.9 Drill rate 5.2'/min; Rods chattered intermittently- added polymer in hole for more lubrication
226				225.8-230.4 close jts, calcite filling and carbonate coating, tight to p. open, smooth to silt. rough, 10°-15°, 40°-60°, pcs 0.2'-0.8'	100/46		Box 17		No water return TC=17,384 PSI
228				fresh, hard, strong, med. xln, green-gray, closely frac.					Run 56, 228.7-232.6 Drill rate 0.18'/min No water return
230					94/32				
232				232.1-232.6 v. closely frac., mod. weath.; xln. in a 0.05' wide zone, pcs < 0.15'					Run 57, 232.6-237.3 Drill rate 0.25'/min
234				233.3-233.8 v. closely frac., pcs < 0.1', chloritic coating on frac.	100/32				
236				236.6-236.7 mod. weath, sl. altered xln. zone, trace clay, 30°					
238				237.8-245.2 v. closely frac., carbonate staining, tight to part. open, silt med. rough, 30°-80°, core badly broken due to high angle jts, gen. < 0.2'	67/0		Box 18		Run 58, 237.3-241.2 Drill rate 0.15'/min No water return
240									

00173

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 13 of 14
Date 30 April, 84

Boring No DH84-7 Angle (from Horizontal) 60° Ground Elevation 1625.300 Ft.
 Feature D/S Portals Area Bearing 025° Rock Elevation 1621.100 Ft.
 Coordinates: N 3,227,402.849 Date Started 28 April, 1984 Overburden Thickness 4.2 Ft. ±
 E 742,558.414 Date Completed 1 May, 1984 Ground-Water Elevation 1567.5 Ft. 7/84
 Core Sizes HQ Total Depth 263.5 ft. Logged by Hensen/Wilkinson

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
240				QUARTZ: DIORITE, cont., sli. weath, hard, strong, med. xln, green-gray, plag, hbl, feldspars are discolored in places					Run 58, cont.
242				240.0-241.2 closely frac. 0.1'-0.3', mod. rough, 10°-15°					Run 59, 241.2-245.2 Drill rate 0.13'/min.
244				242.3-242.9 sli. weath; altered along frags. v. closely frac, sli. weath. and alt. discoloration of fsp., 0°-10° or 90°		100/13	Box 18		
246				243.2 0.02' wide quartz vein, sli. alt. discoloration of fsp. 242.9-245.2 angles of frags. gen. 10°-45°					Run 60, 245.2-250.2 Drill rate 0.20'/min.
248				247.9-248.5 Clay fillings; sl. alt. to mod. weath., mod. hard, mod. strong to weak, med. xln, lt. green-gray; kaolin., hbl. epidote.		100/35			TC = 8,656 PSI
250				250.2-251.2 v. closely frac. 0.02'-0.1', 0°-40°					Run 61, 250.2-255.2
252				251.2-252.2 v. closely frac, core badly broken, prob. mech. sli. rough some chlor. on frac.					TC = 7,358 PSI
254				252.2-255.0 close to v. closely frac. 0.05'-0.3', mod. to sli. rough, calc./chlor. on frac., 30°-40°		98/24	Box 19		Day shift 5/1/84
256				mod. to close. frac., calc, tr. clay, sli. rough					Run 62, 255.2-258.8 Clay at bottom of run
258				257.6-263.0 ALTERED DIORITE sl. to mod. altered, sl. to mod. weath, mod. hard to soft; weak, tr. kaolin., discolor		83/0			Run 63, 258.8-263.5 Core ground at top
260				258.1-258.7 mod. altered clay along frags, 30°-60° shield & regrnd. by drill 258.7-259.5					

00173

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 1 of 5
Date 12 May '84

Boring No DH84-8 Angle (from Horizontal) 60° Ground Elevation 1677.1 Ft.
 Feature D/S Portals Area Bearing 012° Rock Elevation 1669.7 Ft.
 Coordinates: N 3,227,433.3 Date Started 12 May, 1984 Overburden Thickness 8.5 Ft. ±
 E 743,112.9 Date Completed 13 May, 1984 Ground-Water Elevation 1673.5 Ft. 7/84
 Core Sizes HQ Total Depth 100.0 Ft. Logged by Scarlett

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
0				Rock: fragments to 0.2" DIORITE; sl. to mod. weath.; angular; no matrix recovered					LY 38-COR, HQ Run 1, 0.0-4.5 Lost water at start of hole
2									
4									
6				Rock frag.; Boulders; pcs. to 0.4"; DIORITE; sl. to mod. weathered; subangular to angular; no matrix recovered					Run 2, 4.5-6.4
8				Diorite and Andesite rock frag.; clear ice in open frags.					Run 3, 6.4'-10.0' Hole caved in at 10' Possible top of rock at 8.5'
8.5				TOP OF ROCK AT 8.5 FT.					
10				8.5-47.5 DIORITE; sl. to mod. weath.; mod. hard to sl. hard; mod. strong; med. xln; lt. to med. gray; plag; hb					Run 4, 10.0-13.0 Suspect most of rock frags are cave
12				v. close to closely frac.; Fe stained; part open, rough; 0-100 or 50-100; pcs. 0.05"-0.1"; mod. weath.; Fe stained on all frags; brown-gray; calcite; p. open; med. rough; 500-600; pcs. < .05 - .4"		83/13			Run 5, 13.0-18.0
14									
16				15.5-19.0 mod. to severely weath. mod. hard to soft; mod. strong to weak; heavy Fe stain; clay and ice in frags; part open to open; slight to mod. rough; ice to 1/4"; brn. to red-brn. clay; sl. plest.		90/28			
18									Set casing to 10.5'
20				19.0 weath.; hard; strong; grn-gray		100/65	Box 2		Run 6, 18.0-20.0 Good water return

Boring No DH 84-8 Angle (from Horizontal) 60° Ground Elevation 1677.1 Ft.
 Feature D/S Portals Area Bearing 012° Rock Elevation 1669.7 Ft.
 Coordinates: N 3,227,433.3 Date Started 12 May, 1984 Overburden Thickness 8.5 Ft. 4
 E 743,112.9 Date Completed 13 May, 1984 Ground-Water Elevation 1673.5 Ft. 7/89
 Core Sizes HQ Total Depth 100.0 Ft. Logged by Scarlett

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
20				DIORITE cont; sl. weath; hard; mod. strong to strong; med. xln; gray-gray w/ brn. Fe stain; plag, hbl, chlorite					Run 7, 20.0-25.0: Clay is lt gray and brown; brn. clay low-med. plast, gray med. high plast.
22				close to v. closely frac; Fe stain, calcite, clay; p. open to open; sl. to med; rough; 30°, 60°-80°, pos. 0.5-0.8'		98/30			
24				mod. strong to v. strong; blue-gray			Box 2		
26				25.5-28.7 - closely frac. most at 45°		100/0			Run 8, 25.0-28.7
28									
30						97/21			Run 9, 28.7-32.0
32				31.8-32.8 and 34.7-36.4 sl. altered, mod. hard; mod. strong; med. xln; lt. gray; plag, kaolin; hbl, chlorite					Run 10, 32.0-37.0 Day shift 13 May 84 Drill rate 0.5/min
34				34.0-35.0 v. closely frac.		100/94			
36							Box 3		
38				sl. weath. to fresh; v. hard; v. strong; med. xln; blue-gray; closely frac.					Run 11, 37.0-42.0 Drill rate 0.14/min Water loss 100% 2' into run
40				37.0-38.0 frags rehealed by calcite; rough, 0.5-0.8-80°		90/80			

Boring No DH 84-8 Angle (from Horizontal) 60° Ground Elevation 1677.1 Ft.
 Feature D/S Portals Area Bearing 012° Rock Elevation 1669.7 Ft.
 Coordinates: N 3,227,433.3 Date Started 12 May, 1984 Overburden Thickness 8.5 Ft. ±
 E 743,112.9 Date Completed 13 May, 1984 Ground-Water Elevation 1673.5 Ft. 7/84
 Core Sizes HQ Total Depth 100.0 Ft. Logged by Scarlett

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
40				DIORITE cont; sil. weath; hard; strong med. xln; green-gray plag, hbl; closely to v. closely frac;			Box 3		Run 11, cont. TC = 14,004 PSI
42				Fe stained, sl. open; rough; most frags. 0-30° or 80-90° pcs. 0.05-0.8'					Run 12, 42.0-46.5
44				41.0 tr. sulfide mineralization on frac.					
44				42.0-42.5 sl. altered; lt. greenish gray; kalin, chlorite		93/71			
45									Run 13, 46.5-51.5
48				47.5-66.5 ALTERED DIORITE; mod. to severely altered; mod. hard to sl. hard; mod. strong; med. xln; lt. gray to lt. green; kalin, chlor; plag; hbl, epidote;		100/80			TC = 8,802 PSI
50				v. close to closely frac; some frags. rehealed by calcite or coated w/ clay; part open; rough; most frags 10°-35°, also 45° and 90°; pcs. 0.05'-0.7'					Run 14, 51.5-56.7
52				48.0-50.0 appears sl. permeable (part open to open frags)			Box 4		
54				48.5-49.7 secondary qtz. and calcite mineralization and veining; sl. pitted along some veins		100/77			
56				50.5 0.01' offset of a rehealed frac. by another frac.					
58				49.9-50.0 and 54.1-54.3 severely weath; v. soft; clayey and sl. friable along frac					Run 15, 56.7-61.7
60				54.0 Ice in frac.		100/42			

Boring No DH 84-B Angle (from Horizontal) 60° Ground Elevation 1677.1 Ft.
 Feature D/S Portal's Area Bearing 012° Rock Elevation 1669.7 Ft.
 Coordinates: N 3,227,433.3 Date Started 12 May, 1984 Overburden Thickness 8.5 Ft. ±
 E 743,112.9 Date Completed 13 May, 1984 Ground-Water Elevation 1673.5 Ft. 7/84
 Core Sizes HQ Total Depth 100.0 Ft. Logged by Scarlett

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R. RCD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
60				ALTERED DIORITE cont; mod. to severely altered, mod. hard to sl. hard; mod. strong; med. xyn; lt. gray to lt. green-gray; kaolin, chlor., plag, hbl, epidote.					Run 15, cont
62				v. close to closely frac, same frags revealed by calcite or coated w/clay, part open, rough, 10-45°, pcs. 0.05'-0.7'		82/39			Run 16, 61.7-66.3 started at 11:20 losing water at 11:45, finished at 11:50. Unrecovered zone prob. at 61.7-62.5
64				60.3-63.4 severely altered; sl. hard to v. soft; weak; kaolin, epidote, chlorite.					TC = 26,623 PSI
66				v. closely frac. 0.02'-0.1' extensive secondary calcite and other mineralization and veining; in places sl. pitted along frags. clayey zone - 61.6-62.6 (0.8' core loss probably from this zone)		100/57	Box 5		Run 17, 66.3-70.0 Drill rate 0.19/min
68				63.4-66.5 mod. to sl. altered mod. hard; mod. strong; tr. sulfide mineralization					
70				66.5-80.0 DIORITE, fresh to sl. altered; v. hard to hard; v. strong to strong; med. xyn; greenish-gray; plag, hbl, kaolin, chlorite, epidote, pyrite		100/80			
72				closely frac; calcite, p. open, rough; tr. smooth; 0°, 30°-45°, 90°; pcs. 0.1'-0.7'					Run 18, 70.0-75.0 Drill rate 0.25/min
74									
76									Run 19, 75.0-80.0 Drill rate 0.25/min
78									TC = 16,504 PSI
80						100/88	Box 6		

Boring No DH 84-8 Angle (from Horizontal) 60° Ground Elevation 1677.1 Ft.
 Feature D/S Portal's Area Bearing 012° Rock Elevation 1669.7 Ft.
 Coordinates: N 3,227,433.3 Date Started 12 May, 1984 Overburden Thickness 8.5 Ft. &
 E 743,112.9 Date Completed 13 May, 1984 Ground-Water Elevation 1673.5 Ft. 7/84
 Core Sizes HQ Total Depth 100.0 Ft. Logged by Scarlett

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
80		X		80.0 - 82.4 ALTERED DIORITE, sl. to mod. alter; mod. hard to hard; mod. strong to strong; med. xylm; lt. greenish gray; plag; epidote, kaolin, chlorite, hbl.					Run 20, 80.0-85.0 Drill rate 0.2/min
82		X		close frac; sl. chloritic or calcite coating; tr. sulfide mineralization; tight to pl. open; rough; 0-300; a few healed fracs, 45-90°; pls. 0.1-0.4, most 0.2-0.4		100/90			
84		X		82.7 irregular qtz. vein.			Box 6		TC = 11,984 PSI
86		X		83.8 irregular qtz. vein.					Run 21, 85.0-90.0 Drill rate 0.2/min.
88		X		86.4 - 100.0 DIORITE, fresh; v. hard; v. strong; med. xylm; greenish gray; plag, hbl		100/90			
90		X		close to mod. close frac; calcite and/or sulfides; part open; rough; 0°-30°-45°; pls. 0.1-1.5					Run 22, 90.0-95.0 Drill rate 0.7/min
92		X		86.0 - 87.0 frac. 80°					
94		X		91.0 - 94.2 sl. altered; hard; strong; lt. greenish-gray; kaolin, epidote, plag, hbl		99/66			
96		X					Box 7		Run 23, 95.0-100.0 Drill rate 0.2/min TC = 19,044 PSI
98		X		98.0 frac. healed by qtz. vein; 0.03' wide; 60°		100/84			
100		X		T.D. = 100.0 Ft.					TC = 17,385 PSI

00173

HARZA-EBASCO

SUSITNA JOINT VENTURE

SOIL BORING LOG

Sheet 1 of 26
Date 13 May '84

Boring No DH84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° (S45W) Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Total Depth 497.5 Ft.
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Logged by Pulley / Frey

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Box Number	Remarks
0			Ct 1		0.9'		0.0-1.7 BOULDERS AND GRAVEL w/ fines washed away.		LY38-COR, HQ RUN 1 0.0-1.7' lost all water at 0.5'
2							1.7 SAND, frozen, med. to fine, poorly graded, olive brn.		Fast penetration w/v. low pres.
4			Ct 2		0.5'				Run 2, 1.7'-6.7' sand sample recovered by blocking casing
6									
8			Ct 3		0.7'		GRAVEL, rock fragments; subrounded; up to 0.15'; tr. Fe stain		Run 3, 6.7'-11.7' PW casing to 10'
10									
12									Run 4, 11.7'-15.5' Day shift 5/14/84
14			Ct 4		2.5'		BOULDER AND GRAVEL; angular (?) to subrounded; fines wash away; heavy Fe stain on some frag.; igneous rocks		
16									Run 5, 15.5'-26.7' At 18' water became discolored (lt. brn.) and carried sand with it.
18			Ct 5		0.4'		Cobble, pcs. to 0.3'; fine material washed away		
20									

Boring No DH84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Total Depth 497.5 Ft.
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Logged by Pulley / Frey

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Box Number	Remarks
20									Run 5, cont.
22									
24			Ct 5		0.4'				
26									Added revert mud to stabilize hole and improve recovery.
28			Ct 6		1.3'	CL-CH	GRAVEL, subrounded to subangular; sl. weath; Fe stain; pes. to 0.2'		Run 6, 26.7' - 28.5'
30						SM	Silty CLAY, med. plasticity, dense stiff; little fine to med sand, tr. to little gravel; polish and stratifications; subrded. to subangular mod. brown to gray		Run 7, 28.5' - 33.5'
32			Ct 7		4.5'	GM	28.5-29.4 Silty SAND; dense; subangular to subrounded; fine to coarse; little clay, mod. plasticity; trace gravel to 0.1'; olive gray.		
34							29.4-33.5 Silty Sandy GRAVEL; dense; angular, fragments of cobbles (up to 0.2'); fine to med; tr. clay, oxidized; light med. brn; andesite porphyry; Fe stain		Run 8, 33.5' - 38.5'
36			Ct 8		3.0'	SM	33.5-33.7 Silty CLAY, sil. to med. plast.; dense, stiff, varves; olive gray		
38							33.7 Silty SAND to Sandy SILT; dense; little gravel to cobbles; subangular to angular, fresh to mod. weathered; mostly fine, tr. medium; oxidized; mod. brn. to olive brown (till)		Run 9, 38.5' - 43.5'
40			Ct 9						

Boring No DH84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Total Depth 497.5 Ft.
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Logged by Pulley / Frey

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Box Number	Remarks
40							Silty SAND to Sandy SILT cont; dense; little gravel cobbles, mod. - severely weath, predominantly Diorite and Andesite Porphyry (Till/Outwash transition)		Run 9, cont.
42			Ct 9		5.0'				
44							GRAVEL size rock fragments; pcs. < 0.2'; fresh to sl. weath; angular to subrounded; fines washed away		Run 10, 43.5'-48.5'
46			Ct 10		1.0'				43.5'-49.5' Ran out of drilling mud and fines washed out
48							Gravel size rock fragments; pcs. < 0.1'; fresh to sl. weath; angular to subrounded, fines washed away		Run 11, 48.5'-49.5' Night shift 5/14
50			Ct 11		0.3'				Run 12, 49.5'-54.5' Trace gave in hole
52						SM	Silty SAND; dense; little gravel and cobbles, subangular to subrounded; fine to med; oxidized; light moderate brown		49.5'-52.0' Brn. wash water
54			Ct 12		3.8'		Sl. S. Good sample recovery		Using M1 drill drilling mud beginning at 52.0'
56									Wash water grn. brn. to brn.
58									SP
60									Run 13, 54.5'-58.5'
							silty sand w/ pebbles and cobbles as above		
							56.5-57.0 soft spot, more silty		
			Ct 13		4.0'				Drillin suspended on 5/14/84 at 58.5' start day shift 5/19/84
							Silty SAND; med. dense to dense; moist; little gravel; sub-round; fine to coarse; tr. clay; light moderate brown (outwash)		Run 14, 58.5'-63.5'

Boring No DH84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Total Depth 497.5 Ft.
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Logged by Pulley / Frey

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Box Number	Remarks
60							Silty SAND; med dense to dense; little gravel; subround; fine to coarse; tr. clay; light moderate brown		Run 14, cont. Brown return water. Color change at
62			Ct 14		4.9'		60.5-60.8 andesitic rock fragment		61.5 to gray return water
64							61.5- Silty SAND; dense to v. dense; moist; little gravel; sub-rounded to subangular; fine to coarse; trace clay; blue-gray to olive-gray	M -	Run 15; 63.5-68.5'
66			Ct 15		5.0'		65.0-65.2 subangular piece of altered diorite in part of core		
68							67.4-67.6 trace silt and clay med. dense, soft		Return water flowing back down around FW casing
70						SM			Run 16, 68.5'-73.2'
72			Ct 16		4.1'		70.8-71.4 tr. silt and clay, soft		
74									Run 17, 73.2'-77.7'
76			Ct 17		0.6'				Mixed thicker polymer mud
78									Run 18, 77.7'-79.7'
80			Ct 18		1.5'		79.2-79.5 andesitic rock frag., weathered		Run 19, 79.7'-84.0'

Boring No DH84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Total Depth 497.5 Ft.
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Logged by Pulley / Frey

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Box Number	Remarks
80							Silty SAND cont; dense to v. dense; moist; little gravel; sub-round to subangular; striations and polish; fine to coarse; tr. to little clay; blue-gray to olive-gray	Box 4	Run 19, cont. Greenish-gray return waters; drilling with polymer
82		Ct 19		4.2'	SM	80.7-80.9 clayey layer; little sand			SW
84						81.0-81.3 rock fragments up to 0.1 diam. 82.2-83.0 mottled olive-gray to lt. gray-brown			Run 20, 84.0-88.0 84.8-86.0 probable location of 0.8 core loss
86			Ct 20		3.2		84.8-86.0 sand lense, tr. silt and clay; moist, non-cohesive; fine to medium		
88							88.0-90.1 Boulder, grano-diorite, severely weathered, v. soft, weak, med. xln, reddish green-gray, plag/kaolin, chlorite/nbl, quartz	Box 5	Run 21, 88.0-91.0
90		Ct 21		3.0'					
92			Ct 22		4.0'		91.4-91.7 and 94.0-95.0 Diorite/granodioritic rock fragments, severely weath.		Run 22, 91.0-95.0 greenish gray return water
94									
96			Ct 23		3.2'		Increase in gravel content; ~25% gravel lithology is a mixture of diorite, granodiorite, andesite, all med. to severely weath, acc. sl. weath.		Run 23, 95.0-98.5'
98									
100			Ct 24		5.0'			Box 6	Run 24, 98.5'-103.5'

00173

Boring No DH84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Total Depth 497.5 Ft.
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft 7/84
 Logged by Pulley / Frey

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Box Number	Remarks
100							Silty SAND cont; dense to v. dense; moist; silty; gravelly sand, w/ tr. clay, subround to subangular, v. fine to coarse; gray to greenish-gray	Box 6	Run 24, 98.5'-103.5'
102			Ct 24		5.0'	SM			
104								Box 6	Run 25, 103.5'-108.5'
106			Ct 25		5.0'				
108							10-25% gravel	Box 6	Run 26, 108.5'-113.5'
110									
112			Ct 26		5.0'		112.5'-112.7' sandy zone, tr. silt clay, and gravel	Box 7	Run 27, 113.5'-118.5'
114							114.5'-115.0' sand, little silt; soft		Drill rate 0.2'/min
116			Ct 27		5.0'			Box 7	Run 28, 118.5'-123.5'
118									Drill rate 0.16'/min
120			Ct 28		5.0'				

Boring No DH84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Total Depth 497.5 Ft.
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Logged by Pulley / Frey

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Box Number	Remarks
120									
			Ct 28		5.0'	SM	Silty SAND cont; dense to v. dense; moist; little gravel; subround to subangular; striations and polish; fine to coarse; tr. to little clay; si. to mod. plasticity; blue-gray to olive-gray	Box 7	Run 28, cont. Greenish gray return water; 100% return
124			Ct 29		2.0'		Lithology of gravel: size, clasts is a mixture of diorite, granodiorite, andesite, sl. weath, occ. mod. to severely weath.		Run 29, 123.5'-125.5'
126			Ct 30		3.0'	CL	125.5-128.9 SANDY CLAY, little sand, tr. gravel, dense, stiff, moist to wet	Box 8	Run 30, 125.5'-128.5' Drill rate 0.14/min.
128							127.2 core parted along surface with slickensides		Run 31, 128.5'-133.5' Drill rate 0.23/min.
130			Ct 31		5.0'		Gravel comprises 2.25%		
132							132.5-133.3 Boulder, andesite; fresh	Box 9	
134						SP	133.7-135.0 Sandy, lense; tr. silt and clay, mod. dense, moist, fine to coarse; greenish gray		Run 32, 133.5'-138.5' 133.7-135.0 probable location of 0.9 core loss Drill rate 0.29/min.
136			Ct 32		4.1'		137.0-138.5 occ. pockets or lense of lt. gray clay; stiff, dry to moist, dense		
138						SM			Run 33, 138.5'-143.5'
140			Ct 33		5.0'				

SOIL BORING LOG

Boring No DH84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Total Depth 497.5 Ft.
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Logged by Pulley / Frey

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Box Number	Remarks
140							Silty SAND cont. mod. dense to v. dense; moist; tr. gravel, subround to subangular; fine to coarse; str. clay; olive gray.	Box 9	Run 33, 138.5-143.5 Greenish-gray return water, ~100% return.
142			Ct 33		5.0'				
144						SM	143.5-144.2 Cobble; severely weathered; lt. green-gray; kaolinitic; st. plastic.	Box 9	Run 34, 143.5-148.5
146			Ct 34		2.2'		144.2-144.5 Gravel; cave?; subrounded to subangular		
148							144.5-147.3 Core loss, assume soil		
148							TOP OF ROCK, 148.2 FT.		
150									Run 35, see sht. 9
152							SEE GEOLOGIC LOG		
154									
156									
158									
160									

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. ±
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R. RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
140									
142									
144				SEE SOIL LOG					
146									
148				TOP OF ROCK, 148.2 Ft.					Start night shift 5/19/84
150				148.2-217.7 DIORITE; severely to mod. weath; v. soft to sl. hard; weak; med. to coarse xln; plag; hbl; qtz; friable; kaolin. and chlor. of plag and hbl. closely frac; chlorite - part open to a en; sl. rough; friable; 100% f50; p.c.s. 20.5'	93%		Box 9		RUN 35, 148.5'-150.0'
152				150.1-150.2 Altered Diorite or Felsic Dike; severely weath/ altered (?); soft; weak; fine to med. xln; Fe stain; chalky white to lt. gray	100%				RUN 36, 150.0'-155.0'
154				154.3 mod. weath; sl. hard, weak					Water pres. jumping
156									RUN 37, 155.0'-158.5'
158									
160					90%		Box 10		RUN 38, 158.5'-163.5'

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. ±
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/8'
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
160		//	3 5 9 12	DIORITE cont; mod. weath; soft; weak; med-coarse xln; plag; hb; qtz; green-gray; kadlin. of plag; chlor. of hb; friable; rock strength precludes determination of RQD	90/0	Box 10			Run 38, cont.
162				162.1-162.5 closely frac; chlor, tr. Fe stains; clay; part open to open, st. rough to smooth; 10°-50° pas. 20.25' to 0.1; generally <0.3'					Run 39, 162.5-166.5'
164				163.1-163.5 soft; v. weak; friable					
166				165.5-166.9 silty to med. hard; weak to mod. strong					
168				167.2-167.4 v. soft; v. weak; silty sand filling; friable					
170				Core loss of 1.5'					Run 40, 168.5-173.5'
172									DRILL rate 0.29'/min
174				172.6-174.1 v. closely frac; friable; 20.25' to 0.2'					
176				173.0-173.1 Breccia; v. soft, sand and silt size particles					Run 41, 173.5-178.5'
178				176.6 clay filling along frac; greasy sheen; soft; possible slicken-sides					
180	176.9-179.1 core badly broken; friable; mostly sand size particles; tr. clay; core loss 1.2'	Run 42, 178.5-183.5'							

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 11 of 26
Date 19 May '84

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Features 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. *
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																	
	Lithology	Structure	Fracture Log																							
180	[Lithology pattern]	[Structure symbols]	[Fracture Log symbols]	DIORITE cont; mod. weath; soft to sl. hard; weak; med. xyl; plag; tr. bio. hbl, Qtz; lt. green-gray; friable; chlor of hbl; rock strength precludes determination of RQD, incomplete.	[C.R. Graphic]	88/0	Box 12	[Instrumentation]	Run 42, cont.																	
182				184.2-188.2 severely weath; v. soft; v. weak; crumbles to silty sand.					94/0	Run 43, 183.5'-188.5'																
184				184.7 red stain on core irregular pattern, hematite (?)						100/0	Box 13	[Instrumentation]														
186				188.2-189.1 breccia, slickensides; soft; weak; friable; silty sand; tr. clay; dense									70/7	Box 13	[Instrumentation]											
188				189.1-191.6 sl. weath; mod. hard; mod. strong												66/0	Box 13	[Instrumentation]								
190				191.9-192.0 clay filling along frac; rock fragments within															[Instrumentation]	[Instrumentation]						
192				192.2-193.5 sl. weath; mod. hard; mod. strong																	[Instrumentation]	[Instrumentation]				
194				193.0 close to v. closely spaced, parallel frac, at 50°																			[Instrumentation]	[Instrumentation]		
196				196.0-203.1 clay fillings high plasticity, slickensides, breccia (?); severely weath; soft to v. soft; weak; approx. 0.6' of clay fillings; chalky white to mostly olive gray; core loss 3.2"																					[Instrumentation]	[Instrumentation]
198																										
200		[Instrumentation]	[Instrumentation]																							

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. ±
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																																															
	Lithology	Structure	Fracture Log																																																					
200	[Lithology pattern]	[Structure pattern]	[Fracture Log]	DIORITE, cont.; severely weath, soft, weak, med. xyn; plg, hbl, qtz, tr. bld, green-gray friable, matrix chlor. to clay; numerous healed / tight frac, core broken along closely to v. closely frac; clay calcite, chlor; tight to part open; smooth to sl. rough; 20°-50°, 80°; pas. < 0.05 to 0.8; generally < 0.3	66/0				Run 46, cont.																																															
202				196.0-203.5 clay fillings; high plasticity; slickensides; breccia cont.					100/0																																															
204				203.5-210.5 soft to sl. hard; weak brittle, friable; shattered appearance											70/0																																									
206				207.0-213.5 v. closely frac; clay, calcite, hematite; tight to open; sl. to med. rough; pas. < 0.2; core loss of 1.5																	100/53																																			
208				210.5 fresh, to sl. weath; med. hard to hard; med. strong to strong; rock strength allows for RQD determination																																																				
210				213.3-214.0 calcite mineralization, small, irregular																																																				
212				214.0-214.4 Andesite porphyry, fresh; hard; strong; welded contacts																																																				
214				214.7-217.7 v. closely frac; calcite, clay; tight to part open, sl. rough, clay fillings at 217.3 and 217.7; slickensides, breccia, soft; weak; tr. Fe stain																																																				
216				217.7-207.2 DIORITE; fresh; hard; strong; fine to med. xyn																																																				
218				217.7-218.9 fine to med. xyn. Increase in red stain																																																				
220																																																								

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. ±
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
220				DIORITE cont.; fresh; hard; strong; med. xln; green-gray closely to v. closely frag; tr. hematite and Fe stain; part open, med. rough; 50-75°; pcs. all to 1.0'; many healed frags, calcite	100/53	100/53	Box 14		Run 50, cont.
222									
224									Run 51, 223.6-228.5'
226									
228				226.6-227.7 core broken along high angle, parallel jts, 75°					DC = 4,801 PSI
230									Day shift 5/20/84 Run 52, 228.5'-233.7'
232									
234				234.0-234.7 v. closely frag; intersecting jts.; pcs. < 0.15'					Run 53, 233.7-238.6' After run 53, drove HW casing to 214'
236									
238									Run 54, 238.6'-240.6'
240				239.6-242.1 v. closely frag; pcs. < 0.2'					

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 7.25° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. ±
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84 ±
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
240				DIORITE cont. fresh, hard; strong; med. xln; plaq; hbl; bio; grn-grey					Run 54; cont. Night shift
242				closely frac. tight to part open; sl. to med. rough; 100-400°; 80°; 80°; pcs. 0.1' - 1.4' generally					Run 55, 240.6-245.5 * New bit at 241'
244				239.6-242.1 v; closely frac. cont.		100/49			Cave at 240' sand and rock frag.
246				244.3; 244.7 slickensides on frac. chlor.; 50°		100/97	Box 16		Run 56, 242.3-248.5'
248						100/78			Run 57, 243.5'-253.5'
250						100/61	Box 17		Run 58, 253.5'-258.0' Drill rate 0.23/min
252									
254									
256									
258				257.8 clay and calcite filling along frac.					Run 59, 250.0-263.7'
260									

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. ±
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 5 9 12					
260				DIORITE cont.; fresh; hard; strong; med. xyl; green-gray				Run 59, cont.
262				closely to v. closely frac; calcite, chlor, clay; tight to part open; sl. to med. rough; 10°-50°, 60°, 70°; PCS < 0.1" to 0.9"	100/43			
264				262.8 clay and calcite filling along frac; 10°		Box 17		Run 60; 263.7-268.5 water pres. jumping; lost circulation temp.
266				264.7-265.3 v. closely frac; shattered; friable; soft; weak	100/33			
268				265.3-267.0 v. closely frac; calcite, clay; PCS < 0.2"				
270				267.3-267.5 clay and calcite filling				Run 61; 268.5-275.5
272				270.9-271.6 and 272.3-2727; mod. - severely alter/weath.; soft; portions are decom. diorite, mod. kaolin.	98/14			
274				270.6-273.5 v. closely frac. and broken along hinge; calcite, chlor, clay; p. open; sl. to med. rough; PCS < 0.2"; shattered and friable from 271.1-271.4		Box 18		Run 62; 273.5-278.5
276				275.5-276.3 v. closely frac; clay; calcite chlor; tight to part open; med. rough; shattered; PCS < 0.1"	100/32			
278				276.3 closely to v. closely frac; PCS < 0.4"				Run 63; 278.5-283.5
280								

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. X
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks		
	Lithology	Structure	Fracture Log 3 6 9 12								
280	[Hand-drawn lithology sketch]	[Hand-drawn structure sketch]	[Hand-drawn fracture log sketch]	DIORITE con't, fresh, hard, strong; fine to med. xyn; green-gray; closely to v. closely frac; chlor, calcite, clay; tight to part open; sl. rough; 10°-50°; 60°; 70°; pcs: <0.1 to 0.5; generally <0.3'	100/10	100/10	Box 18		Run 63, cont.		
282				283.8 frac; chlor, slickensides						Run 64, 283.5'-288.5'	
284											
286											
288				286.2-287.8 v. closely frac. to shattered; filling; pcs. <0.05'							
290				288.4-289.3 v. closely frac. to shattered; slickensides, clay coatings, pcs. <0.1'							
292				289.8-294.3 shattered; fine to med. xyn; numerous calcite healed frag; red stain							
294											TC=0 PSI Day Shift 5/21/84 HW casing at 217 Run 66, 293.5'-298.5'
296				294.3-295.8 mod. altered; soft, weak; kaolin; of feldspar; chalky white							
298				297.3-300.0 sl. altered, tr. kaolin of feldspar to clay							
300	298.5-302.5 v. closely frac, clay, fillings and friable along frac; soft, wet; pcs generally <0.1'; lt. gray			Run 67, 298.5'-303.3'							
				298.8-298.9 sandy-clay filling; mod. plasticity							

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. ±
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
300				DIORITE cont; sl. altered; hard; mod. strong; fine to med. xyls, reddish-gray		100/0	Box 20		Run 67, cont.
302				closely to v. closely frac; calcite part open, med. rough, soft to 100 0.1' to 0.3'; many calcite healed frags.					Run 68, 302.3' - 307.0'
304				298.5 - 307.5 v. closely frac. zone; cont					
306				304.8 - 304.9 clay and calcite along frag, 3/4" gray clayey sand, dense, saturated					
308				307.2 - 321.5 ALTERED DIORITE, mod. to severely altered; soft to sl. hard; weak; fine to med. xyls; chalky; white to lt. gray; friable; brittle; lack of feldspars					
310				closely frac; calcite; clay; tight; sl. rough p.c.s. < 0.05					
312				312.5 - 321.5 No frags.					
314									
316									
318									
320									

8.5

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. x
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/8 1/8
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
320				ALTERED DIORITE; cont.					Run 71, cont. Run 72, 320.4-325.5'
				321.5 clay filling; lt. to med grn-gray					
322				321.5-333.8 DIORITE; sl. weath; sl. mod. hard; mod. strong; med. xyl.; green-gray; occ. molted lt. green		100/18	Box 21		
				324 closely frac; calcite, clay, chlor; part open to open; med. rough to smooth; occ. slicken- sided, 25° to 75°; 2' to 1.5'; many healed frags.					
324				323.8-323.9 clay filled frac; 1/4" str.; saturated					Run 73, 324.5-328.5'
326				324.3 slickensides on frac.		100/33			
				327.8 slickensides on frac, clay, chlor.					
328									Run 74, 328.5-333.5'
				329.7-330.2 core badly broken, crushed; friable; sand size particles		100/58	Box 22		
330									
332									
									Run 75, 333.5-338.5'
334									
				333.8-350.4 ALTERED DIORITE; mod. to severely altered, soft to v. soft; weak; med. xyl. to no texture; lt. gray to lt. green-gray kaolin; rock strength precludes RQD determination numerous clay filled; healed fracs; clay, calcite and Fe stain; many planar, thin, clay fillings		96/14			
336									
									Run 76, 338.5-343.5'
338									
340						100/100	Box 23		

8.5

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. ±
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2146 Ft. 7/84
 Core Sizes HS Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks		
	Lithology	Structure	Fracture Log								
340	[Dotted pattern]			ALTERED DIORITE cont; med. to severe alteration; soft to v. soft; weak; med. xyn; lt. gray to lt. green gray, calc in numerous clay filled, healed fracs.	100/100		Box 23		Run 76, cont: All mechanical, rock crumbled when hit with hammer		
342				340.3-340.7 med to sl. alteration; st. hard; weak							
344										Run 77, 343.5-348.5 1 pc in inner tube	
346										Drilling 2nd gear, water 200 psi, to split core, drove nail through	
348											
350										348.5-348.8 clay filling, 0.5" thick, soft, gray, saturated, low plasticity	
352										350.4-400.5 DIORITE, fresh, hard, strong, med. xyn, green-gray to lt. gray	
354										closely frac; calcite, clay; tight to open; sl. to med. rough; 15° to 30°, pcs. 0.1" - 1.0"	Run 78, 348.5-353.5'
356											Run 79, 353.5-358.5'
358											TC = 22,259 PSI
360				Run 80, 358.5-363.5'							

8.5

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. ±
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																																																
	Lithology	Structure	Fracture Log 3 8 9 12																																																						
360				DIORITE, can't; fresh; hard; strong; med. xyl; green-gray close to v. closely frac; clay calcite; pi. open to open, med. rough, 15°-80°, pcs. < 0.05' to 1.9'; generally 0.8'; friable along many frac.	100/50	Box 24			Run 80, cont.																																																
362				360.6-361.1 v. closely frac; clay & calcite fillings; pcs. < 0.1'					88/0	Box 24			Run 81, 363.5'-367.5'																																												
364				361.1-363.0 no fractures									88/0	Box 24																																											
366				363.6-368.8 v. closely frac; tr. clay and calcite; silty to med. rough; core badly broken; pcs. < 0.2'; core loss 0.5 ft.														100/20	Box 25																																						
368																							100/20	Box 25																																	
370																												98/30	Box 25																												
372																																	98/30	Box 25																							
374				373.0-375.4 v. closely frac; clay fillings; chalky white to lt. gray; sl. plasticity; healed frac, calcite; pcs. 0.15'																																		75/20																			
376				374.3-374.4 clay filling; 0.5" dense; saturated, chalky white																																																					
378				376.9-377.8 v. closely frac; friable																																																					
380				379.1-380.6 v. closely frac; silty sand filling; friable; pcs. < 0.15'; core loss 0.5'																																																					

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. 4
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation 2140 Ft. 7/84
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log												
380	[Dotted pattern]	55°	[Fracture log symbols]	DIORITE cont; fresh, hard to v. hard; strong; med. xyl; grn-gray; plag, hb, bio	100/71	100/71	Box 25		Run 85, cont.						
382				closely to mod. close frac. calcite, chlor, tight to f. open; sl. rough to rough; 1/8" to 5/8"; pls. 0.1" to 1.7"											
384				generally > 0.5"; most frags. have thin calcite coating.										Night shift Run 86, 384.0 - 386.5	
386															
388															Run 87, 386.2 - 388.5 TC = 28,998 PSI
390										389.4 - 389.8 core broken along high angle jts.					Run 88, 388.5 - 392.5 Bit blocked Hole making water during tube pulls (4.5 mins) 1.1.5 gpm
392										391.3 - 391.6 sl. altered along frac.					Run 89, 392.5 - 397.6
394										393.5 clay filling along frac; friable					
396										395.9 clay filling, 1/8", lt. grn-gray					
398															Run 90, 397.5 - 402.5
400			398.8 - 400.5 sl. altered; sandy-clay, breccia filling, 0.2, mod. plasticity; soft; calcite veins.												

00173

HARZA-EBASCO

SUSITNA JOINT VENTURE

GEOLOGIC LOG

Sheet 22 of 26

Date 21 May '84

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. *
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
400				400.5-428.0 QUARTZ DIORITE fresh, hard to v. hard, v. strong med. to coarse xyn; lt. gm. gray	100/63	Box 27			Run 90, cont.
402									2.554 to mod. lose frag. calcite; tight; sl. rough; 30°-60°; prs 0.4"-1.0"
404					100/100				
406				405.6 patches of red stain					
408									Run 92, 407.6'-412.5'
410									
412									Run 93, 412.5'-417.5'
414									
416									TE = 24,903 PSI
418									Run 94, 417.5'-418.8' Replaced w/ new bit
420				419.5-419.6 open joint; sl. alter; kaolin; calcite; friable; penetration of alteration	100/100	Box 28			Run 95, 418.8'-425.8'

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. x
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R. ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 8 9 12						
420				QUARTZ DIORITE cont; fresh, hard to v. hard, v. strong; med. xyl. green-gray					Run 95, cont.
422				close to mod. close frac; carbonate, calcite, tight, st. rough; 30°-70°; friable		100/88	Box 28		
424				423.0-424.2 mod. alteration, mod. hard; mod. strong; lt. grn-gray; lt. kaolin					Run 96, 423.8'-428.3' Core was blown out of inner tube
426				426.2-426.3 core badly broken, crushed; friable, pcs. < 0.65'		84/18			
428				426.3-427.0 core loss					
430				428.0-433.7 ALTERED DIORITE, mod. to sl. alter, mod. hard to hard, mod. strong, med. xyl. lt. green-gray					Run 97, 428.3'-433.4'
432				428.0-428.9 mod. altered; breccia w/ clay seams, calcite fillings		100/73	Box 29		
434				433.7-439.2 QUARTZ DIORITE, fresh to sl. altered; hard; strong; med. xyl. lt. green-gray					Run 98, 433.4'-439.5'
436				close frac; calcite; part open to open, med. rough; 10°-30°; pcs. 0.1'-0.6'		100/51			
438				439.2-471.8 ALTERED DIORITE, mod. alter, mod. hard, mod. strong; kaolin; greenish-white					Run 99, 438.5'-443.5'
440				v. close frac; kaolinite and calcite, pcs. < 0.1 ft		100/56	Box 30		

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Eins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. ±
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ± 2140 Ft. 7/20/8
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
440				ALTERED DIORITE, cont; s. to med. altered, local zones severely altered; soft to med. hard; weak to mod. strong; med. xfin. to no texture; lt. gray to lt. green gray; tr. of some kaolink. closely frac; clay, calcite; tr. chlor. carbonate; tight to pore open; smooth to rough; 15° to 65°; p.c.s. 0.1-2.5'		100/50	BOX 30		Run 99, cont.
442									
444				439.5-440.6 v. closely frac, broken along several healed frac. 442.8-443.8 clay filled, healed frac; lt. green to med. gray, possible slickensides; soft, weak planes		100/0			Run 100, 443.5-448.5
446									
448				444.7-447.0 mod. to severely altered; soft; weak; gray; kaolink; several thin surfaces smooth; chloritic; clay; slicken- sides; tr. at 445.9, 446.4, 447.3					Run 101, 448.5-453.5
450				448.6-449.6 v. soft, weak, friable zone crumbles to sand size particles		100/30			
452				452.0 and 452.5 healed jt. 0.1" calcite; sulfide mineral- ization in between					
454				453.2-453.2 clay filled frac; soft; weak; lt. green gray to thin gray seams					Run 102, 453.5-458.5
456				455.1 calcite and clay filled frac, 456		20/62	BOX 31		
458				455.9-458.0 v. closely frac, many partially healed, shattered appearance; in clay, friable 459.9-463.0 v. closely frac; clay filled frac; slickensides soft to sl. hard; weak; stiff chalky white to med. gray primary clay fillings		100/58			Run 103, 458.5-463.5
460									


Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. ±
 E 745,860.5 Date Completed 22 May, 1984 Ground-Water Elevation ±2140 Ft. 7/84
 Core Sizes HQ Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
460				ALTERED DIORITE cont; sl. altered; mod. hard to hard; mod. strong to strong; med. xyn, lt. green-gray; tr. kaolin; closely frac; calcite; carbonate, clay; part open; sl. to med. rough; 150-200°; p.c.s. 0.1-2.5		100/38	Box 31		Run 103, cont.
462									
464				459.9-463.0 v. closely frac. w/ clay filled frags, slicken-sides, cont.					Run 104, 463.5-468.5 Note: orientation of major calcite jets uncertain because in 2 separate runs
466				465.7-466.0 friable, calcite vein, clay filled (?) outside mineralization, 75°		100/94			
468							Box 32		Run 105, 468.5-473.5
470									
472				471.0 clay filled frac; med to stiff; saturated; 40°; 0.1" thick		100/80			
474				471.8-497.5 DIORITE; fresh, hard; strong; med. xyn, green-gray; close to mod. close frac; calcite; tight to part open; sl. rough; 10°-40°; p.c.s. 0.4' to 2.0'					Run 106, 473.5-478.5
476				473.8-476.6 sl. altered, hard, strong		100/100	Box 33		
478									
480									

Boring No DH 84-9 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Eins' Area Bearing 225° Rock Elevation 2040.1 Ft.
 Coordinates: N 3,229,560.3 Date Started 13 May, 1984 Overburden Thickness 148.2 Ft. X
 E 745,840.5 Date Completed 22 May, 1984 Ground-Water Elevation ±240 Ft. 7/84
 Core Sizes HA Total Depth 497.5 Ft. Logged by Wright/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
480	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	DIORITE cont. fresh, hard to v. hard; strong to v. strong; med. xyl; greenish-gray	[Vertical bar]	100/80	Box 33	[Vertical bar]	RUN 107, cont.
482				close to mod. close frac; calcite, tight to part open; sl. rough, 50 to 65°; pas. 2.2 to > 2.0					
484				483.7 healed frac; sl. alter; calcite filling; part open; 70°					
486									
488									
490				488.5-493.5 old, healed frac; thin; calcite					
492				490.2-490.7 v. closely frac; pas. 2.0-1"					
494									
496									
498									
500									


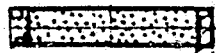
Boring No DH 84-10 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 230° (S50W) Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 24 May, 1984 Total Depth 254.0 Ft. ±
 E 745,813.2 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/84
 Logged by Rurka

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Instrumentation	Remarks
0							0.0-10.3 Gravelly SAND med. dense; wet; subrounded; fine to med.; tr. coarse; tr. to little silt; gravel to cobbles up to 6"		LY38-COR, HQ Run 1, 0.0-6.5 HQ casing at 5.0 Drill rate 0.3'/min Return water Rusty brown
2									
4			Ct 1		1.5'	GM			
6									Run 2, 6.5-9.0
8			Ct 2		1.8				
10									Run 3, 9.0-14.0
12			Ct 3		4.0		10.3-61.6 Silty SAND; v. dense wet; subangular to subrounded fine to med.; tr. coarse; little to tr. clay; sl. plasticity; little gravel, striations and polish; diorite fragments are severely weath. in places; light to mod. brown	X M	
14									
16			Ct 4		3.8'	SM			
18									 SM-ML
20							striations and polish on gravel pcs.		Run 5, 19.0-22.3 Drill rate 0.3'/min

Boring No DH84-10 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 230° Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 24 May, 1984 Total Depth 254.0 Ft.
 E 745,813.3 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/8"
 Logged by Rutka/Wilkinson

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Instrumentation	Remarks
20									Run 5, cont.
22			Ct 5		0.6'		Silty SAND cont, v. dense; saturated; angular to sub rounded; fine to med; tr. clay; lt. yellow brn.	Box 1	Drill rate 0.3/min Color change of return water to greenish
24						SM	22.0 color change to olive gray streaks and pods of lt. mod. brn. within		Run 6, 22.3-27.3
26			Ct 6		5.0'				
28									Run 7, 27.3-32.0
30			Ct 7		4.7'		30.0 mottled w/lt. brn. silty sand, increase in gravel percentage		
32								Box 2	Run 8, 32.0-37.1
34			Ct 8		5.1'	ML	34.2-34.8 pc. of cobble 34.8-35.3 Clay SILT; med. plasticity; v. dense; stiff, wet		
36									SW-SM
38			Ct 9		1.6'				Run 9, 37.1-39.0 Night shift 5/24
40									Run 10, 39.0-44.0

Boring No DH84-10 Angle (from Horizontal) 55° Ground Elevation 2101.5 Ft.
 Feature 'Fins' Area Bearing 230° Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 24 May, 1984 Total Depth 254.0 Ft. &
 E 745,813.2 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/84
 Logged by MSR/SEW

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Instrumentation	Remarks
40									Run 10, cont Core brks. all mech.
42			Ct 10		5.0'	SM	Silty SAND, cont; v. dense; moist; angular-subrounded; mostly fine; little coarse sand; little gravel up to 0.4; tr. clay; sl. plasticity; olive gray; (C11)		 SP
44								Box 3	Run 11, 44.0-49.0 Green return water Drilling w/Minex Core brks. all mech. Drill rate (48-49) 0.11'/min.
46			Ct 11		5.0'				48'-olive brn. return water variable return 10-70%
48						ML	47.1-47.3 Clayey SILT, mod. plasticity dense; stiff; moist; tr. fine sand; ML 47.3 Color change to lt. mod. brn.		Run 12, 49.0-54.0 Return water olive brn./lt. brn./green brn.
50							Silty SAND cont; v. dense; moist; angular-subangular; fine gr; little clay; little to some fine gravel; max. 0.1' tr. weath. diorite; lt. mod. brn.		
52			Ct 12		5.0'		52.3-53.0 weath. diorite cobble		 SW
54								Box 4	Run 13, 54.0-59.0 56.0' grn. return water Drill rate (54-59) 0.17'/min.
56			Ct 13		4.9'		55.4-58.4 color change to mostly olive brown		
58									
60			Ct 14						Run 14, 59.0-64.0

Boring No DH84-10 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 2300 Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 24 May, 1984 Total Depth 254.0 Ft. &
 E 745,813.2 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/84
 Logged by MSR/SEW

Depth (Elevation)	Rig Blow Count	Sample Interval	Sample No. and Type	Blow Count per 0.5 ft.	Length Recovered	Graphic Log	Soil Description	Instrumentation	Remarks
60							Silty SAND cont; v. dense; moist; angular - subround; fine to med. little clay; sl. plasticity; 20% gravel up to 0.2'; mottled olive brn to lt. mod. brn; oxidation.		Run 14, 59.0-64.0
62			Ct 14		5.0'				
64								TOP OF ROCK at 61.6 Ft.	Faster drilling
66							SEE GEOLOGIC LOG		
68									
70									
72									
74									
76									
78									
80									

Boring No DH84-10 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 230° Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 23 May, 1984 Overburden Thickness 61.6 Ft. A
 E 745,813.2 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/84
 Core Sizes HQ Total Depth 254.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
60				SEE SOIL BORING LOG					Run 14, cont.
				TOP OF ROCK at 61.6 Ft.					RQD=0 because of weakness.
				61.6-19.0 DIORITE;					All breaks mech.
62				severely weath; v. soft;		100%	Box 4		
				v. weak; med; x y/n; lt. mod. brn. to gray brn. kaolin. and chlor. of to sandy silt and chloritic clay some feld intact; crystalline texture intact; friable					
64				rock strength precludes any determination of fracturing, RQD=0.					Run 15, 64.0-69.0
									Faster drilling; rtn. water alive brn.
66						100%			
									SW
68									Rod is rattling
				69.0 color to green-gray; some lt. mod. brown; possibly tr. qtz.					Run 16, 69.0-74.0
70									Drill rate 0.25/min. RQD=0 due to v. soft; all breaks mech.
72						100%			
74							Box 5		Run 17, 74.0-79.0
76									
78						98%			
80									Run 18, 79.0-84.0

Boring No DH 84-10 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 230° Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 23 May, 1984 Overburden Thickness 61.6 Ft. ±
 E 745,813.2 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/84
 Core Sizes HQ Total Depth 254.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
80				DIORITE cont; severely weath; v. soft; v. weak; med. xyn kaolin. and chlor. of plagiocl. to silty sand/clay; xyn. text. v. intact; friable; green gray; rock strength precludes determination of frac's.	90/0	Box 5		Run 18, 79.0-84.0 Drill rate 0.3'/min All brks mech. 0.5' core washed at top	
82									SW-SM
84									Run 19, 84.0-89.0 Washout at top, decided to thicken mud. All breaks mech.
86									85.1-85.5 fine xyn, more clay. 85.5-91.2 tr. to little qtz(?)
88									
90									Run 20, 89.0-94.0 Drill rate 0.18'/min Return Water 100%
92									91.2 color change to lt. gray; v. soft (sl. harder than above); weak; friable
94									Run 21, 94.0-99.0
96									
98									Run 22, 99.0-104.0
100									

Boring No DH84-10 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 230° Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 23 May, 1984 Overburden Thickness 61.6 Ft. ±
 E 745,813.2 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/8"
 Core Sizes HQ Total Depth 254.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks						
	Lithology	Structure	Fracture Log 3 6 9 12												
100				DIORITE cont; severely weath; soft to v. soft; weak; med. xyl; plag, hbl, bio, chlorite, tr. qtz (?); green gray; friable; crumbles to a silty sand; rock strength precludes determination of RQD mod. to v. close frac; chlor, clay; tight; sl. rough; 101.4: able to delineate frac. sl. reddish (oxidation) weath. on some jts.	100%	Box 7		Run 22, 99.0-104.0 Gr. gray rth. water 100% RQP = 0 (weak) Abundant mech. breaks							
102				104				106	108	110	112	114	116	118	120
104				106				108	110	112	114	116	118	120	120
106				108				110	112	114	116	118	120	120	120
108				110				112	114	116	118	120	120	120	120
110				112				114	116	118	120	120	120	120	120
112				114				116	118	120	120	120	120	120	120
114				116				118	120	120	120	120	120	120	120
116				118				120	120	120	120	120	120	120	120
118				120				120	120	120	120	120	120	120	120
120										119.0-120.8 Altered Diorite; alter. severely weath; v. soft; v. weak; med. xyl; intense kaolin, of fops and mafics (?) chalky wht. - lt. gr.	10%	Box 8	Run 25, 114.0-119.0	Run 26, 119.0-124.0 start clay sh. it 5/25/84	

Boring No DH84-10 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 230° Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 23 May, 1984 Overburden Thickness 61.6 Ft. A
 E 745,813.2 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/8
 Core Sizes HQ Total Depth 254.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log 3 6 9 12						
120				PIORITE cont.; severely weath;	100/0	Box 8			Run 26, cont.
122				soft to sl. hard; med. xlyn;					All secs of core
124				friable; plag, hbl, bio, chlorite;					can be broken
126				kaolin, tr. hematite and qtz;					by hand.
128				greenish-gray rock crumbles					Numerous mech.
130				to silty sand; rock strength					breaks
132				precludes determination of					
134				ROD					
136				clay to mod. frac, dk. grn;					Run 27, 124.0-129.0
138				chlorite or biotite, qtz.					= 100% return
140	hematite; tight; smooth to	greenish-gray							
	sl. rough; 10°-30°; pcs. 0.1'-1.5'	drilling w/ Polymer							
		mud							
					92/0				
129.4-131.7				Altered; severely weath;					Run 28, 129.0-134.9
130				soft; weak; med. xlyn; chalky.					Drill rate 0.14/min.
132				white to lt. gray; plag, kaolin,					
134				chlorite					
136				closely frac, 0.2'-0.4'					
134.0				mod. weath; sl. to mod.		Box 9			Run 29, 134.0-137.3
136				hard; weak to mod strong					Drill rate 0.28/min
138									Core not break-
135.8-136.6				little hematite,					able by hand
138				(tr. throughout)					
140					100/64				Run 30, 138.3-144.0

Boring No DH 84-10 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 230° Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 23 May, 1984 Overburden Thickness 61.6 Ft. A
 E 745,813.2 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/8"
 Core Sizes HQ Total Depth 254.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks							
	Lithology	Structure	Fracture Log													
140				DIORITE cont; mod. weath; sl. to mod. hard; weak; mod. strong; med. xyl; greenish gray; plag, hpl, kaolin, chlorite, tr. qtz, biotite closely frac, chlorite, tight; sl. to med. rough; 10° 45°, 90°, pcs. 0.1' - 0.8'	100/21	100/40	Box 10		Run 30, cont. Drill rate 0.26'/min. 100% return green -gray water, Drilling w/ Polymer mud							
142																
144															Run 31, 144.0-149.0 Drill rate 0.25'/min.	
146																
148																
148.6-149.2											Core broken along high angle jt.					
149.9											sl. weath; mod. hard; mod. strong					Run 32, 149.0-154.2 Drill rate 0.24'/min.
151.2											Clay filling along frac, slickensided; 0.1'					
151.3-154.7											kaolin of matrix (?) 154.5 fresh; mod. hard to hard; mod, strong to strong					
154																Run 33, 154.2-159.0 Drill rate 0.23'/min
155.9-157.7				sl. altered, varies from med. to fine xyl.												
158																
158.9				Clay filling along frac; 0.05' wide, mod. plasticity						Run 34, 159.0-164.0						
160																

Boring No DH84-10 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 230° Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 23 May, 1984 Overburden Thickness 61.6 Ft. ±
 E 745,813.2 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/84
 Core Sizes HQ Total Depth 254.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
160				DIORITE, fresh; hard; mod. strong to strong; med. xln; greenish-gray; plag, hbl, bio; tr. atz, tr. hematite					Run 34, cont. Drill rate 0.23/min 100% return, green-grey water, Drilling w/ Polymer mud.
162				closely frac; chlorite, calcite; tight to part open; sl. rough; 30-45% pgs; 0.1'-1.2'		100/60	Box 11		TC=21,641 PSI
164				162.0 - Fe stain on revealed frags; 10-20%					Run 35, 164.0-169.0 Drill rate 0.19/min Numerous revealed frags
166				164.5-178.4 ALTERED DIORITE, sl. to severely altered; mod. hard to v. soft; v. weak to mod. strong; med. xln; chalky white to lt. gray; kaolin of feldspars; closely frac; calcite, clay; tight to part open; sl. to med. rough		100/16			
168				166.2-169.4 v. soft to soft; brecciated frags of altered rock set in clay matrix, frac. planes at 167.0+167.6, each is a 0.02'-0.05' wide; v. soft; dk. gray clay; mod. to hi plasticity					Run 36, 169.0-174.0 Drill rate 0.24/min Pyrite mineralization at 170.6, 170.85-170.9, 171.3-171.4
170				171.4-172.4 clay filling along several frac, hi plasticity; rock is brittle and broken up					
172				173.5 clay filled frac; dk. gray; slickensided		100/50			
174				174.0-174.2 kaolin; friable; chalky white					Run 37, 174.0-179.0 Drill rate 0.17/min Numerous revealed frags in core
176				175.3 clay filled frac; dk. gray			Box 12		
178						100/59			
180				178.4-183.6 DIORITE; sl. weath; hard; strong; med to coarse xln; CI ≈ 30-40% 179.8 Chlor. frac; slickensides					Run 38, 179.0-184.2

Boring No DH 84-10 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 230° Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 23 May, 1984 Overburden Thickness 61.6 Ft. ±
 E 745,813.2 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/84
 Core Sizes HQ Total Depth 254.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R.-Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks	
	Lithology	Structure	Fracture Log							
			3 6 9 12							
180	[Dotted pattern]	[Diagonal lines]	[Vertical lines]	DIORITE cont; fresh to sl; weath; hard; strong; med. to coarse xyn; dk. greenish-gray; plag, hbl, chlorite, epidote, quartz; closely to v. closely frac; chlorite, calcite; part open; rough; pcs: 0.1'-1.2'	100/67	100/67	Box 13		Run 39, cont; Drill rate 0.14/min. 100% return, drilling w/ polymer mud	
182				181.6 calcite vein; Fe stained; 45°; 0.05' wide						
184				182.2-183.5 v. closely frac, pcs. 0.05'						
186				183.6-236.8: QUARTZ DIORITE fresh, v. hard to hard, v. strong to strong; med. xyn; greenish-gray; plag; hbl; qtz; gradational contact						
188				closely; frac; numerous minor healed frags; clay, calcite; tight to sl. open; rough; 12-45°						
190										
192				190.6-190.8 sl. weath; slight frac						
194										
196										
198										
200							Box 14		Run 41, 194.1-199.0 Drill rate 0.12/min.	
									Run 42, 199.0-204.2	

Boring No DH84-10 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 230° Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 23 May, 1984 Overburden Thickness 61.6 Ft. A
 E 745,813.2 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/84
 Core Sizes HQ Total Depth 254.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks	
	Lithology	Structure	Fracture Log 3 6 9 12							
200	[Dotted pattern]	[Vertical lines]	[Dotted]	200.0 QUARTZ DIORITE cont.; fresh; v. hard; v. strong; med. xfin.; greenish gray; plag, hbl; qtz; tr. KSPAR	100/100	100/100	Box 14		Run 42, cont. Drill rate 0.12/min. 100% return - green gray Polymer mud	
202				mod. close to closely frac; calcite; tight; sl. to med. rough; 12-45° numerous minor revealed fracs; pcs. 0.2'-1.7'						
204										
206										
208										Run 43, 204.2-207.0
210				209.4-210.2 v. closely frac; clay to 1/2" thick along frac; mod. to high plasticity; friable olive gray						Run 44, 207.0-209.0 Night shift 5/25/84 Bit change Core ground at top
212				210.6 mostly mod. close frac; pcs. 0.3'-2.7'						Run 45, 209.0-214.0 Drill rate 0.13/min.
214				213.8 clay and calcite filling; along frac; up to 1/4"; open; 45°						Run 46, 214.0-219.1
216										
218				217.3-217.5 Irregular calcite fillings						
220				Run 47, 219.1-224.3 TC = 14, 28.3 PSI						

Boring No DH84-10 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 230° Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 23 May, 1984 Overburden Thickness 61.6 Ft. Δ
 E 745,813.2 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/84
 Core Sizes HQ Total Depth 254.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./RQD %	Box Number	Instrumentation	Remarks																
	Lithology	Structure	Fracture Log 3 6 9 12																						
220	[Lithology pattern: diagonal dashes]	[Structure: mostly blank]	[Fracture Log: mostly blank]	QUARTZ DIORITE cont; fresh; v. hard; v. strong; med. xylm; green-gray; plag, hbl, epidote (?), chlorite, (Ksp) (?), Qtz; irregular texture; most med. xylm, fine xylm bands; occ. coarse xylm, plagi, calcite, p. open; med. rough; 5-45°; pcs. 0.2-4.7'	100/96	100/96	Box 15		Run #7, cont.																
222				224.0-229.0 MASSIVE					100/100	Box 16	Run #8; 224.3-229.1 No frags														
224				225.0-227.6 Andesite Porphyry; fresh; hard; strong; aphanitic; dk. green; w/ med. xylm; grana-diorite xenoliths and plagi phenocrysts; gradational/irregular contacts							100/68	Box 17	Run #9; 229.1-234.0												
226													100/66	Box 17	Run #10; 234.0-239.0 Drill rate 0.15'/min										
228															100/66	Box 17	TC = 20,949 PSI								
230																	100/66	Box 17	Run #11; 239.0-244.0						
232																			100/66	Box 17					
234				234.8-235.6 plagi altered to epidote (?)																	100/66	Box 17			
236																							100/66	Box 17	
238				236.8-244.0 ANDESITE PORPHYRY fresh; hard to v. hard; strong, aphanitic groundmass; diorite xenoliths and plagi phenocrysts up to 0.11'; gray-green																					100/66
240	238.5 - calcite vein 1/2"; chalky white 238.5-239.0 v. close frac, clay, calcite pcs. 0.2'	100/66	Box 17																						

Boring No PH 84-10 Angle (from Horizontal) 55° Ground Elevation 2161.5 Ft.
 Feature 'Fins' Area Bearing 230° Rock Elevation 2111.0 Ft.
 Coordinates: N 3,229,232.7 Date Started 23 May, 1984 Overburden Thickness 61.6 Ft. A
 E 745,813.2 Date Completed 26 May, 1984 Ground-Water Elevation 2142.0 Ft. 7/84
 Core Sizes HQ Total Depth 254.0 Ft. Logged by Wilkinson/Hansen

Depth (Elevation)	Graphic Log			Classification and Physical Description	C.R. Graphic	C.R./ROD %	Box Number	Instrumentation	Remarks
	Lithology	Structure	Fracture Log						
240				ANDESITE PORPHYRY cont; fresh; hard to v. hard; strong; aphanitic w/ xenoliths and phenocrysts; gray-green		100/82			Run S1, cont. Return water white at end of run.
242				close ly frac; calcite; tight; sl. rough; 10°-20°, 50°-60°; pcs: 0.1"-1.0"					
244				2427 calcite vein; 1/4" wide; chalky, white					
				243.7-245.8 frac. subparallel to core, healed by calcite and clay			Box 17		Run S2, 244.0-249.0 start day shift 5/26/84
246				244.0-254.0 QUARTZ DIORITE; fresh; hard to v. hard; strong; med. xln; greenish gray; close to mod. close frac;		100/70			
248				calcite; tight to part open; rough; 0°-10°, 45°; pcs. 0.2"-1.5"					
250									Run S3, 249.0-254.0 Drill rate 0.15'/min.
252						26/92	Box 18		
254				T.D. = 254.0 Ft.					Finished hole 0845 5/26/84
256									