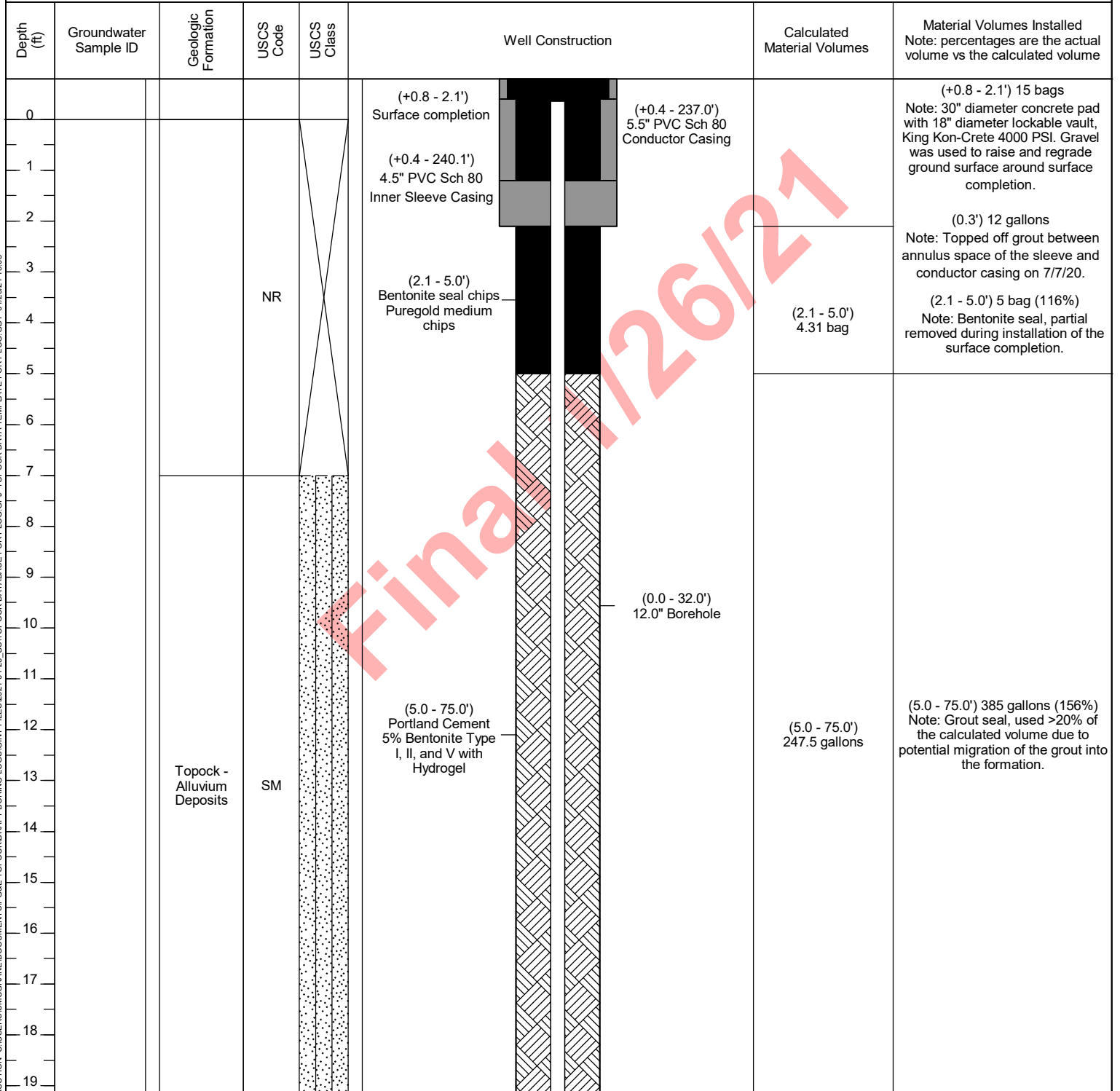


Well Construction Log

Sheet: 1 of 15

Date Started: 11/14/2019	Surface Elevation: 538.53 ft amsl	Well ID: MW-70BR-287
Date Completed: 07/07/2020	Shallow Well Elevation: NA ft amsl	
Drilling Co.: Cascade	Deep Well Elevation: 538.28 ft amsl	Client: PG&E
Drilling Method: Sonic Drilling	Northing (NAD83): 2100512.18	Project: Final GW Remedy Phase 1
Driller Name: E. Ramos / J. Hernandez	Easting (NAD83): 7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst: FS / JC / JS	Borehole Diameter: 3.8-12 inches	
Logger: GW / RC / SM	Static Water Level: See Log for Depths	Project Number: RC000753.0051
Editor: Sean McGrane	Development End Date: 7/24/2020	
Total Depth: 287 ft bgs	Well Completion: <input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	



Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Well Construction Log


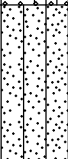



Sheet: 2 of 15

Date Started:	11/14/2019	Surface Elevation:	538.53 ft amsl	Well ID: MW-70BR-287
Date Completed:	07/07/2020	Shallow Well Elevation:	NA ft amsl	
Drilling Co.:	Cascade	Deep Well Elevation:	538.28 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2100512.18	Project: Final GW Remedy Phase 1
Driller Name:	E. Ramos / J. Hernandez	Easting (NAD83):	7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst:	FS / JC / JS	Borehole Diameter:	3.8-12 inches	
Logger:	GW / RC / SM	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	7/24/2020	
Total Depth:	287 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction		Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
20		Topock - Alluvium Deposits	SM		(+0.4 - 240.1') 4.5" PVC Sch 80 Inner Sleeve Casing	(+0.4 - 237.0') 5.5" PVC Sch 80 Conductor Casing		
21								
22								
23								
24		Topock - Alluvium Deposits	SM					
25								
26						(0.0 - 32.0') 12.0" Borehole		
27								
28		Topock - Alluvium Deposits	SM					
29					(5.0 - 75.0') Portland Cement 5% Bentonite Type I, II, and V with Hydrogel			
30								
31								
32		Topock - Alluvium Deposits	SM					
33								
34								
35					(34.5 - 35.5') Centralizer			
36		Topock - Alluvium Deposits	SM					
37								
38								
39						(32.0 - 237.0') 10.0" Borehole		
		Topock - Alluvium Deposits	SW-SM					

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Date Started: 11/14/2019	Surface Elevation: 538.53 ft amsl	Well ID: MW-70BR-287
Date Completed: 07/07/2020	Shallow Well Elevation: NA ft amsl	
Drilling Co.: Cascade	Deep Well Elevation: 538.28 ft amsl	Client: PG&E
Drilling Method: Sonic Drilling	Northing (NAD83): 2100512.18	Project: Final GW Remedy Phase 1
Driller Name: E. Ramos / J. Hernandez	Easting (NAD83): 7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst: FS / JC / JS	Borehole Diameter: 3.8-12 inches	
Logger: GW / RC / SM	Static Water Level: See Log for Depths	Project Number: RC000753.0051
Editor: Sean McGrane	Development End Date: 7/24/2020	
Total Depth: 287 ft bgs	Well Completion: <input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction		Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
40		Topock - Alluvium Deposits	SW-SM		(+0.4 - 240.1') 4.5" PVC Sch 80 Inner Sleeve Casing	(+0.4 - 237.0') 5.5" PVC Sch 80 Conductor Casing		
41								
42								
43								
44								
45		Topock - Alluvium Deposits	SM		(5.0 - 75.0') Portland Cement 5% Bentonite Type I, II, and V with Hydrogel	(32.0 - 237.0') 10.0" Borehole		
46								
47								
48								
49								
50	Topock - Alluvium Deposits	SC						
51								
52	Topock - Alluvium Deposits	SM						
53								
54	Topock - Alluvium Deposits	SM						
55								
56	Topock - Alluvium Deposits	SM						
57								
58								
59								

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Date Started: 11/14/2019	Surface Elevation: 538.53 ft amsl	Well ID: MW-70BR-287
Date Completed: 07/07/2020	Shallow Well Elevation: NA ft amsl	
Drilling Co.: Cascade	Deep Well Elevation: 538.28 ft amsl	Client: PG&E
Drilling Method: Sonic Drilling	Northing (NAD83): 2100512.18	Project: Final GW Remedy Phase 1
Driller Name: E. Ramos / J. Hernandez	Easting (NAD83): 7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst: FS / JC / JS	Borehole Diameter: 3.8-12 inches	
Logger: GW / RC / SM	Static Water Level: See Log for Depths	Project Number: RC000753.0051
Editor: Sean McGrane	Development End Date: 7/24/2020	
Total Depth: 287 ft bgs	Well Completion: <input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
60		Topock - Alluvium Deposits	SM		(+0.4 - 240.1') 4.5" PVC Sch 80 Inner Sleeve Casing		
61		Topock - Alluvium Deposits	GM				
62		Topock - Alluvium Deposits	SW-SC				
63							
64		Topock - Alluvium Deposits	SW-SM				
65							
66							
67					(5.0 - 75.0') Portland Cement 5% Bentonite Type I, II, and V with Hydrogel	(5.0 - 75.0') 247.5 gallons	(5.0 - 75.0') 385 gallons (156%) Note: Grout seal, used >20% of the calculated volume due to potential migration of the grout into the formation.
68							
69		Topock - Bedrock - Metadiorite					
70							
71							
72							
73							
74							
75			NR				
76							
77					(75.0 - 114.0') Bentonite seal chips Puregold medium chips	(75.0 - 114.0') 20.6 bags	(75.0 - 114.0') 25.5 bags (124%) Note: Bentonite seal across screen intervals of existing wells. Used >20% of the calculated volume due to potential voids forming during drilling.
78		Topock - Bedrock - Metadiorite					
79							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Well Construction Log









Sheet: 5 of 15

Date Started:	11/14/2019	Surface Elevation:	538.53 ft amsl	Well ID: MW-70BR-287
Date Completed:	07/07/2020	Shallow Well Elevation:	NA ft amsl	
Drilling Co.:	Cascade	Deep Well Elevation:	538.28 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2100512.18	Project: Final GW Remedy Phase 1
Driller Name:	E. Ramos / J. Hernandez	Easting (NAD83):	7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst:	FS / JC / JS	Borehole Diameter:	3.8-12 inches	
Logger:	GW / RC / SM	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	7/24/2020	
Total Depth:	287 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
80		Topock - Bedrock - Metadiorite			(+0.4 - 240.1') 4.5" PVC Sch 80 Inner Sleeve Casing		
81							
82							
83			NR				
84							
85		Topock - Bedrock - Metadiorite			(84.5 - 85.5') Centralizer		
86							
87							
88			NR				
89					(75.0 - 114.0') Bentonite seal chips Puregold medium chips		
90							
91							
92							
93		Topock - Bedrock - Metadiorite					
94							
95							
96							
97							
98							
99							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Date Started: 11/14/2019	Surface Elevation: 538.53 ft amsl	Well ID: MW-70BR-287
Date Completed: 07/07/2020	Shallow Well Elevation: NA ft amsl	
Drilling Co.: Cascade	Deep Well Elevation: 538.28 ft amsl	Client: PG&E
Drilling Method: Sonic Drilling	Northing (NAD83): 2100512.18	Project: Final GW Remedy Phase 1
Driller Name: E. Ramos / J. Hernandez	Easting (NAD83): 7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst: FS / JC / JS	Borehole Diameter: 3.8-12 inches	
Logger: GW / RC / SM	Static Water Level: See Log for Depths	Project Number: RC000753.0051
Editor: Sean McGrane	Development End Date: 7/24/2020	
Total Depth: 287 ft bgs	Well Completion: <input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction		Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
100		Topock - Bedrock - Metadiorite	NR		(+0.4 - 240.1') 4.5" PVC Sch 80 Inner Sleeve Casing		(+0.4 - 237.0') 5.5" PVC Sch 80 Conductor Casing	(75.0 - 114.0') 20.6 bags (75.0 - 114.0') 25.5 bags (124%) Note: Bentonite seal across screen intervals of existing wells. Used >20% of the calculated volume due to potential voids forming during drilling.
101								
102								
103								
104								
105		Topock - Bedrock - Metadiorite	NR		(75.0 - 114.0') Bentonite seal chips Puregold medium chips		(75.0 - 114.0') 20.6 bags	(75.0 - 114.0') 25.5 bags (124%) Note: Bentonite seal across screen intervals of existing wells. Used >20% of the calculated volume due to potential voids forming during drilling.
106								
107								
108								
109								
110		Topock - Bedrock - Metadiorite	NR		(32.0 - 237.0') 10.0" Borehole			(114.0 - 235.0') 94 buckets (89%) Note: Bentonite seal across screen intervals of existing wells.
111								
112								
113								
114								
115		Topock - Bedrock - Metadiorite	NR		(114.0 - 235.0') Bentonite seal pellets Pel-Plug (TR30) 3/8"		(114.0 - 235.0') 105.54 buckets	(114.0 - 235.0') 94 buckets (89%) Note: Bentonite seal across screen intervals of existing wells.
116								
117								
118								
119								

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Well Construction Log

Sheet: 7 of 15

Date Started:	11/14/2019	Surface Elevation:	538.53 ft amsl	Well ID: MW-70BR-287
Date Completed:	07/07/2020	Shallow Well Elevation:	NA ft amsl	
Drilling Co.:	Cascade	Deep Well Elevation:	538.28 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2100512.18	Project: Final GW Remedy Phase 1
Driller Name:	E. Ramos / J. Hernandez	Easting (NAD83):	7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst:	FS / JC / JS	Borehole Diameter:	3.8-12 inches	
Logger:	GW / RC / SM	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	7/24/2020	
Total Depth:	287 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
120					(+0.4 - 240.1') 4.5" PVC Sch 80 Inner Sleeve Casing		
121							
122							
123		Topock - Bedrock - Metadiorite					
124							
125							
126							
127							
128							
129		Topock - Bedrock - Metadiorite			(114.0 - 235.0') Bentonite seal pellets Pel-Plug (TR30) 3/8"		
130						(114.0 - 235.0') 105.54 buckets	(114.0 - 235.0') 94 buckets (89%) Note: Bentonite seal across screen intervals of existing wells.
131							
132							
133							
134		Topock - Bedrock - Metadiorite					
135					(134.5 - 135.5') Centralizer		
136							
137							
138							
139							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Well Construction Log

Sheet: 8 of 15

Date Started:	11/14/2019	Surface Elevation:	538.53 ft amsl	Well ID: MW-70BR-287
Date Completed:	07/07/2020	Shallow Well Elevation:	NA ft amsl	
Drilling Co.:	Cascade	Deep Well Elevation:	538.28 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2100512.18	Project: Final GW Remedy Phase 1
Driller Name:	E. Ramos / J. Hernandez	Easting (NAD83):	7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst:	FS / JC / JS	Borehole Diameter:	3.8-12 inches	
Logger:	GW / RC / SM	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	7/24/2020	
Total Depth:	287 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
140					(+0.4 - 240.1') 4.5" PVC Sch 80 Inner Sleeve Casing		
141							
142		Topock - Bedrock - Metadiorite					
143							
144							
145							
146							
147			NR				
148							
149					(114.0 - 235.0') Bentonite seal pellets Pel-Plug (TR30) 3/8"		
150		Topock - Bedrock - Metadiorite					
151							
152							
153							
154							
155							
156							
157							
158		Topock - Bedrock - Metadiorite					
159							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Well Construction Log

Sheet: 9 of 15

Date Started:	11/14/2019	Surface Elevation:	538.53 ft amsl	Well ID: MW-70BR-287
Date Completed:	07/07/2020	Shallow Well Elevation:	NA ft amsl	
Drilling Co.:	Cascade	Deep Well Elevation:	538.28 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2100512.18	Project: Final GW Remedy Phase 1
Driller Name:	E. Ramos / J. Hernandez	Easting (NAD83):	7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst:	FS / JC / JS	Borehole Diameter:	3.8-12 inches	
Logger:	GW / RC / SM	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	7/24/2020	
Total Depth:	287 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
160					(+0.4 - 240.1') 4.5" PVC Sch 80 Inner Sleeve Casing		
161							
162		Topock - Bedrock - Metadiorite					
163							
164							
165							
166							
167							
168							
169					(114.0 - 235.0') Bentonite seal pellets Pel-Plug (TR30) 3/8"		
170							
171		Topock - Bedrock - Metadiorite					
172							
173							
174							
175							
176			NR				
177							
178		Topock - Bedrock - Metadiorite					
179							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Date Started: 11/14/2019	Surface Elevation: 538.53 ft amsl	Well ID: MW-70BR-287
Date Completed: 07/07/2020	Shallow Well Elevation: NA ft amsl	
Drilling Co.: Cascade	Deep Well Elevation: 538.28 ft amsl	Client: PG&E
Drilling Method: Sonic Drilling	Northing (NAD83): 2100512.18	Project: Final GW Remedy Phase 1
Driller Name: E. Ramos / J. Hernandez	Easting (NAD83): 7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst: FS / JC / JS	Borehole Diameter: 3.8-12 inches	
Logger: GW / RC / SM	Static Water Level: See Log for Depths	Project Number: RC000753.0051
Editor: Sean McGrane	Development End Date: 7/24/2020	
Total Depth: 287 ft bgs	Well Completion: <input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
180					(+0.4 - 240.1') 4.5" PVC Sch 80 Inner Sleeve Casing		
181							
182							
183		Topock - Bedrock - Metadiorite					
184							
185					(184.5 - 185.5') Centralizer		
186							
187							
188							
189		Topock - Bedrock - Metadiorite			(114.0 - 235.0') Bentonite seal pellets Pel-Plug (TR30) 3/8"		
190						(32.0 - 237.0') 10.0" Borehole	(114.0 - 235.0') 105.54 buckets
191							(114.0 - 235.0') 94 buckets (89%) Note: Bentonite seal across screen intervals of existing wells.
192							
193							
194							
195			NR				
196							
197							
198		Topock - Bedrock - Metadiorite					
199							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Well Construction Log

Date Started:	11/14/2019	Surface Elevation:	538.53 ft amsl	Well ID: MW-70BR-287
Date Completed:	07/07/2020	Shallow Well Elevation:	NA ft amsl	
Drilling Co.:	Cascade	Deep Well Elevation:	538.28 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2100512.18	Project: Final GW Remedy Phase 1
Driller Name:	E. Ramos / J. Hernandez	Easting (NAD83):	7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst:	FS / JC / JS	Borehole Diameter:	3.8-12 inches	
Logger:	GW / RC / SM	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	7/24/2020	
Total Depth:	287 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
200					(+0.4 - 240.1') 4.5" PVC Sch 80 Inner Sleeve Casing		
201							
202		Topock - Bedrock - Metadiorite					
203							
204							
205							
206							
207							
208							
209					(114.0 - 235.0') Bentonite seal pellets Pel-Plug (TR30) 3/8"		
210							
211		Topock - Bedrock - Metadiorite					
212							
213							
214							
215							
216							
217			NR				
218		Topock - Bedrock - Metadiorite					
219							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287



Date Started: 11/14/2019	Surface Elevation: 538.53 ft amsl	Well ID: MW-70BR-287
Date Completed: 07/07/2020	Shallow Well Elevation: NA ft amsl	
Drilling Co.: Cascade	Deep Well Elevation: 538.28 ft amsl	Client: PG&E
Drilling Method: Sonic Drilling	Northing (NAD83): 2100512.18	Project: Final GW Remedy Phase 1
Driller Name: E. Ramos / J. Hernandez	Easting (NAD83): 7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst: FS / JC / JS	Borehole Diameter: 3.8-12 inches	
Logger: GW / RC / SM	Static Water Level: See Log for Depths	Project Number: RC000753.0051
Editor: Sean McGrane	Development End Date: 7/24/2020	
Total Depth: 287 ft bgs	Well Completion: <input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction		Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
220		Topock - Bedrock - Metadiorite			(+0.4 - 240.1') 4.5" PVC Sch 80 Inner Sleeve Casing	(+0.4 - 237.0') 5.5" PVC Sch 80 Conductor Casing		
221								
222								
223								
224								
225		Topock - Bedrock - Metadiorite						
226								
227					(114.0 - 235.0') Bentonite seal pellets Pel-Plug (TR30) 3/8"		(114.0 - 235.0') 105.54 buckets	(114.0 - 235.0') 94 buckets (89%) Note: Bentonite seal across screen intervals of existing wells.
228						(32.0 - 237.0') 10.0" Borehole		
229								
230		Topock - Bedrock - Metadiorite						
231								
232								
233					(232.0 - 233.0') Centralizer			
234								
235		Topock - Bedrock - Metadiorite			(234.0 - 235.0') Shale Trap			
236								
237					(236.0 - 237.0') Shale Trap			
238					(235.0 - 240.1') Portland Cement 5% Bentonite Type I, II, and V with Hydrogel	(237.0 - 238.0') 4.62" Borehole	(235.0 - 240.1') 60 gallons	(235.0 - 240.1') 60 gallons (100%) Note: The 60 gallons of grout was installed in the 4" inch PVC sleeve. The grout was then pressurized to push the grout out into the formation and annulus space between the sleeve and conductor casing through holes at the bottom.
239			Topock - Bedrock - Metadiorite				(238.0 - 238.5') 4.62" Borehole	
							(238.5 - 240.1') 4.62" Borehole	

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Well Construction Log

Date Started:	11/14/2019	Surface Elevation:	538.53 ft amsl	Well ID: MW-70BR-287
Date Completed:	07/07/2020	Shallow Well Elevation:	NA ft amsl	
Drilling Co.:	Cascade	Deep Well Elevation:	538.28 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2100512.18	Project: Final GW Remedy Phase 1
Driller Name:	E. Ramos / J. Hernandez	Easting (NAD83):	7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst:	FS / JC / JS	Borehole Diameter:	3.8-12 inches	
Logger:	GW / RC / SM	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	7/24/2020	
Total Depth:	287 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
240		Topock - Bedrock - Metadiorite	NR		(238.5 - 240.1') 4.62" Borehole	(235.0 - 240.1') 60 gallons	
241					(240.1 - 258.0') 4.62" Open Borehole		
242							
243							
244							
245		Topock - Bedrock - Metadiorite			(240.1 - 287.0') Metadiorite bedrock		
246							
247							
248							
249							
250							
251							
252							
253							
254							
255							
256							
257							
258							
259							
					(258.0 - 287.0') 3.8" Open Borehole		

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Well Construction Log

Sheet: 14 of 15

Date Started:	11/14/2019	Surface Elevation:	538.53 ft amsl	Well ID: MW-70BR-287
Date Completed:	07/07/2020	Shallow Well Elevation:	NA ft amsl	
Drilling Co.:	Cascade	Deep Well Elevation:	538.28 ft amsl	Client: PG&E
Drilling Method:	Sonic Drilling	Northing (NAD83):	2100512.18	Project: Final GW Remedy Phase 1
Driller Name:	E. Ramos / J. Hernandez	Easting (NAD83):	7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst:	FS / JC / JS	Borehole Diameter:	3.8-12 inches	
Logger:	GW / RC / SM	Static Water Level:	See Log for Depths	Project Number: RC000753.0051
Editor:	Sean McGrane	Development End Date:	7/24/2020	
Total Depth:	287 ft bgs	Well Completion:	<input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
260							
261							
262							
263							
264							
265							
266							
267							
268							
269		Topock - Bedrock - Metadiorite			(240.1 - 287.0') Metadiorite bedrock		
270							
271							
272							
273							
274							
275							
276							
277							
278							
279							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Date Started: 11/14/2019	Surface Elevation: 538.53 ft amsl	Well ID: MW-70BR-287
Date Completed: 07/07/2020	Shallow Well Elevation: NA ft amsl	
Drilling Co.: Cascade	Deep Well Elevation: 538.28 ft amsl	Client: PG&E
Drilling Method: Sonic Drilling	Northing (NAD83): 2100512.18	Project: Final GW Remedy Phase 1
Driller Name: E. Ramos / J. Hernandez	Easting (NAD83): 7615832.54	Location: PG&E Topock, Needles, California
Drilling Asst: FS / JC / JS	Borehole Diameter: 3.8-12 inches	
Logger: GW / RC / SM	Static Water Level: See Log for Depths	Project Number: RC000753.0051
Editor: Sean McGrane	Development End Date: 7/24/2020	
Total Depth: 287 ft bgs	Well Completion: <input checked="" type="checkbox"/> Flush <input type="checkbox"/> Stick-up <input type="checkbox"/> To Be Completed in Well Vault	

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
280							
281							
282							
283		Topock - Bedrock - Metadiorite			(240.1 - 287.0') Metadiorite bedrock		
284							
285							
286							
287							
288							
289							
290							
291							
292							
293							
294							
295							
296							
297							
298							
299							

Tagged Total Depth After
Clean Out 287 ft.bgs

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during before the specific capacity test; installed in MW-70BR-287

Rock Coring Log

Sheet: 1 of 20

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS / JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
1								(0.0 - 7.0') Topock - Alluvium Deposits; No recovery (NR)	(0.0 - 7.0') Very soft drilling with 9" core barrel. Very loose material fell out of core barrel once brought up to the drill deck for sample retrieval.	(0.0 - 27.0') No water used
2										
3										
4	0.0 in. 0.0%				Topock - Alluvium Deposits	NR			(0.0 - 190.0') Rough drilling advancing 10" casing	
5										
6										
7										
8								(7.0 - 24.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); pale yellow (2.5Y 7/4); very fine grained to coarse grained, angular to subround; some granules to very large pebbles, subangular to subround; little silt; trace clay; dry; iron oxide staining; some red staining on gravel clasts	(7.0 - 17.0') Normal drilling with 9" core barrel.	
9										
10										
11	120 in. 100%				Topock - Alluvium Deposits	SM				
12										
13										
14										
15										

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Date Started:	<u>10/23/2019</u>	Surface Elevation:	<u>538.53 ft amsl</u>	Boring No.: <u>MW-70BR-D</u>
Date Completed:	<u>11/19/2019</u>	Northing (NAD83):	<u>2100512.18</u>	
Drilling Co.:	<u>Cascade</u>	Easting (NAD83):	<u>7615832.54</u>	Client: <u>PG&E</u>
Drilling Method:	<u>Sonic Drilling</u>	Total Depth:	<u>288.7 ft bgs</u>	Project: <u>Final GW Remedy Phase 1</u>
Drill Rig Type:	<u>Boart Longyear Track</u>	Borehole Diameter:	<u>3.8-12 inches</u>	Location: <u>PG&E Topock, Needles,</u>
Driller Name:	<u>E. Ramos / J. Hernandez</u>	Depth to First Water:	<u>79.6 ft bgs</u>	<u>California</u>
Drilling Asst:	<u>FS /JC / JS</u>	Sonic Drilling:	<u>10 ft Core Barrel</u>	Project Number: <u>RC000753.0051</u>
Logger:	<u>GW / RC / SM</u>	Sampling Interval:	<u>Continuous</u>	Bedrock Sampling: <u>HQ3 Core Barrel</u>
Editor:	<u>Sean McGrane</u>	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
16	120 in. 100%				Topock - Alluvium Deposits	SM			(17.0 - 27.0') Rough drilling with 9" core barrel.	
17										
18										
19										
20										
21										
22	120 in. 100%									
23										
24										
25					Topock - Alluvium Deposits	SM		(24.0 - 29.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); light olive brown (2.5Y 5/3) some light yellowish brown (10YR 6/4); very fine grained to coarse grained, angular to subround; some granules to very large pebbles, angular to subround; little silt; trace small cobbles, angular; dry; iron oxide staining; some red staining on gravel clasts		
26										
27										
28	96 in. 100%								(27.0 - 35.0') Tight drilling with 9" core barrel. Soil inside core barrel swelled up.	(27.0 - 77.0') 55 gallons of water used; 0 gallons of water recovered; 55 gallons of water lost
29										
30					Topock - Alluvium Deposits	SM		(29.0 - 35.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); light olive brown (2.5Y 5/3) some pink (7.5YR 7/3); very fine grained to very coarse grained, angular to subround; some granules to large pebbles, angular to subangular; some silt; trace		

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS / JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

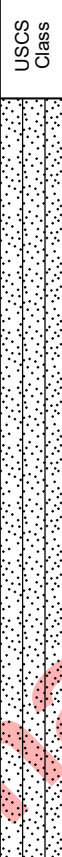

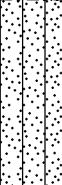
Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
31	96 in. 100%				Topock - Alluvium Deposits	SM		clay; dry; mottled; strong cementation; iron oxide staining; gravel clasts predominantly metadiorite, metadiorite partially weathered with red staining on most clasts		
32										
33										
34										
35	24 in. 100%				Topock - Alluvium Deposits	SM		(35.0 - 37.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 5/4); very fine grained to very coarse grained; little granules to large pebbles, angular to subround; little silt; trace clay; dry; weak cementation; iron oxide staining	(35.0 - 37.0') Normal drilling with 9" core barrel.	(35.0 - 160.0') 8750 gallons of water used; 5500 gallons of water recovered; 3250 gallons of water lost
36										
37										
38										
39	138 in. 115%				Topock - Alluvium Deposits	SW-SM		(37.0 - 45.0') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW-SM); brown (7.5YR 5/3) with brown (7.5YR 5/4); very fine grained to medium grained, angular to subround; little granules to large pebbles, angular to subround; little coarse to very coarse grained sand, angular to subround; little silt; little clay; trace small to large cobbles, angular to subround; dry; weak cementation	(37.0 - 47.0') Normal drilling with 9" core barrel. Extra recovery due expansion of sediments in core bag.	
40										
41										
42										
43										
44										
45										

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Rock Coring Log

Sheet: 4 of 20

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS / JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
46	138 in. 115%				Topock - Alluvium Deposits	SM		(45.0 - 53.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 5/3); very fine grained to medium grained, angular to subround; little granules to large pebbles, angular to subround; little coarse to very coarse grained sand, angular to subround; little silt; trace small to large cobbles, angular to subround; trace clay; dry; weak cementation	(47.0 - 57.0') Normal drilling with 9" core barrel.	
47										
48										
49										
50										
51										
52	138 in. 115%									
53										
54										
55										
56					Topock - Alluvium Deposits	SC		(53.0 - 55.0') Topock - Alluvium Deposits; Clayey sand with gravel (SC); brown (7.5YR 5/4); very fine grained to medium grained, subangular to subround; little granules to large pebbles, subround to round; little clay; trace small to large cobbles, angular to subround; trace coarse to very coarse grained sand; trace silt; dry; weak cementation; iron oxide staining		
57										
58	120 in. 100%				Topock - Alluvium Deposits	SM		(55.0 - 57.0') Topock - Alluvium Deposits; Silty sand (SM); reddish brown (5YR 5/4); very fine grained to medium grained, subangular to subround; little granules to large pebbles, subround to round; little silt; trace small to large cobbles, angular to subround; trace coarse to very coarse grained sand; trace clay; dry; weak cementation; iron oxide staining	(57.0 - 67.0') Normal drilling with 9" core barrel.	
59										
60										

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Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS / JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
61					Topock - Alluvium Deposits	SM		(60.3 - 61.0') Topock - Alluvium Deposits; Well graded gravel (GM); boulder		
62					Topock - Alluvium Deposits	GM				
63					Topock - Alluvium Deposits	SW-SC		(61.0 - 63.0') Topock - Alluvium Deposits; Clayey sand with gravel (SW-SC); reddish brown (5YR 5/4); medium pebbles to medium grained, angular to subround; some granules to large pebbles, angular to subround; little clay; trace small to large cobbles, angular to subround; trace boulders, round; trace coarse to very coarse grained sand, angular to subround; trace silt; dry; moderate cementation; iron oxide staining		
64	120 in. 100%				Topock - Alluvium Deposits	SW-SM		(63.0 - 67.0') Topock - Alluvium Deposits; Well graded sand with gravel (SW-SM); reddish brown (5YR 5/4); very fine grained to medium grained, angular to subround; some granules to large pebbles, angular to subround; trace small to large cobbles, angular to subround; trace boulders, round; trace coarse to very coarse grained sand; dry; moderate cementation; iron oxide staining		
65					Topock - Alluvium Deposits	SW-SM				
66					Topock - Alluvium Deposits	SW-SM				
67					Topock - Alluvium Deposits	SW-SM				
68					Topock - Bedrock - Metadiorite			(67.0 - 74.0') Topock-metadiorite; GLEY1 2.5/6 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <1 mm green/black matrix with zones of 1 to 4 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined	(67.0 - 72.0') Core barrel filled with soil from moving casing down 10'. Only able to proceed 5' in drilling. Potential bedrock contact.	
69	60 in. 100%				Topock - Bedrock - Metadiorite					
70					Topock - Bedrock - Metadiorite					
71					Topock - Bedrock - Metadiorite					
72					Topock - Bedrock - Metadiorite					
73	24 in. 40%				Topock - Bedrock - Metadiorite				(72.0 - 77.0') Rough drilling with 9" core barrel. Drilled through and pulverized rock poor recovery.	
74					Topock - Bedrock - Metadiorite					
75					Topock - Bedrock - Metadiorite	NR		(74.0 - 77.0') No recovery; see drilling notes		(74.0 - 77.0') 5 gallons of water used; 0 gallons of

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Rock Coring Log

Sheet: 6 of 20

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS /JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
76	24 in. 40%					NR				water recovered; 5 gallons of water lost
77										
78								(77.0 - 82.0') Topock-metadiorite; GLEY1 2.5/6 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 4 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined	(77.0 - 82.0') Rough drilling, refusal with 9" core barrel, switch to 8" core barrel and 9" casing.	(77.0 - 127.0') 7880 gallons of water used; 7630 gallons of water recovered; 250 gallons of water lost
79					Topock - Bedrock - Metadiorite					
80										
81										
82	84 in. 70%							(82.0 - 85.0') No recovery; see drilling notes		
83						NR			(82.0') Normal drilling with 8" core barrel. Material washout from 82' to 85' as noted by driller, explains no recovery.	
84										
85								(85.0 - 87.0') Topock-metadiorite; GLEY1 2.5/6 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 4 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined, abundance of iron oxidation	(84.0 - 87.0') Rough drilling with 8" core barrel.	
86					Topock - Bedrock - Metadiorite					
87								(87.0 - 89.0') No recovery; see drilling notes		
88	96 in. 80%					NR			(87.0 - 89.0') Bedrock pulverized and washed out to surface in order to advance bit.	
89										
90					Topock - Bedrock - Metadiorite			(89.0 - 97.0') Topock-metadiorite; GLEY1 2.5/6 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix		

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Rock Coring Log

Sheet: 7 of 20

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS / JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
91								with zones of 1 to 4 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined		
92										
93					Topock - Bedrock - Metadiorite					
94	96 in. 80%									
95										
96										
97										
98								(97.0 - 105.0') Topock-metadiorite; GLEY1 2.5/6 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 4 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, very intensely veined		
99										
100										
101	96 in. 80%				Topock - Bedrock - Metadiorite					
102										
103										
104										
105										

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Rock Coring Log

Sheet: 8 of 20

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS / JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
106	96 in. 80%					NR		(105.0 - 107.0') No recovery; see drilling notes	(105.0 - 107.0') Bedrock pulverized and washed out to surface in order to advance bit.	
107										
108										
109										
110										
111										
112	120 in. 100%									
113										
114										
115										
116										
117										
118	120 in. 100%									
119										
120										

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS / JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
121					Topock - Bedrock - Metadiorite					
122								(121.0 - 127.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 4 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined (121.3 - 122.3'); Highly oxidized		
123	120 in. 100%				Topock - Bedrock - Metadiorite					
124										
125										
126										
127										
128								(127.0 - 133.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix, zones of 1-10 mm white phenocrysts and 0.25-1.0 mm white phenocrysts, intensely fractured, intensely veined (white and light red) (127.5 - 133.0'); 10R 6/8; Light red mineral present, coarse to very coarse phenocrysts 0.5 to 5 mm	(127.0 - 137.0') Dry drilled for bottom 2 ft to get full recovery for run, resulted in sluff in bottom 2 ft of core.	(127.0 - 167.0') 4750 gallons of water used; 4000 gallons of water recovered; 750 gallons of water lost
129					Topock - Bedrock - Metadiorite					
130										
131	120 in. 100%									
132										
133										
134					Topock - Bedrock - Metadiorite			(133.0 - 137.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 4 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined (white and red)		
135										

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS /JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
136	120 in. 100%				Topock - Bedrock - Metadiorite					
137								(137.0 - 140.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 4 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined		
138					Topock - Bedrock - Metadiorite					
139										
140										
141								(140.0 - 146.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with some zones of 1 to 4 mm white phenocrysts and zones of 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined		
142	108 in. 90%				Topock - Bedrock - Metadiorite					
143										
144										
145										
146										
147						NR		(146.0 - 147.0') No recovery; see drilling notes	(146.0 - 147.0') Bedrock pulverized and washed out to surface in order to advance bit.	
148	120 in. 100%				Topock - Bedrock - Metadiorite			(147.0 - 157.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very finely crystalline to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; very fine to coarse grained <= 1 mm green/black matrix with zones of coarse to very coarse 1 to 4 mm white phenocrysts and zones of medium grained to coarse grained, intensely fractured, intensely veined	(147.0 - 157.0') Dry drilled for bottom 2 ft to get full recovery for run, resulted in sluff in bottom 2 ft of core.	
149										
150										

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS / JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
151										
152										
153	120 in. 100%				Topock - Bedrock - Metadiorite					
154										
155										
156										
157										
158								(157.0 - 167.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with some zones of 1 to 4 mm white phenocrysts and zones of 0.25 to 1.0 mm white phenocrysts, fractured, intensely veined	(157.0 - 167.0') Dry drilled for bottom 2 ft to get full recovery for run, resulted in sluff in bottom 2 ft of core.	
159										
160										
161	120 in. 100%				Topock - Bedrock - Metadiorite			(160.0 - 163.5'); Abundance of veins widths ranging from 1 to 5 mm, intact cores ranging from 0.25' to 1.0'		(160.0 - 190.0') 3000 gallons of water used; 2000 gallons of water recovered; 1000 gallons of water lost
162										
163										
164										
165										

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Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS /JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
166	120 in. 100%				Topock - Bedrock - Metadiorite					
167								(167.0 - 176.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 5 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined, zones of deformation		(167.0 - 207.0') 4333 gallons of water used; 2750 gallons of water recovered; 1583 gallons of water lost
168										
169										
170					Topock - Bedrock - Metadiorite					
171										
172	108 in. 90%								(170.0 - 237.0') Used approximately 90 gallons of hydrogel bentonite mud to flush fines out of borehole. Hydrogel was recovered during flushing with clean water.	(170.0 - 237.0') 4360 gallons of water used; 2325 gallons of water recovered; 2035 gallons of water lost
173										
174										
175										
176										
177						NR		(176.0 - 177.0') No recovery; see drilling notes	(176.0 - 177.0') Bedrock pulverized and washed out to surface in order to advance bit.	
178	120 in. 100%				Topock - Bedrock - Metadiorite			(177.0 - 187.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 5 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined, zones of deformation	(177.0 - 187.0') Dry drilled for bottom 2 ft to get full recovery for run, resulted in sluff in bottom 2 ft of core.	
179										
180										

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Rock Coring Log

Sheet: 13 of 20

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS / JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
181								(181.0 - 184.5'); Intact cores ranging from 1.0' to 1.25'		
182					Topock - Bedrock - Metadiorite					
183	120 in. 100%									
184										
185										
186										
187										
188								(187.0 - 193.5') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 4 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined, zones of deformation	(187.0 - 197.0') Rock core fell out of core barrel when tripping out, required overdrilling for recovery, pulverized and washed away bottom of core.	
189										
190										
191	78 in. 65%				Topock - Bedrock - Metadiorite				(190.0 - 217.0') Rough drilling advancing 10" casing	(190.0 - 217.0') 3750 gallons of water used; 2750 gallons of water recovered; 1000 gallons of water lost
192										
193										
194						NR		(193.5 - 197.0') No recovery; see drilling notes		
195										

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Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS / JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
196	78 in. 65%					NR				
197								(197.0 - 207.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 4 mm white phenocrysts and some zones of 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined	(197.0 - 207.0') Rough drilling, 9" casing difficult to reach depth, bit teeth might be worn.	
198										
199										
200										
201										
202	120 in. 100%				Topock - Bedrock - Metadiorite			(202.0 - 207.0'); 10R 6/8; Light red mineral present, coarse to very coarse phenocrysts 0.5 to 5 mm		
203										
204										
205										
206										
207										
208								(207.0 - 216.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 4 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined, zones of deformation	(207.0 - 217.0') Dry drilled for bottom 2 ft to get full recovery for run, resulted in sluff in bottom 1 ft of core, 216-217' washed out.	(207.0 - 237.0') 3750 gallons of water used; 3500 gallons of water recovered; 250 gallons of water lost
209	108 in. 90%				Topock - Bedrock - Metadiorite					
210										

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS / JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
211					Topock - Bedrock - Metadiorite					
212										
213	108 in. 90%									
214										
215										
216										
217						NR		(216.0 - 217.0') No recovery; see drilling notes		
218					Topock - Bedrock - Metadiorite			(217.0 - 221.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 4 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined, zones of deformation	(217.0 - 227.0') Rough drilling	
219										
220										
221	120 in. 100%				Topock - Bedrock - Metadiorite			(221.0 - 224.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 4 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, some outsized 5 to 10 mm phenocrysts, intensely fractured, intensely veined, zones of deformation		
222										
223										
224										
225								(224.0 - 233.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix		




Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS / JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
226	120 in. 100%							with zones of 1 to 4 mm white phenocrysts and little zones of 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined, highly deformed zones (224.1 - 225.0'); banded		
227										
228										
229					Topock - Bedrock - Metadiorite					
230										
231										
232	120 in. 100%									
233										
234								(233.0 - 237.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1; slightly to moderately weathered; hard to very hard; very fine grained to very coarse grained; massive; fracture spacing very close to close; iron oxide staining; <= 1 mm green/black matrix with zones of 1 to 4 mm white phenocrysts and 0.25 to 1.0 mm white phenocrysts, intensely fractured, intensely veined		
235					Topock - Bedrock - Metadiorite			(234.5 - 236.0'); 5GY 4/4; highly altered zone, olive green coloration, frequent iron oxide staining		
236										
237										
238	34 in. 100%	(237.0 - 239.8) 10.55 mins/ft	40	3	Topock - Bedrock - Metadiorite			(237.0 - 239.8') Topock-metadiorite; RQD 40%; GLEY1 6/1 some GLEY1 2.5/1; moderately to highly weathered; hard to very hard; very finely crystalline to coarsely crystalline; massive; fracture spacing close; wet; iron oxide staining; ground mass composed of black and greenish gray minerals white phenocrysts 1-4 mm throughout. Numerous chlorite and calcite veins throughout (237.1 - 237.5'); Broken zone (237.5 - 238.0'); Joint 80 degree fracture, iron, calcite secondary mineralization, unfoliated (238.0 - 238.2'); Joint 55 degree fracture, iron, calcite secondary mineralization, unfoliated (238.3 - 238.4'); Joint 35 degree fracture, iron, calcite secondary mineralization, unfoliated		(237.0 - 240.0') 1035.84 gallons of water used; 637.44 gallons of water recovered; 398.4 gallons of water lost
239				4						
240			83	2						(237.0 - 288.0') 557.8 gallons of water used; 358.6 gallons of water

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS / JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
241	54 in. 90%	(239.8 - 244.8) 2.88 mins/ft	83	2	Topock - Bedrock - Metadiorite	NR		(238.6 - 239.0'); Joint 70 degree fracture, iron secondary mineralization, unfoliated (239.0 - 239.4'); Joint 70 degree fracture, iron secondary mineralization, unfoliated (239.5 - 239.7'); Joint 60 degree (239.8 - 244.3') Topock-metadiorite; RQD 83%; GLEY1 6/1 some GLEY1 2.5/1; slightly weathered; hard; fracture spacing medium; iron oxide staining; 243.1-244.8 ft. bgs thin chlorite mineral veins show evidence of faulting; offset by approx. 5 mm (239.801'); Mechanical fracture (239.8 - 240.1'); Broken zone (240.05'); Horizontal joint (240.5 - 240.9'); Joint 55 degree fracture, iron secondary mineralization, unfoliated (240.8'); Vug (241.7 - 242.0'); Joint 70 degree fracture, iron secondary mineralization, unfoliated (241.71'); Horizontal joint, iron secondary mineralization (242.4'); Joint 10 degree fracture, iron, secondary mineralization, unfoliated (242.8 - 243.0'); Joint 30 degree fracture, iron secondary mineralization (243.7 - 243.7'); Mechanical fracture (243.8 - 244.3'); Joint 70 degree fracture (244.3 - 244.8') No recovery; see drilling notes (244.8 - 250.0') Topock-metadiorite; RQD 90%; GLEY1 6/1 some GLEY1 2.5/1; freshly weathered; very hard; iron oxide staining (244.8 - 245.1'); Parallel joints 45 degrees fractures, iron, calcite secondary mineralization, unfoliated (245.9 - 245.9'); Joint 65 degree, fracture, iron, calcite secondary mineralization, unfoliated (246.4 - 246.6'); Joints 45 degrees fractures, iron, calcite secondary mineralization, unfoliated (247.7'); 55 degree fracture, iron secondary mineralization, unfoliated (248.0 - 248.2'); Joint 55 degree fracture, iron, calcite secondary mineralization, unfoliated (248.2'); Joint 70 degree fracture, iron secondary mineralization, unfoliated (248.25'); Joint 25 degree fracture, iron secondary mineralization, unfoliated (248.3 - 248.5'); Joint		recovered; 199.2 gallons of water lost (240.0 - 245.0') 717.12 gallons of water used; 159.36 gallons of water recovered; 557.76 gallons of water lost
242				2						
243				2						
244				1						
245				1						
246	62 in. 100%	(244.8 - 250.0) 6.25 mins/ft	90	1	Topock - Bedrock - Metadiorite	NR		(243.7 - 243.7'); Mechanical fracture (243.8 - 244.3'); Joint 70 degree fracture (244.3 - 244.8') No recovery; see drilling notes (244.8 - 250.0') Topock-metadiorite; RQD 90%; GLEY1 6/1 some GLEY1 2.5/1; freshly weathered; very hard; iron oxide staining (244.8 - 245.1'); Parallel joints 45 degrees fractures, iron, calcite secondary mineralization, unfoliated (245.9 - 245.9'); Joint 65 degree, fracture, iron, calcite secondary mineralization, unfoliated (246.4 - 246.6'); Joints 45 degrees fractures, iron, calcite secondary mineralization, unfoliated (247.7'); 55 degree fracture, iron secondary mineralization, unfoliated (248.0 - 248.2'); Joint 55 degree fracture, iron, calcite secondary mineralization, unfoliated (248.2'); Joint 70 degree fracture, iron secondary mineralization, unfoliated (248.25'); Joint 25 degree fracture, iron secondary mineralization, unfoliated (248.3 - 248.5'); Joint	(245.5') Very soft drilling. Very loose material fell out of core barrel once brought up to the drill deck for sample retrieval.	(245.0 - 250.0') 298.8 gallons of water used; 398.4 gallons of water recovered; 99.6 gallons of water gained (247.0 - 258.0') 816.72 gallons of water used; 219.12 gallons of water recovered; 597.6 gallons of water lost
247				1						
248				3						
249				1						
250										
251				1						
252	61 in. 100%	(250.0 - 255.1) 4.14 mins/ft	85	3	Topock - Bedrock - Metadiorite	NR		(250.0 - 255.1') Topock-metadiorite; RQD 85%; freshly to moderately weathered; very hard to very soft; microcrystalline to coarsely crystalline; fracture spacing medium; iron oxide staining; 251.65-255.1 ft. bgs aphanitic-porphyritic crystal size, soft/moderately to highly weathered at 252.9, 253.3-253.5, 254-254.3 ft. bgs (250.5 - 250.6'); Joint 45 degree fracture, iron, secondary mineralization (251.1 - 251.2'); Joint 15 degree fracture (251.3 - 251.5'); Joint 40 degree fracture, iron, calcite secondary mineralization, unfoliated (251.5 - 251.7'); Joint 45 degree fracture, iron, calcite secondary mineralization, unfoliated (251.9 - 252.1'); Joint 45 degree fracture, iron secondary mineralization, unfoliated (252.2 - 252.2'); Joint 10 degree fracture, iron secondary mineralization, unfoliated (253.2 - 253.2'); Joint 30 degree fracture, iron, calcite secondary mineralization, unfoliated (253.8 - 253.9'); Joint 30 degree fracture, iron, calcite secondary mineralization, unfoliated (254'); Horizontal joint	(250.0 - 255.0') Water pressure add rpms stayed constant during run.	(250.0 - 255.0') 298.5 gallons of water used; 179.28 gallons of water recovered; 119.22 gallons of water lost
253				2						
254				2						
255				1						
									(254.7 -	

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS /JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
256	60 in. 100%	(255.1 - 260.1) 2.96 mins/ft	87	>10	Topock - Bedrock - Metadiorite			(255.0 - 256.0'); Broken zone (255.1 - 260.1') Topock-metadiorite; RQD 87%; GLEY1 6/1 some GLEY1 2.5/1; freshly to slightly weathered; very hard; very finely crystalline to coarsely crystalline; fracture spacing wide; iron oxide staining; phanaritic 257.1-258.1 ft bgs (256.2 - 256.4'); Joint 30 degree fracture, iron, calcite, secondary mineralization, unfoliated (256.7 - 256.9'); Joint 30 degree fracture, iron, calcite secondary mineralization, unfoliated	259.5') Water pressure and RPMs stayed consistent.	(255.0 - 260.0') 368.45 gallons of water used; 313.07 gallons of water recovered; 55.38 gallons of water lost
257				2						
258				0						
259				4				(258.2 - 258.3'); Joint 30 degree fracture, iron, calcite secondary mineralization, unfoliated (258.2 - 258.5'); Joint 75 degree fracture, iron, calcite secondary mineralization, unfoliated (258.4 - 258.6'); Joint 40 degree fracture, iron, calcite secondary mineralization, unfoliated (258.9 - 259.1'); Joint 40 degree fracture, iron, calcite secondary mineralization, unfoliated (259.4 - 254.5'); Joint 25 degree fracture, iron, calcite secondary mineralization, unfoliated		
260	60 in. 100%	(260.1 - 265.1) 2.19 mins/ft	53	>10				(260.0 - 260.7'); Broken zone (260.1 - 265.1') Topock-metadiorite; RQD 53%; GLEY1 6/1 some GLEY1 2.5/1; slightly to moderately weathered; very hard; fracture spacing medium to very close; iron oxide staining; phanaritic crystal size 261.8-262.7 ft. bgs (260.7 - 260.7'); Joint 10 degree fracture, iron, secondary mineralization (261.3'); Horizontal joint, iron secondary mineralization (261.3 - 261.6'); Two vertical joints (261.5 - 261.7'); Joint 40 degree fracture, iron, secondary mineralization		(260.0 - 265.0') 390.43 gallons of water used; 340.96 gallons of water recovered; 49.47 gallons of water lost
261				4						
262				0						
263				6				(263.3 - 264.0'); Broken zone		
264	41 in. 100%	(265.1 - 268.5) 7.64 mins/ft	90	0				(265.1 - 268.5') Topock-metadiorite; RQD 90%; GLEY1 6/1 some GLEY1 2.5/1; freshly to slightly weathered; very hard; very finely crystalline to medium crystalline; hard; fracture spacing medium to close; slight gneissic texture 267.7-268.5 ft. bgs (265.6 - 265.7'); Mechanical fracture (265.8 - 266.0'); Joint 40 degree fracture, calcite secondary mineralization, unfoliated (266.7 - 267.1'); Joint 50 degree fracture, iron, calcite secondary mineralization, unfoliated (267.0 - 267.1'); Joint 30 degree fracture, iron, calcite secondary mineralization unfoliated		(265.0 - 268.0') 597.6 gallons of water used; 380.57 gallons of water recovered; 217.03 gallons of water lost
265				1						
266				2				(267.8 - 268.2'); Joint 75 degree fracture, iron, calcite secondary mineralization, unfoliated		
267				0				(268.5 - 268.5'); Mechanical 5 degree fracture (268.5 - 268.7'); Joint 40 degree fracture, unfoliated (268.5 - 269.0') Topock-metadiorite; RQD 0%; GLEY1 6/1 some GLEY1 2.5/1; slightly weathered; very hard; fracture spacing close (268.8 - 269.0'); Joint 40 degree fracture, calcite secondary mineralization, unfoliated		
268	6.0 in. 100%	(268.5 - 269.0) 40.07 mins/ft	0	1					(268.0') Core barrel stopped penetrating stopped drilling break core will go back to retrieve last	(268.0 - 269.2') 509.95 gallons of water used; 353 gallons of water recovered; 156.95 gallons of water lost
269				2						
270	12 in. 100%	(269.0 - 270.0) 4.90 mins/ft	40	4						(269.2 - 270.0')


Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Date Started:	<u>10/23/2019</u>	Surface Elevation:	<u>538.53 ft amsl</u>	Boring No.: <u>MW-70BR-D</u>
Date Completed:	<u>11/19/2019</u>	Northing (NAD83):	<u>2100512.18</u>	
Drilling Co.:	<u>Cascade</u>	Easting (NAD83):	<u>7615832.54</u>	Client: <u>PG&E</u>
Drilling Method:	<u>Sonic Drilling</u>	Total Depth:	<u>288.7 ft bgs</u>	Project: <u>Final GW Remedy Phase 1</u>
Drill Rig Type:	<u>Boart Longyear Track</u>	Borehole Diameter:	<u>3.8-12 inches</u>	Location: <u>PG&E Topock, Needles,</u>
Driller Name:	<u>E. Ramos / J. Hernandez</u>	Depth to First Water:	<u>79.6 ft bgs</u>	<u>California</u>
Drilling Asst:	<u>FS /JC / JS</u>	Sonic Drilling:	<u>10 ft Core Barrel</u>	Project Number: <u>RC000753.0051</u>
Logger:	<u>GW / RC / SM</u>	Sampling Interval:	<u>Continuous</u>	Bedrock Sampling: <u>HQ3 Core Barrel</u>
Editor:	<u>Sean McGrane</u>	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties	
271	60 in. 100%	(270.0 - 275.0) 1.61 mins/ft	66	4	Topock - Bedrock - Metadiorite			(269.0 - 270.0') Topock-metadiorite; RQD 40%; GLEY1 6/1 some GLEY1 2.5/1; slightly to moderately weathered; hard; fracture spacing close to very close; iron oxide staining (269.01'); Mechanical horizontal fracture (269.2 - 269.3'); Joint 40 degree fracture, calcite, secondary mineralization, unfoliated (269.5 - 270.0'); Broken zone	two ft.	509.95 gallons of water used; 39.84 gallons of water recovered; 470.11 gallons of water lost	
272				2				(270.0 - 275.0') Topock-metadiorite; RQD 66%; GLEY1 6/1 some GLEY1 2.5/1; slightly weathered; hard; fracture spacing medium; iron oxide staining; 270-270.7 ft. bgs GLEY 1 7/ (light gray), portion of rock contains more quartz, few chlorite veins no calcite veins	(268.5') Slow cutting rate		(270.0 - 275.0') 159.36 gallons of water used; 92.56 gallons of water recovered; 66.8 gallons of water lost
273				2				(270.4 - 270.5'); Joint 20 degree fracture, iron, secondary mineralization	(269.0') Slow coring had to stop for day before retrieving core.		
274				4				(270.5 - 270.6'); Joint 40 degree fracture, iron, secondary mineralization (270.5 - 270.6'); Joint 20 degree fracture, iron secondary mineralization, unfoliated (270.8 - 270.9'); Joint 30 degree fracture, iron secondary mineralization, unfoliated (271.0 - 271.0'); Joint 15 degree fracture, iron, calcite secondary mineralization, unfoliated (271.6 - 271.9'); Joint 50 degree fracture, calcite secondary mineralization, unfoliated	(269.2 - 270.0') Coring rate increased, water pressure and RPMs stayed consistent.		
275				2				(270.5 - 270.6'); Joint 20 degree fracture, iron secondary mineralization, unfoliated (271.0 - 271.0'); Joint 15 degree fracture, iron, calcite secondary mineralization, unfoliated (271.6 - 271.9'); Joint 50 degree fracture, calcite secondary mineralization, unfoliated	(270.0 - 275.0') Smooth coring, water pressure and RPMs stayed consistent.		
276	60 in. 100%	(275.0 - 276.3) 0.77 mins/ft	74	1				(272.2 - 272.3'); Joint 15 degree fracture, iron, calcite secondary mineralization, unfoliated (272.6 - 272.7'); Joint 20 degree fracture, calcite secondary mineralization, unfoliated (273.2 - 273.4'); Joint 30 degree fracture, iron, calcite secondary mineralization, unfoliated (273.5 - 273.7'); Joint 45 degree fracture, iron, calcite secondary mineralization, unfoliated (273.7 - 273.8'); Joint 20 degree fracture, iron, calcite secondary mineralization, unfoliated (273.9 - 274.1'); Joint 40 degree fracture, calcite secondary mineralization, unfoliated (274.25'); Horizontal joint, iron, calcite secondary mineralization, unfoliated (275.0 - 275.2'); Mechanical degree fracture	(275.0 - 280.0') Water pressure and RPMs stayed consistent.	(275.0 - 280.0') 370.5 gallons of water used; 231.1 gallons of water recovered; 139.4 gallons of water lost	
277		4		(273.2 - 273.4'); Joint 30 degree fracture, iron, calcite secondary mineralization, unfoliated (273.5 - 273.7'); Joint 45 degree fracture, iron, calcite secondary mineralization, unfoliated (273.7 - 273.8'); Joint 20 degree fracture, iron, calcite secondary mineralization, unfoliated (273.9 - 274.1'); Joint 40 degree fracture, calcite secondary mineralization, unfoliated (274.25'); Horizontal joint, iron, calcite secondary mineralization, unfoliated (275.0 - 275.2'); Mechanical degree fracture				(276.3') Pause run to tighten part on head.			
278		>10		(273.5 - 273.7'); Joint 45 degree fracture, iron, calcite secondary mineralization, unfoliated (273.7 - 273.8'); Joint 20 degree fracture, iron, calcite secondary mineralization, unfoliated (273.9 - 274.1'); Joint 40 degree fracture, calcite secondary mineralization, unfoliated (274.25'); Horizontal joint, iron, calcite secondary mineralization, unfoliated (275.0 - 275.2'); Mechanical degree fracture							
279		1		(273.7 - 273.8'); Joint 20 degree fracture, iron, calcite secondary mineralization, unfoliated (273.9 - 274.1'); Joint 40 degree fracture, calcite secondary mineralization, unfoliated (274.25'); Horizontal joint, iron, calcite secondary mineralization, unfoliated (275.0 - 275.2'); Mechanical degree fracture							
280		2		(273.9 - 274.1'); Joint 40 degree fracture, calcite secondary mineralization, unfoliated (274.25'); Horizontal joint, iron, calcite secondary mineralization, unfoliated (275.0 - 275.2'); Mechanical degree fracture							
281	60 in. 100%	(280.0 - 285.0) 4.61 mins/ft	73	2				(275.0 - 280.0') Topock-metadiorite; RQD 74%; GLEY1 6/1 some GLEY1 2.5/1; slightly to moderately weathered; very hard; very finely crystalline to coarsely crystalline; massive; iron oxide staining; 275-276 ft. bgs porphoritic crystal size, aphanitic 276-280 ft. bgs, fewer phenocrysts		(280.0 - 285.0') 366.5 gallons of water used; 223.9 gallons of water recovered; 142.6 gallons of water lost	
282				3				(279.6 - 279.6'); Joint 10 degree fracture			
283				4				(280.0 - 285.0') Topock-metadiorite; RQD 73%; GLEY1 6/1 some GLEY1 2.5/1; slightly to moderately weathered; hard; very finely crystalline to very coarsely crystalline; massive; fracture spacing medium to very close; iron oxide staining; porphyritic crystal size (280.01'); Mechanical horizontal fracture (280.0 - 280.2'); Vertical joint (280.2'); Horizontal joint, iron secondary mineralization (281.0 - 281.1'); Joint 10 degree fracture, iron, calcite secondary mineralization, unfoliated (281.5'); Joint 5 degree fracture, iron, calcite secondary mineralization, unfoliated (281.9 - 282.1'); Joint 30 degree fracture, calcite secondary mineralization, unfoliated (282'); Two vertical joint, iron, calcite secondary mineralization, unfoliated (282.2 - 282.2'); Joint 10 degree fracture, iron, calcite secondary mineralization, unfoliated (282.8 - 283.8'); Broken zone			
284				>10				(280.2'); Horizontal joint, iron secondary mineralization (281.0 - 281.1'); Joint 10 degree fracture, iron, calcite secondary mineralization, unfoliated (281.5'); Joint 5 degree fracture, iron, calcite secondary mineralization, unfoliated (281.9 - 282.1'); Joint 30 degree fracture, calcite secondary mineralization, unfoliated (282'); Two vertical joint, iron, calcite secondary mineralization, unfoliated (282.2 - 282.2'); Joint 10 degree fracture, iron, calcite secondary mineralization, unfoliated (282.8 - 283.8'); Broken zone			
285				2				(282.2 - 282.2'); Joint 10 degree fracture, iron, calcite secondary mineralization, unfoliated (282.8 - 283.8'); Broken zone			
285								(284.7 - 284.7'); Joint 20 degree fracture, calcite secondary			

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Date Started:	10/23/2019	Surface Elevation:	538.53 ft amsl	Boring No.: <u>MW-70BR-D</u>	
Date Completed:	11/19/2019	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	288.7 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Borehole Diameter:	3.8-12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Depth to First Water:	79.6 ft bgs		California
Drilling Asst:	FS /JC / JS	Sonic Drilling:	10 ft Core Barrel	Project Number:	RC000753.0051
Logger:	GW / RC / SM	Sampling Interval:	Continuous	Bedrock Sampling:	HQ3 Core Barrel
Editor:	Sean McGrane	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Fractures Per Foot	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid and Properties
286	44 in. 100%	(285.0 - 288.7) 1.86 mins/ft	93	1	Topock - Bedrock - Metadiorite			mineralization, unfoliated (284.8 - 284.5'); Joint 30 degree fracture, iron, calcite secondary mineralization, unfoliated (285.0 - 288.7') Topock-metadiorite; RQD 93%; GLEY1 6/1 some GLEY1 2.5/1; slightly to moderately weathered; hard; very finely crystalline to coarsely crystalline; massive; fracture spacing medium to close (285.0 - 285.1'); Mechanical fracture (285.7 - 286.0'); Broken zone (286.0 - 286.6'); Joint 65 degree fracture, iron, calcite secondary mineralization, unfoliated possible slickenlines (286.8 - 287.0'); Joint 25 degree fracture, calcite secondary mineralization, unfoliated	(285.0 - 288.7') Water pressure and RPMs stayed consistent.	(285.0 - 288.0') 171.3 gallons of water used; 99.3 gallons of water recovered; 72 gallons of water lost
287				3						
288				1						
				0						
289	<div>(288.2 - 288.3'); Joint 20 degree fracture, calcite secondary mineralization, unfoliated (288.4 - 288.6'); Joint 50 degree fracture, calcite secondary mineralization, unfoliated (288.7 - 288.8'); Mechanical fracture End of Boring at 288.7 ft bgs.</div>									
290										
291										
292										
293										
294										
295										
296										
297										
298										
299										
300										

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; NR = no recovery; Notes: blue water table symbol represents depth to water measured prior to well repair; wells MW-70BR-287 installed in borehole

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches	Project Number:	RC000753.0051
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone		
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
1					(0.0 - 7.0') Topock - Alluvium Deposits; No recovery (NR)	(0.0 - 85.0') Post sleeve installation, drill rods pushed into the sleeve to pressurize grout out of the holes in the bottom of the sleeve into the formation and up the annulus space between the sleeve and conductor. Rods were left in place for 24 hours while grout cured.	(0.0 - 240.1') 60 gallons of bentonite slurry used; 39.84 gallons of bentonite slurry recovered; 20.16 gallons of bentonite slurry lost (0.1 - 240.1') 358.56 gallons of water used; 318.72 gallons of water recovered; 39.84 gallons of water lost
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.

Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Drilling and Sleeve Installation Log

Sheet: 2 of 20

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches		California
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone	Project Number:	RC000753.0051
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
16							
17							
18							
19							
20		SM					
21							
22							
23							
24							
25							
26		SM					
27							
28							
29							
30		SM					

 (-0.4 - 237.0')
5.5" PVC Sch 80
Conductor
Casing

 (24.0 - 29.0') Topock - Alluvium Deposits;
Silty sand with gravel (SM); light olive brown
(2.5Y 5/3) some light yellowish brown (10YR
6/4)

 (29.0 - 35.0') Topock - Alluvium Deposits;
Silty sand with gravel (SM); light olive brown
(2.5Y 5/3) some pink (7.5YR 7/3)

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.

Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Drilling and Sleeve Installation Log

Sheet: 3 of 20

Date Started: 06/25/2020	Surface Elevation: 538.53 ft amsl	Boring No.: MW-70BR-287 SR
Date Completed: 07/01/2020	Northing (NAD83): 2100512.18	
Drilling Co.: Cascade	Easting (NAD83): 7615832.54	Client: PG&E
Drilling Method: Sonic Drilling	Total Depth: 287.0 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type: Boart Longyear Track	Conductor Casing Diameter: 12 inches	Location: PG&E Topock, Needles, California
Driller Name: E. Ramos / J. Hernandez	Drill Casing Diameter: 10 inches	Project Number: RC000753.0051
Drilling Asst: FS / JC / JS	Drill Bit: 3 1/2" & 4 5/8" Tricone	
Tool-Pusher: Arnold Lamon	Depth to First Water: 79.6 ft bgs	
Rig Geologist: GW / RC / SM	Converted to Well: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
31							
32							
33		SM					
34							
35							
36		SM			(35.0 - 37.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 5/4)		
37							
38				(-0.4 - 237.0') 5.5" PVC Sch 80 Conductor Casing	(37.0 - 45.0') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW-SM); brown (7.5YR 5/3) with brown (7.5YR 5/4)		
39							
40							
41		SW-SM					
42							
43							
44							
45							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.

Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Drilling and Sleeve Installation Log

Sheet: 4 of 20

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches	Project Number:	RC000753.0051
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone		
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
46					(45.0 - 53.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 5/3)		
47							
48							
49		SM					
50							
51							
52							
53				(-0.4 - 237.0') 5.5" PVC Sch 80 Conductor Casing			
54		SC			(53.0 - 55.0') Topock - Alluvium Deposits; Clayey sand with gravel (SC); brown (7.5YR 5/4)		
55					(55.0 - 57.0') Topock - Alluvium Deposits; Silty sand (SM); reddish brown (5YR 5/4)		
56		SM					
57					(57.0 - 60.3') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown (5YR 5/4)		
58		SM					
59							
60							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.

Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches	Project Number:	RC000753.0051
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone		
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
61		SM			(60.3 - 61.0') Topock - Alluvium Deposits; Well graded gravel (GM)		
62		GM			(61.0 - 63.0') Topock - Alluvium Deposits; Clayey sand with gravel (SW-SC); reddish brown (5YR 5/4)		
63		SW-SC					
64					(63.0 - 67.0') Topock - Alluvium Deposits; Well graded sand with gravel (SW-SM); reddish brown (5YR 5/4)		
65		SW-SM					
66							
67							
68				(-0.4 - 237.0') 5.5" PVC Sch 80 Conductor Casing	(67.0 - 74.0') Topock-metadiorite; GLEY1 2.5/6 and GLEY1 8/1		
69							
70							
71							
72							
73							
74							
75		NR			(74.0 - 77.0') No recovery		

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair. Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Drilling and Sleeve Installation Log

Sheet: 6 of 20

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches	Project Number:	RC000753.0051
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone		
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
76		NR					
77					(77.0 - 82.0') Topock-metadiorite; GLEY1 2.5/6 and GLEY1 8/1		
78							
79							
80							
81							
82							
83		NR		(-0.4 - 237.0') 5.5" PVC Sch 80 Conductor Casing	(82.0 - 85.0') No recovery		
84							
85					(85.0 - 87.0') Topock-metadiorite; GLEY1 2.5/6 and GLEY1 8/1		
86							
87					(87.0 - 89.0') No recovery		
88		NR					
89					(89.0 - 97.0') Topock-metadiorite; GLEY1 2.5/6 and GLEY1 8/1		
90							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.

Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches	Project Number:	RC000753.0051
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone		
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
91							
92							
93							
94							
95							
96							
97							
98							
99							
100							
101							
102							
103							
104							
105							

(92.0 - 240.1') Approximate depth to which grout was installed inside the PVC sleeve. PVC sleeve had a PVC end cap and 4 one inch holes drilled one foot above bottom.

(-0.4 - 237.0')
5.5" PVC Sch 80
Conductor Casing

(97.0 - 105.0') Topock-metadiorite; GLEY1 2.5/6 and GLEY1 8/1

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.

Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Drilling and Sleeve Installation Log

Sheet: 8 of 20

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches	Project Number:	RC000753.0051
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone		
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
106		NR			(105.0 - 107.0') No recovery		
107					(107.0 - 112.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1		
108							
109							
110							
111							
112					(112.0 - 117.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1		
113				(-0.4 - 237.0') 5.5" PVC Sch 80 Conductor Casing			
114							
115							
116							
117					(117.0 - 121.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1		
118							
119							
120							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.

Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Drilling and Sleeve Installation Log

Sheet: 9 of 20

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches	Project Number:	RC000753.0051
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone		
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
121					(121.0 - 127.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1 (121.3 - 122.3'); Highly oxidized		
122							
123							
124							
125							
126							
127							
128				(-0.4 - 237.0') 5.5" PVC Sch 80 Conductor Casing	(127.0 - 133.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1 (127.5 - 133.0'); 10R 6/8; Light red mineral present, coarse to very coarse phenocrysts 0.5 to 5 mm		
129							
130							
131							
132							
133					(133.0 - 137.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1		
134							
135							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.

Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Drilling and Sleeve Installation Log

Sheet: 10 of 20

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches	Project Number:	RC000753.0051
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone		
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
136							
137					(137.0 - 140.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1		
138							
139							
140					(140.0 - 146.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1		
141							
142							
143							
144							
145							
146							
147							
148							
149							
150							

 (-0.4 - 237.0')
5.5" PVC Sch 80
Conductor
Casing

NR

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.

Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

SLEEVE INSTALLATION_PG&E_TOPOCK C:\USERS\SMOGRAND\DOCUMENTS\PG&E_TOPOCK\DRIFT BORING LOGS\GINT FILES\2021-01-26_USTOPOCK DATABASE FOR PLOG.GPJ TOPOCK DATA TEMPLATE FOR PLOG.GDT 01/26/21 12:32

Date Started: 06/25/2020	Surface Elevation: 538.53 ft amsl	Boring No.: MW-70BR-287 SR
Date Completed: 07/01/2020	Northing (NAD83): 2100512.18	
Drilling Co.: Cascade	Easting (NAD83): 7615832.54	Client: PG&E
Drilling Method: Sonic Drilling	Total Depth: 287.0 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type: Boart Longyear Track	Conductor Casing Diameter: 12 inches	Location: PG&E Topock, Needles, California
Driller Name: E. Ramos / J. Hernandez	Drill Casing Diameter: 10 inches	Project Number: RC000753.0051
Drilling Asst: FS / JC / JS	Drill Bit: 3 1/2" & 4 5/8" Tricone	
Tool-Pusher: Arnold Lamon	Depth to First Water: 79.6 ft bgs	
Rig Geologist: GW / RC / SM	Converted to Well: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
151							
152							
153							
154							
155							
156							
157							
158							
159							
160							
161							
162							
163							
164							
165							

(-0.4 - 237.0') (157.0 - 167.0') Topock-metadiorite; GLEY1
5.5" PVC Sch 80 2.5/4 and GLEY1 8/1
Conductor Casing

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.
Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Date Started: 06/25/2020	Surface Elevation: 538.53 ft amsl	Boring No.: MW-70BR-287 SR
Date Completed: 07/01/2020	Northing (NAD83): 2100512.18	
Drilling Co.: Cascade	Easting (NAD83): 7615832.54	Client: PG&E
Drilling Method: Sonic Drilling	Total Depth: 287.0 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type: Boart Longyear Track	Conductor Casing Diameter: 12 inches	Location: PG&E Topock, Needles, California
Driller Name: E. Ramos / J. Hernandez	Drill Casing Diameter: 10 inches	Project Number: RC000753.0051
Drilling Asst: FS / JC / JS	Drill Bit: 3 1/2" & 4 5/8" Tricone	
Tool-Pusher: Arnold Lamon	Depth to First Water: 79.6 ft bgs	
Rig Geologist: GW / RC / SM	Converted to Well: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
166							
167					(167.0 - 176.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1		
168						(168.0') Tag line got hung up when attempting to tag borehole on 6/26/20.	
169							
170							
171							
172							
173				(-0.4 - 237.0') 5.5" PVC Sch 80 Conductor Casing			
174							
175							
176					(176.0 - 177.0') No recovery		
177		NR			(177.0 - 187.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1		
178							
179							
180							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.

Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Drilling and Sleeve Installation Log

Sheet: 13 of 20

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches	Project Number:	RC000753.0051
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone		
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
181							
182							
183							
184							
185							
186							
187							
188							
189							
190							
191							
192							
193							
194							
195							

(-0.4 - 237.0')
5.5" PVC Sch 80
Conductor
Casing

(187.0 - 193.5') Topock-metadiorite; GLEY1
2.5/4 and GLEY1 8/1

(193.5 - 197.0') No recovery

(193.0') Encountered obstruction when tagging after clean out when drilling with tricone bit. Could not get tagline pass 193 ft. when attempting to tag borehole on 6/26/20.

NR

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.
Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Drilling and Sleeve Installation Log

Sheet: 14 of 20

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches	Project Number:	RC000753.0051
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone		
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
196		NR					
197					(197.0 - 207.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1		
198							
199							
200							
201							
202							
203							
204							
205							
206							
207							
208							
209							
210							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.

Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Date Started: 06/25/2020	Surface Elevation: 538.53 ft amsl	Boring No.: MW-70BR-287 SR
Date Completed: 07/01/2020	Northing (NAD83): 2100512.18	
Drilling Co.: Cascade	Easting (NAD83): 7615832.54	Client: PG&E
Drilling Method: Sonic Drilling	Total Depth: 287.0 ft bgs	Project: Final GW Remedy Phase 1
Drill Rig Type: Boart Longyear Track	Conductor Casing Diameter: 12 inches	Location: PG&E Topock, Needles, California
Driller Name: E. Ramos / J. Hernandez	Drill Casing Diameter: 10 inches	Project Number: RC000753.0051
Drilling Asst: FS / JC / JS	Drill Bit: 3 1/2" & 4 5/8" Tricone	
Tool-Pusher: Arnold Lamon	Depth to First Water: 79.6 ft bgs	
Rig Geologist: GW / RC / SM	Converted to Well: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
211							
212							
213							
214							
215							
216					(216.0 - 217.0') No recovery		
217		NR					
218				(-0.4 - 237.0') 5.5" PVC Sch 80 Conductor Casing	(217.0 - 221.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1		
219							
220							
221					(221.0 - 224.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1	(221.0') Tagged depth prior to installing the 4 5/8" tricone bit.	
222							
223							
224					(224.0 - 233.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1		
225							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.

Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Drilling and Sleeve Installation Log

Sheet: 16 of 20

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches		California
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone	Project Number:	RC000753.0051
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
226						(225.0') Depth Tricone bit was placed inside conductor casing prior to drilling to remove blockage in well. Tricone bit was installed without resistance.	
227							
228							
229							
230							
231				(-0.4 - 237.0') 5.5" PVC Sch 80 Conductor Casing			
232							
233					(233.0 - 237.0') Topock-metadiorite; GLEY1 2.5/4 and GLEY1 8/1		
234							
235					(234.5 - 236.0'); 5GY 4/4; highly altered zone, olive green coloration, frequent iron oxide staining		
236							
237						(236.0') The drill rods got hung up when trying to put back down to 246 ft. bgs the approximate depth of the bottom of the conductor casing. During attempts to get drill rods back down to 246 ft. bgs added fresh water to thin the mud so the bean pump could recirculate the mud. During recirculation observed a piece of PVC thread from conductor casing and pieces of shale trap in mud tub. Tripped out drill rods to tag hole.	
238					(237.0 - 239.8') Topock-metadiorite; RQD 40%; GLEY1 6/1 some GLEY1 2.5/1 (237.1 - 237.5'); Broken zone (237.5 - 238.0'); Joint 80 degree fracture, iron, calcite secondary mineralization, unfoliated	(236.6 - 240.0') 517.92 gallons of water used; 318.72 gallons of water recovered; 199.2 gallons of water lost	
239				(237.0 - 287.0') Open borehole	(238.0 - 238.2'); Joint 55 degree fracture, iron, calcite secondary mineralization, unfoliated (238.3 - 238.4'); Joint 35 degree fracture, iron, calcite secondary mineralization, unfoliated	(236.6 - 240.1') Tagged depth to grout with drill rods inside the PVC sleeve after 24 hours. The grout and end PVC end cap were removed by drilling.	(237.1 - 246.0') 885 gallons of bentonite recovered; 617.2 gallons of water lost
240					(238.6 - 239.0'); Joint 70 degree fracture, iron secondary mineralization, unfoliated	(237.0') Encountered obstruction when drilling with tricone bit. Obstruction was material that could not be bailed out during development.	(237.0 - 242.7') 1115.2 gallons of water used; 498 gallons of water recovered; 597.6 gallons of bentonite slurry recovered; 287.4 gallons of bentonite

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.

Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches		California
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone	Project Number:	RC000753.0051
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
241					(239.0 - 239.4'); Joint 70 degree fracture, iron secondary mineralization, unfoliated (239.5 - 239.7'); Joint 60 degree (239.8 - 244.3') Topock-metadiorite; RQD 83%; GLEY1 6/1 some GLEY1 2.5/1 (239.801'); Mechanical fracture (239.8 - 240.1'); Broken zone (240.05'); Horizontal joint (240.5 - 240.9'); Joint 55 degree fracture, iron secondary mineralization, unfoliated (240.8'); Vug (241.7 - 242.0'); Joint 70 degree fracture, iron secondary mineralization, unfoliated (241.71'); Horizontal joint, iron secondary mineralization (242.4'); Joint 10 degree fracture, iron, secondary mineralization, unfoliated (242.8 - 243.0'); Joint 30 degree fracture, iron secondary mineralization (243.7 - 243.7'); Mechanical fracture (243.8 - 244.3'); Joint 70 degree fracture (244.3 - 244.8') No recovery	(237.1 - 246.0') Used bentonite mud to remove rock cuttings. (238.0') Encountered fracture during drilling with Tricone bit. (238.5') Encountered fracture during drilling with Tricone bit. (240.0') Observed small fragments of PVC in water returns. Drillers think it is from the drill rods rubbing on the conductor casing. Return water is gray in color and feels gritty. Drillers state it is from rock flour/cuttings not bentonite. (240.1 - 287.0') Cleaned out borehole with 3 1/2" tricone bit after sleeve was installed. Conducted an initial round of development to remove any remaining drilling mud on 7/1/30 by bailing and pumping. Purged approximately 40 gallons.	slurry lost (237.2 - 246.0') 1155.36 gallons of water used; 597.6 gallons of water recovered; 557.76 gallons of water lost (240.0 - 287.0') 350 gallons of bentonite slurry used; 350 gallons of bentonite slurry recovered; 0 gallons of bentonite slurry lost (240.1 - 287.0') 517.92 gallons of water used; 318.72 gallons of water recovered; 199.2 gallons of water lost (242.7 - 246.0') 1254.96 gallons of water used; 756.96 gallons of water recovered; 498 gallons of water lost
242							
243							
244							
245		NR			(244.8 - 250.0') Topock-metadiorite; RQD 90%; GLEY1 6/1 some GLEY1 2.5/1 (244.8 - 245.1'); Parallel joints 45 degrees fractures, iron, calcite secondary mineralization, unfoliated (245.9 - 245.9'); Joint 65 degree, fracture, iron, calcite secondary mineralization, unfoliated (246.4 - 246.6'); Joints 45 degrees fractures, iron, calcite secondary mineralization, unfoliated		
246							
247							
248				(237.0 - 287.0') Open borehole	(247.7'); 55 degree fracture, iron secondary mineralization, unfoliated (248.0 - 248.2'); Joint 55 degree fracture, iron, calcite secondary mineralization, unfoliated (248.2'); Joint 70 degree fracture, iron secondary mineralization, unfoliated (248.25'); Joint 25 degree fracture, iron secondary mineralization, unfoliated (248.3 - 248.5'); Joint	(246.0') Confirmed the rod count was correct and depth accurate. Pulled drill rods back up and lost approximately 5 ft of hole. Drillers think it is due to cuttings settling out. Added bentonite mud to well and recirculated to remove cuttings. Pulled up drill rods due to mud too thick to pump with bean pump. Driller states the rods were dragging a bit.	(246.0 - 258.0') 816.72 gallons of water used; 219.12 gallons of water recovered; 597.6 gallons of water lost
249							
250					(250.0 - 255.1') Topock-metadiorite; RQD 85% (250.5 - 250.6'); Joint 45 degree fracture, iron, secondary mineralization		
251					(251.1 - 251.2'); Joint 15 degree fracture (251.3 - 251.5'); Joint 40 degree fracture, iron, calcite secondary mineralization, unfoliated (251.5 - 251.7'); Joint 45 degree fracture, iron, calcite secondary mineralization, unfoliated (251.9 - 252.1'); Joint 45 degree fracture, iron secondary mineralization, unfoliated (252.2 - 252.2'); Joint 10 degree fracture, iron secondary mineralization, unfoliated (253.2 - 253.2'); Joint 30 degree fracture, iron, calcite secondary mineralization, unfoliated (253.8 - 253.9'); Joint 30 degree fracture, iron, calcite secondary mineralization, unfoliated (254'); Horizontal joint	(254.0') Observed pieces of shale trap rubber and PVC in mud cuttings use shaker screen to sieve out PVC and rubber.	
252							
253							
254							
255							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.
Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches	Project Number:	RC000753.0051
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone		
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
256					(255.0 - 256.0'); Broken zone (255.1 - 260.1') Topock-metadiorite; RQD 87%; GLEY1 6/1 some GLEY1 2.5/1		
257					(256.2 - 256.4'); Joint 30 degree fracture, iron, calcite, secondary mineralization, unfoliated (256.7 - 256.9'); Joint 30 degree fracture, iron, calcite secondary mineralization, unfoliated		
258					(258.2 - 258.3'); Joint 30 degree fracture, iron, calcite secondary mineralization, unfoliated (258.2 - 258.5'); Joint 75 degree fracture, iron, calcite secondary mineralization, unfoliated (258.4 - 258.6'); Joint 40 degree fracture, iron, calcite secondary mineralization, unfoliated (258.9 - 259.1'); Joint 40 degree fracture, iron, calcite secondary mineralization, unfoliated (259.4 - 254.5'); Joint 25 degree fracture, iron, calcite secondary mineralization, unfoliated	(258.0') Drillers requested to drill deeper with 4 5/8" Tricone bit to give any cuttings a place to go after the first attempt to install sleeve was unsuccessful. Once the drilled to 258 ft. bgs approximately 2.5 ft. of material fell back into hole and the sleeve was installed successfully to a depth of approximately 240.1 ft bgs.	
259					(260.0 - 260.7'); Broken zone (260.1 - 265.1') Topock-metadiorite; RQD 53%; GLEY1 6/1 some GLEY1 2.5/1 (260.7 - 260.7'); Joint 10 degree fracture, iron, secondary mineralization (261.3'); Horizontal joint, iron secondary mineralization (261.3 - 261.6'); Two vertical joints (261.5 - 261.7'); Joint 40 degree fracture, iron, secondary mineralization (263.3 - 264.0'); Broken zone		
260							
261							
262							
263							
264							
265							
266							
267							
268							
269							
270							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair.
Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Drilling and Sleeve Installation Log

Sheet: 19 of 20

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles,
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches		California
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone	Project Number:	RC000753.0051
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
271					calcite secondary mineralization, unfoliated (269.0 - 270.0') Topock-metadiorite; RQD 40%; GLEY1 6/1 some GLEY1 2.5/1 (269.01'); Mechanical horizontal fracture (269.2 - 269.3'); Joint 40 degree fracture, calcite, secondary mineralization, unfoliated (269.5 - 270.0'); Broken zone (270.0 - 275.0') Topock-metadiorite; RQD 66%; GLEY1 6/1 some GLEY1 2.5/1 (270.4 - 270.5'); Joint 20 degree fracture, iron, secondary mineralization (270.5 - 270.6'); Joint 40 degree fracture, iron, secondary mineralization (270.5 - 270.6'); Joint 20 degree fracture, iron secondary mineralization, unfoliated (270.8 - 270.9'); Joint 30 degree fracture, iron secondary mineralization, unfoliated (271.0 - 271.0'); Joint 15 degree fracture, iron, calcite secondary mineralization, unfoliated (271.6 - 271.9'); Joint 50 degree fracture, calcite secondary mineralization, unfoliated (272.2 - 272.3'); Joint 15 degree fracture, iron, calcite secondary mineralization, unfoliated (272.6 - 272.7'); Joint 20 degree fracture, calcite secondary mineralization, unfoliated (273.2 - 273.4'); Joint 30 degree fracture, iron, calcite secondary mineralization, unfoliated (273.5 - 273.7'); Joint 45 degree fracture, iron, calcite secondary mineralization, unfoliated (273.7 - 273.8'); Joint 20 degree fracture, iron, calcite secondary mineralization, unfoliated (273.9 - 274.1'); Joint 40 degree fracture, calcite secondary mineralization, unfoliated (274.25'); Horizontal joint, iron, calcite secondary mineralization, unfoliated (275.0 - 275.2'); Mechanical degree fracture (275.0 - 280.0') Topock-metadiorite; RQD 74%; GLEY1 6/1 some GLEY1 2.5/1	(270.0') Driller states hole loosened up during clean out with tricone bit on 6/30/20. (272.0') Driller states hole tightened up during clean out with tricone bit on 6/30/20. (273.0') Driller states hole loosened up during clean out with tricone bit on 6/30/20. (277.0') Observed less PVC shavings in mud returns. Driller states PVC shavings could be from rock cuttings grinding on wall of sleeve	
272							
273							
274							
275							
276							
277							
278				(237.0 - 287.0') Open borehole			
279							
280							
281							
282							
283							
284							
285					(284.7 - 284.7'); Joint 20 degree fracture,		

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Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.

Date Started:	06/25/2020	Surface Elevation:	538.53 ft amsl	Boring No.: MW-70BR-287 SR	
Date Completed:	07/01/2020	Northing (NAD83):	2100512.18		
Drilling Co.:	Cascade	Easting (NAD83):	7615832.54	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	287.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Boart Longyear Track	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	E. Ramos / J. Hernandez	Drill Casing Diameter:	10 inches	Project Number:	RC000753.0051
Drilling Asst:	FS / JC / JS	Drill Bit:	3 1/2" & 4 5/8" Tricone		
Tool-Pusher:	Arnold Lamon	Depth to First Water:	79.6 ft bgs		
Rig Geologist:	GW / RC / SM	Converted to Well:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (Descriptions from the MW-70BR boring log, reference log for full geologic descriptions)	Drilling notes and observations for the drilling and installation of the sleeve to repair conductor casing	Drilling Fluid
286							
287				(237.0 - 287.0') Open borehole	calcite secondary mineralization, unfoliated (284.8 - 284.5'); Joint 30 degree fracture, iron, calcite secondary mineralization, unfoliated (285.0 - 287.0') Topock-metadiorite; RQD 93%; GLEY1 6/1 some GLEY1 2.5/1 (285.0 - 285.1'); Mechanical fracture (285.7 - 286.0'); Broken zone (286.0 - 286.6'); Joint 65 degree fracture, iron, calcite secondary mineralization, unfoliated possible slickenlines (286.8 - 287.0'); Joint 25 degree fracture, calcite secondary mineralization, unfoliated		
288					Tagged Total Depth After Clean Out 287 ft.bgs		
289							
290							
291							
292							
293							
294							
295							
296							
297							
298							
299							
300							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery, SR = Sleeve Repair; Notes: blue water table symbol represents depth to water measured prior to well repair. Borehole was partially overdrilled to install 4.5 inch sleeve due to evidence of damage to the 5.5 inch diameter conductor casing.