Well Construction Log

ARCADIS

Date Started:	05/01/2023	Surface Elevation:	520.26 ft amsl	**Well ID: ER-03**	
Date Completed:	05/04/2023	Shallow Well Elevation:	517.69 ft amsl*		
Drilling Co.:	Cascade	Deep Well Elevation:	N/A	Client:	PG&E
Drilling Method:	Roto-Sonic	Northing (NAD83):	2100908.17	Project:	Final GW Remedy Phase 2A
Driller Name:	Matt Arnold	Easting (NAD83):	7616862.06	Location:	PG&E Topock, Needles California
Drilling Asst:	D Hoeppner / G Alvarado	Borehole Diameter:	10.5-12 inches		
Logger:	Ellen Redner	Static Water Level:	See Log for Depths	Project Number:	30126255
Editor:	Sean McGrane	Development End Date:	5/22/2023		
Total Depth:	163 ft bgs	Well Completion:	☐ Flush ☐ Stick-up ☒ To Be Completed in Well Vault		

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Construction Details	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
0		Fill	GW		(0.0 - 66.0') 6" Sch. 80 PVC Casing; (0.0 - 4.0') Cemex #2/16 Mesh (16x30) Lapis Lustre Sand with Granular Bentonite; (0.0 - 8.0') 12" Diameter Borehole		Note: Backfill sand and residual bentonite from the mud tub seal will be removed during the excavation to be completed during the installation of the well vault.
		NA	NA				
		Alluvium Deposits	GW				
		Weathered Bedrock - Conglomerate	NA				
4		Weathered Bedrock - Conglomerate	NA				
6	No Groundwater Samples Collected				(8.0 - 163.0') 10.5" Diameter Borehole		
11		Weathered Bedrock - Conglomerate	NA		(4.0 - 31.5') Quikrete Portland Cement Type I, II OR IL, with up to 5% Halliburton Quik-Gel Bentonite	(4.0 - 31.5') 81.8 gallons	(4.0 - 31.5') 100 gallons (122%) Note: Second lift of the grout seal, used >20% of the calculated volume due to potential voids that formed during drilling.
16		Weathered Bedrock - Conglomerate	NA				
20							

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Drilling Method:	Roto-Sonic	Northing (NAD83):	2100908.17	Project:	Final GW Remedy Phase 2A
Driller Name:	Matt Arnold	Easting (NAD83):	7616862.06	Location:	PG&E Topock, Needles California
Drilling Asst:	D Hoeppner / G Alvarado	Borehole Diameter:	10.5-12 inches		
Logger:	Ellen Redner	Static Water Level:	See Log for Depths	Project Number:	30126255
Editor:	Sean McGrane	Development End Date:	5/22/2023		
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Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Construction Details	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
21			NA		(0.0 - 66.0') 6" Sch. 80 PVC Casing		
22							
23		Competent Bedrock - Conglomerate	NA		(22.5 - 23.5') Kwik-Zip Centralizer		Note: Centralizer had to be trimmed to fit inside drill casing.
24							
25					(4.0 - 31.5') Quikrete Portland Cement Type I, II OR IL, with up to 5% Halliburton Quik-Gel Bentonite	(4.0 - 31.5') 81.8 gallons	(4.0 - 31.5') 100 gallons (122%) Note: Second lift of the grout seal, used >20% of the calculated volume due to potential voids that formed during drilling.
26		Competent Bedrock - Conglomerate	NA				
27							
28							
29							
30	No Groundwater Samples Collected						
31		Competent Bedrock - Conglomerate	NA				
32							
33							
34							
35					(31.5 - 52.0') Quikrete Portland Cement Type I, II OR IL, with up to 5% Halliburton Quik-Gel Bentonite	(31.5 - 52.0') 56.8 gallons	(31.5 - 52.0') 100 gallons (176%) Note: First lift of the grout seal, used >20% of the calculated volume due to potential voids that formed during drilling.
36							
37							
38		Weathered Bedrock - Conglomerate	NA				
39							
40							

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Drilling Method:	Roto-Sonic	Northing (NAD83):	2100908.17	Project:	Final GW Remedy Phase 2A
Driller Name:	Matt Arnold	Easting (NAD83):	7616862.06	Location:	PG&E Topock, Needles California
Drilling Asst:	D Hoeppner / G Alvarado	Borehole Diameter:	10.5-12 inches		
Logger:	Ellen Redner	Static Water Level:	See Log for Depths	Project Number:	30126255
Editor:	Sean McGrane	Development End Date:	5/22/2023		
Total Depth:	163 ft bgs	Well Completion:	☐ Flush ☐ Stick-up ☒ To Be Completed in Well Vault		

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Construction Details	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
41					(0.0 - 66.0') 6" Sch. 80 PVC Casing		
42		Weathered Bedrock - Conglomerate	NA				
43							
44							
45		Weathered Bedrock - Conglomerate	NA		(31.5 - 52.0') Quikrete Portland Cement Type I, II OR IL, with up to 5% Halliburton Quik-Gel Bentonite	(31.5 - 52.0') 56.8 gallons	(31.5 - 52.0') 100 gallons (176%) Note: First lift of the grout seal, used >20% of the calculated volume due to potential voids that formed during drilling.
46							
47							
48							
49		Weathered Bedrock - Conglomerate	NA				
50	No Groundwater Samples Collected						
51							
52							
53		Weathered Bedrock - Conglomerate	NA		(52.0 - 57.5') Cemex #0/30 Mesh (30x50) Lapis Lustre Sand	(52.0 - 57.5') 4.1 bags	(52.0 - 57.5') 6 bags (146%) Note: Transition sand seal, used >20% of the calculated volume due to potential voids that formed during drilling.
54							
55							
56							
57							
58		Weathered Bedrock - Conglomerate	NA		(57.5 - 58.0') Enviroplug Medium Bentonite Chips	(57.5 - 58.0') 0.3 bags	(57.5 - 58.0') 0.5 bags (167%) Note: Bentonite seal, used >20% of the calculated volume due to potential voids that formed during drilling.
59					(58.0 - 163.0') Cemex #2/16 Mesh (16x30) Lapis Lustre Sand	(58.0 - 163.0') 78.6 bags	
60							

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Drilling Co.:	Cascade	Deep Well Elevation:	N/A	Client:	PG&E
Drilling Method:	Roto-Sonic	Northing (NAD83):	2100908.17	Project:	Final GW Remedy Phase 2A
Driller Name:	Matt Arnold	Easting (NAD83):	7616862.06	Location:	PG&E Topock, Needles California
Drilling Asst:	D Hoeppner / G Alvarado	Borehole Diameter:	10.5-12 inches		
Logger:	Ellen Redner	Static Water Level:	See Log for Depths	Project Number:	30126255
Editor:	Sean McGrane	Development End Date:	5/22/2023		
Total Depth:	163 ft bgs	Well Completion:	☐ Flush ☐ Stick-up ☒ To Be Completed in Well Vault		

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Construction Details	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
61					(0.0 - 66.0') 6" Sch. 80 PVC Casing		
62							
63					(62.5 - 63.5') Kwik-Zip Centralizer		Note: Centralizer had to be trimmed to fit inside drill casing.
64							
65							
66					(66.0 - 156.0') 6" 0.02-Slot 316L SS Wire Wrap Screen		
67							
68		Weathered Bedrock - Conglomerate	NA				(58.0 - 163.0') 99 bags (126%) Note: Filter pack, used >20% of the calculated volume due to potential voids that formed during drilling. Successfully completed the pre-alignment test using the "Dummy Tool" and swabbed filter pack for approximately 160 minutes to promote settling of the filter pack prior to the installation of the bentonite/transition sand seal. Conducted field sieve test on the filter pack sand prior to installation. Test results were consistent with the manufacture's published grain-size distribution.
69							
70	No Groundwater Samples Collected				(58.0 - 163.0') Cemex #2/16 Mesh (16x30) Lapis Lustre Sand	(58.0 - 163.0') 78.6 bags	
71							
72							
73							
74							
75							
76							
77							
78		Weathered Bedrock - Conglomerate	NA				
79							
80							

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Drilling Method:	Roto-Sonic	Northing (NAD83):	2100908.17	Project:	Final GW Remedy Phase 2A
Driller Name:	Matt Arnold	Easting (NAD83):	7616862.06	Location:	PG&E Topock, Needles California
Drilling Asst:	D Hoeppner / G Alvarado	Borehole Diameter:	10.5-12 inches		
Logger:	Ellen Redner	Static Water Level:	See Log for Depths	Project Number:	30126255
Editor:	Sean McGrane	Development End Date:	5/22/2023		
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Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Construction Details	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
81	No Groundwater Samples Collected	Weathered Bedrock - Conglomerate	NA		(66.0 - 156.0') 6" 0.02-Slot 316L SS Wire Wrap Screen	(58.0 - 163.0') 78.6 bags	(58.0 - 163.0') 99 bags (126%) Note: Filter pack, used >20% of the calculated volume due to potential voids that formed during drilling. Successfully completed the pre-alignment test using the "Dummy Tool" and swabbed filter pack for approximately 160 minutes to promote settling of the filter pack prior to the installation of the bentonite/transition sand seal. Conducted field sieve test on the filter pack sand prior to installation. Test results were consistent with the manufacture's published grain-size distribution.
82							
83		Weathered Bedrock - Conglomerate	NA				
84							
85							
86							
87							
88							
89							
90					(58.0 - 163.0') Cemex #2/16 Mesh (16x30) Lapis Lustre Sand		
91		Weathered Bedrock - Conglomerate	NA				
92							
93							
94							
95							
96							
97							
98		Weathered Bedrock - Conglomerate	NA				
99							
100							

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Drilling Co.:	Cascade	Deep Well Elevation:	N/A	Client:	PG&E
Drilling Method:	Roto-Sonic	Northing (NAD83):	2100908.17	Project:	Final GW Remedy Phase 2A
Driller Name:	Matt Arnold	Easting (NAD83):	7616862.06	Location:	PG&E Topock, Needles California
Drilling Asst:	D Hoeppner / G Alvarado	Borehole Diameter:	10.5-12 inches		
Logger:	Ellen Redner	Static Water Level:	See Log for Depths	Project Number:	30126255
Editor:	Sean McGrane	Development End Date:	5/22/2023		
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Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Construction Details	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
101					(66.0 - 156.0') 6" 0.02-Slot 316L SS Wire Wrap Screen		
102		Weathered Bedrock - Conglomerate	NA				
103							
104							
105		Weathered Bedrock - Conglomerate	NA				
106							
107							
108							
109							
110	No Groundwater Samples Collected	Weathered Bedrock - Conglomerate	NA		(58.0 - 163.0') Cemex #2/16 Mesh (16x30) Lapis Lustre Sand	(58.0 - 163.0') 78.6 bags	(58.0 - 163.0') 99 bags (126%) Note: Filter pack, used >20% of the calculated volume due to potential voids that formed during drilling. Successfully completed the pre-alignment test using the "Dummy Tool" and swabbed filter pack for approximately 160 minutes to promote settling of the filter pack prior to the installation of the bentonite/transition sand seal. Conducted field sieve test on the filter pack sand prior to installation. Test results were consistent with the manufacture's published grain-size distribution.
111							
112							
113							
114							
115		Weathered Bedrock - Conglomerate	NA				
116							
117							
118		Weathered Bedrock - Conglomerate	NA				
119							
120							

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Drilling Method:	Roto-Sonic	Northing (NAD83):	2100908.17	Project:	Final GW Remedy Phase 2A
Driller Name:	Matt Arnold	Easting (NAD83):	7616862.06	Location:	PG&E Topock, Needles California
Drilling Asst:	D Hoeppner / G Alvarado	Borehole Diameter:	10.5-12 inches		
Logger:	Ellen Redner	Static Water Level:	See Log for Depths	Project Number:	30126255
Editor:	Sean McGrane	Development End Date:	5/22/2023		
Total Depth:	163 ft bgs	Well Completion:	☐ Flush ☐ Stick-up ☒ To Be Completed in Well Vault		

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Construction Details	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
121					(66.0 - 156.0') 6" 0.02-Slot 316L SS Wire Wrap Screen		
122							
123							
124							
125							
126							
127							
128		Weathered Bedrock - Conglomerate	NA				(58.0 - 163.0') 99 bags (126%) Note: Filter pack, used >20% of the calculated volume due to potential voids that formed during drilling. Successfully completed the pre-alignment test using the "Dummy Tool" and swabbed filter pack for approximately 160 minutes to promote settling of the filter pack prior to the installation of the bentonite/transition sand seal. Conducted field sieve test on the filter pack sand prior to installation. Test results were consistent with the manufacture's published grain-size distribution.
129							
130	No Groundwater Samples Collected				(58.0 - 163.0') Cemex #2/16 Mesh (16x30) Lapis Lustre Sand	(58.0 - 163.0') 78.6 bags	
131							
132							
133							
134							
135							
136							
137							
138		Weathered Bedrock - Conglomerate	NA				
139							
140							

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Drilling Method:	Roto-Sonic	Northing (NAD83):	2100908.17	Project:	Final GW Remedy Phase 2A
Driller Name:	Matt Arnold	Easting (NAD83):	7616862.06	Location:	PG&E Topock, Needles California
Drilling Asst:	D Hoeppner / G Alvarado	Borehole Diameter:	10.5-12 inches		
Logger:	Ellen Redner	Static Water Level:	See Log for Depths	Project Number:	30126255
Editor:	Sean McGrane	Development End Date:	5/22/2023		
Total Depth:	163 ft bgs	Well Completion:	☐ Flush ☐ Stick-up ☒ To Be Completed in Well Vault		

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Construction Details	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
141	No Groundwater Samples Collected	Weathered Bedrock - Conglomerate	NA		(66.0 - 156.0') 6" 0.02-Slot 316L SS Wire Wrap Screen	(58.0 - 163.0') 78.6 bags	(58.0 - 163.0') 99 bags (126%) Note: Filter pack, used >20% of the calculated volume due to potential voids that formed during drilling. Successfully completed the pre-alignment test using the "Dummy Tool" and swabbed filter pack for approximately 160 minutes to promote settling of the filter pack prior to the installation of the bentonite/transition sand seal. Conducted field sieve test on the filter pack sand prior to installation. Test results were consistent with the manufacture's published grain-size distribution.
142		Weathered Bedrock - Conglomerate	NA				
143							
144		Weathered Bedrock - Metadiorite	NA				
145							
146							
147							
148							
149							
150					(58.0 - 163.0') Cemex #2/16 Mesh (16x30) Lapis Lustre Sand		
151		Weathered Bedrock - Metadiorite	NA				
152							
153							
154							
155							
156							
157		Weathered Bedrock - Metadiorite	NA		(157.0 - 158.0') Kwik-Zip Centralizer		Note: Centralizer had to be trimmed to fit inside drill casing.
158							
159							
160		Weathered Bedrock - Metadiorite	NA				

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Well Construction Log

ARCADIS

Sheet: 9 of 9

Well ID: ER-03

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Date Completed:	05/04/2023	Shallow Well Elevation:	517.69 ft amsl*		
Drilling Co.:	Cascade	Deep Well Elevation:	N/A	Client:	PG&E
Drilling Method:	Roto-Sonic	Northing (NAD83):	2100908.17	Project:	Final GW Remedy Phase 2A
Driller Name:	Matt Arnold	Easting (NAD83):	7616862.06	Location:	PG&E Topock, Needles California
Drilling Asst:	D Hoeppner / G Alvarado	Borehole Diameter:	10.5-12 inches		
Logger:	Ellen Redner	Static Water Level:	See Log for Depths	Project Number:	30126255
Editor:	Sean McGrane	Development End Date:	5/22/2023		
Total Depth:	163 ft bgs	Well Completion:	☐ Flush ☐ Stick-up ☒ To Be Completed in Well Vault		

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Construction Details	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
161	No Groundwater Samples Collected	Weathered Bedrock - Metadiorite	NA		(156.0 - 161.5') Sch. 80 PVC Sump and 316L Stainles Steel End Cap	(58.0 - 163.0') 78.6 bags	
162		Weathered Bedrock - Metadiorite	NA				
163					End of Boring at Target Depth of 163 ft bgs.		
164							
165							
166							
167							
168							
169							
170							
171							
172							
173							
174							
175							
176							
177							
178							
179							
180							

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Boring Log

ARCADIS

Sheet: 1 of 14

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 Pilot**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
1	24 in. 100%	NA		Fill	GW		(0-0.5 ft) Well graded gavel with sand (GW); brown (7.5YR 5/4) some strong brown (7.5YR 4/6); small to very large pebbles, angular to subround; some very fine to very coarse grained sand, subangular to subround; little granules, angular to subround; little small cobbles, angular to subround; dry.	(0.0 - 2.0') Air-knifed for utility clearance. Air-knifing to the target depth of 5 feet bgs was not possible due to bedrock at approximately 2 feet bgs.	
				NA	NA		(0.5-1 ft) Asphalt from old Route 66.		
				Alluvium Deposits	GW		(1-1.5 ft) Well graded gavel with sand (GW); yellowish red (5YR 5/6); small to very large pebbles, subangular to subround; some very fine to very coarse grained sand, subangular to round; little granules, subangular to subround; little small cobbles, subangular to subround; dry.		
2				Weathered Bedrock - Conglomerate	NA		(1.5-2.0 ft) Sedimentary Rock - Conglomerate; reddish brown (5YR 4/4); microcrystalline to fine grained, subround to angular; slightly to moderately weathered; soft to hard.		
3	42 in. 88%	NA	0.0	Weathered Bedrock - Conglomerate	NA		(2-6 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6); very fine to very coarse grained, subangular to subround; some small cobbles, subangular to subround; highly weathered; competent pieces medium hard to hard; massive; reacts with HCL; dry; friable; pulverized by drilling process.	(2.0 - 6.0') Drilled dry with 8-inch core barrel. Sample compacted in bag. Very hard drilling to install 8-inch diameter conductor casing to a depth of 6 feet bgs.	
6									
7	75 in. 63%	NA	0.0	Weathered Bedrock - Conglomerate	NA		(6-16 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6); very fine to very coarse grained, subangular to subround; some small cobbles, subangular to subround; highly weathered; more competent pieces medium hard to hard; massive; reacts with HCL; dry; friable; pulverized by drilling process.	(6.0 - 16.0') Drilled dry with 8-inch core barrel. Core barrel was temporarily locked up in formation. Sample compacted in bag.	
8									
9									
10									
11									
12									

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Boring Log

ARCADIS

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 Pilot**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
13									
14	75 in. 63%	NA	0.0	Weathered Bedrock - Conglomerate	NA		(6-16 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6); very fine to very coarse grained, subangular to subround; some small cobbles, subangular to subround; highly weathered; more competent pieces medium hard to hard; massive; reacts with HCL; dry; friable; pulverized by drilling process.		
15									
16									
17							(16-20.5 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(16.0 - 36.0') Smooth drilling, cored and flushed drill casing with water. Driller states the casing was flushed over core barrel to straighten out 6-inch casing. Core sample was drilled in two 10-foot runs without tripping out sample.	(16.0 - 36.0') 753 gallons of drilling fluid added; 735 gallons of drilling fluid recovered; 18 gallons of water lost to formation.
18				Weathered Bedrock - Conglomerate	NA				
19									
20	66 in. 55%	NA	50.0						
21							(20.5-26 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6); very fine to very coarse grained, subangular to subround; some granule to medium pebble clasts, subangular to subround; slightly weathered; hard; moderately to intensely fractured; massive; reacts with HCL; granule to medium pebble clasts composed mostly of metadiorite. (21.53-21.55 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (21.85-21.87 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (22.11-22.13 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (22.43-22.45 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (22.67-22.69 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (23.19-23.2 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (23.55-23.57 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface.		
22				Competent Bedrock - Conglomerate	NA				
23									
24									

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Boring Log

ARCADIS

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 Pilot**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
25	66 in. 55%	0.5 mins/ft	50.0	Competent Bedrock - Conglomerate	NA		(23.69-23.71 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (23.95-24 ft) Mechanical fracture; 15 degrees; no secondary mineralization; iron oxide staining; tight aperture; rough surface. (20.5-26 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6); very fine to very coarse grained, subangular to subround; some granule to medium pebble clasts, subangular to subround; slightly weathered; hard; moderately to intensely fractured; massive; reacts with HCL; granule to medium pebble clasts composed mostly of metadiorite. (24.31-24.32 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface.		
26				Competent Bedrock - Conglomerate	NA		(24.44-24.47 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (24.65-24.67 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (24.7-25.5 ft) Intensely fractured zone. (25.53-25.55 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (26-26.3 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
27							(26.3-36 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4); very fine to coarse grained, subangular to subround; little granule to medium pebble clasts, angular to subangular; slightly to moderately weathered; hard; slightly to moderately fractured; massive; reacts with HCL; granule to medium pebble clasts composed mostly of metadiorite. (27-27.02 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (27.53-27.54 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (27.7-27.8 ft) Mechanical fracture; 20 degrees; no secondary mineralization or staining; tight aperture; rough surface.		
28									
29									
30							(28.05-28.06 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (28.55-28.56 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (28.76-28.78 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; open aperture; rough surface. (29.1-29.3 ft) Natural fracture; 60 degrees; secondary mineralization; iron oxide staining; tight aperture; smooth surface; vugged. (30.4-31 ft) Natural fracture; 60 degrees; secondary mineralization; iron oxide staining; open aperture; rough surface; vugged.		
31	116 in. 97%	1.3 mins/ft	52.6	Competent Bedrock - Conglomerate	NA				
32							(32.1-32.3 ft) Mechanical fracture; 90 degrees; no secondary mineralization or staining; open aperture; smooth surface; vugged.		
33							(32.93-32.95 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (33.2-33.22 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (33.45-33.48 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (33.92-33.94 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface.		
34							(34.34-34.38 ft) Mechanical fracture; 10 degrees; no secondary mineralization or staining; tight aperture; rough surface.		
35							(34.8-35.8 ft) Natural fracture; 80 degrees; unidentified green mineral secondary mineralization; iron oxide staining; tight aperture; rough surface; vugged.		
36									

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Boring Log

ARCADIS

Boring No.: ER-03 Pilot

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl	Client:	PG&E
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17	Project:	Final GW Remedy Phase 2A
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Location:	PG&E Topock, Needles California
Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs		
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches		
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
37							(36-44.7 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(36.0 - 46.0') Easy drilling, core sample was drilled in one 10-foot run and sample retrieved. Approximately 1 foot of sample tagged inside of core barrel before retrieving. (36.0 - 56.0') Cored and flushed drill casing with water.	(36.0 - 56.0') 400 gallons of drilling fluid added; 396 gallons of drilling fluid recovered; 4 gallons of water lost to formation.
38									
39									
40				Weathered Bedrock - Conglomerate	NA				
41	16 in. 13%	1 mins/ft	0.0						
42									
43									
44									
45				Weathered Bedrock - Conglomerate	NA		(44.7-46 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4); very fine to coarse grained, subangular to subround; little granule to medium pebble clasts, angular to subangular; moderately weathered; hard; very intensely fractured; massive; reacts with HCL; granule to medium pebble clasts composed mostly of metadiorite. (44.8-45.4 ft) Intensely fractured zone. (45.4-45.41 ft) Mechanical fracture; 10 degrees; no secondary mineralization or staining; open aperture; rough surface. (45.59-45.6 ft) Mechanical fracture; 180 degrees; no secondary mineralization or staining; tight aperture; rough surface. (45.83-45.85 ft) Mechanical fracture; 5 degrees; no secondary mineralization or staining; tight aperture; rough surface.		
46									
47	42 in. 35%	1.7 mins/ft	0.0	Weathered Bedrock - Conglomerate	NA		(46-52.5 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(46.0 - 56.0') Smooth drilling, core sample was drilled in one 10-foot run and sample retrieved.	
48									

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Boring Log

ARCADIS

Sheet: 5 of 14

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 Pilot**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
49							(46-52.5 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
50				Weathered Bedrock - Conglomerate	NA				
51									
52	42 in. 35%	1.7 mins/ft	0.0						
53							(52.5-56 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4); very fine to coarse grained, subangular to subround; granule to medium pebbles clasts, angular to subangular; moderately to highly weathered; hard; very intensely fractured; massive; reacts with HCL; granule to medium pebble clasts composed mostly of metadiorite.		
54				Weathered Bedrock - Conglomerate	NA				
55									
56									
57							(56-76 ft) No Recovery; core potentially washed out by drilling fluids during coring.	(56.0 - 76.0') Cored and flushed drill casing water. Core sample was drilled in two 10-foot runs without tripping out sample. (56.0 - 66.0') Approximately 2 feet of sample tagged inside of core barrel before advancing to approximately 76 feet bgs.	(56.0 - 76.0') 434 gallons of drilling fluid added; 405 gallons of drilling fluid recovered; 29 gallons of water lost to formation.
58	0.0 in. 0.0%	2 mins/ft	0.0	Weathered Bedrock - Conglomerate	NA				
59									
60									

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Boring Log

ARCADIS

Boring No.: ER-03 Pilot

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl	Client:	PG&E
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17	Project:	Final GW Remedy Phase 2A
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Location:	PG&E Topock, Needles California
Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs		
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches		
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
61							(56-76 ft) No Recovery; core potentially washed out by drilling fluids during coring.		
62									
63	0.0 in. 0.0%	2 mins/ft	0.0						
64									
65									
66				Weathered Bedrock - Conglomerate	NA				
67									
68									
69	0.0 in. 0.0%	0.8 mins/ft	0.0						
70									
71									
72									

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Boring Log

ARCADIS

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 Pilot**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
73							(56-76 ft) No Recovery; core potentially washed out by drilling fluids during coring.		
74	0.0 in. 0.0%	0.8 mins/ft	0.0	Weathered Bedrock - Conglomerate	NA				
75									
76							(76-81.8 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(76.0 - 96.0') Cored and flushed drill casing with water. Core sample was drilled in two 10-foot runs without tripping out sample. Water recovery estimates may be high throughout log due to fluctuating pump rates. (76.0 - 79.0') Rough drilling. (79.0 - 96.0') Normal drilling.	(76.0 - 96.0') 570 gallons of drilling fluid added; 460 gallons of drilling fluid recovered; 110 gallons of water lost to formation.
77									
78									
79				Weathered Bedrock - Conglomerate	NA				
80	50 in. 42%	1 mins/ft	13.0						
81									
82							(81.8-86 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4); very fine to coarse grained, subangular to subround; little granule to medium pebble clasts, angular to subangular; moderately to highly weathered; hard; very intensely fractured; massive; reacts with HCL; granule to medium pebble clasts composed mostly of metadiorite.		
83				Weathered Bedrock - Conglomerate	NA				
84									

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Boring Log

ARCADIS

Boring No.: ER-03 Pilot

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl		
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
85	50 in. 42%	1 mins/ft	13.0	Weathered Bedrock - Conglomerate	NA		(81.8-86 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4); very fine to coarse grained, subangular to subround; little granule to medium pebble clasts, angular to subangular; moderately to highly weathered; hard; very intensely fractured; massive; reacts with HCL; granule to medium pebble clasts composed mostly of metadiorite. (85.45-86 ft) Natural fracture; 80 degrees; iron oxide staining; tight aperture; smooth surface.		
86							(86-96 ft) No Recovery; potentially washed out by drilling fluids during coring.		
91	0.0 in. 0.0%	1.3 mins/ft	0.0	Weathered Bedrock - Conglomerate	NA				

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Boring Log

ARCADIS

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 Pilot**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
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Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
97							(96-104 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(96.0 - 116.0') Cored and flushed drill casing with water. Core sample was drilled in two 10-foot runs without tripping out sample.	(96.0 - 116.0') 440 gallons of drilling fluid added; 420 gallons of drilling fluid recovered; 20 gallons of water lost to formation.
98									
99									
100				Weathered Bedrock - Conglomerate	NA				
101	24 in. 20%	1.4 mins/ft	0.0						
102									
103									
104									
105				Weathered Bedrock - Conglomerate	NA		(104-106 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4); very fine to coarse grained, subangular to subround; little granules to medium pebble clasts, angular to subangular; moderately to highly weathered; hard; very intensely fractured; massive; reacts with HCL; granule to medium pebble clasts composed mostly of metadiorite.		
106									
107	15 in. 13%	1 mins/ft	0.0	Weathered Bedrock - Conglomerate	NA		(106-114.75 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(106.0 - 110.0') Hard drilling.	
108									

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Boring Log

ARCADIS

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 Pilot**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
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Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
109							(106-114.75 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
110								(110.0 - 116.0') Normal drilling.	
111				Weathered Bedrock - Conglomerate	NA				
112	15 in. 13%	1 mins/ft	0.0						
113									
114									
115				Weathered Bedrock - Conglomerate	NA		(114.75-116 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4); very fine to coarse grained, subangular to subround; little granules to medium pebble clasts, angular to subangular; moderately to highly weathered; hard; very intensely fractured; massive; reacts with HCL; granule to medium pebble clasts composed mostly of metadiorite.		
116							(116-136 ft) No Recovery; potentially washed out by drilling fluids during coring.	(116.0 - 136.0') Normal drilling, cored and flushed drill casing with water. Core sample was drilled in two 10-foot runs without tripping out sample.	(116.0 - 136.0') 496 gallons of drilling fluid added; 680 gallons of drilling fluid recovered; 184 gallons of formation water generated.
117									
118	0.0 in. 0.0%	1.1 mins/ft	0.0	Weathered Bedrock - Conglomerate	NA				
119									
120									

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Boring Log

ARCADIS

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 Pilot**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
121							(116-136 ft) No Recovery; potentially washed out by drilling fluids during coring.		
122									
123	0.0 in. 0.0%	1.1 mins/ft	0.0						
124									
125									
126				Weathered Bedrock - Conglomerate	NA				
127									
128									
129	0.0 in. 0.0%	1 mins/ft	0.0						
130									
131									
132									

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Boring Log

ARCADIS

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 Pilot**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
133							(116-136 ft) No Recovery; potentially washed out by drilling fluids during coring.		
134	0.0 in. 0.0%	1 mins/ft	0.0	Weathered Bedrock - Conglomerate	NA				
135									
136							(136-142 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(136.0 - 146.0') Cored and flushed drill casing with water. Core sample was drilled in two 10-foot runs without tripping out sample.	(136.0 - 146.0') 245 gallons of drilling fluid added; 320 gallons of drilling fluid recovered; 75 gallons of formation water generated.
137									
138								(136.0 - 143.0') Normal drilling.	
139				Weathered Bedrock - Conglomerate	NA				
140	34 in. 28%	1.1 mins/ft	11.8						
141									
142				Weathered Bedrock - Conglomerate	NA		(142-142.5 ft) Metamorphic Rock - Metadiorite; very dark greenish gray (5G 3/1), microcrystalline to fine grained, subangular to subround; fresh to slightly weathered; hard; very intensely fractured; medium-bedding thickness; iron oxide staining; calcium chlorite secondary mineralization, reacts with HCL; NOTE: Metadiorite boulder within the conglomerate.		
143				Weathered Bedrock - Metadiorite	NA		(142.5-143 ft) Sedimentary Rock - Conglomerate; pinkish white (2.5YR 8/2) and dark reddish brown (2.5YR 3/4); microcrystalline to coarse grained, subangular to subround; highly weathered; hard; very intensely fractured; massive; reacts with HCL.	(143.0 - 146.0') Hard drilling, potential metadiorite contact.	
144									

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Boring Log

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 Pilot**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
145	34 in. 28%	1.1 mins/ft	11.8	Weathered Bedrock - Metadiorite	NA		(143-146 ft) Metamorphic Rock - Metadiorite; very dark greenish gray (5G 3/1); microcrystalline to fine grained, subangular to subround; highly weathered; hard; very intensely fractured; massive; iron oxide staining; calcium chlorite secondary mineralization, reacts with HCL; pulverized by drilling process.		
146							(146-156 ft) No Recovery; potentially washed out by drilling fluids during coring.	(146.0 - 163.0') Cored and flushed drill casing with water. Core sample was drilled in two 10-foot runs without tripping out sample. Hard drilling when advancing the 4-inch diameter core barrel, very hard when overdrilling 6-inch diamter drill casing.	(146.0 - 163.0') 741 gallons of drilling fluid added; 460 gallons of drilling fluid recovered; 281 gallons of water lost to formation.
147									
148									
149									
150									
151	0.0 in. 0.0%	0.1 mins/ft	0.0	Weathered Bedrock - Metadiorite	NA				
152									
153								(153.0') Decrease in drilling water returns. The 6-inch diameter casing bcame locked in the formation and could not be advanced further. The 4-inch diameter core barrel with the sample could not be	
154									
155									
156									

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Boring Log

ARCADIS

Date Started:	03/08/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 Pilot**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Depth to First Water:	60.6 ft bgs		
Drilling Asst:	D Hoeppner / G Alvarado	Sonic Drilling:	10 ft Core Barrel	Project Number:	30126255
Logger:	SM / ER / JA	Sampling Interval:	Continuous	Bedrock Sampling:	10 ft Core Barrel
Editor:	Sean McGrane	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery	Drilling Run and Average Penetration Rate	RQD (%)	Geologic Formation	USCS Code	USCS Class	Rock Description	Drilling Notes	Drilling Fluid and Properties
157				Weathered Bedrock - Metadiorite	NA		(156-159 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	retrieved. The 8-inch diameter casing was drilled to approximately 143 feet bgs to free 6-inch diameter casing on. Once the 6-inch diameter casing was free it was advanced to total depth and the core sample retireved on 4/27/23. .	
158									
159	48 in. 57%	0.9 mins/ft	14.5				(159-162 ft) Metamorphic Rock - Metadiorite: very dark greenish gray (5G 3/1); microcrystalline to fine grained, subangular to subround; moderately to highly weathered; hard; very intensely fractured; massive; iron oxide staining; calcium chlorite secondary mineralization, reacts with HCL; very broken by drilling process.(159-159.1 ft) Natural fracture; 35 degrees; calcium chlorite secondary mineralization, reacts with HCL; iron oxide staining; open aperture; rough surface; vugged. (159.3-159.31 ft) Natural fracture; 180 degrees; calcium chlorite seconday mineralization, reacts with HCL; iron oxide staining; tight aperture; rough surface; vugged. (159.5-159.52 ft) Natural fracture; 180 degrees, calcium chlorite secondary mineralization, reacts with HCL; iron oxide staining; tight aperture; rough surface; vugged. (159.69-159.72 ft) Natural fracture; 30 degrees; calcium chlorite secondary mineralization, reacts with HCL; iron oxide staining; tight aperture; rough surface; vugged. (161.75-161.95 ft) Natural fracture; 45 degrees; calcium chlorite secondary mineralization, reacts with HCL; tight aperture; smooth surface; vugged.		
160				Weathered Bedrock - Metadiorite	NA				
161									
162				Weathered Bedrock - Metadiorite	NA		(162-163 ft) Metamorphic Rock - Metadiorite; very dark greenish gray (5G 3/1); microcrystalline to fine grained, subangular to subround; slightly weathered; hard; slightly fractured; massive; iron oxide staining; calcium chlorite secondary mineralization, reacts with HCL; NOTE: section of competent core. (162.15-162.2 ft) Natural fracture; 20 degrees; calcium chlorite secondary mineralization, reacts with HCL; open aperture; rough surface; vugged. End of Boring at Target Depth of 163 ft bgs.		
163									
164									
165									
166									
167									
168									

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater; Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Date Started:	04/26/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 8-inch**
Date Completed:	04/28/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	8 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	8-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
1	(0.0 - 6.0) 0.17 mins/ft	GW		(0-0.5 ft) Well graded gavel with sand (GW); brown (7.5YR 5/4) some strong brown (7.5YR 4/6).	**This "ER-03 8-inch" drilling log documents an intermediate reaming step to an 8-inch diameter borehole. Additional drilling logs document reaming to create the target design borehole diameter of 10.5-inches.**	
		NA		(0.5-1 ft) Asphalt from old Route 66.		
2		GW		(1-1.5 ft) Well graded gavel with sand (GW); yellowish red (5YR 5/6).	(0.0 - 6.0') Soft drilling. The 7-inch diameter drill casing was planned to be flushed over the 6-inch diameter casing prior to flushing the 8-inch diameter casing. The 7-inch diameter driver was not functioning. Therefore, the 8-inch diameter casing was flushed over the 6-inch diameter casing.	
		NA		(1.5-2.0 ft) Sedimentary Rock - Conglomerate; reddish brown (5YR 4/4).		
3				(2-6 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6).		
4		NA				
5						
6						
7	(6.0 - 11.0) 1.60 mins/ft			(6-16 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6).	(6.0 - 16.0') Soft drilling	(6.0 - 16.0') 368 gallons of water used; 350 gallons of water recovered; 18 gallons of water lost
8						
9						
10						
11		NA				
12	(11.0 - 16.0) 1.00 mins/ft					
13						
14						
15						
16						
17	(16.0 - 36.0) 0.70 mins/ft			(16-20.5 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(16.0 - 36.0') Soft drilling	(16.0 - 36.0') 170 gallons of water used; 160 gallons of water recovered; 10 gallons of water lost
18		NA				
19						
20						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

ARCADIS

Date Started:	04/26/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 8-inch**
Date Completed:	04/28/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	8 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	8-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
20		NA				
21				(20.5-26 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6).		
22						
23		NA				
24						
25				(24.7-25.5 ft) Intensely fractured zone.		
26		NA		(26-26.3 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
27				(26.3-36 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
28	(16.0 - 36.0) 0.70 mins/ft					
29						
30						
31		NA				
32						
33						
34						
35						
36				(36-44.7 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(36.0 - 46.0') Soft drilling	(36.0 - 46.0') 267 gallons of water used; 180 gallons of water recovered; 87 gallons of water lost
37						
38	(36.0 - 46.0) 0.60 mins/ft	NA				
39						
40						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 3 of 9

Date Started:	04/26/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 8-inch**
Date Completed:	04/28/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	8 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	8-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	[X] Yes [ ] No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
41				(36-44.7 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
42		NA				
43	(36.0 - 46.0) 0.60 mins/ft					
44						
45		NA		(44.7-46 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4). (44.8-45.4 ft) Intensely fractured zone.		
46				(46-52.5 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(46.0 - 56.0') Soft drilling	(46.0 - 56.0') 136 gallons of water used; 90 gallons of water recovered; 46 gallons of water lost
47						
48		NA				
49						
50						
51	(46.0 - 56.0) 0.60 mins/ft					
52						
53				(52.5-56 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
54		NA				
55						
56				(56-76 ft) No Recovery; core potentially washed out by drilling fluids during coring.	(56.0 - 66.0') Soft drilling	(56.0 - 66.0') 155 gallons of water used; 130 gallons of water recovered; 25 gallons of water lost
57						
58	(56.0 - 66.0) 0.60 mins/ft	NA				
59						
60						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 4 of 9

Date Started:	04/26/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 8-inch**
Date Completed:	04/28/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	8 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	8-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
61				(56-76 ft) No Recovery; core potentially washed out by drilling fluids during coring.		
62						
63	(56.0 - 66.0) 0.60 mins/ft					
64						
65						
66					(66.0 - 76.0') Normal drilling	(66.0 - 76.0') 143 gallons of water used; 100 gallons of water recovered; 43 gallons of water lost
67						
68		NA				
69						
70						
71	(66.0 - 76.0) 0.60 mins/ft					
72						
73						
74						
75						
76				(76-81.8 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(76.0 - 86.0') Normal drilling	(76.0 - 86.0') 204 gallons of water used; 130 gallons of water recovered; 74 gallons of water lost
77						
78	(76.0 - 86.0) 0.70 mins/ft	NA				
79						
80						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Boring No.: ER-03 8-inch

Date Started:	04/26/2023	Surface Elevation:	520.26 ft amsl
Date Completed:	04/28/2023	Northing (NAD83):	2100908.17
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches
Driller Name:	Matt Arnold	Drill Casing Diameter:	8 inches
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	8-inch cutting shoe
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs
Rig Geologist:	Ellen Redner	Converted to Well:	[X] Yes [ ] No

Client: PG&E
Project: Final GW Remedy Phase 2A
Location: PG&E Topock, Needles California
Project Number: 30126255

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
81		NA		(76-81.8 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
82						
83	(76.0 - 86.0) 0.70 mins/ft			(81.8-86 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
84		NA				
85						
86						
87				(86-96 ft) No Recovery; potentially washed out by drilling fluids during coring.	(86.0 - 92.0') Normal drilling	(86.0 - 92.0') 219 gallons of water used; 165 gallons of water recovered; 54 gallons of water lost
88						
89						
90						
91	(86.0 - 96.0) 0.80 mins/ft	NA				
92					(92.0 - 96.0') Soft drilling	
93						
94						
95						
96						
97				(96-104 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(96.0 - 106.0') Normal drilling	(96.0 - 106.0') 167 gallons of water used; 180 gallons of water recovered; 13 gallons of water gained
98	(96.0 - 106.0) mins/ft	NA				
99						
100						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 6 of 9

Boring No.: ER-03 8-inch

Date Started:	04/26/2023	Surface Elevation:	520.26 ft amsl		
Date Completed:	04/28/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	8 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	8-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
101				(96-104 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
102		NA				
103	(96.0 - 106.0) mins/ft					
104				(104-106 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
105		NA				
106						
107				(106-114.75 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(106.0 - 116.0') Normal drilling	(106.0 - 116.0') 242 gallons of water used; 170 gallons of water recovered; 72 gallons of water lost
108						
109						
110						
111	(106.0 - 116.0) 1.00 mins/ft	NA				
112						
113						
114						
115				(114.75-116 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
116		NA				
117				(116-136 ft) No Recovery; potentially washed out by drilling fluids during coring.	(116.0 - 126.0') Normal drilling	(116.0 - 126.0') 257 gallons of water used; 220 gallons of water recovered; 37 gallons of water lost
118	(116.0 - 126.0) 0.70 mins/ft	NA				
119						
120						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 7 of 9

Date Started:	04/26/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 8-inch**
Date Completed:	04/28/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	8 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	8-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
121				(116-136 ft) No Recovery; potentially washed out by drilling fluids during coring.		
122						
123	(116.0 - 126.0) 0.70 mins/ft					
124						
125						
126					(126.0 - 136.0') Soft drilling	(126.0 - 136.0') 100 gallons of water used; 70 gallons of water recovered; 30 gallons of water lost
127						
128		NA				
129						
130						
131	(126.0 - 136.0) 0.40 mins/ft					
132						
133						
134						
135						
136				(136-142 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(136.0 - 143.0') Normal drilling. Tripped out 8-inch casing after advancing the 9-inch diameter drill casing to approximately 146 feet bgs.	(136.0 - 143.0') 148 gallons of water used; 160 gallons of water recovered; 12 gallons of water gained
137						
138	(136.0 - 143.0) 1.14 mins/ft	NA				
139						
140						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Date Started:	04/26/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 8-inch**
Date Completed:	04/28/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	8 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	8-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
141	(136.0 - 143.0) 1.14 mins/ft	NA		(136-142 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
142		NA		(142-142.5 ft) Metamorphic Rock - Metadiorite; very dark greenish gray (5G 3/1).		
143		NA		(142.5-143 ft) Sedimentary Rock - Conglomerate; pinkish white (2.5YR 8/2) and dark reddish brown (2.5YR 3/4).		
144		NA		(143-146 ft) Metamorphic Rock - Metadiorite; very dark greenish gray (5G 3/1).		
145						
146	(143.0 - 156.0) 1.15 mins/ft	NA		(146-156 ft) No Recovery; potentially washed out by drilling fluids during coring.	(146.0 - 156.0') Hard drilling. Drilled with 8-inch diameter core barrel.	(146.0 - 156.0') 598 gallons of water used; 220 gallons of water recovered; 378 gallons of water lost
147						
148						
149						
150						
151						
152						
153						
154						
155						
156	(156.0 - 163.0) 1.86 mins/ft	NA		(156-159 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(156.0 - 163.0') Hard drilling. Drilled with 8-inch diameter core barrel.	(156.0 - 163.0') 165 gallons of water used; 40 gallons of water recovered; 125 gallons of water lost
157						
158						
159		NA		(159-162 ft) Metamorphic Rock - Metadiorite: very dark greenish gray (5G 3/1).		
160						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 9 of 9

Date Started:	04/26/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 8-inch**
Date Completed:	04/28/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	8 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	8-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
161	(156.0 - 163.0) 1.86 mins/ft	NA		(159-162 ft) Metamorphic Rock - Metadiorite: very dark greenish gray (5G 3/1).		
162		NA		(162-163 ft) Metamorphic Rock - Metadiorite; very dark greenish gray (5G 3/1).		
163				End of Boring at Target Depth of 163 ft bgs.		
164						
165						
166						
167						
168						
169						
170						
171						
172						
173						
174						
175						
176						
177						
178						
179						
180						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 1 of 8

Date Started:	04/27/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 9-inch**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	157.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	9 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	9-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
1	(0.0 - 6.0) 0.17 mins/ft	GW		(0-0.5 ft) Well graded gavel with sand (GW); brown (7.5YR 5/4) some strong brown (7.5YR 4/6).	**This "ER-03 9-inch" drilling log documents an intermediate reaming step to a 9-inch diameter borehole. Additional drilling logs document reaming to create the target design borehole diameter of 10.5-inches.** (0.0 - 6.0') Soft drilling	
2		NA		(0.5-1 ft) Asphalt from old Route 66.		
3		GW		(1-1.5 ft) Well graded gavel with sand (GW); yellowish red (5YR 5/6).		
4		NA		(1.5-2.0 ft) Sedimentary Rock - Conglomerate; reddish brown (5YR 4/4).		
5		NA		(2-6 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6).		
6						
7	(6.0 - 16.0) 0.10 mins/ft	NA		(6-16 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6).	(6.0 - 16.0') Soft drilling	(6.0 - 16.0') 34 gallons of water used; 10 gallons of water recovered; 24 gallons of water lost
8						
9						
10						
11						
12						
13						
14						
15						
16						
17	(16.0 - 26.0) 0.20 mins/ft	NA		(16-20.5 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(16.0 - 26.0') Soft drilling	(16.0 - 26.0') 48 gallons of water used; 20 gallons of water recovered; 28 gallons of water lost
18						
19						
20						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 2 of 8

Date Started:	04/27/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 9-inch**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	157.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	9 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	9-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
21		NA		(20.5-26 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6).		
22						
23	(16.0 - 26.0) 0.20 mins/ft	NA				
24						
25				(24.7-25.5 ft) Intensely fractured zone.		
26						
27		NA		(26-26.3 ft) No Recovery; top of core potentially washed out by drilling fluids during coring. (26.3-36 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).	(26.0 - 36.0') Normal drilling	(26.0 - 36.0') 84 gallons of water used; 65 gallons of water recovered; 19 gallons of water lost
28						
29						
30						
31	(26.0 - 36.0) 0.40 mins/ft	NA				
32						
33						
34						
35						
36						
37				(36-44.7 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(36.0 - 46.0') Soft drilling	(36.0 - 46.0') 87 gallons of water used; 35 gallons of water recovered; 52 gallons of water lost
38	(36.0 - 46.0) 0.20 mins/ft	NA				
39						
40						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 3 of 8

Date Started:	04/27/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 9-inch**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	157.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	9 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	9-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
41				(36-44.7 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
42		NA				
43	(36.0 - 46.0) 0.20 mins/ft					
44						
45		NA		(44.7-46 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4). (44.8-45.4 ft) Intensely fractured zone.		
46				(46-52.5 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(46.0 - 56.0') Soft drilling	(46.0 - 56.0') 34 gallons of water used; 20 gallons of water recovered; 14 gallons of water lost
47						
48		NA				
49						
50						
51	(46.0 - 56.0) 0.20 mins/ft					
52						
53				(52.5-56 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
54		NA				
55						
56				(56-76 ft) No Recovery; core potentially washed out by drilling fluids during coring.	(56.0 - 66.0') Soft drilling	(56.0 - 66.0') 34 gallons of water used; 30 gallons of water recovered; 4 gallons of water lost
57						
58	(56.0 - 66.0) 0.20 mins/ft	NA				
59						
60						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 4 of 8

Date Started:	04/27/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 9-inch**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	157.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	9 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	9-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
61				(56-76 ft) No Recovery; core potentially washed out by drilling fluids during coring.		
62						
63	(56.0 - 66.0) 0.20 mins/ft					
64						
65						
66					(66.0 - 76.0') Soft drilling	(66.0 - 76.0') 39 gallons of water used; 30 gallons of water recovered; 9 gallons of water lost
67						
68		NA				
69						
70						
71	(66.0 - 76.0) 0.20 mins/ft					
72						
73						
74						
75						
76				(76-81.8 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(76.0 - 86.0') Normal drilling	(76.0 - 86.0') 142 gallons of water used; 50 gallons of water recovered; 92 gallons of water lost
77						
78	(76.0 - 86.0) 0.40 mins/ft	NA				
79						
80						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Date Started:	04/27/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 9-inch**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	157.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	9 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	9-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
81		NA		(76-81.8 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
82						
83	(76.0 - 86.0) 0.40 mins/ft			(81.8-86 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
84		NA				
85						
86						
87				(86-96 ft) No Recovery; potentially washed out by drilling fluids during coring.	(86.0 - 96.0') Normal drilling	(86.0 - 96.0') 107 gallons of water used; 55 gallons of water recovered; 52 gallons of water lost
88						
89						
90						
91	(86.0 - 96.0) 0.40 mins/ft	NA				
92						
93						
94						
95						
96				(96-104 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(96.0 - 106.0') Soft drilling	(96.0 - 106.0') 85 gallons of water used; 40 gallons of water recovered; 45 gallons of water lost
97						
98	(96.0 - 106.0) 0.30 mins/ft	NA				
99						
100						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 6 of 8

Date Started:	04/27/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 9-inch**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	157.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	9 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	9-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
101				(96-104 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
102		NA				
103	(96.0 - 106.0) 0.30 mins/ft					
104						
105		NA		(104-106 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
106						
107				(106-114.75 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(106.0 - 116.0') Soft drilling	(106.0 - 116.0') 107 gallons of water used; 70 gallons of water recovered; 37 gallons of water lost
108						
109						
110		NA			(110.0 - 120.0') Drilling water returns decrease.	
111	(106.0 - 116.0) 0.30 mins/ft					
112						
113						
114						
115		NA		(114.75-116 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
116						
117				(116-136 ft) No Recovery; potentially washed out by drilling fluids during coring.	(116.0 - 126.0') Soft drilling	(116.0 - 126.0') 71 gallons of water used; 30 gallons of water recovered; 41 gallons of water lost
118	(116.0 - 126.0) 0.20 mins/ft	NA				
119						
120						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 7 of 8

Date Started:	04/27/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 9-inch**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	157.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	9 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	9-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
121				(116-136 ft) No Recovery; potentially washed out by drilling fluids during coring.		
122						
123	(116.0 - 126.0) 0.20 mins/ft					
124						
125						
126					(126.0 - 136.0') Soft drilling	(126.0 - 136.0') 43 gallons of water used; 15 gallons of water recovered; 28 gallons of water lost
127						
128		NA				
129						
130						
131	(126.0 - 136.0) 0.20 mins/ft					
132						
133						
134						
135						
136				(136-142 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(136.0 - 143.0') Soft drilling (136.0 - 146.0') Redrilled on 4/29/23, after advancing the 10-inch diameter casing to approximately 140 feet bgs and the 9-inch diameter casing became freed up.	(136.0 - 143.0') 207 gallons of water used; 150 gallons of water recovered; 57 gallons of water lost
137						
138	(136.0 - 146.0) 0.90 mins/ft	NA				(136.0 - 146.0') 108 gallons of water used; 0 gallons of water recovered; 108 gallons of water lost
139						
140						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 8 of 8

Date Started:	04/27/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 9-inch**
Date Completed:	04/29/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	157.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	9 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	9-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
141		NA		(136-142 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
142		NA		(142-142.5 ft) Metamorphic Rock - Metadiorite; very dark greenish gray (5G 3/1).		
143	(136.0 - 146.0) 0.90 mins/ft			(142.5-143 ft) Sedimentary Rock - Conglomerate; pinkish white (2.5YR 8/2) and dark reddish brown (2.5YR 3/4).	(143.0 - 146.0') Hard drilling. Drill casing became locked up in the formation potentially due to a decease in the volume of drilling returns. Attempted to free up the casing by working it up and down. The casing eventually locked up at approximately 143 feet bgs. The 10-inch diameter casing was advanced to free up the 9-inch diameter casing.	
144		NA		(143-146 ft) Metamorphic Rock - Metadiorite; very dark greenish gray (5G 3/1).		
145						
146						
147				(146-156 ft) No Recovery; potentially washed out by drilling fluids during coring.	(146.0 - 156.0') Hard drilling	(146.0 - 156.0') 207 gallons of water used; 175 gallons of water recovered; 32 gallons of water lost
148						
149						
150						
151	(146.0 - 156.0) 0.80 mins/ft	NA			(151.0 - 155.0') Driller states that loses in drilling water circulation is potentially causing the drill cuttings to lock the drill casing up in the formation.	
152						
153						
154						
155						
156						
157	(156.0 - 157.0) 4.00 mins/ft	NA		(156-159 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(156.0 - 157.0') Hard drilling. The 9-inch diameter casing would no longer advance. Driller states that the teeth on the cutting shoe have potentially been sheered off. The 9-inch diameter casing was tripped out and the borehole reamed to total depth using the 10-inch diamter drill casing.	(156.0 - 157.0') 109 gallons of water used; 55 gallons of water recovered; 54 gallons of water lost
				End of Boring at Target Depth of 157 ft bgs.		
158						
159						
160						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 1 of 9

Date Started:	04/28/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 10.5-inch**
Date Completed:	04/30/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	10.5 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	10-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
1	(0.0 - 6.0) 0.17 mins/ft	GW		(0-0.5 ft) Well graded gavel with sand (GW); brown (7.5YR 5/4) some strong brown (7.5YR 4/6).	**This "ER-03 10.5-inch" drilling log documents the final reaming step to ream the borehole to the target design borehole diameter of 10.5-inches.** (0.0 - 157.0') Used water to flush the casing back down after tripping out to replace the cutting shoe for the second time. (0.0 - 6.0') Soft drilling	(0.0 - 157.0') 1021 gallons of water used; 290 gallons of water recovered; 731 gallons of water lost
2		NA		(0.5-1 ft) Asphalt from old Route 66.		
3		GW		(1-1.5 ft) Well graded gavel with sand (GW); yellowish red (5YR 5/6).		
4		NA		(1.5-2.0 ft) Sedimentary Rock - Conglomerate; reddish brown (5YR 4/4). (2-6 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6).		
5						
6						
7	(6.0 - 16.0) 0.40 mins/ft	NA		(6-16 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6).	(6.0 - 16.0') Soft drilling	(6.0 - 16.0') 75 gallons of water used; 20 gallons of water recovered; 55 gallons of water lost
8						
9						
10						
11						
12						
13						
14						
15						
16						
17	(16.0 - 26.0) 6.50 mins/ft	NA		(16-20.5 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(16.0 - 26.0') Normal drilling	(16.0 - 26.0') 123 gallons of water used; 40 gallons of water recovered; 83 gallons of water lost
18						
19						
20						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 2 of 9

Date Started:	04/28/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 10.5-inch**
Date Completed:	04/30/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	10.5 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	10-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	[X] Yes [ ] No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
21		NA		(20.5-26 ft) Sedimentary Rock - Conglomerate; yellowish red (5YR 4/6).		
22						
23	(16.0 - 26.0) 6.50 mins/ft	NA				
24						
25				(24.7-25.5 ft) Intensely fractured zone.		
26		NA		(26-26.3 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(26.0 - 36.0') Normal drilling	(26.0 - 36.0') 171 gallons of water used; 30 gallons of water recovered; 141 gallons of water lost
27				(26.3-36 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
28						
29						
30						
31	(26.0 - 36.0) 6.50 mins/ft	NA				
32						
33						
34						
35						
36				(36-44.7 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(36.0 - 46.0') Soft drilling	(36.0 - 46.0') 121 gallons of water used; 60 gallons of water recovered; 61 gallons of water lost
37						
38	(36.0 - 46.0) 0.30 mins/ft	NA				
39						
40						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Boring No.: ER-03 10.5-inch

Date Started:	04/28/2023	Surface Elevation:	520.26 ft amsl
Date Completed:	04/30/2023	Northing (NAD83):	2100908.17
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches
Driller Name:	Matt Arnold	Drill Casing Diameter:	10.5 inches
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	10-inch cutting shoe
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs
Rig Geologist:	Ellen Redner	Converted to Well:	[X] Yes [ ] No

Client: PG&E
Project: Final GW Remedy Phase 2A
Location: PG&E Topock, Needles California
Project Number: 30126255

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
41				(36-44.7 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
42		NA				
43	(36.0 - 46.0) 0.30 mins/ft					
44						
45		NA		(44.7-46 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4). (44.8-45.4 ft) Intensely fractured zone.		
46				(46-52.5 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(46.0 - 56.0') Soft drilling	(46.0 - 56.0') 75 gallons of water used; 15 gallons of water recovered; 60 gallons of water lost
47						
48		NA				
49						
50						
51	(46.0 - 56.0) 0.30 mins/ft					
52						
53				(52.5-56 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
54		NA				
55						
56				(56-76 ft) No Recovery; core potentially washed out by drilling fluids during coring.	(56.0 - 66.0') Soft drilling	(56.0 - 66.0') 73 gallons of water used; 20 gallons of water recovered; 53 gallons of water lost
57						
58	(56.0 - 66.0) 0.30 mins/ft	NA				
59						
60						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Date Started:	04/28/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 10.5-inch**
Date Completed:	04/30/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	10.5 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	10-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
61				(56-76 ft) No Recovery; core potentially washed out by drilling fluids during coring.		
62						
63	(56.0 - 66.0) 0.30 mins/ft					
64						
65						
66					(66.0 - 70.0') Normal drilling	(66.0 - 70.0') 105 gallons of water used; 65 gallons of water recovered; 40 gallons of water lost
67						
68		NA				
69						
70					(70.0 - 76.0') Soft drilling	
71	(66.0 - 76.0) 0.40 mins/ft					
72						
73						
74						
75						
76				(76-81.8 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(76.0 - 86.0') Normal drilling	(76.0 - 86.0') 243 gallons of water used; 80 gallons of water recovered; 163 gallons of water lost
77						
78	(76.0 - 86.0) 1.20 mins/ft	NA				
79						
80						

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Drilling Log

Date Started:	04/28/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 10.5-inch**
Date Completed:	04/30/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	10.5 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	10-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
81		NA		(76-81.8 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
82						
83	(76.0 - 86.0) 1.20 mins/ft			(81.8-86 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
84		NA				
85						
86						
87				(86-96 ft) No Recovery; potentially washed out by drilling fluids during coring.	(86.0 - 96.0') Normal drilling	(86.0 - 96.0') 314 gallons of water used; 130 gallons of water recovered; 184 gallons of water lost
88						
89						
90						
91	(86.0 - 96.0) 1.50 mins/ft	NA				
92						
93						
94						
95						
96						
97				(96-104 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(96.0 - 106.0') Normal drilling	(96.0 - 106.0') 390 gallons of water used; 275 gallons of water recovered; 115 gallons of water lost
98	(96.0 - 106.0) 1.30 mins/ft	NA				
99						
100						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 6 of 9

Date Started:	04/28/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 10.5-inch**
Date Completed:	04/30/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	10.5 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	10-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
101				(96-104 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.		
102		NA				
103	(96.0 - 106.0) 1.30 mins/ft					
104						
105		NA		(104-106 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
106						
107				(106-114.75 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(106.0 - 116.0') Normal drilling	(106.0 - 116.0') 530 gallons of water used; 458 gallons of water recovered; 72 gallons of water lost
108						
109						
110		NA				
111	(106.0 - 116.0) 1.40 mins/ft					
112						
113						
114						
115				(114.75-116 ft) Sedimentary Rock - Conglomerate; dark reddish brown (5YR 3/4).		
116		NA				
117				(116-136 ft) No Recovery; potentially washed out by drilling fluids during coring.	(116.0 - 126.0') Normal drilling	(116.0 - 126.0') 320 gallons of water used; 135 gallons of water recovered; 185 gallons of water lost
118	(116.0 - 126.0) 1.10 mins/ft	NA				
119						
120						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 7 of 9

Date Started:	04/28/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 10.5-inch**
Date Completed:	04/30/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	10.5 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	10-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
121				(116-136 ft) No Recovery; potentially washed out by drilling fluids during coring.		
122						
123	(116.0 - 126.0) 1.10 mins/ft					
124						
125						
126						
127					(126.0 - 136.0') Normal drilling	(126.0 - 136.0') 332 gallons of water used; 170 gallons of water recovered; 162 gallons of water lost
128		NA				
129						
130						
131	(126.0 - 136.0) 1.00 mins/ft					
132						
133						
134						
135						
136						
137				(136-142 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(136.0 - 140.0') Normal drilling	(136.0 - 140.0') 284 gallons of water used; 80 gallons of water recovered; 204 gallons of water lost
138	(136.0 - 140.0) 3.00 mins/ft	NA			(138.0 - 140.0') Hard drilling. Casing getting locked up in the formation potentially due to a decrease in drilling water returns. Trip out casing the teeth on the cutting show were completely sheared off.	
139						
140						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Date Started:	04/28/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 10.5-inch**
Date Completed:	04/30/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	10.5 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	10-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
141		NA		(136-142 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(140.0 - 146.0') Hard drilling	(140.0 - 146.0') 161 gallons of water used; 105 gallons of water recovered; 56 gallons of water lost
142		NA		(142-142.5 ft) Metamorphic Rock - Metadiorite; very dark greenish gray (5G 3/1).		
143	(140.0 - 146.0) 1.33 mins/ft			(142.5-143 ft) Sedimentary Rock - Conglomerate; pinkish white (2.5YR 8/2) and dark reddish brown (2.5YR 3/4).		
144		NA		(143-146 ft) Metamorphic Rock - Metadiorite; very dark greenish gray (5G 3/1).		
145						
146						
147				(146-156 ft) No Recovery; potentially washed out by drilling fluids during coring.	(146.0 - 156.0') Hard drilling	(146.0 - 156.0') 377 gallons of water used; 260 gallons of water recovered; 117 gallons of water lost
148						
149						
150						
151	(146.0 - 156.0) 1.80 mins/ft	NA			(151.0 - 155.0') Driller states that loses in drilling water circulation is potentially causing the drill cuttings to lock the drill casing up in the formation.	
152						
153						
154						
155						
156						
157	(156.0 - 157.0) 7.00 mins/ft	NA		(156-159 ft) No Recovery; top of core potentially washed out by drilling fluids during coring.	(156.0 - 157.0') Hard drilling. Casing getting locked up in the formation potentially due to a decrease in drilling water returns. Worked casing up and down to free the casing. Tripped casing back out the teeth on the cutting shoe were worn off. Tripped out 9-inch diameter drill casing.	(156.0 - 157.0') 577 gallons of water used; 220 gallons of water recovered; 357 gallons of water lost
158	(157.0 - 163.0) 2.17 mins/ft				(157.0 - 163.0') Hard drilling. Recirculated drilling water to clean out the borehole in preparation for the installation of the well.	(157.0 - 163.0') 230 gallons of water used; 150 gallons of water recovered; 80 gallons of water lost
159						
160		NA		(159-162 ft) Metamorphic Rock - Metadiorite: very dark greenish gray (5G 3/1).		

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.

Drilling Log

Sheet: 9 of 9

Date Started:	04/28/2023	Surface Elevation:	520.26 ft amsl	**Boring No.:**	**ER-03 10.5-inch**
Date Completed:	04/30/2023	Northing (NAD83):	2100908.17		
Drilling Co.:	Cascade	Easting (NAD83):	7616862.06	Client:	PG&E
Drilling Method:	Roto-Sonic	Total Depth:	163.0 ft bgs	Project:	Final GW Remedy Phase 2A
Drill Rig Type:	Truck Mounted Sonic	Conductor Casing Diameter:	12 inches	Location:	PG&E Topock, Needles California
Driller Name:	Matt Arnold	Drill Casing Diameter:	10.5 inches		
Drilling Asst:	D Hoeppner / G Alvarado	Drill Bit:	10-inch cutting shoe	Project Number:	30126255
Tool-Pusher:	N/A	Depth to First Water:	60.6 ft bgs		
Rig Geologist:	Ellen Redner	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations for reaming to open the borehole in preparation for the installation of the well.	Drilling Fluid
161	(157.0 - 163.0) 2.17 mins/ft	NA		(159-162 ft) Metamorphic Rock - Metadiorite: very dark greenish gray (5G 3/1).		
162		NA		(162-163 ft) Metamorphic Rock - Metadiorite; very dark greenish gray (5G 3/1).		
163				End of Boring at Target Depth of 163 ft bgs.		
164						
165						
166						
167						
168						
169						
170						
171						
172						
173						
174						
175						
176						
177						
178						
179						
180						

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, Notes: solid blue and hollow blue water table marks represent depth to water (ft. bgs.) the approximate static measured during drilling and the static depth to water measured during well development, respectively.