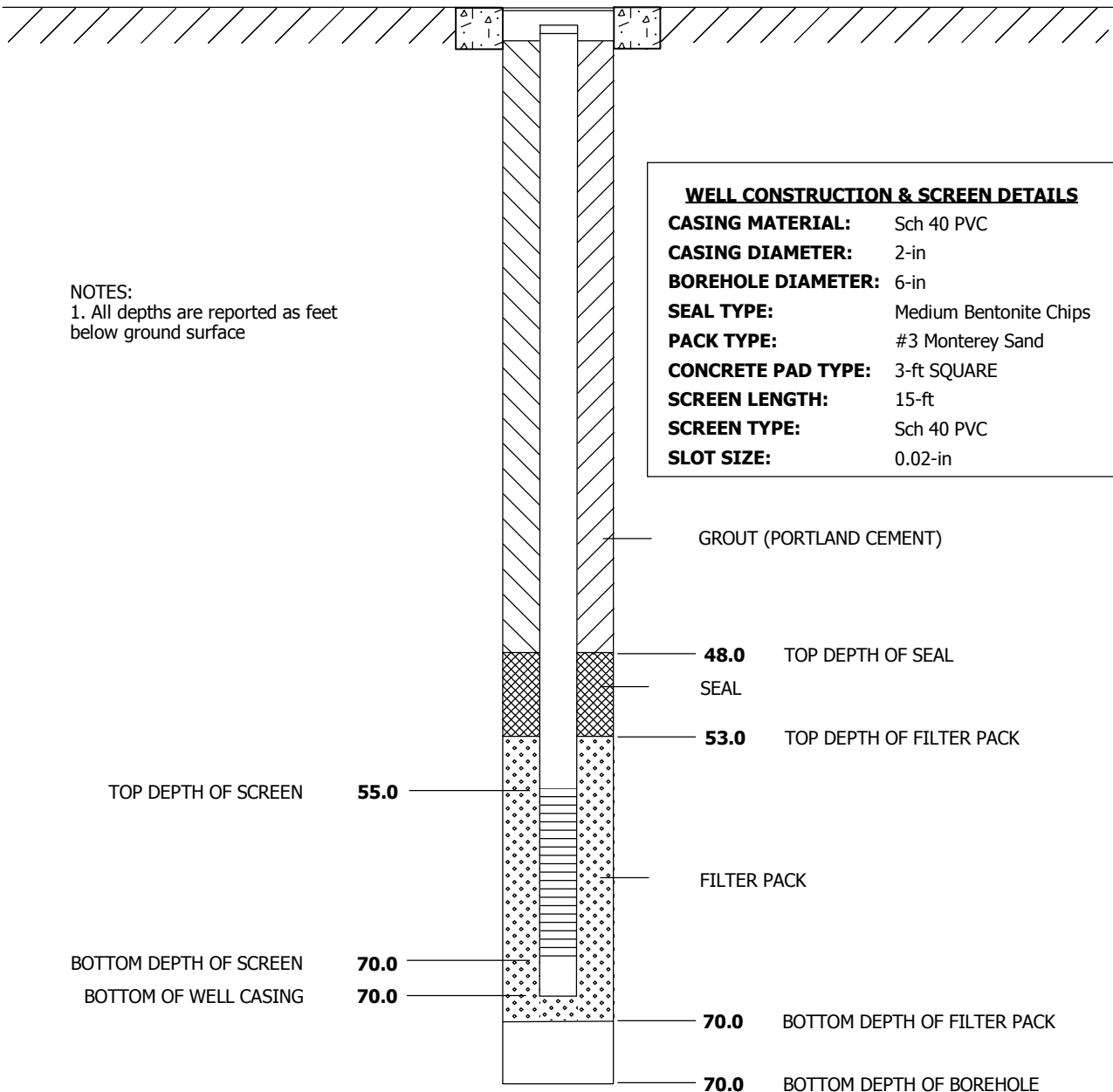


# WELL COMPLETION DIAGRAM

<b>PROJECT NO:</b> 382653.FP.04.FW	<b>PROJECT:</b> PG&E Topock - ERGI	<b>WELL NO:</b> <i>MW-57-070</i>
<b>LOCATION:</b> Site B		
<b>DRILLING CONTRACTOR:</b> Boart Longyear (D. Roberts)	<b>DRILLING START:</b> 1/28/2009	
<b>DRILLING METHOD:</b> Rotosonic	<b>DRILLING END:</b> 1/28/2009	
<b>LOGGER:</b> A. Brewster (Northstar)	<b>WELL COMPLETION DATE:</b> 1/28/2009	
<b>GROUND SURFACE ELEVATION (NAVD 88):</b> 508.97 ft AMSL	<b>GENERAL REMARKS:</b> Alias during field work: MW-57M	
<b>NORTHING (CCS NAD 83 Z 5):</b> 2100893.58	<b>EASTING (CCS NAD 83 Z 5):</b> 7616394.98	

## 12-IN DIAMETER WELL VAULT (FLUSH WITH GRADE)



<b>WELL CONSTRUCTION &amp; SCREEN DETAILS</b>	
<b>CASING MATERIAL:</b>	Sch 40 PVC
<b>CASING DIAMETER:</b>	2-in
<b>BOREHOLE DIAMETER:</b>	6-in
<b>SEAL TYPE:</b>	Medium Bentonite Chips
<b>PACK TYPE:</b>	#3 Monterey Sand
<b>CONCRETE PAD TYPE:</b>	3-ft SQUARE
<b>SCREEN LENGTH:</b>	15-ft
<b>SCREEN TYPE:</b>	Sch 40 PVC
<b>SLOT SIZE:</b>	0.02-in

**NOTES:**  
1. All depths are reported as feet below ground surface

TOP DEPTH OF SCREEN      **55.0**

BOTTOM DEPTH OF SCREEN      **70.0**  
BOTTOM OF WELL CASING      **70.0**

GROUT (PORTLAND CEMENT)

**48.0** TOP DEPTH OF SEAL

SEAL

**53.0** TOP DEPTH OF FILTER PACK

FILTER PACK

**70.0** BOTTOM DEPTH OF FILTER PACK

**70.0** BOTTOM DEPTH OF BOREHOLE

WELL DIAGRAM IS NOT TO SCALE



PROJECT NUMBER: <b>382653.FP.04.FW</b>	BORING NUMBER: <b>MW-57</b>	SHEET 1 OF 11
<b>SOIL BORING LOG</b>		

PROJECT : PG&E Topock - ERGI LOCATION : Site B (2100899.6 N, 7616389.4 E)

ELEVATION : 509.0 ft DRILLING CONTRACTOR : Boart Longyear (D. Roberts)

DRILLING EQUIPMENT AND METHOD : Track-mounted Rig, Rotasonic drill head and tools ORIENTATION : Vertical

WATER LEVELS : Approx. 52 ft BGS START : 1/14/2009 END : 1/20/2009 LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)	RECOVERY (in)	LAB SAMPLE	USCS CODE/LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
					<p><b>Sandy Silt With Gravel (ML)</b> 0.0-3.0' - dark brown, (7.5YR 3/3), dry, loose, 20% gravel, 30% sand, 50% fines, angular gravel, poorly graded, no dominant mineralogy, matrix-supported, max clast size = 10 mm</p>		
3.0 4.0	10:10	<p><b>Silty Gravel (GM)</b> 3.0-46.0' - dark brown, (7.5YR 3/3), dry, loose, 40% gravel, 20% sand, 40% fines, angular gravel, poorly graded, no dominant mineralogy, matrix-supported, max clast size = 100 mm</p>					
8.0 9.0	11:00, 14:00 (FD)	GM					
18.0 19.0	11:10						
20							



PROJECT NUMBER:  
382653.FP.04.FW

BORING NUMBER:  
MW-57

SHEET 2 OF 11

# SOIL BORING LOG

PROJECT : PG&E Topock - ERGI

LOCATION : Site B (2100899.6 N, 7616389.4 E)

ELEVATION : 509.0 ft

DRILLING CONTRACTOR : Boart Longyear (D. Roberts)

DRILLING EQUIPMENT AND METHOD : Track-mounted Rig, Rotosonic drill head and tools

ORIENTATION : Vertical

WATER LEVELS : Approx. 52 ft BGS

START : 1/14/2009

END : 1/20/2009

LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)		USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
INTERVAL (ft)	RECOVERY (in)				
	LAB SAMPLE		SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
	COMPLETE		<p><b>Silty Gravel (GM)</b> 3.0-46.0' - dark brown, (7.5YR 3/3), dry, loose, 40% gravel, 20% sand, 40% fines, angular gravel, poorly graded, no dominant mineralogy, matrix-supported, max clast size = 100 mm</p>		
25					
30		GM			
35					
40					



<b>PROJECT NUMBER:</b> <b>382653.FP.04.FW</b>	<b>BORING NUMBER:</b> <b>MW-57</b>
SHEET 3 OF 11	
<h2 style="margin: 0;">SOIL BORING LOG</h2>	

PROJECT : PG&E Topock - ERGI	LOCATION : Site B (2100899.6 N, 7616389.4 E)
ELEVATION : 509.0 ft	DRILLING CONTRACTOR : Boart Longyear (D. Roberts)
DRILLING EQUIPMENT AND METHOD : Track-mounted Rig, Rotasonic drill head and tools	ORIENTATION : Vertical
WATER LEVELS : Approx. 52 ft BGS	START : 1/14/2009      END : 1/20/2009      LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)			USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS		
	RECOVERY (in)		LAB SAMPLE					SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
	COMPLETE								
45				GM	<b>Silty Gravel (GM)</b> 3.0-46.0' - dark brown, (7.5YR 3/3), dry, loose, 40% gravel, 20% sand, 40% fines, angular gravel, poorly graded, no dominant mineralogy, matrix-supported, max clast size = 100 mm				
50				Tmc	<b>Conglomerate (Tmc)</b> 46.0-145.5' - bedrock is consolidated. Drilling method pulverizes most of the core. Intact portions of core are yellowish red (5YR 4/6), dry, matrix-supported conglomerate with no dominant clast mineralogy				
55									
60									



PROJECT NUMBER:  
**382653.FP.04.FW**

BORING NUMBER:  
**MW-57**

SHEET 4 OF 11

## SOIL BORING LOG

PROJECT : PG&E Topock - ERGI

LOCATION : Site B (2100899.6 N, 7616389.4 E)

ELEVATION : 509.0 ft

DRILLING CONTRACTOR : Boart Longyear (D. Roberts)

DRILLING EQUIPMENT AND METHOD : Track-mounted Rig, Rotosonic drill head and tools


ORIENTATION : Vertical

WATER LEVELS : Approx. 52 ft BGS

START : 1/14/2009

END : 1/20/2009

LOGGER : A. Brewster (Northstar)

DEPTH BELOW EXISTING GRADE (ft)	INTERVAL (ft)			USCS CODE/ LITHOLOGY	SOIL DESCRIPTION	SYMBOLIC LOG	COMMENTS
65	COMPLETE			Tmc	<b>Conglomerate (Tmc)</b> 46.0-145.5' - bedrock is consolidated. Drilling method pulverizes most of the core. Intact portions of core are yellowish red (5YR 4/6), dry, matrix-supported conglomerate with no dominant clast mineralogy		Boring by Rotosonic completed 1/14/09. Install permanent 5-in diameter PVC conductor casing (portland cement grout). Begin rotary core drilling at 70.0' bgs.
70	70.0				Begin rock coring from 70.0 ft bgs See the next page for the rock core log.		
75							
80							



PROJECT NUMBER:  
382653.FP.04.FW

BORING NUMBER:  
MW-57

SHEET 5 OF 11

# ROCK CORE LOG

PROJECT : PG&E Topock - ERGI

LOCATION : Site B (2100899.6 N, 7616389.4 E)

ELEVATION : 509.0 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. 52 ft BGS

START : 1/14/2009

END : 1/20/2009

LOGGER : A. Brewster (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
70.0	R1 5.3 ft 0%	0	NR		<b>No Recovery</b> 70-75.3'		
75 75.3						R1 = 23.0 min	
80	R2 9.5 ft 103%	100	0		<b>Conglomerate (Tmc)</b> 75.3-145.5' - light brown, (5YR 5/6), no dominant clast mineralogy, fine to coarse grained, medium strong (R3), unweathered, matrix-supported, massive		
85 84.8			0			Added Approx. 50 gallons of water	
90	R3 10 ft 100%	100	0				









<b>PROJECT NUMBER:</b> <b>382653.FP.04.FW</b>	<b>BORING NUMBER:</b> <b>MW-57</b>	<b>SHEET 8 OF 11</b>
<b>ROCK CORE LOG</b>		

PROJECT : PG&E Topock - ERGI      LOCATION : Site B (2100899.6 N, 7616389.4 E)

ELEVATION : 509.0 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. 52 ft BGS      START : 1/14/2009      END : 1/20/2009      LOGGER : A. Brewster (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
135	134.7	100	0		<b>Conglomerate (Tmc)</b> 75.3-145.5' - light brown, (5YR 5/6), no dominant clast mineralogy, fine to coarse grained, medium strong (R3), unweathered, matrix-supported, massive	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD DROPS, TEST RESULTS, ETC.  R7 = 15.0 min	
			0				
			0				
			1	133' - Joint, 35 deg, rough, planar, < 1 mm calcite infilling, reddish staining, tight (likely caused by drilling)			
			0				
			1	135' - Joint, 60 deg, rough, undulating, < 2 mm calcite infilling, reddish staining, tight			
			0				
			1	137.1' - Joint, 35 deg, rough, undulating, reddish staining, minor yellow staining, tight			
			0				
			0				
140	R8 10.1 ft 100%	100	0		145.5-153.1' - moderate reddish orange, (10R 6/6), no dominant clast mineralogy, fine to coarse grained, medium strong (R3), completely weathered, matrix-supported, foliated	Conglomerate from 144.5-153.1 is altered. The matrix of the rock rapidly dissolves on contact with water as evident from the outer portion of the recovered core exposed to drilling fluids and fragments of core intentionally submersed in water.	
			1	141' - Joint, 80 deg, rough, undulating, reddish staining, tight (likely caused by drilling)			
			0				
			0				
			1	144' - Joint, 45 deg, rough, stepped, reddish staining, tightness uncertain			
			0				
			0				
			0				
145	144.8	98	0		146.8-152.6' - Multiple fractures caused by drilling. Preferential cleavage 25 to 35 deg, undulating, slickensided, no infill, reddish staining		
			0				
			0				
			0				
150	R9 10.1 ft 99%	98	0				
			0				



PROJECT NUMBER:  
382653.FP.04.FW

BORING NUMBER:  
MW-57

SHEET 9 OF 11

# ROCK CORE LOG

PROJECT : PG&E Topock - ERGI

LOCATION : Site B (2100899.6 N, 7616389.4 E)

ELEVATION : 509.0 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. 52 ft BGS

START : 1/14/2009

END : 1/20/2009

LOGGER : A. Brewster (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
155	154.9		0		<b>Conglomerate (Tmc)</b> 145.5-153.1' - moderate reddish orange, (10R 6/6), no dominant clast mineralogy, fine to coarse grained, medium strong (R3), completely weathered, matrix-supported, foliated		
			0				
			0				
			0				
			0		<b>Metaconglomerate (Tmc)</b> 153.1-154.6' - dark yellowish orange, (10YR 6/6), strong (R4), unweathered, massive, moderate HCl reaction, conglomerate matrix has been largely replaced with minerals that have a moderate reaction with HCl, however relict conglomerate structure is apparent.	R9 = 17.5 min	
			>10		<b>Altered Metadiorite (pTbr)</b> 154.6-155.6' - moderate yellowish brown, (10YR 5/4), largely felsic mineralogy, medium grained, strong (R4), unweathered, no HCL reaction, portions of this interval exhibit mylonitic texture		
	R10 4.8 ft 100%	58	0				
			0				
			1		158.2' - Joint, 60 deg dip along multiple planes, rough, undulating, < 1 mm calcite infilling covering 50% of one plane, yellowish staining, tightness uncertain		
160	159.7		0				
			0				
			>10		160.9-164.2' - Fracture zone, reddish staining, yellow staining from 162.3-164.2'		
	R11 4.7 ft 100%	51	>10				
			>10				
			>10				
165	164.4		0			R11 = 13.3 min	
			0				
			0				
			1		166.1' - Mechanical break, near 90 deg, calcite infilling, calcite healed fracture, most likely induced by drilling		
	R12 4.6 ft 100%	53	0		166.8-167.0' - slightly weathered		
			0				
			0				
			0				
170	169.0		0			R12 = 19.3 min	
			0				

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.  
R10 = 23.0 min



PROJECT NUMBER:  
**382653.FP.04.FW**

BORING NUMBER:  
**MW-57**

SHEET 10 OF 11

# ROCK CORE LOG

PROJECT : PG&E Topock - ERGI

LOCATION : Site B (2100899.6 N, 7616389.4 E)

ELEVATION : 509.0 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. 52 ft BGS

START : 1/14/2009

END : 1/20/2009


LOGGER : A. Brewster (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	
175	R13 4.8 ft 100%	69	0	Metadiorite (pTbr) 155.6-191.9' - dusky yellowish green, (10GY 3/2), intermediate (dioritic) mineralogy, fine to medium grained, strong (R4), unweathered, massive to foliated	Last 1.5' = 2-3x faster drill rate			
			0					
			>10			172.2-173.8' - Fracture zone, reddish staining		
	R14 173.8-174.3 0.5 ft 100%		>10				R13 = 25.3 min	
			0				R14 = 7.5 min	
	R15 3.4 ft 100%	71	1			174.4' - Joint, 30 deg, smooth, undulating, < 1 mm calcite infilling, reddish staining, tight	@ 175' bgs: drill rate increases	
			0			175.2' - Mechanical break, 35 deg, < 2 mm calcite infilling, along calcite healed fracture		
			1			176.6' - Joint, 60 deg, rough, undulating, reddish staining, tight		
			1			177.3' - Joint, 30 deg, rough, undulating, < 1 mm calcite infilling, reddish staining, tight	R15 = 17.0 min	
			0					
	180	R16 4.2 ft 100%	100			1	179.1' - Joint, 20 deg, rough, undulating, < 1 mm calcite infilling, reddish staining, tight	
						1	180' - Joint, 30 deg, rough, undulating, minor reddish staining, tight	
			1	181.2' - Joint, 25 deg, rough, undulating, < 1 mm calcite infilling, reddish and black staining, tight	R16 = 15.5 min			
			1	182.1, 189.6' - Joint (2), 10 deg, smooth, undulating, < 1 mm clay infilling, reddish staining, tight, clay infilling is dark-reddish brown				
185			0					
			0					
			0					
			0					
			1					
190	R17 10 ft 100%	92	0	185.8 - 186.0' - Multiple breaks, likely induced by drilling				
			0					



<b>PROJECT NUMBER:</b> 382653.FP.04.FW	<b>BORING NUMBER:</b> MW-57	<b>SHEET 11 OF 11</b>
<b>ROCK CORE LOG</b>		

<b>PROJECT :</b> PG&E Topock - ERGI	<b>LOCATION :</b> Site B (2100899.6 N, 7616389.4 E)
<b>ELEVATION :</b> 509.0 ft	<b>DRILLING CONTRACTOR :</b> Boart Longyear (D. Roberts)
<b>CORING EQUIPMENT AND METHOD :</b> Track-mounted Rig, LF-70 Drill Head and HQ-sized tools (diamond bit)	<b>ORIENTATION :</b> Vertical
<b>WATER LEVELS :</b> Approx. 52 ft BGS	<b>START :</b> 1/14/2009 <b>END :</b> 1/20/2009 <b>LOGGER :</b> A. Brewster (Northstar)

DEPTH AND ELEVATION BELOW SURFACE (ft)	CORE RUN LENGTH AND RECOVERY (%)	DISCONTINUITIES		SYMBOLIC LOG	LITHOLOGY	COMMENTS
		R Q D (%)	FRACTURES PER FOOT			
				DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS		
191.9			0		<b>Metadiorite (pTbr)</b> 155.6-191.9' - dusky yellowish green, (10GY 3/2), intermediate (dioritic) mineralogy, fine to medium grained, strong (R4), unweathered, massive to foliated	R17 = 35.5 min
195						
200						
205						
210						
End Drilling on 1/20/2009 Total Borehole Depth: 191.9 ft bgs						