Well Construction Log

ARCADIS Design & Consultancy for natural and built assets

Date Started:	08/12/2019	Surface Elevation:	465.81 ft amsl	**Well ID: RB-4**	
Date Completed:	06/29/2020	Shallow Well Elevation:	465.91 ft amsl		
Drilling Co.:	Cascade	Deep Well Elevation:	NA ft amsl	Client:	PG&E
Drilling Method:	Dual Rotary	Northing (NAD83):	2102908.88	Project:	Final GW Remedy Phase 1
Driller Name:	Jon Martinez	Easting (NAD83):	7616335.73	Location:	PG&E Topock, Needles, California
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	18 inches		
Logger:	E. Nygaard / A. Mack	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
Editor:	Sean McGrane	Development End Date:	10/21/2019		
Total Depth:	146 ft bgs	Well Completion:	☒ Flush ☐ Stick-up ☐ To Be Completed in Well Vault		

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
0					(+1.0 - 2.5') Temporary surface completion		(+1.0 - 2.5') 19 bags Note: 30 inch diameter Quickrete and Kon-Crete cement pad dyed buff with 18 inch diameter lockable vault.
1		Topock - Fill	SP		(+0.1 - 28.0') 8" SHUR-GRIP SDR17 PVC Casing		Note: 12 inch diameter sonotube around well casing filled with native sand.
2							
3					(2.5 - 4.5') Cemex #60 Mesh (40x70) Lapis Lustre Sand	(2.5 - 4.5') 12.8 bags	(2.5 - 4.5') 8 bags (63%) Note: Temporary backfill sand partially removed during installation of Temporary surface completion.
4			NR				
5							
6							
7		Topock - Fill	SP				
8							
9					(4.5 - 15.0') Portland Cement 3% Bentonite Type I, II and V with Hydrogel	(4.5 - 15.0') 111.3 gallons	(4.5 - 15.0') 110 gallons (99%) Note: Grout seal
10					(0.0 - 20.0') 18.0" Borehole		
11							
12			NR				
13							
14					(13.5 - 14.5') Centralizer		
15							
16	RB-4-VAS-15-20 (0.0556 J ppb) 4/12/2019 09:20				(15.0 - 17.0') Bentonite seal pellets Pel-Plug (TR30) 3/8"	(15.0 - 17.0') 4.5 buckets	(15.0 - 17.0') 5 buckets (111%) Note: Seal between transition sand and grout
17		Topock - Fluvial Deposits	SP				
18		Topock - Fluvial Deposits	SP-SM		(17.0 - 20.1') Cemex #60 Mesh (40x70) Lapis Lustre Sand	(17.0 - 20.1') 8.8 bags	(17.0 - 20.1') 8 bags (91%) Note: Transition sand
19							

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Drilling Co.:	Cascade	Deep Well Elevation:	NA ft amsl	Client:	PG&E
Drilling Method:	Dual Rotary	Northing (NAD83):	2102908.88	Project:	Final GW Remedy Phase 1
Driller Name:	Jon Martinez	Easting (NAD83):	7616335.73	Location:	PG&E Topock, Needles, California
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	18 inches		
Logger:	E. Nygaard / A. Mack	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
Editor:	Sean McGrane	Development End Date:	10/21/2019		
Total Depth:	146 ft bgs	Well Completion:	☒ Flush ☐ Stick-up ☐ To Be Completed in Well Vault		

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
20		Topock - Fluvial Deposits	SP-SM		(+0.1 - 28.0') 8" SHUR-GRIP SDR17 PVC Casing; (0.0 - 20.0') 18.0" Borehole	(17.0 - 20.1') 8.8 bags	(17.0 - 20.1') 8 bags (91%) Note: Transition sand
21							
22							
23			NR				
24							
25							
26							
27							
28					(28.0 - 58.0') 8" 10-slot 316L SS Wire Wrap Screen		
29					(20.1 - 60.0') Cemex #0/30 Mesh (30x50) Lapis Lustre Sand; (20.0 - 40.0') 18.0" Borehole	(20.1 - 60.0') 113.1 bags	(20.1 - 60.0') 110 bags (97%) Note: Filter pack, swabbed filter pack for approximately 74 minutes prior to installation of transition sand.
30		Topock - Fluvial Deposits	SP-SM				
31							
32							
33							
34							
35			NR				
36							
37		Topock - Fluvial Deposits	SP				
38							
39							

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Well Construction Log

Sheet: 3 of 8

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Drilling Co.:	Cascade	Deep Well Elevation:	NA ft amsl	Client:	PG&E
Drilling Method:	Dual Rotary	Northing (NAD83):	2102908.88	Project:	Final GW Remedy Phase 1
Driller Name:	Jon Martinez	Easting (NAD83):	7616335.73	Location:	PG&E Topock, Needles, California
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	18 inches		
Logger:	E. Nygaard / A. Mack	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
Editor:	Sean McGrane	Development End Date:	10/21/2019		
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Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
40		Topock - Fluvial Deposits	SP		(28.0 - 58.0') 8" 10-slot 316L SS Wire Wrap Screen; (20.0 - 40.0') 18.0" Borehole		
41		Topock - Fluvial Deposits	GW				
42	RB-4-VAS-41-46 (<0.033 U ppb) 4/12/2019 12:05		NR				
43							
44							
45							
46							
47		Topock - Fluvial Deposits	SP		(20.1 - 60.0') Cemex #0/30 Mesh (30x50) Lapis Lustre Sand; (40.0 - 60.0') 18.0" Borehole	(20.1 - 60.0') 113.1 bags	(20.1 - 60.0') 110 bags (97%) Note: Filter pack, swabbed filter pack for approximately 74 minutes prior to installation of transition sand.
48							
49							
50							
51							
52		Topock - Fluvial Deposits	SP-SM				
53			NR				
54							
55							
56							
57		Topock - Fluvial Deposits	SP-SM				
58							
59		Topock - Fluvial Deposits	SM		(58.0 - 83.0') 8" SHUR-GRIP SDR17 PVC Casing		

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Drilling Co.:	Cascade	Deep Well Elevation:	NA ft amsl	Client:	PG&E
Drilling Method:	Dual Rotary	Northing (NAD83):	2102908.88	Project:	Final GW Remedy Phase 1
Driller Name:	Jon Martinez	Easting (NAD83):	7616335.73	Location:	PG&E Topock, Needles, California
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	18 inches		
Logger:	E. Nygaard / A. Mack	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
Editor:	Sean McGrane	Development End Date:	10/21/2019		
Total Depth:	146 ft bgs	Well Completion:	☒ Flush ☐ Stick-up ☐ To Be Completed in Well Vault		

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
60		Topock - Fluvial Deposits	SM		(40.0 - 60.0') 18.0" Borehole; (59.5 - 60.5') Centralizer; (60.0 - 61.2') Cemex #60 Mesh (40x70) Lapis Lustre Sand		
61		Topock - Fluvial Deposits	SP / SC / CL			(60.0 - 61.2') 3.4 bags	(60.0 - 61.2') 3 bags (88%) Note: Transition sand
62		Topock - Fluvial Deposits			(58.0 - 83.0') 8" SHUR-GRIP SDR17 PVC Casing		
63		Topock - Fluvial Deposits	SP				
64							
65		Topock - Fluvial Deposits	SP				
66							
67		Topock - Fluvial Deposits	SP		(61.2 - 73.9') Bentonite seal pellets Pel-Plug (TR30) 3/8"	(61.2 - 73.9') 28.8 buckets	(61.2 - 73.9') 28 buckets (97%) Note: Intermediate seal
68							
69		Topock - Fluvial Deposits	GP		(60.0 - 80.0') 18.0" Borehole		
70		Topock - Fluvial Deposits	SP				
71		Topock - Fluvial Deposits	ML				
72							
73							
74			NR		(73.9 - 75.2') Cemex #0/30 Mesh (30x50) Lapis Lustre Sand	(73.9 - 75.2') 3.5 bags	(73.9 - 75.2') 3 bags (86%) Note: Transition sand
75							
76							
77		Topock - Fluvial Deposits	SP		(75.2 - 146.0') Cemex #2/16 Mesh (16x30) Lapis Lustre Sand	(75.2 - 146.0') 160.6 bags	(75.2 - 146.0') 154 bags (96%) Note: Filter pack, swabbed filter pack for approximately 64 minutes prior to installation of transition sand.
78							
79							

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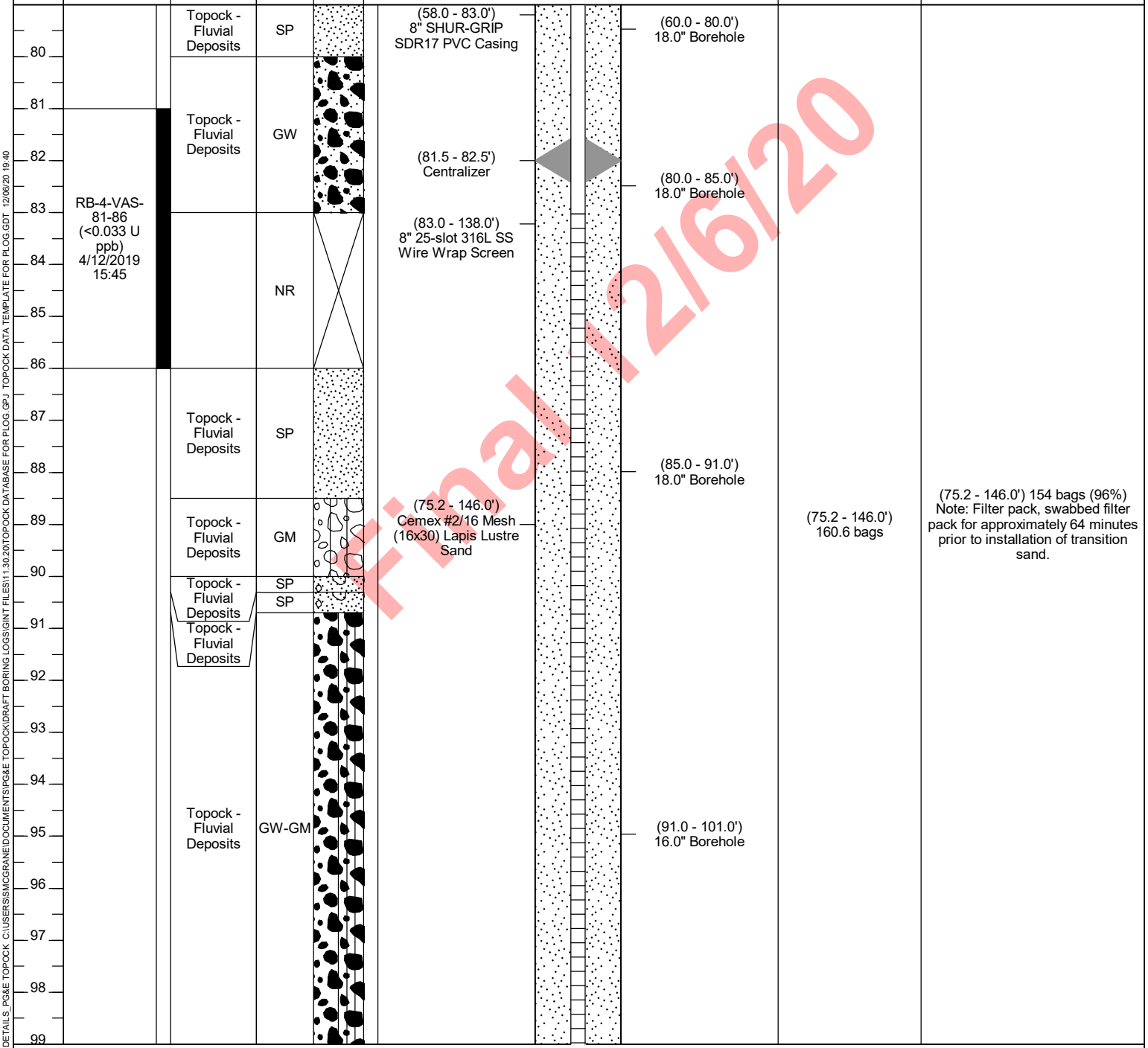
Date Completed:	06/29/2020	Shallow Well Elevation:	465.91 ft amsl		
Drilling Co.:	Cascade	Deep Well Elevation:	NA ft amsl	Client:	PG&E
Drilling Method:	Dual Rotary	Northing (NAD83):	2102908.88	Project:	Final GW Remedy Phase 1
Driller Name:	Jon Martinez	Easting (NAD83):	7616335.73	Location:	PG&E Topock, Needles, California
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	18 inches		
Logger:	E. Nygaard / A. Mack	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
Editor:	Sean McGrane	Development End Date:	10/21/2019		
Total Depth:	146 ft bgs	Well Completion:	☒ Flush ☐ Stick-up ☐ To Be Completed in Well Vault		



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Drilling Method:	Dual Rotary	Northing (NAD83):	2102908.88	Project:	Final GW Remedy Phase 1
Driller Name:	Jon Martinez	Easting (NAD83):	7616335.73	Location:	PG&E Topock, Needles, California
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	18 inches		
Logger:	E. Nygaard / A. Mack	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
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Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
100		Topock - Fluvial Deposits	GW-GM		(83.0 - 138.0') 8" 25-slot 316L SS Wire Wrap Screen; (91.0 - 101.0') 16.0" Borehole		
101							
102							
103			NR		(101.0 - 106.0') 16.0" Borehole		
104							
105							
106							
107							
108							
109					(75.2 - 146.0') Cemex #2/16 Mesh (16x30) Lapis Lustre Sand	(75.2 - 146.0') 160.6 bags	(75.2 - 146.0') 154 bags (96%) Note: Filter pack, swabbed filter pack for approximately 64 minutes prior to installation of transition sand.
110							
111							
112		Topock - Alluvium Deposits	SM		(106.0 - 120.0') 16.0" Borehole		
113							
114							
115							
116							
117							
118							
119							

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Date Completed:	06/29/2020	Shallow Well Elevation:	465.91 ft amsl	Project:	Final GW Remedy Phase 1
Drilling Co.:	Cascade	Deep Well Elevation:	NA ft amsl	Location:	PG&E Topock, Needles, California
Drilling Method:	Dual Rotary	Northing (NAD83):	2102908.88		
Driller Name:	Jon Martinez	Easting (NAD83):	7616335.73		
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	18 inches		
Logger:	E. Nygaard / A. Mack	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
Editor:	Sean McGrane	Development End Date:	10/21/2019		
Total Depth:	146 ft bgs	Well Completion:	☒ Flush ☐ Stick-up ☐ To Be Completed in Well Vault		

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
120					(83.0 - 138.0') 8" 25-slot 316L SS Wire Wrap Screen; (106.0 - 120.0') 16.0" Borehole		
121							
122							
123	RB-4-VAS-121-126 (<0.033 U ppb) 4/13/2019 11:56	Topock - Alluvium Deposits	SM				
124							
125							
126							
127							
128							
129					(75.2 - 146.0') Cemex #2/16 Mesh (16x30) Lapis Lustre Sand; (120.0 - 140.0') 16.0" Borehole	(75.2 - 146.0') 160.6 bags	(75.2 - 146.0') 154 bags (96%) Note: Filter pack, swabbed filter pack for approximately 64 minutes prior to installation of transition sand.
130							
131		Topock - Alluvium Deposits	GM				
132							
133							
134							
135		Topock - Alluvium Deposits	SM				
136							
137	RB-4-VAS-136-141 (<0.17 U ppb) 4/13/2019 17:18						
138							
139							

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Drilling Co.:	Cascade	Deep Well Elevation:	NA ft amsl	Client:	PG&E
Drilling Method:	Dual Rotary	Northing (NAD83):	2102908.88	Project:	Final GW Remedy Phase 1
Driller Name:	Jon Martinez	Easting (NAD83):	7616335.73	Location:	PG&E Topock, Needles, California
Drilling Asst:	A. & H. Amezguita	Borehole Diameter:	18 inches		
Logger:	E. Nygaard / A. Mack	Static Water Level:	See Log for Depths	Project Number:	RC000753.0051
Editor:	Sean McGrane	Development End Date:	10/21/2019		
Total Depth:	146 ft bgs	Well Completion:	☒ Flush ☐ Stick-up ☐ To Be Completed in Well Vault		

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
140	RB-4-VAS-136-141 (<0.17 U ppb) 4/13/2019 17:18	Topock - Alluvium Deposits	SM		(120.0 - 140.0') 16.0" Borehole; (140.0 - 141.0') Centralizer	(75.2 - 146.0') 160.6 bags	(75.2 - 146.0') 154 bags (96%) Note: Filter pack, swabbed filter pack for approximately 64 minutes prior to installation of transition sand.
141							
142		Topock - Weathered Bedrock - conglomerate	SM		(75.2 - 146.0') Cemex #2/16 Mesh (16x30) Lapis Lustre Sand; (140.0 - 146.0') 15.5" Borehole		
143							
144					(138.0 - 143.7') Sump and PVC End Cap		
145			NR				
146					End of Boring at 146.0 ft bgs.		
147							
148							
149							
150							
151							
152							
153							
154							
155							
156							
157							
158							
159							

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ARCADIS Design & Consultancy for natural and built assets

Drilling Log

Sheet: 1 of 8

Date Started:	08/06/2019	Surface Elevation:	465.81 ft amsl	**Boring No.:**	**RB-4**
Date Completed:	08/11/2019	Northing (NAD83):	2102908.88		
Drilling Co.:	Cascade	Easting (NAD83):	7616335.73	Client:	PG&E
Drilling Method:	Dual Rotary	Total Depth:	146.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches		
Drilling Asst:	A. & H. Amezguita	Drill Bit:	17 inch Tricone	Project Number:	RC000753.0051
Tool-Pusher:	Scott Johnson	Depth to First Water:	11.0 ft bgs		
Rig Geologist:	E. Nygaard / A. Mack	Converted to Well:	[X] Yes [ ] No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
1–2		SP			(0.0 - 2.0') Topock - Fill; Poorly graded sand (SP); (10YR5/3)	(0.0 - 20.0') Smooth drilling	(0.0 - 40.0') 4176 gallons of water used; 2800 gallons of water recovered; 1376 gallons of water lost
2–6		NR			(2.0 - 6.0') No recovery (NR)		
6–8		SP			(6.0 - 8.0') Topock - Fill; Poorly graded sand (SP); (10YR5/3)		
8–16	(0.0 - 20.0) 6.10 mins/ft	NR		(0.0 - 20.0') 18.0" Steel Casing	(8.0 - 16.0') No recovery (NR)	(10.0') Observed Cemex #3 Mesh (8x20) sand in drill cuttings (see photo log).	
16–17		SP			(16.0 - 17.5') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/4)		
17–20		SP-SM			(17.5 - 20.0') Topock - Fluvial Deposits; Poorly graded sand with silt (SP-SM); brown (7.5YR 4/2) (18') brown (7.5YR 4/3)		

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Drilling Method:	Dual Rotary	Total Depth:	146.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches		
Drilling Asst:	A. & H. Amezguita	Drill Bit:	17 inch Tricone	Project Number:	RC000753.0051
Tool-Pusher:	Scott Johnson	Depth to First Water:	11.0 ft bgs		
Rig Geologist:	E. Nygaard / A. Mack	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
21					(20.0 - 26.0') No recovery (NR)	(20.0') Observed Cemex #3 Mesh (8x20) sand in drill cuttings (see photo log).	
22						(20.1 - 40.0') Drilling became a little rougher	
23		NR				(21.0') Observed Cemex #3 Mesh (8x20) sand in drill cuttings (see photo log).	
24							
25							
26					(26.0 - 34.0') Topock - Fluvial Deposits; Poorly graded sand with silt (SP-SM); brown (7.5YR 4/2)		
27							
28							
29							
30	(20.0 - 40.0) 3.75 mins/ft	SP-SM		(20.0 - 40.0') 18.0" Steel Casing		(30.0') Observed Cemex #3 Mesh (8x20) sand in drill cuttings (see photo log).	
31							
32							
33							
34					(34.0 - 36.0') No recovery (NR)		
35		NR					
36					(36.0 - 40.0') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/3)		
37							
38		SP					
39							
40							

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Drilling Method:	Dual Rotary	Total Depth:	146.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches		
Drilling Asst:	A. & H. Amezguita	Drill Bit:	17 inch Tricone	Project Number:	RC000753.0051
Tool-Pusher:	Scott Johnson	Depth to First Water:	11.0 ft bgs		
Rig Geologist:	E. Nygaard / A. Mack	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
41		GW			(40.0 - 41.0') Topock - Fluvial Deposits; Well graded gravel with sand (GW); brown (7.5YR 5/4)	(40.0') Observed Cemex #3 Mesh (8x20) sand in drill cuttings (see photo log).	(40.0 - 85.0') 21600 gallons of water used; 12960 gallons of water recovered; 8640 gallons of water lost
					(41.0 - 46.0') No recovery (NR)	(40.1 - 60.0') Rough drilling	
42							
43		NR					
44							
45							
46					(46.0 - 52.0') Topock - Fluvial Deposits; Poorly graded sand with gravel (SP); brown (7.5YR 5/3)		
47							
48							
49		SP					
50	(40.0 - 60.0) 7.01 mins/ft			(40.0 - 60.0') 18.0" Steel Casing		(50.0') Observed Cemex #3 Mesh (8x20) sand in drill cuttings (see photo log).	
51							
52							
		SP-SM			(52.0 - 53.0') Topock - Fluvial Deposits; Poorly graded sand with silt (SP-SM); brown (7.5YR 5/3)		
53					(53.0 - 56.0') No recovery (NR)		
54		NR					
55							
56							
		SP-SM			(56.0 - 58.0') Topock - Fluvial Deposits; Poorly graded sand with silt (SP-SM); brown (7.5YR 5/3)		
57							
58							
		SM			(58.0 - 60.0') Topock - Fluvial Deposits; Silty sand with gravel (SM); brown (7.5YR 5/3)		
59							
60							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, NR = no recovery; Notes: blue water table symbol represents depth to water measured during the first pilot borehole VAS interval

Drilling Log

ARCADIS Design & Consultancy for natural and built assets

Boring No.: RB-4

Date Started:	08/06/2019	Surface Elevation:	465.81 ft amsl	Client:	PG&E
Date Completed:	08/11/2019	Northing (NAD83):	2102908.88	Project:	Final GW Remedy Phase 1
Drilling Co.:	Cascade	Easting (NAD83):	7616335.73	Location:	PG&E Topock, Needles, California
Drilling Method:	Dual Rotary	Total Depth:	146.0 ft bgs		
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches		
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches		
Drilling Asst:	A. & H. Amezguita	Drill Bit:	17 inch Tricone	Project Number:	RC000753.0051
Tool-Pusher:	Scott Johnson	Depth to First Water:	11.0 ft bgs		
Rig Geologist:	E. Nygaard / A. Mack	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
61		SP, SC, CL			(60.0 - 60.1') Topock - Fluvial Deposits; Poorly graded sand (SP); yellowish brown / moderate yellowish brown (10YR 5/4)	(60.0') Observed Cemex #3 Mesh (8x20) sand in drill cuttings (see photo log).	
62					(60.1 - 60.4') Topock - Fluvial Deposits; Clayey sand (SC); brown (7.5YR 4/4)		
63		SP			(60.4 - 60.7') Topock - Fluvial Deposits; Lean clay (CL); dark brown (7.5YR 3/4)		
64					(60.7 - 65.0') Topock - Fluvial Deposits; Poorly graded sand with gravel (SP); brown (7.5YR 5/4)		
65							
66		SP			(65.0 - 67.0') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/4)		
67							
68		SP			(67.0 - 69.0') Topock - Fluvial Deposits; Poorly graded sand with gravel (SP); brown (7.5YR 5/4)		
69		GP			(69.0 - 69.5') Topock - Fluvial Deposits; Poorly graded gravel with sand (GP); brown (7.5YR 5/4)		
70	(60.0 - 80.0) 5.90 mins/ft	SP		(60.0 - 80.0') 18.0" Steel Casing	(69.5 - 71.0') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/4)	(70.0') Observed Cemex #3Mesh (8x20) sand in drill cuttings (see photo log).	
71							
72		ML			(71.0 - 73.0') Topock - Fluvial Deposits; Silt with sand (ML); dark brown (7.5YR 3/3)		
73							
74		NR			(73.0 - 76.0') No recovery (NR)		
75						(75.0 - 80.0') Rough drilling	
76							
77					(76.0 - 80.0') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/3)		
78		SP					
79							
80							

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ARCADIS Design & Consultancy for natural and built assets

Drilling Log

Date Started:	08/06/2019	Surface Elevation:	465.81 ft amsl	**Boring No.:**	**RB-4**
Date Completed:	08/11/2019	Northing (NAD83):	2102908.88		
Drilling Co.:	Cascade	Easting (NAD83):	7616335.73	Client:	PG&E
Drilling Method:	Dual Rotary	Total Depth:	146.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches		
Drilling Asst:	A. & H. Amezguita	Drill Bit:	17 inch Tricone	Project Number:	RC000753.0051
Tool-Pusher:	Scott Johnson	Depth to First Water:	11.0 ft bgs		
Rig Geologist:	E. Nygaard / A. Mack	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
81	(80.0 - 85.0) 2.80 mins/ft	GW		(80.0 - 85.0') 18.0" Steel Casing	(80.0 - 83.0') Topock - Fluvial Deposits; Well graded gravel with sand (GW); brown (7.5YR 4/3)	(80.0') Observed Cemex #3 Mesh (8x20) sand in drill cuttings (see photo log). (80.1 - 85.0') Rough drilling	
82							
83					(83.0 - 86.0') No recovery (NR)		
84		NR					
85						(85.0 - 90.0') Rough drilling, drill rig bouncing, drilling could not proceed past 91 ft. Ground surface subsiding around borehole and rig. Have to switch to 16-inch drill casing.	
86					(86.0 - 88.5') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/4)		
87		SP					
88	(85.0 - 91.0) 28.07 mins/ft			(85.0 - 91.0') 18.0" Steel Casing			
89		GM			(88.5 - 90.0') Topock - Fluvial Deposits; Silty gravel with sand (GM); brown (7.5YR 4/3)		
90		SP			(90.0 - 90.3') Topock - Fluvial Deposits; Poorly graded sand with gravel (SP); black (5Y 2.5/2)		
91		SP			(90.3 - 90.7') Topock - Fluvial Deposits; Poorly graded sand with gravel (SP); yellowish brown (10YR 5/6)	(91.0 - 101.0') Rough drilling, observed Cemex #3 Mesh (8x20) sand in drill cuttings (see photo log).	(91.0 - 106.0') 14625 gallons of water used; 11375 gallons of water recovered; 3250 gallons of water lost
92					(90.7 - 100.0') Topock - Fluvial Deposits; Well graded gravel with silt and sand (GW-GM); brown (7.5YR 4/3)		
93							
94							
95	(91.0 - 101.0) 11.69 mins/ft	GW-GM		(91.0 - 101.0') 16.0" Steel Casing			
96							
97							
98							
99							
100							

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ARCADIS Design & Consultancy for natural and built assets

Drilling Log

Boring No.: RB-4

Date Started:	08/06/2019	Surface Elevation:	465.81 ft amsl		
Date Completed:	08/11/2019	Northing (NAD83):	2102908.88		
Drilling Co.:	Cascade	Easting (NAD83):	7616335.73	Client:	PG&E
Drilling Method:	Dual Rotary	Total Depth:	146.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches		
Drilling Asst:	A. & H. Amezguita	Drill Bit:	17 inch Tricone	Project Number:	RC000753.0051
Tool-Pusher:	Scott Johnson	Depth to First Water:	11.0 ft bgs		
Rig Geologist:	E. Nygaard / A. Mack	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
101	(91.0 - 101.0) 11.69 mins/ft			(91.0 - 101.0') 16.0" Steel Casing	(100.0 - 106.0') No recovery (NR)		
102						(101.0 - 106.0') Rough drilling, Observed Cemex #3 Mesh (8x20) sand in drill cuttings (see photo log).	
103	(101.0 - 106.0) 7.35 mins/ft	NR		(101.0 - 106.0') 16.0" Steel Casing			
104							
105							
106					(106.0 - 130.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); dark brown (7.5YR 3/3)		(106.0 - 146.0') 4875 gallons of water used; 8125 gallons of water recovered; 3250 gallons of water gained
107							
108							
109							
110							
111						(110.0') Observed Cemex #3 Mesh (8x20)) sand in drill cuttings (see photo log).	
112							
113	(106.0 - 120.0) 3.59 mins/ft	SM		(106.0 - 120.0') 16.0" Steel Casing			
114							
115							
116							
117							
118							
119							
120							

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Drilling Log

Date Started:	08/06/2019	Surface Elevation:	465.81 ft amsl	**Boring No.:**	**RB-4**
Date Completed:	08/11/2019	Northing (NAD83):	2102908.88		
Drilling Co.:	Cascade	Easting (NAD83):	7616335.73	Client:	PG&E
Drilling Method:	Dual Rotary	Total Depth:	146.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches		
Drilling Asst:	A. & H. Amezguita	Drill Bit:	17 inch Tricone	Project Number:	RC000753.0051
Tool-Pusher:	Scott Johnson	Depth to First Water:	11.0 ft bgs		
Rig Geologist:	E. Nygaard / A. Mack	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
121						(120.0') Observed Cemex #3 Mesh (8x20) sand in drill cuttings (see photo log).	
122							
123							
124							
125		SM					
126							
127							
128							
129							
130	(120.0 - 140.0) 1.32 mins/ft			(120.0 - 140.0') 16.0" Steel Casing	(130.0 - 132.0') Topock - Alluvium Deposits; Silty gravel with sand (GM); dark brown (7.5YR 3/3)	(130.0') Observed Cemex #3 Mesh (8x20) sand in drill cuttings (see photo log).	
131		GM					
132					(132.0 - 141.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); dark brown (7.5YR 3/3)		
133							
134							
135							
136		SM					
137							
138							
139							
140							

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Drilling Log

ARCADIS Design & Consultancy for natural and built assets

Sheet: 8 of 8

Boring No.: RB-4

Date Started:	08/06/2019	Surface Elevation:	465.81 ft amsl		
Date Completed:	08/11/2019	Northing (NAD83):	2102908.88		
Drilling Co.:	Cascade	Easting (NAD83):	7616335.73	Client:	PG&E
Drilling Method:	Dual Rotary	Total Depth:	146.0 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Foremost DR-24HD	Conductor Casing Diameter:	18 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Jon Martinez	Drill Casing Diameter:	16 inches		
Drilling Asst:	A. & H. Amezguita	Drill Bit:	17 inch Tricone	Project Number:	RC000753.0051
Tool-Pusher:	Scott Johnson	Depth to First Water:	11.0 ft bgs		
Rig Geologist:	E. Nygaard / A. Mack	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Drilling Run (ft) and Average Penetration Rate	USCS Code	USCS Class	Casing Diameter	Description (See Pilot boring log for full geologic descriptions)	Drilling notes and observations confirming presence of temporary backfill material in drill cuttings	Drilling Fluid
141		SM				(140.0') Observed Wildcat Washed Plastering Sand in drill cuttings (see photo log).	
142					(141.0 - 144.0') Topock - Weathered Bedrock - conglomerate; Silty sand with gravel (SM); reddish brown (2.5YR 4/4)		
143	(140.0 - 146.0) 1.95 mins/ft	SM		(140.0 - 146.0') 15.5" Open Hole			
144							
145		NR			(144.0 - 146.0') No recovery (NR)		
146							
					End of Boring at 146.0 ft bgs.		
147							
148							
149							
150							
151							
152							
153							
154							
155							
156							
157							
158							
159							
160							

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ARCADIS Design & Consultancy for natural and built assets

Boring Log

Sheet: 1 of 9

Date Started:	04/11/2019	Surface Elevation:	465.97 ft amsl	**Boring No.:**	**RB-4 Pilot**
Date Completed:	04/17/2019	Northing (NAD83):	2102908.71		
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Terrasonic track mount	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Dan O'Mara	Depth to First Water:	11.0 ft bgs		
Drilling Asst:	E. Huellmantel / J. Pacheco	Sampling Method:	4 inch x 10 ft. Core Barrel	Project Number:	RC000753.0051
Logger:	D. Maurer / G. Jeffers	Sampling Interval:	Continuous		
Editor:	S. McGrane / G. Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
1				Topock - Fill	SP		(0.0 - 2.0') Topock - Fill; Poorly graded sand (SP); (10YR5/3); fine grained to medium grained; dry; trace amounts of wood fragments		(0.0 - 26.0') No water used
2									
3	240				NR		(2.0 - 6.0') No recovery (NR)	(2.0 - 6.0') Poor recovery, loose sands, no indication that core fell out of the core fell of core barrel, possibly pushing through loose sand.	
4									
5									
6				Topock - Fill	SP		(6.0 - 8.0') Topock - Fill; Poorly graded sand (SP); (10YR5/3); fine grained to medium grained; dry; trace amounts of wood fragments		
7									
8							(8.0 - 16.0') No recovery (NR)	(8.0 - 16.0') Poor recovery, loose sands, possibly pushing through loose sand.	
9									
10									
11	24				NR				
12									
13									
14									
15									
16				Topock - Fluvial Deposits	SP		(16.0 - 17.5') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/4); fine grained to medium grained; moist to wet	(15.0') Sample screen was pulled up to collect sample closer to the water table.	
17									
18	48	RB-4-SS-16-20 4/16/2019 11:15	RB-4-VAS-15-20 (0.0556 J ppb) 4/12/2019 09:20	Topock - Fluvial Deposits	SP-SM		(17.5 - 20.0') Topock - Fluvial Deposits; Poorly graded sand with silt (SP-SM); brown (7.5YR 4/2); very fine grained to medium grained; little silt; wet (18') brown (7.5YR 4/3)		
19									
20									

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ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: RB-4 Pilot

Date Started:	04/11/2019	Surface Elevation:	465.97 ft amsl	Client:	PG&E
Date Completed:	04/17/2019	Northing (NAD83):	2102908.71	Project:	Final GW Remedy Phase 1
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Location:	PG&E Topock, Needles, California
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs		
Drill Rig Type:	Terrasonic track mount	Borehole Diameter:	6-12 inches		
Driller Name:	Dan O'Mara	Depth to First Water:	11.0 ft bgs		
Drilling Asst:	E. Huellmantel / J. Pacheco	Sampling Method:	4 inch x 10 ft. Core Barrel	Project Number:	RC000753.0051
Logger:	D. Maurer / G. Jeffers	Sampling Interval:	Continuous		
Editor:	S. McGrane / G. Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
21							(20.0 - 26.0') No recovery (NR)	(20.0 - 26.0') Poor recovery in loose sands. No indication of lost core. driller noted water at 24 feet. 26 to 24 feet was wet which indicated core recovered was 26 to 22 feet bgs.	
22									
23	48				NR				
24									
25									
26							(26.0 - 34.0') Topock - Fluvial Deposits; Poorly graded sand with silt (SP-SM); brown (7.5YR 4/2); very fine grained to medium grained; little silt; wet		(26.0 - 36.0') 15 gallons of water used; gallons of water recovered; gallons of water lost
27		RB-4-SS-26-30 4/16/2019 11:20							
28							(28') brown (7.5YR 5/3)		
29									
30				Topock - Fluvial Deposits	SP-SM				
31	90						(31'); trace organics; 1 inch diameter by 3 inches long piece of wood observed		
32		RB-4-SS-30-34 4/16/2019 11:25							
33									
34									
35					NR		(34.0 - 36.0') No recovery (NR)	(34.0 - 36.0') No recovery, soft sands, no indication that core fell out of core barrel.	
36									(36.0 - 46.0') No water used
37							(36.0 - 40.0') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/3); fine grained to medium grained; wet		
38	60	RB-4-SS-36-40 4/16/2019 11:30		Topock - Fluvial Deposits	SP				
39									
40									

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Boring Log

ARCADIS Design & Consultancy for natural and built assets

Date Started:	04/11/2019	Surface Elevation:	465.97 ft amsl	**Boring No.:**	**RB-4 Pilot**
Date Completed:	04/17/2019	Northing (NAD83):	2102908.71		
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Terrasonic track mount	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Dan O'Mara	Depth to First Water:	11.0 ft bgs		
Drilling Asst:	E. Huellmantel / J. Pacheco	Sampling Method:	4 inch x 10 ft. Core Barrel	Project Number:	RC000753.0051
Logger:	D. Maurer / G. Jeffers	Sampling Interval:	Continuous		
Editor:	S. McGrane / G. Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
41				Topock - Fluvial Deposits	GW		(40.0 - 41.0') Topock - Fluvial Deposits; Well graded gravel with sand (GW); brown (7.5YR 5/4); small pebbles to very large pebbles, subround to round; some medium to coarse grained sand, subround to round; wet		
42							(41.0 - 46.0') No recovery (NR)	(41.0 - 46.0') No recovery, loose sands, no indication that core fell out of core barrel.	
43	60		RB-4-VAS-41-46 (<0.033 U ppb) 4/12/2019 12:05		NR				
44									
45									
46									
47		RB-4-SS-46-50 4/16/2019 11:35		Topock - Fluvial Deposits	SP		(46.0 - 52.0') Topock - Fluvial Deposits; Poorly graded sand with gravel (SP); brown (7.5YR 5/3); medium grained to coarse grained, subround to round; little small to very large pebbles, subround to round; wet		(46.0 - 56.0') 20 gallons of water used; 0 gallons of water recovered; 20 gallons of water lost
48									
49									
50									
51	84	RB-4-SS-50-53 4/16/2019 11:40							
52				Topock - Fluvial Deposits	SP-SM		(52.0 - 53.0') Topock - Fluvial Deposits; Poorly graded sand with silt (SP-SM); brown (7.5YR 5/3); fine grained to medium grained; little silt; wet		
53							(53.0 - 56.0') No recovery (NR)	(53.0 - 56.0') No recovery, loose sands, no indication that core fell out of core barrel.	
54					NR				
55									
56									
57		RB-4-SS-56-60 4/16/2019 11:45		Topock - Fluvial Deposits	SP-SM		(56.0 - 58.0') Topock - Fluvial Deposits; Poorly graded sand with silt (SP-SM); brown (7.5YR 5/3); fine grained to medium grained; little silt; trace medium to large pebbles, subround to round; wet		(56.0 - 76.0') 20 gallons of water used; 0 gallons of water recovered; 20 gallons of water lost
58	204								
59				Topock - Fluvial Deposits	SM		(58.0 - 60.0') Topock - Fluvial Deposits; Silty sand with gravel (SM); brown (7.5YR 5/3); very fine grained to medium grained; little granules to very large pebbles; little silt; little clay		
60									

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, U = not detected above the laboratory reporting limit, J = estimated value, NR = no recovery; Notes: blue water table symbol represents depth to water measured during the first VAS interval; apparent partial recoveries can be the result of potential compaction of sediments in the core bag

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: RB-4 Pilot

Date Started:	04/11/2019	Surface Elevation:	465.97 ft amsl	Client:	PG&E
Date Completed:	04/17/2019	Northing (NAD83):	2102908.71	Project:	Final GW Remedy Phase 1
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Location:	PG&E Topock, Needles, California
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs		
Drill Rig Type:	Terrasonic track mount	Borehole Diameter:	6-12 inches		
Driller Name:	Dan O'Mara	Depth to First Water:	11.0 ft bgs		
Drilling Asst:	E. Huellmantel / J. Pacheco	Sampling Method:	4 inch x 10 ft. Core Barrel	Project Number:	RC000753.0051
Logger:	D. Maurer / G. Jeffers	Sampling Interval:	Continuous		
Editor:	S. McGrane / G. Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
61				Topock - Fluvial Deposits	SP / SC / CL		(60.0 - 60.1') Topock - Fluvial Deposits; Poorly graded sand (SP); yellowish brown / moderate yellowish brown (10YR 5/4); medium grained to coarse grained, subround to round; wet		
62				Topock - Fluvial Deposits			(60.1 - 60.4') Topock - Fluvial Deposits; Clayey sand (SC); brown (7.5YR 4/4); very fine grained to medium grained; some clay; little silt; wet		
63		RB-4-SS-61-65 4/16/2019 11:50		Topock - Fluvial Deposits	SP		(60.4 - 60.7') Topock - Fluvial Deposits; Lean clay (CL); dark brown (7.5YR 3/4); medium plasticity; little very fine to fine grained sand; little silt; wet		
64				Topock - Fluvial Deposits			(60.7 - 65.0') Topock - Fluvial Deposits; Poorly graded sand with gravel (SP); brown (7.5YR 5/4); fine grained to medium grained; little small to very large pebbles, subround to round; trace silt; wet		
65									
66				Topock - Fluvial Deposits	SP		(65.0 - 67.0') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/4); fine grained to medium grained; trace small to medium pebbles, subround to round; trace silt		
67		RB-4-SS-65-69 4/16/2019 11:55							
68	204			Topock - Fluvial Deposits	SP		(67.0 - 69.0') Topock - Fluvial Deposits; Poorly graded sand with gravel (SP); brown (7.5YR 5/4); fine grained to medium grained; little medium to large pebbles, subround to round; trace silt		
69									
70				Topock - Fluvial Deposits	GP		(69.0 - 69.5') Topock - Fluvial Deposits; Poorly graded gravel with sand (GP); brown (7.5YR 5/4); granules to medium pebbles, subround to round; some medium to coarse grained sand, subround to round; wet		
71				Topock - Fluvial Deposits	SP		(69.5 - 71.0') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/4); fine grained to medium grained; trace small to medium pebbles, subround to round; trace silt; wet		
72		RB-4-SS-71-73 4/16/2019 12:00		Topock - Fluvial Deposits	ML		(71.0 - 73.0') Topock - Fluvial Deposits; Silt with sand (ML); dark brown (7.5YR 3/3) little yellowish brown (10YR 5/6); very fine grained to medium grained; low plasticity; some very fine to fine grained sand; little clay; wet		
73									
74					NR		(73.0 - 76.0') No recovery (NR)	(73.0 - 76.0') No recovery, loose sands, no indication that core fell out of core barrel.	
75									
76							(75.5'); small layer of potential charcoal collected by on-site archaeologist		
77							(76.0 - 80.0') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/3); fine grained to medium grained; trace silt; wet		(76.0 - 86.0') 15 gallons of water used; 0 gallons of water recovered; 15 gallons of water lost
78	84	RB-4-SS-76-80 4/16/2019 12:05		Topock - Fluvial Deposits	SP				
79									
80									

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ARCADIS Design & Consultancy for natural and built assets

Boring Log

Sheet: 5 of 9

Date Started:	04/11/2019	Surface Elevation:	465.97 ft amsl	**Boring No.:**	**RB-4 Pilot**
Date Completed:	04/17/2019	Northing (NAD83):	2102908.71		
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs	Project:	Final GW Remedy Phase 1
Drill Rig Type:	Terrasonic track mount	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Driller Name:	Dan O'Mara	Depth to First Water:	11.0 ft bgs		
Drilling Asst:	E. Huellmantel / J. Pacheco	Sampling Method:	4 inch x 10 ft. Core Barrel	Project Number:	RC000753.0051
Logger:	D. Maurer / G. Jeffers	Sampling Interval:	Continuous		
Editor:	S. McGrane / G. Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
81		RB-4-SS-80-83 4/16/2019 12:10		Topock - Fluvial Deposits	GW		(80.0 - 83.0') Topock - Fluvial Deposits; Well graded gravel with sand (GW); brown (7.5YR 4/3); granules to very large pebbles, subround to round; some medium to very coarse grained sand, subround to round; trace silt; trace clay; wet		
82									
83	84		RB-4-VAS-81-86 (<0.033 U ppb) 4/12/2019 15:45						
84					NR		(83.0 - 86.0') No recovery (NR)	(83.0 - 86.0') No recovery, loose sands, no indication that core fell out of core barrel.	
85									
86									(86.0 - 96.0') 15 gallons of water used; 0 gallons of water recovered; 15 gallons of water lost
87		RB-4-SS-86-88.5 4/16/2019 12:15		Topock - Fluvial Deposits	SP		(86.0 - 88.5') Topock - Fluvial Deposits; Poorly graded sand (SP); brown (7.5YR 5/4); fine grained to medium grained; trace silt; wet		
88									
89				Topock - Fluvial Deposits	GM		(88.5 - 90.0') Topock - Fluvial Deposits; Silty gravel with sand (GM); brown (7.5YR 4/3); granules to very large pebbles, subangular to round; little fine to medium grained sand; little silt; trace clay; wet		
90				Topock - Fluvial Deposits	SP		(90.0 - 90.3') Topock - Fluvial Deposits; Poorly graded sand with gravel (SP); black (5Y 2.5/2); fine grained to coarse grained, subround to round; little granules to small pebbles, subround to round; trace silt; wet		
91				Topock - Fluvial Deposits	SP		(90.3 - 90.7') Topock - Fluvial Deposits; Poorly graded sand with gravel (SP); yellowish brown (10YR 5/6); medium grained to very coarse grained, subround to round; some granules to medium pebbles, subround to round; trace silt; wet; iron oxide staining		
92									
93	168	RB-4-SS-91-95 4/16/2019 12:20					(90.7 - 100.0') Topock - Fluvial Deposits; Well graded gravel with silt and sand (GW-GM); brown (7.5YR 4/3); granules to small cobbles, subround to round; little very fine to medium grained sand; little silt; trace clay; wet		
94									
95				Topock - Fluvial Deposits	GW-GM				
96									(96.0 - 106.0') 15 gallons of water used; 0 gallons of water recovered; 15 gallons of water lost
97		RB-4-SS-95-100 4/16/2019 12:25							
98									
99									
100									

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Boring Log

ARCADIS Design & Consultancy for natural and built assets

Boring No.: RB-4 Pilot

Date Started:	04/11/2019	Surface Elevation:	465.97 ft amsl	Client:	PG&E
Date Completed:	04/17/2019	Northing (NAD83):	2102908.71	Project:	Final GW Remedy Phase 1
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Location:	PG&E Topock, Needles, California
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs		
Drill Rig Type:	Terrasonic track mount	Borehole Diameter:	6-12 inches		
Driller Name:	Dan O'Mara	Depth to First Water:	11.0 ft bgs		
Drilling Asst:	E. Huellmantel / J. Pacheco	Sampling Method:	4 inch x 10 ft. Core Barrel	Project Number:	RC000753.0051
Logger:	D. Maurer / G. Jeffers	Sampling Interval:	Continuous		
Editor:	S. McGrane / G. Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
101							(100.0 - 106.0') No recovery (NR)	(100.0 - 106.0') No recovery, loose sands, no indication that core fell out of core barrel.	
102									
103	168				NR				
104									
105									
106							(106.0 - 130.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); dark brown (7.5YR 3/3); very fine grained to very coarse grained, subround to round; some granules to very large pebbles, subround to round; little clay; trace silt; wet		(106.0 - 116.0') 15 gallons of water used; 0 gallons of water recovered; 15 gallons of water lost
107									
108		RB-4-SS-106-110 4/16/2019 12:30							
109							(109'); decrease in granules and pebbles, increase in silt		
110									
111									
112		RB-4-SS-110-115 4/16/2019 12:35							
113	240			Topock - Alluvium Deposits	SM		(113') fine grained to very coarse grained, angular to subangular; some granules to medium pebbles, angular; decrease in granules and pebbles, increase in sand		
114									
115									
116									(116.0 - 126.0') 15 gallons of water used; 0 gallons of water recovered; 15 gallons of water lost
117		RB-4-SS-115-120 4/16/2019 12:40							
118									
119									
120									

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ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: RB-4 Pilot

Date Started:	04/11/2019	Surface Elevation:	465.97 ft amsl	Client:	PG&E
Date Completed:	04/17/2019	Northing (NAD83):	2102908.71	Project:	Final GW Remedy Phase 1
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Location:	PG&E Topock, Needles, California
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs		
Drill Rig Type:	Terrasonic track mount	Borehole Diameter:	6-12 inches		
Driller Name:	Dan O'Mara	Depth to First Water:	11.0 ft bgs		
Drilling Asst:	E. Huellmantel / J. Pacheco	Sampling Method:	4 inch x 10 ft. Core Barrel	Project Number:	RC000753.0051
Logger:	D. Maurer / G. Jeffers	Sampling Interval:	Continuous		
Editor:	S. McGrane / G. Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
121									
122		RB-4-SS-120-125 4/16/2019 12:45	RB-4-VAS-121-126 (<0.033 U ppb) 4/13/2019 11:56	Topock - Alluvium Deposits	SM				
123	240								
124									
125									
126							(126') very fine grained to very coarse grained, angular to subangular; some granules to medium pebbles, angular to subangular; increase in granules and pebbles, no clay		(126.0 - 161.0') No water used
127		RB-4-SS-125-130 4/16/2019 12:50							
128									
129									
130									
131				Topock - Alluvium Deposits	GM		(130.0 - 132.0') Topock - Alluvium Deposits; Silty gravel with sand (GM); dark brown (7.5YR 3/3); granules to very large pebbles, angular; some very fine to very coarse grained sand, angular to subangular; little silt; trace clay; wet		
132		RB-4-SS-130-135 4/16/2019 12:55							
133	216						(132.0 - 141.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); dark brown (7.5YR 3/3); fine grained to coarse grained, angular to subangular; little granules to very large pebbles, angular to subangular; little silt; little clay; wet		
134									
135									
136				Topock - Alluvium Deposits	SM				
137		RB-4-SS-135-140 4/16/2019 13:00	RB-4-VAS-136-141 (<0.17 U ppb) 4/13/2019 17:18						
138									
139									
140									

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ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: RB-4 Pilot

Date Started:	04/11/2019	Surface Elevation:	465.97 ft amsl	Client:	PG&E
Date Completed:	04/17/2019	Northing (NAD83):	2102908.71	Project:	Final GW Remedy Phase 1
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Location:	PG&E Topock, Needles, California
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs		
Drill Rig Type:	Terrasonic track mount	Borehole Diameter:	6-12 inches		
Driller Name:	Dan O'Mara	Depth to First Water:	11.0 ft bgs		
Drilling Asst:	E. Huellmantel / J. Pacheco	Sampling Method:	4 inch x 10 ft. Core Barrel	Project Number:	RC000753.0051
Logger:	D. Maurer / G. Jeffers	Sampling Interval:	Continuous		
Editor:	S. McGrane / G. Willford	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
141				Topock - Alluvium Deposits	SM				
142	216			Topock - Weathered Bedrock - conglomerate	SM		(141.0 - 144.0') Topock - Weathered Bedrock - conglomerate; Silty sand with gravel (SM); reddish brown (2.5YR 4/4); very fine grained to medium grained; some granules to very large pebbles, subangular to subround; some silt; trace small cobbles, subangular to subround; trace clay; moist to wet; weak cementation		
143									
144									
145					NR		(144.0 - 146.0') No recovery (NR)	(144.0 - 146.0') Lost core in hopper during sample collection.	
146									
147	60						(146.0 - 161.0') Topock - Weathered Bedrock - conglomerate; Silty sand with gravel (SM); reddish brown (2.5YR 4/4); very fine grained to medium grained; some silt; little granules to very large pebbles, subangular to subround; little clay; trace small cobbles, subangular to subround; moist to wet; weak cementation		
148									
149									
150									
151									
152									
153				Topock - Weathered Bedrock - conglomerate	SM				
154									
155	120						(155'); trace large cobbles; trace boulders		
156									
157			RB-4-VAS-155-160 (<0.17 U ppb) 4/17/2019 12:48						
158									
159									
160									

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ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: RB-4 Pilot

Date Started:	04/11/2019	Surface Elevation:	465.97 ft amsl
Date Completed:	04/17/2019	Northing (NAD83):	2102908.71
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs
Drill Rig Type:	Terrasonic track mount	Borehole Diameter:	6-12 inches
Driller Name:	Dan O'Mara	Depth to First Water:	11.0 ft bgs
Drilling Asst:	E. Huellmantel / J. Pacheco	Sampling Method:	4 inch x 10 ft. Core Barrel
Logger:	D. Maurer / G. Jeffers	Sampling Interval:	Continuous
Editor:	S. McGrane / G. Willford	Converted to Well:	☒ Yes ☐ No

Client:	PG&E	
Project:	Final GW Remedy Phase 1	
Location:	PG&E Topock, Needles, California	
Project Number:	RC000753.0051	

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Soil Description	Drilling Notes	Drilling Fluid
161	120				SM		End of Boring at 161.0 ft bgs.		

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, U = not detected above the laboratory reporting limit, J = estimated value, NR = no recovery; Notes: blue water table symbol represents depth to water measured during the first VAS interval; apparent partial recoveries can be the result of potential compaction of sediments in the core bag

Temporary Backfill Log

ARCADIS Design & Consultancy for natural and built assets

Sheet: 1 of 9

Well ID: RB-4 Pilot

Date Started:	04/24/2019	Surface Elevation:	465.97 ft amsl	Client:	PG&E
Date Completed:	04/24/2019	Northing (NAD83):	2102908.71		
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Project:	Final GW Remedy Phase 1
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs	Location:	PG&E Topock, Needles, California
Driller Name:	Dan O'Mara	Borehole Diameter:	6-12 inches		
Drilling Asst:	E. Huellmantel / J. Pacheco	Depth to First Water:	11.0 ft bgs		
Logger:	D. Maurer / G. Jeffers	Editor:	S. McGrane / G. Willford	Project Number:	RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
1		Topock - Fill	SP		(0.0 - 0.5') Steel Plate		Note: Steel plates with BMPs in place
2					(0.0 - 3.5') 12" Borehole		
3					(0.5 - 5.0') Wildcat Washed Plastering Sand	(0.5 - 5.0') 6.1 bags	(0.5 - 5.0') 3 bags (49%) Note: Surface seal sand. Used <20% of the calculated volume due to potential formation collapse.
4			NR				
5							
6							
7		Topock - Fill	SP				
8							
9							
10							
11							
12			NR		(5.0 - 136.0') Cemex #3 MESH (8x20) Lapis Lustre Sand	(5.0 - 136.0') 51.4 bags	(5.0 - 136.0') 69.5 bags (135%) Note: Backfill sand, used >20% of the calculated volume due to potential voids forming during drilling.
13					(3.5 - 161.0') 6" Borehole		
14							
15							
16		Topock - Fluvial Deposits	SP				
17	RB-4-VAS-15-20 (0.0556 J ppb) 4/12/2019 09:20						
18		Topock - Fluvial Deposits	SP-SM				
19							
20							

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ARCADIS Design & Consultancy for natural and built assets

Temporary Backfill Log

Sheet: 2 of 9

Date Started:	04/24/2019	Surface Elevation:	465.97 ft amsl	**Well ID: RB-4 Pilot**	
Date Completed:	04/24/2019	Northing (NAD83):	2102908.71		
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Dan O'Mara	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	E. Huellmantel / J. Pacheco	Depth to First Water:	11.0 ft bgs		
Logger:	D. Maurer / G. Jeffers	Editor:	S. McGrane / G. Willford	Project Number:	RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
21							
22							
23			NR				
24							
25							
26							
27							
28							
29							
30		Topock - Fluvial Deposits	SP-SM		(5.0 - 136.0') Cemex #3 MESH (8x20) Lapis Lustre Sand; (3.5 - 161.0') 6" Borehole	(5.0 - 136.0') 51.4 bags	(5.0 - 136.0') 69.5 bags (135%) Note: Backfill sand, used >20% of the calculated volume due to potential voids forming during drilling.
31							
32							
33							
34							
35			NR				
36							
37							
38		Topock - Fluvial Deposits	SP				
39							
40							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, BMP = Best Management Practices for stormwater, U = not detected above the laboratory reporting limit, J = estimated value, NR = no recovery; Notes: blue water table symbol represents depth to water measured during the first VAS interval; granular backfill material was removed during overdrilling of the pilot borehole

Temporary Backfill Log

ARCADIS Design & Consultancy for natural and built assets

Date Started:	04/24/2019	Surface Elevation:	465.97 ft amsl	**Well ID: RB-4 Pilot**	
Date Completed:	04/24/2019	Northing (NAD83):	2102908.71		
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Dan O'Mara	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	E. Huellmantel / J. Pacheco	Depth to First Water:	11.0 ft bgs		
Logger:	D. Maurer / G. Jeffers	Editor:	S. McGrane / G. Willford	Project Number:	RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
41		Topock - Fluvial Deposits	GW				
42							
43	RB-4-VAS-41-46 (<0.033 U ppb) 4/12/2019 12:05		NR				
44							
45							
46							
47							
48							
49		Topock - Fluvial Deposits	SP				
50					(5.0 - 136.0') Cemex #3 MESH (8x20) Lapis Lustre Sand	(5.0 - 136.0') 51.4 bags	(5.0 - 136.0') 69.5 bags (135%) Note: Backfill sand, used >20% of the calculated volume due to potential voids forming during drilling.
51							
52		Topock - Fluvial Deposits	SP-SM				
53							
54							
55			NR				
56							
57		Topock - Fluvial Deposits	SP-SM				
58							
59		Topock - Fluvial Deposits	SM				
60					(3.5 - 161.0') 6" Borehole		

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, BMP = Best Management Practices for stormwater, U = not detected above the laboratory reporting limit, J = estimated value, NR = no recovery; Notes: blue water table symbol represents depth to water measured during the first VAS interval; granular backfill material was removed during overdrilling of the pilot borehole

Temporary Backfill Log

ARCADIS Design & Consultancy for natural and built assets

Well ID: RB-4 Pilot

Date Started:	04/24/2019	Surface Elevation:	465.97 ft amsl		
Date Completed:	04/24/2019	Northing (NAD83):	2102908.71		
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Dan O'Mara	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	E. Huellmantel / J. Pacheco	Depth to First Water:	11.0 ft bgs		
Logger:	D. Maurer / G. Jeffers	Editor:	S. McGrane / G. Willford	Project Number:	RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
60		Topock - Fluvial Deposits	SP, SC, CL				
61		Topock - Fluvial Deposits					
62		Topock - Fluvial Deposits					
63		Topock - Fluvial Deposits	SP				
64							
65							
66		Topock - Fluvial Deposits	SP				
67							
68		Topock - Fluvial Deposits	SP				
69		Topock - Fluvial Deposits	GP		(5.0 - 136.0') Cemex #3 MESH (8x20) Lapis Lustre Sand	(5.0 - 136.0') 51.4 bags	(5.0 - 136.0') 69.5 bags (135%) Note: Backfill sand, used >20% of the calculated volume due to potential voids forming during drilling.
70		Topock - Fluvial Deposits	SP		(3.5 - 161.0') 6" Borehole		
71							
72		Topock - Fluvial Deposits	ML				
73							
74			NR				
75							
76							
77							
78		Topock - Fluvial Deposits	SP				
79							
80							

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, BMP = Best Management Practices for stormwater, U = not detected above the laboratory reporting limit, J = estimated value, NR = no recovery; Notes: blue water table symbol represents depth to water measured during the first VAS interval; granular backfill material was removed during overdrilling of the pilot borehole

ARCADIS Design & Consultancy for natural and built assets

Temporary Backfill Log

Sheet: 5 of 9

Well ID: RB-4 Pilot

Date Started:	04/24/2019	Surface Elevation:	465.97 ft amsl		
Date Completed:	04/24/2019	Northing (NAD83):	2102908.71		
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Dan O'Mara	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	E. Huellmantel / J. Pacheco	Depth to First Water:	11.0 ft bgs		
Logger:	D. Maurer / G. Jeffers	Editor:	S. McGrane / G. Willford	Project Number:	RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
81		Topock - Fluvial Deposits	GW				
82							
83	RB-4-VAS-81-86 (<0.033 U ppb) 4/12/2019 15:45						
84			NR				
85							
86							
87		Topock - Fluvial Deposits	SP				
88							
89		Topock - Fluvial Deposits	GM				
90		Topock - Fluvial Deposits	SP		(5.0 - 136.0') Cemex #3 MESH (8x20) Lapis Lustre Sand	(5.0 - 136.0') 51.4 bags	(5.0 - 136.0') 69.5 bags (135%) Note: Backfill sand, used >20% of the calculated volume due to potential voids forming during drilling.
91		Topock - Fluvial Deposits	SP				
92							
93							
94							
95		Topock - Fluvial Deposits	GW-GM				
96							
97							
98							
99							
100					(3.5 - 161.0') 6" Borehole		

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Temporary Backfill Log

ARCADIS Design & Consultancy for natural and built assets

Date Started:	04/24/2019	Surface Elevation:	465.97 ft amsl	**Well ID: RB-4 Pilot**	
Date Completed:	04/24/2019	Northing (NAD83):	2102908.71		
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Dan O'Mara	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	E. Huellmantel / J. Pacheco	Depth to First Water:	11.0 ft bgs		
Logger:	D. Maurer / G. Jeffers	Editor:	S. McGrane / G. Willford	Project Number:	RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
101–120		Topock - Alluvium Deposits	NR (103); SM (113)		(5.0 - 136.0') Cemex #3 MESH (8x20) Lapis Lustre Sand; (3.5 - 161.0') 6" Borehole	(5.0 - 136.0') 51.4 bags	(5.0 - 136.0') 69.5 bags (135%) Note: Backfill sand, used >20% of the calculated volume due to potential voids forming during drilling.

Abbreviations: USCS = Unified Soil Classification System, ft = feet, bgs = below ground surface, amsl = above mean sea level, GW = groundwater, ppb = parts per billion, BMP = Best Management Practices for stormwater, U = not detected above the laboratory reporting limit, J = estimated value, NR = no recovery; Notes: blue water table symbol represents depth to water measured during the first VAS interval; granular backfill material was removed during overdrilling of the pilot borehole

ARCADIS Design & Consultancy for natural and built assets

Temporary Backfill Log

Sheet: 7 of 9

Date Started:	04/24/2019	Surface Elevation:	465.97 ft amsl	**Well ID: RB-4 Pilot**	
Date Completed:	04/24/2019	Northing (NAD83):	2102908.71		
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Dan O'Mara	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	E. Huellmantel / J. Pacheco	Depth to First Water:	11.0 ft bgs		
Logger:	D. Maurer / G. Jeffers	Editor:	S. McGrane / G. Willford	Project Number:	RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
121							
122							
123	RB-4-VAS-121-126 (<0.033 U ppb) 4/13/2019 11:56						
124							
125		Topock - Alluvium Deposits	SM				
126							
127							
128					(5.0 - 136.0') Cemex #3 MESH (8x20) Lapis Lustre Sand	(5.0 - 136.0') 51.4 bags	(5.0 - 136.0') 69.5 bags (135%) Note: Backfill sand, used >20% of the calculated volume due to potential voids forming during drilling.
129							
130					(3.5 - 161.0') 6" Borehole		
131		Topock - Alluvium Deposits	GM				
132							
133							
134							
135							
136		Topock - Alluvium Deposits	SM				
137							
138	RB-4-VAS-136-141 (<0.17 U ppb) 4/13/2019 17:18				(136.0 - 146.0') Wildcat Washed Plastering Sand	(136.0 - 146.0') 3.9 bags	(136.0 - 146.0') 4 bags (103%) Note: Indicator sand
139							
140							

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Temporary Backfill Log

ARCADIS Design & Consultancy for natural and built assets

Well ID: RB-4 Pilot

Date Started:	04/24/2019	Surface Elevation:	465.97 ft amsl		
Date Completed:	04/24/2019	Northing (NAD83):	2102908.71		
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Dan O'Mara	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	E. Huellmantel / J. Pacheco	Depth to First Water:	11.0 ft bgs		
Logger:	D. Maurer / G. Jeffers	Editor:	S. McGrane / G. Willford	Project Number:	RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
141		Topock - Alluvium Deposits	SM				
142		Topock - Weathered Bedrock - conglomerate	SM		(136.0 - 146.0') Wildcat Washed Plastering Sand	(136.0 - 146.0') 3.9 bags	(136.0 - 146.0') 4 bags (103%) Note: Indicator sand
143							
144							
145			NR				
146							
147							
148							
149							
150					(3.5 - 161.0') 6" Borehole		
151							
152							
153		Topock - Weathered Bedrock - conglomerate	SM		(146.0 - 161.0') Bentonite seal chips Puregold Medium Chips	(146.0 - 161.0') 4.1 bags	(146.0 - 161.0') 4 bags (98%) Note: Decommissioned rathole
154							
155							
156							
157	RB-4-VAS-155-160 (<0.17 U ppb) 4/17/2019 12:48						
158							
159							
160							

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ARCADIS Design & Consultancy for natural and built assets

Temporary Backfill Log

Sheet: 9 of 9

Well ID: RB-4 Pilot

Date Started:	04/24/2019	Surface Elevation:	465.97 ft amsl		
Date Completed:	04/24/2019	Northing (NAD83):	2102908.71		
Drilling Co.:	Cascade	Easting (NAD83):	7616336.37	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	161 ft bgs	Project:	Final GW Remedy Phase 1
Driller Name:	Dan O'Mara	Borehole Diameter:	6-12 inches	Location:	PG&E Topock, Needles, California
Drilling Asst:	E. Huellmantel / J. Pacheco	Depth to First Water:	11.0 ft bgs		
Logger:	D. Maurer / G. Jeffers	Editor:	S. McGrane / G. Willford	Project Number:	RC000753.0051

Depth (ft)	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Well Construction	Calculated Material Volumes	Material Volumes Installed Note: percentages are the actual volume vs the calculated volume
161			SM		(3.5 - 161.0') 6" Borehole	(146.0 - 161.0') 4.1 bags	(146.0 - 161.0') 4 bags (98%) Note: Decommissioned rathole
162							
163							
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, ppb = parts per billion, BMP = Best Management Practices for stormwater, U = not detected above the laboratory reporting limit, J = estimated value, NR = no recovery; Notes: blue water table symbol represents depth to water measured during the first VAS interval; granular backfill material was removed during overdrilling of the pilot borehole