

LEGEND

- Portion of borehole exposed during sample collection
- Portion of borehole sealed during sample collection

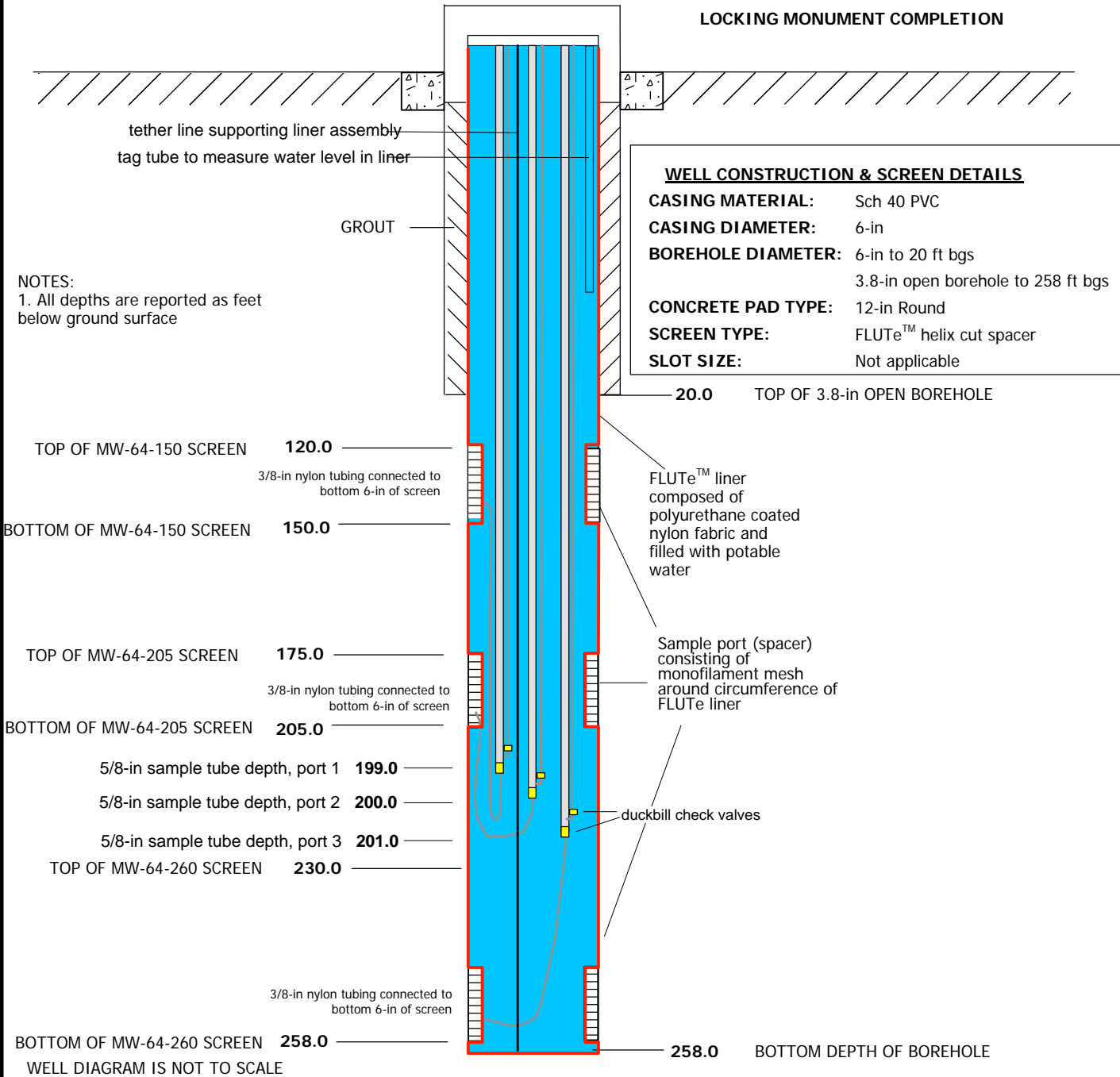
NOTES:

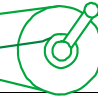
- Scale is approximate.
- All depths presented as feet below ground surface.

MW-64BR Sampling Configurations
 PG&E Topock Compressor Station
 Needles, California

WELL COMPLETION DIAGRAM

PROJECT NO: 382653.FP.04.FW	PROJECT: PG&E Topock - ERGI	WELL NO's: MW-64-150 MW-64-205 MW-64-260
LOCATION: Site C - Alternate		
DRILLING CONTRACTOR: Boart Longyear (D. Roberts)	DRILLING START: 4/6/2009	
DRILLING METHOD: Rotasonic	DRILLING END: 4/8/2009	
LOGGER: A. Brewster (Northstar) and I. Wood	WELL COMPLETION DATE: 7/11/2009	
GROUND SURFACE ELEVATION (NAVD 88): 575.92 ft AMSL	GENERAL REMARKS: 4-inch diameter, 3-port Guelph Water FLUTE™ multi-level system with helical screens installed into open 3.8-inch HQ borehole	
NORTHING (CCS NAD 83 Z 5): 2100520.82		





As-Built Information

Job # 968-3

General:

Job Description: 258' 4"dia. 3 Port Water FLUTE

Customer: CH2M Hill

Location: 155 Grand Ave. Suite 1000 Oakland, CA 94612

Well Designation: MW-64BR

Hole Depth: 258'

Water Table: 120'

Drilling Method: N/A

Casing Information: N/A

Installation Method: Water eversion

Bubbler / Tag: 120'

Liner:

Material: 210d Orange d/c 2 sleeve

Diameter: 4"

Material Above Casing: 3'

Uneverted Material: 4'

Rough Fabrication Legnth: 268'

Termination: End Seal Knot

Knot Diameter Allowance: 2"

Markings on Liner: Ink stamp indicating FLUTE TOC & FLUTE Job# 968-3

Spacer Design: 2 Material helix cut spacer Design (orange mesh) and Mylar

Spacer #	Spacer Bottom [ft]	Spacer Top [ft]
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1	150'	120'
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2	205'	175'
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3	258'	230'
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Tubing & Ports:							
Tubing In Bundle:		NYLON & PVDF					
Tubing In Sleeves:		NYLON & PVDF					
Bubbler Details:		1/4 NYLON					
Port Design:		Superthane feed thru					
Port Locations:		6" @ bottom of spacer					
Vent Design:		1/4 Superthane feed thru w/ 3/8 tygon tubing connected to duct					
Vent Location:		262'					
Pump Assembly:							
Port #:	Transducer Serial #:	Transducer Pressure Rating [psi]:	Diaphragm Depth [ft. btoc]	Cable Serial #:	Cable Length [ft.]	Brass Elbow Depth [ft. btoc]	5/8" Tube Depth [ft. btoc]
1	147349	100	218'	222554	228'	214'	199'
2	147219	100	219'	222555	228'	215'	200'
3	147347	100	220'	222556	228'	216'	201'

Other Info:						
Transducer Type:	Level Troll 500					
Kellum Design:	2" & 1" webbing wrap					
Kellum Locations:	1st kellum @ 18' btoc: others every 40 there after					
Tether:	1/4"					
Marking on Tubing:	Port #'s and color code					
Marking on Cables:	Port #'S					
Bundle Sheating:	Black Diagonal / Taped every 20' intervals					
Marks on Bundle:	E.P. markings @ every 40'					
Pump Tube:	268'					
Reel / Packaging:	SF FLUTE					
Casing Adapter Info:	ABQ FLUTE					
Wellhead Info:	ABQ FLUTE					
Vent Tube:	n/a					
Clamps:	ABQ FLUTE					
Shipped Via:	ABQ FLUTE					
Other Notes:						



PROJECT NUMBER: 382653.FP.04.FW		BORING NUMBER: MW-64	
SHEET 1 OF 14			
ROCK CORE LOG			

PROJECT : PG&E Topock - ERGI	LOCATION : Site C - Alternate (2100520.2 N, 7616939.8 E)
ELEVATION : 576.0 ft	DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)	ORIENTATION : Vertical
WATER LEVELS : Approx. 119 ft BGS	START : 5/3/2009
	END : 5/15/2009
	LOGGER : B. Pelletier (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES			SYMBOLIC LOG	LITHOLOGY	COMMENTS	
		R Q D (%)	FRACTURES PER FOOT	DESCRIPTION				
				DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS				
5					<p>Metadiorite (pTbr) 0-20.0' - dark greenish gray, (6Y 5/4), fine to medium grained, consolidated. Drilling method pulverizes most of the core.</p>	<p>Boring initially drilled to 20.0 ft bgs by Rotosonic tools up to 10-in in diameter. Permanent 6-in PVC conductor casing installed from ground surface to 20 ft bgs (portland cement grout). Boring drilled from 20.0' bgs to total depth of 260.5' bgs using diamond bit rotary core tools (HQ-size, 3.8-in diameter).</p>		
10								
15								
20	20.0							

Total depth of Rotosonic boring is 20.0 ft bgs. Install permanent 6-in conductor casing (portland cement grout). Begin rotary core drilling.



PROJECT NUMBER: 382653.FP.04.FW	BORING NUMBER: MW-64-260	SHEET 2 OF 14
ROCK CORE LOG		

PROJECT : PG&E Topock - ERGI LOCATION : Site C - Alternate (2100520.2 N, 7616939.8 E)
 ELEVATION : 576.0 ft DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
 CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit) ORIENTATION : Vertical
 WATER LEVELS : Approx. 119 ft BGS START : 5/3/2009 END : 5/15/2009 LOGGER : B. Pelletier (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES				SYMBOLIC LOG	LITHOLOGY	COMMENTS		
		R Q D (%)	FRACTURES PER FOOT	DESCRIPTION						
				DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS						
25	R1 5.5 ft 77%	90	2				Metadiorite (pTbr) 20.0-26.6' - dusky yellow green, (5GY 5/2), intermediate (dioritic) mineralogy, fine to medium grained, strong (R4), unweathered, massive to foliated 26.6-35.7' - grayish olive, (10Y 4/2), medium grained, rare serpentine replacement along fractures	General Note: The metadiorite bedrock exhibits many small healed fractures (1-3 mm) of somewhat random orientation. These healed fractures create weaknesses in the rock. It can be difficult to determine if the metadiorite is jointed in-situ, or if the discontinuities are caused by the drilling method. Intervals with fracture per foot counts >10 are likely caused by drilling. R1 = 32.0 min R2 = 18.0 min		
			1							
			>10	22.5' - Joint, >60 deg, iron staining, weathered						
			>5	23.5' - Joint, >60 deg, no staining						
	25.5	R2 1.1 ft 80%	20	>10						
	26.6			>10						
	30	R3 8.9 ft 94%	55	2	27.5' - Joint, 30 deg, 1-2 mm calcite infilling, no staining, relatively straight, tight					
				5						
				8	28.8' - Joint, >60 deg, rough, undulating, calcite infilling, iron staining					
				3						
>10										
2										
2				33' - Joint, > 60 deg, multiple fractures, dark brown staining						
35	R3 8.9 ft 94%	55	2							
			2							
			3	35' - Joint, >60 deg, multiple fractures, some near 90 deg						
			3	36' - Joint, 25 deg, < 2 mm calcite infilling, staining, straight						
40	R3 8.9 ft 94%	55	3							
			3							
			3	37.7' - Multiple joints, undulating, heavy staining						
			5	38.5' - Joint, 35 deg, straight						
			6	39' - Fracture zone, calcite and silica infilling, no staining						



PROJECT NUMBER:
382653.FP.04.FW

BORING NUMBER:
MW-64 SHEET 3 OF 14

ROCK CORE LOG

PROJECT : PG&E Topock - ERGI

LOCATION : Site C - Alternate (2100520.2 N, 7616939.8 E)

ELEVATION : 576.0 ft

DRILLING CONTRACTOR : Boart Longyear (D. Roberts)

CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)

ORIENTATION : Vertical

WATER LEVELS : Approx. 119 ft BGS

START : 5/3/2009

END : 5/15/2009

LOGGER : B. Pelletier (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES				SYMBOLIC LOG	LITHOLOGY	COMMENTS
		R Q D (%)	FRACTURES PER FOOT	DESCRIPTION				
				DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS				
45	R4 10 ft 100%	85	8	40' - Fracture zone, 60 deg and near 90 deg, calcite infilling, rare staining, some chlorite infill?	Metadiorite (pTbr) 40-65.3' - grayish olive, (10Y 4/2), intermediate (dioritic) mineralogy, medium to coarse grained, strong (R4), unweathered, massive to foliated			
			5					
			4					
			7					
			8	44.5' - multiple fractures as above				
	45.5	R5 8 ft 90%	82	6			46.5' - Joint, 60 deg, multiple smaller undulating joints, calcite infill, common iron staining	
				4				
				6				
				>10			48' - Fracture zone, near 90 deg, common fine fractures (< 1 mm), predominately high angle	
				>10			49' - Joint, 60 deg, 1-2 mm calcite infilling	
50	R6 1.8 ft 90%	85	8	50' - Fracture zone, common staining				
			>10	51.0-53.0' - Fracture zone, near 90 deg, undulating, moderate iron staining				
			8	52.0' - moderate foliation, silica and calcite replacement				
			6	53.0-55.0' - microfractures, undulating				
			6					
55	R7 5.7 ft 95%	42	6					
			8					
			>10					
			>10	58' - Fracture zone, strong iron staining, heavy calcite and silica replacement				
			8					
60								



PROJECT NUMBER:
382653.FP.04.FW

BORING NUMBER:
MW-64

SHEET 4 OF 14

ROCK CORE LOG

PROJECT : PG&E Topock - ERGI

LOCATION : Site C - Alternate (2100520.2 N, 7616939.8 E)

ELEVATION : 576.0 ft

DRILLING CONTRACTOR : Boart Longyear (D. Roberts)

CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)

ORIENTATION : Vertical

WATER LEVELS : Approx. 119 ft BGS

START : 5/3/2009

END : 5/15/2009

LOGGER : B. Pelletier (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES		SYMBOLIC LOG	LITHOLOGY	COMMENTS
		RQD (%)	DESCRIPTION			
61.0 65 65.5	R8 4.5 ft 95%	70	6	64' - multiple small (< 1mm) fractures	Metadiorite (pTbr) 60-65.3' - grayish olive, (10Y 4/2), medium to coarse grained, foliated 61' - massive	R7 = 28.0 min
			8			
			8			
			>10			
			8			
			8			
			8			
			8			
70 73.8	R9 8.3 ft 94%	39	66.5' - Joint, >60 deg, undulating, no staining, tight	65.3-105.0' - grayish olive, (10Y 4/2), to light olive, (10Y 5/4), medium grained, strong (R4), unweathered to slightly weathered	R8 = 11.0 min	
			>10			
			>10			
			>10			
			8			
			8			
			8			
			8			
75 75.3	R10 1.5 ft 100%	37	70' - Fracture zone, rough, undulating, no staining, tight	76.0' - slightly weathered 77.0-79.0' - foliated	R9 = 24.0 min R10 = 22.0 min	
			73' - Fracture, 20 deg, smooth, brown staining, tight			
			8			
			>10			
			>10			
			8			
			8			
			8			
80	R11 6.7 ft 93%	30	76' - Fracture zone, rough, undulating, stained			
			77.0-79.0' - Fracture zone, healed with silica			
			8			



PROJECT NUMBER:
382653.FP.04.FW

BORING NUMBER:
MW-64 SHEET 6 OF 14

ROCK CORE LOG

PROJECT : PG&E Topock - ERGI

LOCATION : Site C - Alternate (2100520.2 N, 7616939.8 E)

ELEVATION : 576.0 ft

DRILLING CONTRACTOR : Boart Longyear (D. Roberts)

CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)

ORIENTATION : Vertical

WATER LEVELS : Approx. 119 ft BGS

START : 5/3/2009

END : 5/15/2009

LOGGER : B. Pelletier (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES		SYMBOLIC LOG	LITHOLOGY	COMMENTS
		RQD (%)	DESCRIPTION			
100.3	R16 5 ft 84%	20	>10	102.0-105.3' - Fracture zone, rough, undulating, < 1 mm infilling, heavy staining	Metadiorite (pTbr) 100.0-105.0' - grayish olive, (10Y 4/2), to light olive, (10Y 5/4), intermediate (dioritic) mineralogy, medium grained, strong (R4), unweathered to slightly weathered, massive to foliated	R15 = 21.0 min
			8			
			>10			
			>10			
			>10			
			>10			
105.3	R17 5.7 ft 96%	29	8	105.3-108.0' - Fracture zone, rough, undulating, little to none infilling, staining	105.0-260.0' - grayish olive, (10Y 4/2), intermediate (dioritic) mineralogy, medium to coarse grained, strong (R4), unweathered to slightly weathered, massive to foliated	R16 = 27.0 min
			8			
			8			
			>10			
			>10			
			>10			
110.0	R18 2.5 ft 80%	20	8	111' - Fracture zone, staining		R17 = 15.5 min
			8			
			>10			
			>10			
113.5	R19 1.8 ft 77%	0	>10	113.5' - medium strong (R3)		R18 = 26.0 min
			>10			
115.3	R20 8.2 ft 98%	55	6	115.0-118.0' - Minor fracturing, some infill, mostly tight, weak staining	115.0' - medium to coarse grained, strong (R4)	R19 = 6.0 min
			6			
			8			
			>10			
			>10			
			>10			
120.0			>10	118.0-120.0' - Fractures (3), 80-90 deg, weak staining, tight		
			>10			



PROJECT NUMBER:
382653.FP.04.FW

BORING NUMBER:
MW-64 SHEET 8 OF 14

ROCK CORE LOG

PROJECT : PG&E Topock - ERGI

LOCATION : Site C - Alternate (2100520.2 N, 7616939.8 E)

ELEVATION : 576.0 ft

DRILLING CONTRACTOR : Boart Longyear (D. Roberts)

CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)

ORIENTATION : Vertical

WATER LEVELS : Approx. 119 ft BGS

START : 5/3/2009

END : 5/15/2009

LOGGER : B. Pelletier (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	R Q D (%)	FRACTURES PER FOOT	DISCONTINUITIES	SYMBOLIC LOG	LITHOLOGY	COMMENTS
				DESCRIPTION		ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS	
				DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS			SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.
145	R26 4.2 ft 71%	0	>10			Metadiorite(pTbr) 105.0-260.0' - grayish olive, (10Y 4/2), intermediate (dioritic) mineralogy, medium to coarse grained, strong (R4), unweathered to slightly weathered, massive to foliated 142.0' - coarse grained	R26 = 22.0 min
	142.2		>10	142' - Fracture zone, rough, strong fe/cl staining			
	R27 3.1 ft 97%	56	>10	143' - Fractures (2), 45 deg, smooth, < 2 mm silica infilling, abundant microfractures			
	145.3		>10	145.0-146.0' - Fractures (2), 40 deg, smooth, stepped, silica infilling			
			8	146.5' - Fracture zone, undulating, chlorite infilling, tight			
	R28 7.7 ft 99%	95	6				
			6				
			8				
			8	151' - Fracture, 85 deg, rough, undulating			
			0	152' - Multiple tight fractures			
	153.0		0	153' - Fracture, 60 deg			
	R29 2.3 ft 100%	96	0				
	155.3		1	155' - Fracture, 60 deg, rough, stepped, < 3 mm silica infilling			
			2	156' - Joint, 30 deg, rough, undulating, < 1 mm calcite infilling, iron staining, tight			
			0	156.2' - As above			
		R30 7.4 ft 100%	69	158.0, 158.2, 158.7' - As above			
			3				
			6				
160							



PROJECT NUMBER:
382653.FP.04.FW

BORING NUMBER:
MW-64 SHEET 9 OF 14

ROCK CORE LOG

PROJECT : PG&E Topock - ERGI

LOCATION : Site C - Alternate (2100520.2 N, 7616939.8 E)

ELEVATION : 576.0 ft

DRILLING CONTRACTOR : Boart Longyear (D. Roberts)

CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)

ORIENTATION : Vertical

WATER LEVELS : Approx. 119 ft BGS

START : 5/3/2009

END : 5/15/2009

LOGGER : B. Pelletier (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES			SYMBOLIC LOG	LITHOLOGY		COMMENTS
		R Q D (%)	FRACTURES PER FOOT	DESCRIPTION		ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.	
165	R31 2.6 ft 100%	>10	>10	160' - Highly fractured	Metadiorite(pTbr) 105.0-260.0' - grayish olive, (10Y 4/2), intermediate (dioritic) mineralogy, medium to coarse grained, strong (R4), unweathered to slightly weathered, massive to foliated	R30 = 40.0 min		
		>10	>10	163.8, 164.4, 164.6' - Joint, 30 deg, rough, undulating, < 1 mm calcite infilling, iron staining, moderately tight				
	R32 5.4 ft 100%	65	2	165.1, 165.2, 165.3, 165.4' - Joint, 10, 10, 10, and 30 deg, rough, undulating, < 1 mm calcite infilling, iron staining, tight to moderately tight				
		72	4	166.1, 166.6' - Joint, 30 deg, rough, undulating, no staining, moderately tight				
			2	167.3, 167.5, 167.8' - Joint, 30, 30, and 60 deg, rough, undulating to stepped, iron staining, tight to moderately tight				
			3	168.1, 168.7, 169.6' - Joint, 30, 10, and 30 deg, rough, undulating to stepped, some iron staining, tight				
			2	170' - Fracture zone, < 2 mm calcite infilling, iron staining				
		R33 4.6 ft 100%	61	3			171.0, 171.2, 171.9' - Joint, 10, 30, and 30 deg, rough, undulating to stepped, < 2 mm calcite infilling, iron staining, tight	
	>10		>10	172.5' - Highly fractured, < 5 mm calcite infilling, some iron staining				
	2		174.0, 174.6' - Joint, 10 deg and 30 deg, rough, undulating, some iron staining, tight					
>10	>10		175' - Highly fractured					
175	R34 8 ft 100%	0	174.5' - fine grained, unweathered, foliated	R33 = 18.0 min				
		0	175.0-177.0' - grayish olive green, (5GY 3/2)					
		0	177.0' - dusky yellowish green, (10GY 3/2)					
180		86	2	178.5' - medium to coarse grained, foliated				
				179.2, 179.6' - Joint, 30 deg, rough, undulating, no staining, tight				



PROJECT NUMBER:
382653.FP.04.FW

BORING NUMBER:
MW-64

SHEET 10 OF 14

ROCK CORE LOG

PROJECT : PG&E Topock - ERGI

LOCATION : Site C - Alternate (2100520.2 N, 7616939.8 E)

ELEVATION : 576.0 ft

DRILLING CONTRACTOR : Boart Longyear (D. Roberts)

CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)

ORIENTATION : Vertical

WATER LEVELS : Approx. 119 ft BGS

START : 5/3/2009

END : 5/15/2009

LOGGER : B. Pelletier (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES				SYMBOLIC LOG	LITHOLOGY	COMMENTS
		RQD (%)	FRACTURES PER FOOT	DESCRIPTION	ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS		SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.	
183.3	R35 1.3 ft 100%	100	2	180.1, 180.8' - Joint, 30 deg, rough, undulating, no staining, tight	Metadiorite (pTbr) 105.0-260.0' - dusky yellowish green, (10GY 3/2), intermediate (dioritic) mineralogy, medium to coarse grained, strong (R4), unweathered to slightly weathered, massive to foliated	R34 = 45.0 min R35 = 6.0 min R36 = 8.0 min R37 = 24.0 min		
184.6	R36 2.9 ft 100%	90	1	181.3' - Joint, 30 deg, rough, stepped, no staining, tight				
187.5	R37 7.3 ft 100%	82	3	182.1, 182.4, 182.9, 183.3' - Joint, 30, 30, and 10 deg, rough, undulating to stepped, no staining, tight				
187.5			>10	187' - Fracture zone, < 5 mm calcite infilling, some greenish staining				
188.5	R38 10.2 ft 100%	0	1	185.3' - Joint, 10 deg, smooth, undulating to slickensided, blackish staining, tight				
189.2			1	188.5' - Joint, 60 deg, rough, undulating, < 2 mm calcite infilling, iron staining, tight				
191.5			0	189.2' - Joint, 60 deg, smooth to slickensided, undulating to planar, < 5 mm calcite infilling, iron staining, some blackish staining, tight				
191.5			>10	191.5' - Fracture zone, < 1 mm calcite infilling, some reddish and blackish staining				
192.6	0	0	1	192.6, 193.6' - Joint, 60 deg, rough to smooth, undulating, < 1 mm calcite infilling, some greenish staining, tight				
194.2			>10	194.2' - Highly fractured, greenish staining				
196.0			1	196.5' - Joint, 80 deg, rough, undulating, < 1 mm calcite infilling, some greenish staining, tight				
197.0	0	0	1	197.4' - Joint, 30 deg, rough, stepped, < 2 mm calcite infilling, no staining, moderately tight				
197.0			1	197.0' - greenish staining				
197.0			0					



PROJECT NUMBER:
382653.FP.04.FW

BORING NUMBER:
MW-64 SHEET 11 OF 14

ROCK CORE LOG

PROJECT : PG&E Topock - ERGI LOCATION : Site C - Alternate (2100520.2 N, 7616939.8 E)
 ELEVATION : 576.0 ft DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
 CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit) ORIENTATION : Vertical
 WATER LEVELS : Approx. 119 ft BGS START : 5/3/2009 END : 5/15/2009 LOGGER : B. Pelletier (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES				SYMBOLIC LOG	LITHOLOGY	COMMENTS
		R Q D (%)	FRACTURES PER FOOT	DESCRIPTION	ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS		SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.	
205	205.0	87	0			Metadiorite (pTbr) 200.0-260.0' - dusky yellowish green, (10GY 3/2), intermediate (dioritic) mineralogy, medium to coarse grained, strong (R4), unweathered to slightly weathered, massive to foliated 201.0' - dusky green, (5G 3/2)	R38 = 28.0 min	
			>10	201.3' - Highly fractured, < 5 mm calcite infilling, iron staining				
			0					
			1	203.1' - Joint, 30 deg, rough, undulating, no staining, moderately tight				
			>10	204.2' - Fracture zone, some iron staining				
210			0			205.5' - 12 mm felsic vein, 30 deg to 40 deg dips 207.7' - 50 mm felsic vein, 30 deg to 40 deg dips 208.9' - 8 mm felsic vein, 30 deg to 40 deg dips 211.2' - felsic vein, 70 deg dip 212.0' - dusky yellowish green, (10GY 3/2)	R39 = 32.0 min	
			0					
			0					
			0					
			0					
215	215.0	98	0			213.0-215.0' - Highly fractured, no infill, some greenish staining	R40 = 8.0 min	
			>10					
			0			215.0-218.5' - fine to medium grained 218.5-222.0' - medium to coarse grained, coarse feldspar phenocrysts (12 mm max), no foliation		
			>10					
			0					
			0					
220			1					



PROJECT NUMBER: 382653.FP.04.FW	BORING NUMBER: MW-64
SHEET 12 OF 14	
ROCK CORE LOG	

PROJECT : PG&E Topock - ERGI LOCATION : Site C - Alternate (2100520.2 N, 7616939.8 E)

ELEVATION : 576.0 ft DRILLING CONTRACTOR : Boart Longyear (D. Roberts)

CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit) ORIENTATION : Vertical

WATER LEVELS : Approx. 119 ft BGS START : 5/3/2009 END : 5/15/2009 LOGGER : B. Pelletier (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES				SYMBOLIC LOG	LITHOLOGY	COMMENTS
		R Q D (%)	FRACTURES PER FOOT	DESCRIPTION			ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.
				DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS				
225	R41 10 ft 100%	98	0	219.5' - Joint, 80 deg, smooth, undulating, < 2 mm calcite infilling, iron staining, greenish staining, light blue staining, tight	~	219.5-220.0' - presence of light-blue colored staining on fracture surfaces Metadiorite (pTbr) 220.0-260.0' - dusky yellowish green, (10GY 3/2), intermediate (dioritic) mineralogy, medium to coarse grained, strong (R4), unweathered to slightly weathered, massive to foliated	R41 = 28.0 min	
			0					
			2	222.0, 222.3' - Joint, 60 deg and 30 deg, rough, undulating, < 2 mm calcite infilling, greenish staining, tight				
			>10	223.0, 223.3' - Joint, 60 deg, rough, undulating, < 1 mm calcite infilling, no staining, tight				
			>10	223.5-224.4' - Highly fractured				
230	R42 7.4 ft 100%	82	0			225.0' - dusky green, (5G 3/2), foliated		
			1			225.0-226.0' - bands of felsic minerals, 10 to 60 deg dips, 10 mm max		
			2	226.8, 227.4' - Joint, 80 deg and 60 deg, rough to smooth, undulating, < 1 mm calcite infilling, iron staining, tight				
			2	227.6, 228.1' - Joint, 30 deg, rough, undulating, < 1 mm calcite infilling, no staining, moderately tight				
			0	228.9' - Joint, 40 deg, smooth, undulating, some iron staining, tight		229.0' - fine grained		
			2			230.0' - medium to coarse grained		
			0	230.6, 230.9' - Joint, 30 deg and 60 deg, rough, undulating, < 1 mm talc infilling, no staining, tight to moderately tight		230.6' - felsic vein, 60 deg dip, 25 mm max		
235	R43 2.6 ft 8%	0	>10	232' - Highly fractured, < 2 mm calcite infilling, no staining			R42 = 27.0 min	
			>10	232.4' - Highly fractured				
240	R44 5 ft 40%	18	>10	235' - Highly fractured			R43 = 7.0 min	
			>10					
			>10					
			>10					
			>10					
			>10				R44 = 20.0 min	



PROJECT NUMBER:
382653.FP.04.FW

BORING NUMBER:
MW-64 SHEET 13 OF 14

ROCK CORE LOG

PROJECT : PG&E Topock - ERGI

LOCATION : Site C - Alternate (2100520.2 N, 7616939.8 E)

ELEVATION : 576.0 ft

DRILLING CONTRACTOR : Boart Longyear (D. Roberts)

CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)

ORIENTATION : Vertical

WATER LEVELS : Approx. 119 ft BGS

START : 5/3/2009

END : 5/15/2009

LOGGER : B. Pelletier (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES		SYMBOLIC LOG	LITHOLOGY	COMMENTS		
		R Q D (%)	FRACTURES PER FOOT				DESCRIPTION	
							DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	
242.0	R45 2 ft 100%	30	>10	240' - Highly fractured	<p>Metadiorite (pTbr) 240.0-260.0' - dusky green, (5G 3/2), intermediate (diioritic) mineralogy, medium to coarse grained, strong (R4), unweathered to slightly weathered, massive to foliated</p>	R45 = 5.0 min		
			0					
			245	R46 3 ft 70%			57	>10
1								
0								
248.7	R47 3.7 ft 100%	57	>10	246.4, 246.8' - Joint, 30 deg, rough, undulating to stepped, < 2 mm calcite infilling, no staining, loose		<p>248.0' - quartz based silt infill</p>	R47 = 10.0 min	
			2	247.0-249.0' - Highly fractured				
			>10	247.3-247.6' - Multiple parallel joints, 40 deg, rough to smooth, undulating, < 1 mm calcite infilling, tight				
			>10	248.8' - Joint, 60 deg, rough, undulating, < 5 mm calcite infilling, no staining, moderately tight				
255	R48 6.3 ft 100%	94	0	251.4, 251.7' - Joint, 10 deg and 30 deg, rough, undulating, < 2 mm calcite infilling, no staining, moderately tight	252.8-253.8' - felsic veins, 20 mm max, 10 to 30 deg dips		R48 = 9.0 min	
			0					
			2					
			0					
			0					
260	R49 5.5 ft 100%	100	0					
			0					
			0					
			1	258.0, 259.5, 259.9' - Joint, 30 deg, rough, undulating, no staining, tight				



PROJECT NUMBER: 382653.FP.04.FW	BORING NUMBER: MW-64
SHEET 14 OF 14	
<h2 style="margin: 0;">ROCK CORE LOG</h2>	

PROJECT : PG&E Topock - ERGI LOCATION : Site C - Alternate (2100520.2 N, 7616939.8 E)

ELEVATION : 576.0 ft DRILLING CONTRACTOR : Boart Longyear (D. Roberts)

CORING EQUIPMENT AND METHOD : Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit) ORIENTATION : Vertical

WATER LEVELS : Approx. 119 ft BGS START : 5/3/2009 END : 5/15/2009 LOGGER : B. Pelletier (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES			SYMBOLIC LOG	LITHOLOGY	COMMENTS
		R Q D (%)	FRACTURES PER FOOT	DESCRIPTION		ROCK TYPE, COLOR, MINERALOGY, TEXTURE, HARDNESS, WEATHERING, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.
				DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS			
260.5						R49 = 8.0 min	
265					End Drilling on 5/15/2009 Total Borehole Depth: 260.5 ft bgs		
270							
275							
280							