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December 10, 2018

Ms. Pamela Innis
U.S. Department of the Interior
CHF Remedial Project Manager
One North Central Avenue, Suite 800
Phoenix, AZ 85004-4427

Mr. Aaron Yue
California Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630

Subject: **November 2018 Monthly Progress Report for the Final Groundwater Remedy Construction and Startup, PG&E Topock Compressor Station, Needles, California**
(Document ID: TPK_Monthly Progress Report_November 2018)

Dear Ms. Innis and Mr. Yue:

In compliance with the *1996 Corrective Action Consent Agreement* (CACA) (Attachment 6, Part E, Section 9a and Attachment 7) and the *2013 Remedial Design/Remedial Action Consent Decree* (CD) (¶32 and Appendix C, Section 5), and pursuant to the *Construction/ Remedial Action Work Plan* (C/RAWP) (Section 2.6.3.1), this monthly report describes activities taken at Pacific Gas and Electric Company's (PG&E's) Topock Compressor Station during November 2018 as well as activities planned for the next six weeks (December 11, 2018 to January 19, 2019), and presents available results from sampling and testing performed in November 2018.

In addition, this report discusses material deviations from the approved design documents and/or the C/RAWP, if any, that PG&E has proposed to the California Department of Toxic Substances Control (DTSC) and the U.S. Department of the Interior (DOI), or that have been approved by DTSC and DOI. This report also highlights key personnel changes, if any, and summarizes activities performed and activities planned in support of DOI's 2012 Community Involvement Plan and DTSC's 2013 Community Outreach Plan, as well as contacts with the local community, representatives of the press, and/or public interest groups, if any. This report also includes data from samples collected as part of the sitewide groundwater monitoring program within 60 days of sample collection, as required by the Condition of Approval # xi in DTSC's approval letter dated August 24, 2018.

Please note that since activities conducted to comply with the project's Applicable or Relevant and Appropriate Requirement (ARARs) and the Subsequent Environmental Impact Report (SEIR) mitigation measures are currently reported in separate compliance reports, this information is not repeated in the monthly reports.

Monthly progress reports will be submitted to DTSC and DOI by the 10th day of the following month during construction and start-up of the groundwater remedy at the Topock Compressor Station which officially began on October 2, 2018. This is the second monthly progress report. Please contact me at (760) 791-5884 if you have any questions or comments regarding this submittal.

Sincerely,

Curt Russell
Topock Project Manager

Topock Project Executive Abstract

Document Title: *November 2018 Monthly Progress Report for the Groundwater Remedy Construction and Startup, PG&E Topock Compressor Station, Needles, California*

Submitting Agency: DOI, DTSC

Final Document? ☒ Yes ☐ No

Date of Document: 12/10/2018

Who Created this Document?: (i.e. PG&E, DTSC, DOI, Other) PG&E

Priority Status: ☐ HIGH ☒ MED ☐ LOW

Is this time critical? ☐ Yes ☒ No

Action Required:

☒ Information Only ☐ Review & Input

☐ Other / Explain:

Type of Document:

☐ Draft ☒ Report ☐ Letter ☐ Memo

☐ Other / Explain:

What does this information pertain to?

- ☐ Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA)/Preliminary Assessment (PA)
- ☐ RCRA Facility Investigation (RFI)/Remedial Investigation (RI) (including Risk Assessment)
- ☐ Corrective Measures Study (CMS)/Feasibility Study (FS)
- ☒ Corrective Measures Implementation (CMI)/ Remedial Action(RA)
- ☐ California Environmental Quality Act (CEQA)/ Environmental Impact Report (EIR)
- ☐ Interim Measures
- ☐ Other / Explain:

Is this a Regulatory Requirement?

- ☒ Yes
- ☐ No

If no, why is the document needed?

What is the consequence of NOT doing this item? What is the consequence of DOING this item?

The consequence for not doing this item is PG&E will be out of compliance with the 1996 Corrective Action Consent Agreement (CACA) and the 2013 Remedial Design/ Remedial Action Consent Decree (CD), as well as the Construction/Remedial Action Work Plan (C/RAWP).

Other Justification/s:

☐ Permit ☐ Other / Explain:

Brief Summary of attached document:

This monthly report describes activities taken during November 2018 and activities planned for the next six weeks (December 11, 2018 to January 19, 2019) and presents available results from sampling and testing in November 2018. In addition, this report discusses material deviations from the approved design documents and/or the *Construction/ Remedial Action Work Plan* (C/RAWP), if any, that PG&E has proposed to the California Department of Toxic Substances Control (DTSC) and the U.S. Department of the Interior (DOI) or that have been approved by DTSC and DOI. This report also highlights key personnel changes, if any, and summarizes activities performed and activities planned at the Topock Compressor Station in support of DOI's 2012 Community Involvement Plan and DTSC's 2013 Community Outreach Plan, as well as contacts with local community, representatives of the press, and/or public interest groups, if any.

Written by: Pacific Gas and Electric Company

Recommendations:

Provide input to PG&E.

How is this information related to the Final Remedy or Regulatory Requirements:

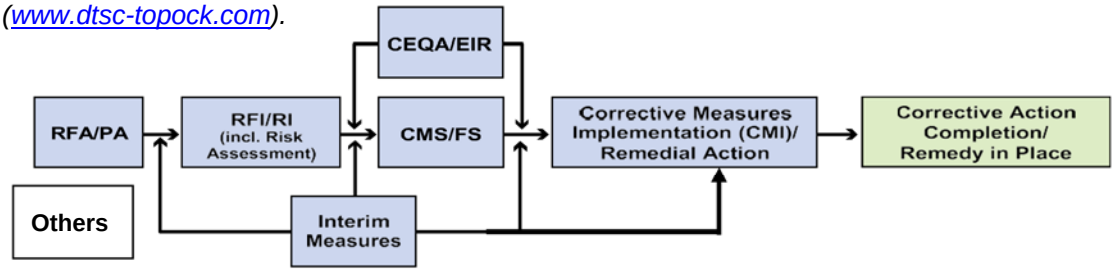
This submittal is required in compliance with the CACA, CD, and pursuant to the C/RAWP.

Other requirements of this information?

None.

Related Reports and Documents:

Click any boxes in the Regulatory Road Map (below) to be linked to the Documents Library on the DTSC Topock Web Site (www.dtsc-topock.com).



Legend
RFA/PA – RCRA Facility Assessment/Preliminary Assessment
RFI/RI – RCRA Facility Investigation/CERCLA Remedial Investigation (including Risk Assessment)
CMS/FS – RCRA Corrective Measure Study/CERCLA Feasibility Study

JACOBS

November 2018
Monthly Progress Report for the Final Groundwater Remedy Construction and Startup

PG&E Topock Compressor Station
Needles, California

Document ID: TPK_Monthly Progress Report_November 2018

December 2018

Prepared for
U.S. Department of the Interior and California Department of Toxic Substances Control

On Behalf of
Pacific Gas and Electric Company

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Acronyms and Abbreviations

µg/m^3	micrograms per cubic meter
AOC	Area of Concern
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
BMP	best management practice
CACA	Corrective Action Consent Agreement
C/RAWP	Construction/Remedial Action Work Plan
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CH2M	CH2M HILL, Inc.
CHQ	Construction Headquarters
DOI	United States Department of the Interior
DTSC	California Department of Toxic Substances Control
ERTC	Environmental Release to Construct
FCR	field contact representative
LOC	level of concern
NTH	National Trails Highway
PG&E	Pacific Gas and Electric Company
RCRA	Resource Conservation and Recovery Act
SEIR	Subsequent Environmental Impact Report
SPY	Soil Processing Yard
SWPPP	Stormwater Pollution Prevention Plan
TCS	Topock Compressor Station
TRC	Technical Review Committee
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WEAT	Worker Environmental Awareness Training
WVR	Work Variance Request

1. Introduction

Pacific Gas and Electric Company (PG&E) is implementing the final groundwater remedy to address chromium in groundwater near the PG&E Topock Compressor Station (TCS), located in eastern San Bernardino County 15 miles southeast of the city of Needles, California.

The U.S. Department of the Interior (DOI) is the lead federal agency overseeing remedial actions at the TCS. PG&E and the United States executed a Remedial Design/Remedial Action Consent Decree (CD), on behalf of the DOI, under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 2012, which was approved by the U.S. District Court for the Central District of California in November 2013 (DOI, 2013). Paragraph 32 and Appendix C (Section 5) of the CD requires PG&E to submit to DOI electronic progress reports during construction of the remedial action and on a quarterly basis after the selected remedy has been implemented and demonstrated to be operating as intended.

The California Department of Toxic Substances Control (DTSC) is the lead state agency overseeing corrective actions at the TCS. Remedial activities are being performed in conformance with the requirements of the Resource Conservation and Recovery Act (RCRA) Corrective Action pursuant to a Corrective Action Consent Agreement (CACA) entered into by PG&E and the DTSC in February 1996 (DTSC, 1996). Attachment 6, Part E, Section 9a and Attachment 7 of the CACA require PG&E to provide certain information in monthly progress reports during construction of the corrective action.

In compliance with the above CACA and CD requirements, PG&E proposed a template for the monthly progress reports in Exhibit 2.6-2 of the Construction/Remedial Action Work Plan (C/RAWP) (CH2M HILL, Inc. [CH2M], 2015b). The C/RAWP was approved by DOI on April 3, 2018 (DOI, 2018) and DTSC on April 24, 2018 (DTSC, 2018a).

This is the second of the monthly progress reports that will be submitted to DOI and DOI for the duration of the remedy construction and startup. This monthly progress report documents activities during November 2018, and follows the content and format described in Exhibit 2.6-2 of the approved C/RAWP. The report is organized as follows:

- **Section 2.1** describes completed construction activities; data collected, generated or received; nature and volume of waste generated; waste handling/disposal; issues encountered; actions taken to rectify problems/issues; personnel changes; and Work Variance Requests (WVRs; i.e., material deviations from the design documents, the C/RAWP, or other approved work plans), if any, as well as agencies' actions on those requests, and potential schedule impacts.
- **Section 2.2** summarizes contacts with representatives of the press, local community, or public interest groups during the reporting period, other activities provided to assist DTSC and/or DOI in support of the Community Outreach Plan (DTSC, 2013) and/or Community Involvement Plan (DOI, 2012), respectively, and anticipated near-term (approximately next six weeks) activities in support of the Community Outreach and Community Involvement Plans.
- **Section 2.3** describes the planned activities for the next six weeks (construction activities, sampling and monitoring events, etc.).
- **Section 2.4** provides information relating to the construction schedule progress, sequencing of activities, information regarding percentage of completion, unresolved delays encountered or anticipated that may affect the future schedule, and a description of efforts made to mitigate those delays or anticipated delays, if any.
- **Section 3** lists the references cited in this report.

Please note that since activities conducted to comply with the project's Applicable or Relevant and Appropriate Requirement (ARARs) and the Subsequent Environmental Impact Report (SEIR; DTSC, 2018b) mitigation measures are currently reported in separate compliance reports, the same information is not repeated in the monthly reports.

2. Monthly Update

2.1 Description of Activities and Work Completed

2.1.1 Work Completed

Highlights of key activities related to the construction of the groundwater remedy completed during November 2018 include the following (in chronological order):

- On July 13, 2018, PG&E sent via email the first weekly six-week look-ahead schedule for the remedy construction field work. The weekly emails provide highlights of field activities in the previous week, field activities scheduled for the next week, and planned activities for the next six weeks. Recipients of the weekly emails are DOI, DTSC, the U.S. Fish and Wildlife Service (USFWS), Tribes, and the Technical Review Committee (TRC). PG&E continues to send these weekly emails to date. As of November 30, 2018, a total of 20 six-week look-ahead schedule emails were sent. **Of those, four six-week look-ahead schedule emails were sent in November 2018 (on November 4, 11, 18, and 25, 2018)**.
- On August 10, 2018, PG&E issued the first Environmental Release to Construct (ERTC) to contractors. As of November 30, 2018, a total of 18 ERTCs were issued for mobilization and construction activities (see Table 2-1). **Of those, five ERTCs were issued in November 2018.**
- Starting on October 4, 2018, PG&E has published a daily construction activities list and discussed the list at the morning tailboards with Tribes and agency representatives. This daily list is intended to inform and facilitate observation by Tribes and agency representatives on site on that day. PG&E continues to publish these daily lists and discuss the list at the daily morning tailboards to date. **In November 2018, a total of 26 daily construction activities lists were published and discussed at the morning tailboards.**
- In November 2018, PG&E completed the following construction activities (see Figures 2-1 and 2-2 for locations of key areas and wells, as well as select photos in **Attachment A**):
  - Delineated the extent of the maximum construction footprint in the jurisdictional water at the Construction Headquarters (CHQ) with snow fence, prior to the start of work on the access road.
  - Installed construction storm water pollution prevention measures (also called Stormwater Pollution Prevention Plan [SWPPP] Best Management Practices [BMPs]) as required in the ERTCs for IRZ-9, IRZ-13, and the access road at the CHQ.
  - Poured concrete into the formwork for the truck containment pad at TCS evaporation ponds.
  - Transplanted 163 sensitive plant species (palo verde and mesquite) from the CHQ, Soil Processing Yard (SPY), and MW-20 Bench. Did not transplant 4 plants because they are either too big or are above underground utilities, and one plant because it was growing through the fence at MW-20 Bench.
  - **Pilot Boring/Well Installation Activities (Rotosonic drilling):**
    a) Completed installation of MW-E on November 27, 2018 (drilled to 150 feet and reamed to 144 feet).
    b) Completed installation of a monitoring well in the first borehole at MW-L on November 27, 2108 (drilled to 315 feet and reamed to 249 feet). Collected water samples at various intervals.
    c) Completed drillng of the pilot boring at IRZ-13 on November 8, 2018 (drilled to 247 feet). Collected water samples at various intervals. Backfilled the borehole with sand.
    d) Completed drilling of the pilot boring at IRZ-15 on November 8, 2018 (drilled to 257 feet). Collected water samples at various intervals. Backfilled the borehole with sand.

e) Completed drilling of the pilot boring at IRZ-20 on November 1, 2018 (drilled to 187 feet). Collected water samples at various intervals. Backfilled the borehole with sand.

f) See **Attachment B** for available information such as boring logs and water analytical results. Boring logs for IRZ-20, MW-E, the first monitoring well at MW-L, and geotechnical boreholes along Pipeline F are available and included in Attachment B.

– **Baseline/Opportunistic Soil Sampling Activities:**

a) Pursuant to the Baseline Soil Sampling and Analysis Plan (Appendix A of the Soil Management Plan [which is Appendix L of the C/RAWP]), one soil sample was collected on November 30, 2018, at approximately 1 foot below ground surface (bgs) at IRZ-9.

b) At the request of DTSC, PG&E collected five opportunistic samples of stained soil encountered on November 14, 2018 during excavation associated with the Compressor Station's Fire Supression project. Three soil samples were collected at approximately 0.5 foot bgs on the east side of the Firepump Auxiliary Building (AOC 23), one sample was collected on the southeast side of the Operator Building and in the vicinity of AOC 15, and one sample was collected in AOC 4 near the water line that comes down from the TCS water storage tanks.

c) See **Attachment C** for information about soil sampling locations and soil analytical results that are available at this time.

– **Perimeter Air Sampling Activities:**

a) Dust monitoring continues in November 2018 at perimeter of the work areas.

b) Perimeter air sampling for hexavalent chromium is performed at the perimeter of the work areas (outside of the exclusion zone) that are inside Areas of Concern (AOCs) within the construction footprint where hexavalent chromium concentrations in soil have been historically reported. No perimeter air sampling was conducted in November 2018.

c) See **Attachment D** for information about previous air sampling locations and air analytical results.

- **Noise Monitoring Activities:**

a) Noise monitoring is conducted at pre-approved locations closest to the construction activities. Through November 2018, noise monitoring was conducted at the following pre-approved locations:

- Location west of the mobile home park at Moabi Regional Park,
- Location Maze A Area 2,
- Location Maze A Area 3,
- Location Maze B Combined Area 1/2 and alternate location (the alternate location was only monitored when drilling at MW-L occurred), and
- Location Maze C Area 1.

b) See **Attachment E** for information about pre-approved noise monitoring locations and a summary of noise monitoring data available to date.

2.1.2 Work Already Underway and During Implementation

- As of December 1, 2018, PG&E has started and will continue to perform the following activities:
  – Continue to drill the second boring at MW-L. Continue to collect water samples.
  – Continue to drill pilot borings at IRZ-9 and IRZ-25. Continue to collect water samples.
  – Continue hydrostatic pressure testing of the temporary construction water pipeline.
  – Continue to improve the access road to the CHQ.

- Continue to water the transplanted plants, at the approved location off NTH, weekly for eight weeks.
- Continue to conduct noise and dust monitoring and inspection of SWPPP BMPs.
- Continue to track and manage waste generated.
- Continue to manage displaced soil per the approved Soil Management Plan.

2.1.3 Waste Generation and Management

As of November 30, 2018, the following waste streams were generated from remedy construction:

- Approximately 30 cubic yards of drill cuttings were generated from well drilling and geotechnical investigation. Of those, approximately 1.3 cubic yards are clay, and PG&E is currently awaiting direction from DOI on the management of clay. The remaining drill cuttings are sampled in accordance to the approved Soil Management Plan, and the final disposition will be reported in future monthly reports.
- Approximately 12,500 gallons of wastewater were generated from drilling operations at well MW-L (about 8,500 gallons), IRZ-13 (about 1500 gallons), IRZ-15 (about 2000 gallons), and MW-E (about 500 gallons). At each drilling location, the wastewater is initially stored in a 3,000-gallon holding tank in the primary work zone, and is transferred from the primary work zone, as needed, to a common 20,000-gallon frac tank located at the MW-20 Bench. Each transfer load is tracked. Once the frac tank is full, its contents will be characterized and managed in accordance with the approved Waste Management Plan (Appendix R of the C/RAWP) and the final disposition will be reported in future monthly reports.
- Approximately 750 gallons of wastewater was generated from decontamination of drilling equipment.
- Approximately 30 cubic yards of general construction waste and 6 cubic yards of recyclables were generated and transported to Republic Services in Lake Havasu City for disposal and management.
- Sanitary waste in portable toilets that is hauled offsite as needed.

2.1.4 Worker Training and Education

- PG&E continues to provide the mandatory Site Health and Safety Training for its employees and contractors on a daily basis. As of November 30, 2018, a total of 38 health and safety training sessions were held and 188 employees and contractors received the training. **Of those, in November 2018, 10 sessions were conducted and 32 employees/contractors were trained.** After the training, the attendees signed the training roster.
- PG&E continues to provide the mandatory Worker Environmental Awareness Training (WEAT) to its employees and contractors that will be involved in the remedy construction project. The training is offered regularly on Mondays and Thursdays, and more frequently as needed. As of November 30, 2018, a total of 36 WEAT sessions were conducted and 221 employees and contractors received the training. **Of those, in November 2018, 8 sessions were conducted and 28 employees/ contractors were trained**. Educational brochures are made available to attendees of the training; they are designed to reinforce the key topics and highlight the take-aways discussed during the classroom training. After the training, the attendees signed the training roster.
- PG&E's onsite biologist also trained Field Contact Representatives (FCRs), who will be responsible for compliance with biological avoidance and mitigation measures. As of November 30, 2018, a total of 7 FCR training sessions were conducted and 33 employees and contractors received the training. **No FCR training sessions were conducted in November 2018**.
- Training records are kept electronically and at the temporary construction trailers at the SPY. The records are available upon request.

2.1.5 Status of Work Variance Requests

PG&E did not submit any new WVRs in November 2018. See Table 2-2 for information regarding activities related to previously proposed WVRs (i.e., material deviations from the design documents, the C/RAWP, or other approved work plans), and agencies' actions on those requests.

2.1.6 Use of Future Activity Allowance

There was no proposed use of Future Activity Allowance (FAA) to date.

2.1.7 Issues Encountered and Actions Taken to Rectify Issues/Problems

- **Access road at the CHQ**
  - Survey conducted prior to construction showed that ground elevation was 6 inches higher than the 100% design. This did not result in a design change, but the road will be 6 inches higher than the 100% design.
  - After conducting compaction test, the old road base was determined to not be suitable for reuse as a base for the new road. Therefore, import fill was used. The old road base is stored at the CHQ for future reuse.

- **Unanticipated mechanical issues with the drill rig at MW-L**
  - Several unanticipated mechanical issues were encountered with the drill rig at MW-L, including the malfunction of the drill head which required a replacement and the slipping and entanglement of the cable line which resulted in drill rods in borehole which required downhole retrieval. Corrective actions were taken in a timely manner by Cascade.

- A representative of Hargis and Associates, consultant to the Fort Mojave Indian Tribe, noted that certain sections of the temporary construction water pipeline were laid on top of rocks with sharp edges and one section was without support. Subsequent to this observation, the contractor placed sand bags on top of the rocks and under the pipeline for additional protection. In addition, the contractor secured the section that was noted as without support with sand bags. The contractor will monitor the pipeline over time and make adjustments as necessary.

2.1.8 Key Personnel Changes

There was no change to key PG&E project personnel in November 2018.

2.2 Communication with the Public

Below are the highlights of key communication and interactions with the public that occurred in November 2018:

- PG&E met with the Pirate Cove General Manager on a regular basis to provide project updates and check-in.
- PG&E met with the General Manager of Topock 66 Resort, the Editor of the *Topock Topics*, and the owner/operator of Golden Shores Water Company on a monthly basis to provide updates on the project and check-in.

2.3 Planned Activities for Next Six Weeks

The planned activities for next six weeks (December 11, 2018 through January 19, 2019) include the following:

- Well installation activities:
  - Complete installation of well at MW-L.

  - Complete the pilot boring at IRZ-9, IRZ-21, IRZ-25, and IRZ-27.
  - Start drilling and installation of well MW-B, MW-N, MW-M, MW-O, MW-F, and MW-G.

- Non-well construction activities:
  - Complete access road to the CHQ.
  - Install perimeter fence at the SPY.
  - Conduct pre-characterization of soil along planned pipeline alignment and in infrastructure location within AOCs.
  - Perform grubbling and clearing along Pipeline C alignment (C1, C2, C3, C4, C5, C7, C8, C9, C10, C14, C17, F1)
  - Continue to conduct noise and dust monitoring and inspection of SWPPP BMPs.
  - Continue to log and manage waste generated.
  - Continue to manage displaced soil per the approved Soil Management Plan.

Attachment F contains the six-week look-ahead schedule available at this time. Any adjustments to the schedule will occur as needed via the weekly emails (sent at the end of each week) and/or the daily list of construction activities (published daily and discussed with agency and Tribal representatives on site on that day).

2.4 Construction Schedule Review

Phase 1 of the groundwater remedy construction started on October 2, 2018. Table 2-3 presents a summary of the percent completeness for key construction activities as of November 30, 2018. PG&E will continue to look for opportunities to optimize the construction workflow and schedule.

3. References

California Department of Toxic Substances Control (DTSC). 1996. *Corrective Action Consent Agreement (Revised), Pacific Gas and Electric Company's Topock Compressor Station, Needles, California. EPA ID No. CAT080011729.* February 2.

California Department of Toxic Substances Control (DTSC). 2013. *Community Outreach Plan, Pacific Gas and Electric Company's Topock Compressor Station, Needles, California.* http://dtsc-topock.com/sites/default/files/2013-01-11_FinalCOP_Web.pdf. January.

California Department of Toxic Substances Control (DTSC). 2018a. *Acceptance and Conditional Approval of Groundwater Remedy Design and Corrective Measures Implementation Workplan at Pacific Gas and Electric Company, Topock Compressor Station, Needles, California.* April 24.

California Department of Toxic Substances Control (DTSC). 2018b. *Final Subsequent Environmental Impact Report for the Pacific Gas and Electric Company Topock Compressor Station Final Groundwater Remediation Project.* April 24.

CH2M HILL, Inc. (CH2M). 2015a. *Basis of Design Report/Final (100%) Design Submittal for the Final Groundwater Remedy, PG&E Topock Compressor Station, Needles, California.* November 18.

CH2M HILL, Inc. (CH2M). 2015b. *Construction/Remedial Action Work Plan for the Final Groundwater Remedy, PG&E Topock Compressor Station, Needles, California.* November 18.

United States Department of the Interior (DOI). 2012. *Community Involvement Plan, Pacific Gas and Electric Topock Compressor Station, Needles, California.* http://dtsc-topock.com/sites/default/files/FINAL_DOI_CIP_10-12.pdf. September.

United States Department of the Interior (DOI). 2013. *Remedial Action/Remedial Design Consent Decree (CD) between the United States of America and Pacific Gas & Electric Company.* Case 5:13-cv-00074-BRO-OP, Document 23. Entered November 21.

United States Department of the Interior (DOI). 2018. *Approval of PG&E Topock Compressor Station Remediation Site – Basis of Design Report/Final (100%) Design Submittal and Construction/Remedial Action Work Plan for the Final Groundwater Remedy and the Supplemental and Errata Information for the Final (100%) Design for the Final Groundwater Remedy, PG&E Topock Compressor Station, Needles, California.* Letter from Pamela Innis/DOI to Curt Russell/PG&E. April 3.

Tables

Table 2-1 Summary of Environmental Release-To-Constructions (ERTCs) Issued to Contractors

November 2018 Monthly Progress Report for the Final Groundwater Remedy Construction and Startup
PG&E Topock Compressor Station, Needles, California

ERTC No.	Brief Description of Covered Areas and Scope of Authorized Activities	Issue Date
Non-Well ERTCs		
1	Initial mobilization activities at the Construction Headquarters (CHQ), Soil Processing Yard (SPY), and three staging areas (#9 Parking area off I-40, #18 MW-20 Bench, and #23 Transwestern Bench). Scope included installation of temporary construction trailers, portable generators, SWPPP BMPs, construction signages, and temporary construction fencing, as well as equipment staging and truck inspections.	August 10, 2018
Addendum 1 to ERTC #1	Scope included setup of wastewater and freshwater storage tanks at MW-20 Bench, improvement of the access road at the CHQ, installation of perimeter fence at the SPY, and grading at SPY.	September 21, 2018
Addendum 2 to ERTC #1	Scope included grading for drill rig setup at IRZ-20.	October 4, 2018
Addendum 3 to ERTC #1	Scope included geotechnical investigation in the footprint of the future Carbon Amendment building at the MW-20 Bench.	October 9, 2018
2	Scope included the installation of the temporary construction water system and construction water tanks at Area #25 Route 66 Welcome Sign.	September 28, 2018
3	Scope included the installation of the Public Information Trailer, a fugitive dust sign, an information kiosk, and a construction delivery sign at the northwest corner of Park Moabi Road and National Trails Highway (NTH).	September 4, 2018
4	Scope included the installation of a truck containment pad at the TCS evaporation ponds and maintenance of the access road to the ponds.	September 24, 2018
6	Scope included the geotechnical investigation along Pipeline F alignment (on the Compressor Station entrance road).	October 3, 2018
7	Scope included the installation of traffic control along the southern end of NTH per the Traffic Control Plan.	September 17, 2018
9	Scope included the transplantation and planting of sensitive plants.	November 9, 2018 *Note that an ERTC walk with Tribes/agencies occurred on October 24, 2018*
Well ERTCs		
5a	Scope included the site setup, drilling, testing, and demobilization at MW-L.	September 27, 2018
5b	Scope included the placement of soil stabilization mats in the floodplain, setup of a temporary staging area near the north end of the access route in the floodplain, rig setup, installation of snow fence to protect plants, drilling, testing, and demobilization at IRZ-15.	October 12, 2018
5c	Scope included the site setup, drilling, testing, and demobilization at IRZ-20 on the MW-20 Bench.	October 15, 2018
5d	Scope included the site setup, drilling, testing, and demobilization at MW-E on the MW-20 Bench.	October 29, 2018
5e	Scope included the site setup, drilling, testing, and demobilization at MW-N in the upland.	November 15, 2018 *Note that an ERTC walk with Tribes/agencies occurred on November 1, 2018*
5f	Scope included the site setup, drilling, testing, and demobilization at IRZ-13 in the floodplain.	November 7, 2018
5g	Scope included the site setup, drilling, testing, and demobilization at IRZ-23 on the MW-20 Bench.	November 8, 2018
5i	Scope included the site setup, drilling, testing, and demobilization at IRZ-9 in the floodplain.	November 28, 2018

Note: ERTC 5h (MW-M) and ERTC 8 (Wastewater Management) are under development.

Table 2-2 Summary of Work Variance Requests (WVRs)

November 2018 Monthly Progress Report for the Final Groundwater Remedy Construction and Startup
PG&E Topock Compressor Station, Needles, California

WVR No.	Brief Description of Work Variance Request	Approval Dates
1	This WVR addressed PG&E's proposed modification to the brine tanks containment for use by the remedy, specifically: • **Upgrade the existing lined containment to concrete** - The original synthetic liner material has degraded from exposure to UV light, heat, and abrasion and must be replaced. PG&E proposed to replace the synthetic-lined containment (including K-rails) with a concrete containment to support the groundwater remedy. The concrete color will be desert tan, and information on this proposed concrete color will be submitted to the agencies for review. The proposed concrete material will be similar to the material of the truck lane in the final remedy design (see Appendix E of the Final Basis of Design Report (CH2M, 2015a),* Section 033 00, Cast-In-Place Concrete). • **Shorten the length of the containment** - This containment will have the same height as the existing containment, but with a slightly smaller footprint (the length is 5 feet shorter). This smaller footprint still meets the required volume for a secondary containment and allows for more space for remedy construction at the tight MW-20 bench.	DOI approved WVR #1 on June 22, 2018 DTSC approved WVR #1 on July 5, 2018
2	PG&E proposed to relocate the tie-in point for remedy construction water to an aboveground location inside TCS and below the TCS Water Storage Tanks. This is to eliminate the risk of damaging the existing pressurized 6-inch water line and to avoid any interference with PG&E Gas Operations control of the Station's water supply. The WVR addressed this relocation, specifically: • **Relocate the construction water tie-in point to an aboveground location below the TCS Water Storage Tanks, inside TCS** – The final design calls for the temporary construction water line to hot-tap into the existing 6-inch steel water line just as the line turns southwest to continue to TCS. PG&E proposed to move the tie-in point to an aboveground valve manifold, located below the TCS Water Storage Tanks in the boneyard area. • **Extend the temporary construction water line to the new tie-in point, along Pipeline 300A access road** – The planned 4-inch high-density polyethylene (HDPE) temporary construction water line will be extended, following the route of the Pipeline 300A access road, to the new tie-in point inside TCS. This pipeline extension is approximately 1,950 feet and is also made of 4-inch HDPE. The pipe will be laid on ground surface and to the south of the 6-inch water line where possible. At the crossing with the SoCal Gas pipeline access road, the pipeline will be at grade with fill to allow for vehicle crossing.	DOI and DTSC approved WVR #2 on August 29, 2018

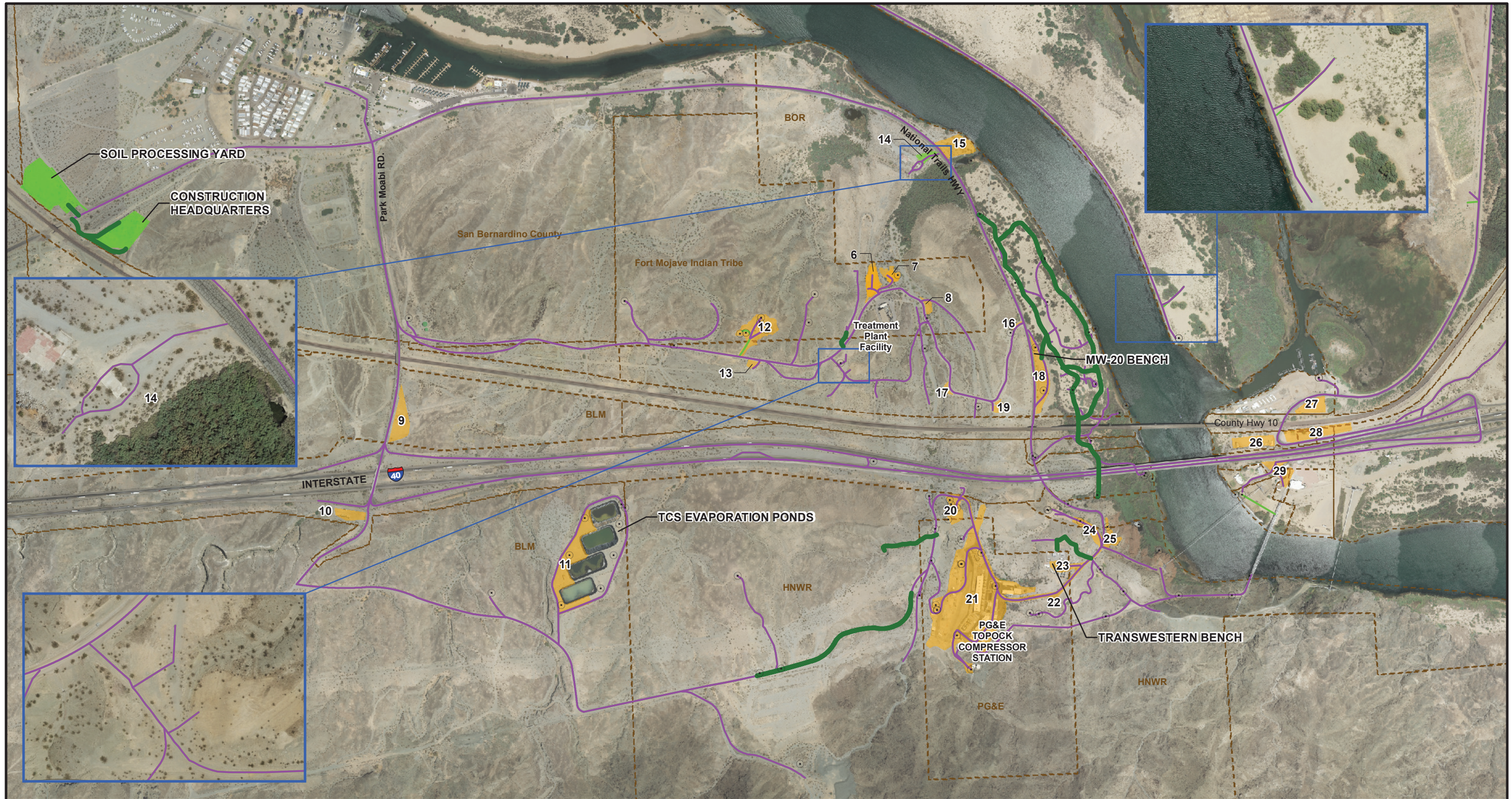
Note:
* CH2M HILL, Inc. (CH2M). 2015a. *Basis of Design Report/Final (100%) Design Submittal for the Final Groundwater Remedy, PG&E Topock Compressor Station, Needles, California*. November 18.

Table 2-3 Summary of Percent Completeness of Key Construction Activities

November 2018 Monthly Progress Report for the Final Groundwater Remedy Construction and Startup
PG&E Topock Compressor Station, Needles, California

Activity	% Complete	Current Status of Construction Activities (as of November 30, 2018)
Project signage & Public Information Office	100%	Complete.
Staging Area 9 setup	100%	Complete.
Staging Area 23 setup	100%	Complete.
Staging Area 18 setup	100%	Complete.
Temporary construction offices at Soil Processing Yard	100%	Complete.
Soil Processing Yard setup for construction staging	100%	Complete.
National Trails Highway lane closure and traffic control installation	100%	Complete.
Temporary construction water line	95%	Pipeline and manifolds installed. Elevated tanks installed. HDPE testing and acceptance complete. TCS manifold sanitization complete. Final acceptance and startup in early December.
TCS Ponds concrete containment pad	95%	Concrete pour complete. BMP removal and available for use in early December.
Construction Headquarters access road	50%	Site prep, excavation, and conduit installation complete. Access road subgrade backfill, concrete reinforcement, and formwork in early December. Concrete pour in mid-December. Available for use in early January.
MW-L	75%	Borehole 1 complete, borehole 2 complete in December. Well development in December.
MW-E	100%	Complete. Well development in December.
IRZ-9 pilot boring	5%	Site prep initiated, complete pilot boring in December.
IRZ-15 pilot boring	100%	Complete.
IRZ-13 pilot boring	95%	Backfill boring and demobilize location in early December.
IRZ-20 pilot boring	100%	Complete.
IRZ-23 pilot boring	95%	Backfill boring and demobilize location in early December.

Figures



LEGEND

- Existing Access Route (will continue to be used for remedial activities)
- Existing Route (to be used as is for access to remedial activities)
- Roads to be improved or constructed for groundwater remedy
- Soil Processing (Area #5) and Construction Headquarter (Area #4) for Remediation Project
- Staging Areas for Remediation Project

Notes:

1. Decontamination pads will be located in Area #4 (Construction Headquarters), Area #21 (Topock Compressor Station), and Area #23 (Transwestern Bench).
2. Areas #15, 16, 17, 19, and 20 will not be used as staging areas. Areas #16, 17, and 19 may be part of the primary work zones for remedy infrastructure along the access road.
3. Area #20 may be part of the primary work zone for installation of future provisional well IRL-6 (if determined to be needed in the future) and associated piping/concrete/vault.
4. Public roadways outside of the EIR project area and the APE can also be used for remedy implementation.

N

0 900

Feet

FIGURE 2.1-1
CONSTRUCTION SITE PLAN AND ACCESS ROUTES

GROUNDWATER REMEDY CONSTRUCTION/ PHASE 1
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

JACOBS

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LEGEND

- Property Boundaries

Existing Wells:

- Extraction Well
- Injection Well
- Monitoring Well
- Water Supply Well

Planned Wells:

- Extraction, National Trails Highway (NTH) In-situ Reactive Zone (IRZ)
- Extraction, Riverbank
- Injection, NTH IRZ
- Injection, Topock Compressor Station
- Remedy Monitoring Well
- Recirculation Well

Pipeline Corridor for Remedy

- Aboveground Pipe
- Underground Pipe/Conduit

Remedy Facilities

- Planned Transformer
- Future Provisional Transformer
- Proposed Remedy Structure
- Contingent Freshwater Pre-injection Treatment System
- New Compressor Station buildings (not part of Remedy)

Approximate extent of hexavalent chromium [Cr(VI)] concentrations exceeding 32 micrograms per liter (µg/L) at any depth ingroundwater based on fourth quarter 2013 sampling events. Dashed where based on limited data.

Note:

1. Note that in compliance with EIR mitigation measure CUL-1a-9, as well as PA and CHPMP mitigation measures, the pipeline along the dirt road west of National Trails Hwy is located in an existing, previously disturbed, access road. In addition, the location of the road and pipeline was field verified and does not create any direct physical impact or effect on the Topock Maze, as it is manifested archaeologically, in compliance with EIR mitigation measure CUL-1a-10, PA, and CHPMP mitigation measures.
2. All well and structure locations are approximate.

N

0 150 300 600

Feet

FIGURE 2.1-2
WELL AND PIPELINE LOCATIONS
GROUNDWATER REMEDY PHASE 1 CONSTRUCTION
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

JACOBS

Path: R:\ENBG\00_Proj\P\PGE\Topock\MapFiles\2018\CMS\Phase1Construction\Fig2_1-2_Well_Pipeline_Loc.mxd

Attachment A
Photographs

PL01 Photo Log Photo Sheet

Improvement of access road to the future Construction Headquarters (CHQ)

Installation of snow fence to delineate the maximum construction footprint in the jurisdictional water (wash) at the CHQ

Preparation of holes to receive plants at approved transplantation location off NTH

Approved plant transplantation area off NTH

Transplanted Palo verde plant with deep irrigation plastic pipes

MW L drill cuttings stored in soil bin

Soil samples composite and sampling

Attachment B
Available Boring Logs and Groundwater Sample Results from Well Drilling

Table B-1. Groundwater Sampling Results for November 2018

November 2018 Monthly Progress Report for the Final Groundwater Remedy Construction and Startup
PG&E Topock Compressor Station, Needles, California

Location	Sample ID	Sample Date	Depth Interval (ft bgs)	Total Dissolved Chromium (µg/L)	Hexavalent Chromium (µg/L)
MW-L	MW-L-VAS-76-81	10/06/18	76 - 81	34	31
MW-L	MW-L-VAS-106-111	10/09/18	106 - 111	0.697 J	0.84
MW-L	MW-L-VAS-141-146	10/10/18	141 - 146	< 0.13 U	< 0.033 U
MW-L	MW-L-VAS-181-186	10/20/18	181 - 186	3.8	3.3
MW-L	MW-L-VAS-218-223	10/21/18	218 - 223	68	66
MW-L	MW-L-VAS-261-266	10/22/18	261 - 266	0.284 J	< 0.17 U
MW-E	MW-E-VAS-52-57	11/05/18	52 - 57	7800	7000
MW-E	MW-E-VAS-82-87	11/06/18	82 - 87	190	200
MW-E	MW-E-VAS-112-117	11/06/18	112 - 117	3000	3100
MW-E	MW-E-VAS-137-142	11/07/18	137 - 142	7900	7300
IRZ-20	IRZ-20-VAS-51-56	10/20/18	51 - 56	130	150
IRZ-20	IRZ-20-VAS-82-87	10/21/18	82 - 87	< 0.13 U	< 0.033 U
IRZ-20	IRZ-20-VAS-112-117	10/22/18	112 - 117	< 0.13 U	< 0.17 U
IRZ-20	IRZ-20-VAS-131-136	10/23/18	131 - 136	< 0.13 U	< 0.17 U
IRZ-20	IRZ-20-VAS-173-178	10/24/18	173 - 178	< 0.13 U	< 0.83 U
IRZ-15	IRZ-15-VAS-32-37	11/01/18	32 - 37	13	13
IRZ-15	IRZ-15-VAS-62-67	11/02/18	62 - 67	< 0.65 U	0.459 J
IRZ-15	IRZ-15-VAS-102-107	11/03/18	102 - 107	< 0.65 U	< 0.17 U
IRZ-15	IRZ-15-VAS-132-137	11/04/18	132 - 137	0.228 J	< 0.17 U
IRZ-15	IRZ-15-VAS-162-167	11/05/18	162 - 167	3400	3200
IRZ-15	IRZ-15-VAS-182-187	11/06/18	182 - 187	130	140
IRZ-15	IRZ-15-VAS-222-227	11/07/18	222 - 227	< 0.13 U	< 0.17 U
IRZ-13	IRZ-13-VAS-32-37	11/17/18	32 - 37	170	220
IRZ-13	IRZ-13-VAS-57-62	11/18/18	57 - 62	< 0.13 U	< 0.17 U
IRZ-13	IRZ-13-VAS-102-107	11/19/18	102 - 107	< 0.13 U	< 0.17 U
IRZ-13	IRZ-13-VAS-142-147	11/19/18	142 - 147	< 0.13 U	< 0.17 U
IRZ-13	IRZ-13-VAS-180-185	11/27/18	180 - 185	230	190
IRZ-13	IRZ-13-VAS-197-202	11/28/18	197 - 202	< 0.13	< 0.83
IRZ-13	IRZ-13-VAS-224-229	11/28/18	224 - 229	< 0.13	< 0.83
IRZ-13	IRZ-13-VAS-237-242	11/29/18	237 - 242	< 0.13 U	< 0.17 U

µg/L = micrograms per liter
ft bgs = feet below ground surface
J = The analyte was positively identified; however, the associated numerical value is an estimated concentration only
U = The analyte was analyzed for but not detected at the analyte method detection limit indicated
VAS = vertical aquifer sampling

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Date Started: 10/03/2018
Date Completed: 12/02/2018
Drilling Co.: Cascade
Drilling Method: Sonic Drilling
Driller Name: Dan O'Mara
Drilling Asst: E. Huellmantel / J. Campbell
Logger: Sean McGrane
Editor: Sean McGrane
Weather: 78 to 84° Partly Cloudy

Surface Elevation: N/A
Northing (NAD83): N/A
Easting (NAD83): N/A
Total Depth: 315 ft bgs
Borehole Diameter: 10 in
Depth to First Water: N/A
Sampling Method: 10 ft Core Barrel
Sampling Interval: Continuous
Converted to Well: ☒ Yes ☐ No

Boring No.: MW-Ld

Client: PG&E
Location: Groundwater Remedy Phase I
Needles, California
Project Number: Topock

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
1–6	72	()		Topock - Alluvium Deposits	SW		(0.0 - 1.5') Topock - Alluvium Deposits; Well graded sand with gravel (SW); brown (10YR 4/3); very fine grained to very coarse grained, angular to subround; some granule to large pebbles; some coarse to very coarse grained sand, subangular to subround; trace cobbles; trace boulders, angular to subangular; trace silt; dry		
1–6	72	()		Topock - Alluvium Deposits	SW		(1.5 - 6.0') Topock - Alluvium Deposits; Well graded sand with gravel (SW); brown (7.5YR 4/3); very fine grained to very coarse grained, subangular to round; some granule to medium pebbles, angular to subangular; trace silt; dry		
6–11	120	()		Topock - Alluvium Deposits	SM		(6.0 - 11.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 4/3); very fine grained to very coarse grained, angular to subround; some granule to very large pebbles, angular to subangular; some silt; trace cobbles, angular; trace boulders, angular to subangular; dry		
11–16	120	()		Topock - Alluvium Deposits	SW-SM		(11.0 - 16.0') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW-SM); dark grayish brown / dark yellowish brown(10YR 4/2); very fine grained to very coarse grained, angular to subangular; some granule to large pebbles; little silt; trace cobbles, angular to subangular; dry		
16–20		()		Topock - Alluvium Deposits	SW-SM		(16.0 - 21.5') Topock - Alluvium Deposits; Well graded sand with silt and gravel (SW-SM); very dark gray (10YR 3/1); very fine grained to very coarse grained, angular to subangular; some granule to very large pebbles; little silt; trace cobbles, angular to subangular; dry	Lost core barrel down hole	

Notes: NR = No Recovery, USCS = Unified Soil Classification System

Date Started: 10/03/2018
Date Completed: 12/02/2018
Drilling Co.: Cascade
Drilling Method: Sonic Drilling
Driller Name: Dan O'Mara
Drilling Asst: E. Huellmantel / J. Campbell
Logger: Sean McGrane
Editor: Sean McGrane
Weather: 78 to 84° Partly Cloudy

Surface Elevation: N/A
Northing (NAD83): N/A
Easting (NAD83): N/A
Total Depth: 315 ft bgs
Borehole Diameter: 10 in
Depth to First Water: N/A
Sampling Method: 10 ft Core Barrel
Sampling Interval: Continuous
Converted to Well: ☒ Yes ☐ No

Boring No.: MW-Ld

Client: PG&E
Location: Groundwater Remedy Phase I
Needles, California
Project Number: Topock

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
21	96			Topock - Alluvium Deposits	SW-SM				
22				Topock - Alluvium Deposits	SM		(21.5 - 22.5') Topock - Alluvium Deposits; Silty sand with gravel (SM); dark gray (10YR 4/1); very fine grained to very coarse grained, angular to subround; some granule to very large pebbles, angular to subangular; some silt; dry		
23				Topock - Alluvium Deposits	GP		(22.5 - 24.0') Topock - Alluvium Deposits; Poorly graded gravel (GP); black (10YR 2/1); small cobbles to large cobbles, angular to subround; dry		
24					NR		(24.0 - 26.0') (NR); No Recovery sample bags broke		
25									
26									
27	60			Topock - Alluvium Deposits	ML		(26.0 - 28.0') Topock - Alluvium Deposits; Sandy silt with gravel (ML); brown (10YR 5/3); no plasticity; some very fine to very coarse grained sand, angular to subangular; little granule to very large pebbles, angular to subangular; trace cobbles, angular to subangular; trace mica; dry	Rough drilling	
28				Topock - Alluvium Deposits	ML		(28.0 - 29.5') Topock - Alluvium Deposits; Sandy silt with gravel (ML); brown (10YR 5/3); no plasticity; and very fine to very coarse grained sand, angular to subangular; little granule to very large pebbles, angular to subangular; trace cobbles, angular to subangular; trace mica; dry		
29				Topock - Alluvium Deposits	GW		(29.5 - 31.0') Topock - Alluvium Deposits; Well graded gravel with sand (GW); dark yellowish brown (10YR 4/4); granules to small cobbles, angular to subround; little very fine to coarse grained sand, subangular to subround; dry		
30									
31									
32	84			Topock - Alluvium Deposits	ML		(31.0 - 34.5') Topock - Alluvium Deposits; Sandy silt with gravel (ML); brown (10YR 5/3); no plasticity; some very fine to very coarse grained sand, angular to subangular; little granule to very large pebbles, angular to subangular; trace cobbles, angular to subangular; trace mica; dry	Lost core barrel down hole	
33									
34									
35				Topock - Alluvium Deposits	SM		(34.5 - 38.0') Topock - Alluvium Deposits; Silty sand (SM); brown (10YR 5/3); very fine grained to fine grained, subangular to subround; and silt; dry		
36									
37									
38									
39				Topock - Alluvium Deposits	SM		(38.0 - 39.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); grayish brown (2.5Y 5/2); very fine grained to very coarse grained, angular to subround; some silt; little granule to large pebbles, angular to subangular; moist		
40				Topock - Alluvium Deposits	SM		(39.0 - 43.0') Topock - Alluvium Deposits; Silty sand (SM); very dark grayish brown (2.5Y 3/2); very fine grained to coarse grained, angular to subangular; and silt; trace granule to medium pebbles, angular to		

Notes: NR = No Recovery, USCS = Unified Soil Classification System

Date Started: 10/03/2018
Date Completed: 12/02/2018
Drilling Co.: Cascade
Drilling Method: Sonic Drilling
Driller Name: Dan O'Mara
Drilling Asst: E. Huellmantel / J. Campbell
Logger: Sean McGrane
Editor: Sean McGrane
Weather: 78 to 84° Partly Cloudy

Surface Elevation: N/A
Northing (NAD83): N/A
Easting (NAD83): N/A
Total Depth: 315 ft bgs
Borehole Diameter: 10 in
Depth to First Water: N/A
Sampling Method: 10 ft Core Barrel
Sampling Interval: Continuous
Converted to Well: ☒ Yes ☐ No

Boring No.: MW-Ld

Client: PG&E
Location: Groundwater Remedy Phase I
Needles, California
Project Number: Topock

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
41				Topock - Alluvium Deposits	SM		subangular; trace clay; moist		
42	96								
43									
44				Topock - Alluvium Deposits	SW		(43.0 - 46.0') Topock - Alluvium Deposits; Well graded sand (SW); brown (7.5YR 5/3); very fine grained to very coarse grained, subangular to subround; trace granule to very large pebbles, angular to subround; trace cobbles, subround; trace silt; dry		
45									
46									
47				Topock - Alluvium Deposits	SM		(46.0 - 51.5') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (10YR 4/3); very fine grained to very coarse grained, subangular to subround; little granule to very large pebbles, subangular to subround; little silt; trace cobbles, subangular to subround; trace clay; trace mica; dry; gravel coursening downward in formation.		
48									
49									
50									
51	120								
52				Topock - Alluvium Deposits	SW-SM		(51.5 - 52.0') Topock - Alluvium Deposits; Well graded sand with silt (SW-SM); brown (10YR 5/3); very fine grained to medium grained, angular to subround; trace silt; little mica; dry		
53				Topock - Alluvium Deposits	SW		(52.0 - 59.0') Topock - Alluvium Deposits; Well graded sand with gravel (SW); very dark grayish brown (10YR 3/2); very fine grained to very coarse grained, angular to subangular; and granule to very large pebbles, subangular to round; trace cobbles, subangular to subround; some mica; dry		
54									
55									
56									
57									
58									
59				Topock - Alluvium Deposits	SM		(59.0 - 62.0') Topock - Alluvium Deposits; Silty sand (SM); brown (10YR 5/3); very fine grained to very coarse grained, angular to subround; little silt; little clay; trace granule to large pebbles, angular to		
60									

Notes: NR = No Recovery, USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Date Started:	10/03/2018	Surface Elevation:	N/A	**Boring No.:**	**MW-Ld**
Date Completed:	12/02/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	315 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Dan O'Mara	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	E. Huellmantel / J. Campbell	Depth to First Water:	N/A		
Logger:	Sean McGrane	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	78 to 84° Partly Cloudy	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
61	120			Topock - Alluvium Deposits	SM		subround; dry		
62									
63				Topock - Alluvium Deposits	GW		(62.0 - 65.5') Topock - Alluvium Deposits; Well graded gravel with sand (GW); light brownish gray / pale yellowish brown(10YR 6/2); granules to small cobbles, angular to subround; little very fine to very coarse grained sand, angular to subround; trace boulders, angular to subangular; dry		
64									
65									
66				Topock - Alluvium Deposits	SM		(65.5 - 67.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); dark grayish brown / dark yellowish brown(10YR 4/2); very fine grained to very coarse grained, angular to subround; little granule to large pebbles, angular to subangular; little silt; little clay; trace cobbles, angular; dry		
67									
68				Topock - Alluvium Deposits	SW-SM		(67.0 - 69.0') Topock - Alluvium Deposits; Well graded gravel with silt (SW-SM); light brownish gray / pale yellowish brown(10YR 6/2); very fine grained to very coarse grained, angular to subangular; little silt; trace granule to medium pebbles, subangular to round; dry		
69									
70				Topock - Alluvium Deposits	SM		(69.0 - 79.5') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 5/3); fine grained to very coarse grained, subangular to subround; little granule to very large pebbles, subangular to round; little silt; trace cobbles, angular to subangular; trace boulders, subangular to well-round; little mica; dry		
71	120								
72							(72.5') olive / moderate olive brown(5Y 4/4); some granule to very large pebbles		
73									
74							(74') dark grayish brown / dark yellowish brown(10YR 4/2)		
75							(75') dark brown (7.5YR 3/4); moist		
76							(76') brown (7.5YR 4/3); and granule to very large pebbles, subangular to round; little silt; trace cobbles, subangular to round; wet; water table	Approximate depth of water table	
77									
78			MW-L-VAS-76-81 (31 ppb)						60 gal of water used
79									
80				Topock - Alluvium	ML		(79.5 - 80.0') Topock - Alluvium Deposits; Sandy silt with gravel (ML);		

Notes: NR = No Recovery, USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Date Started:	10/03/2018	Surface Elevation:	N/A	**Boring No.:**	**MW-Ld**
Date Completed:	12/02/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	315 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Dan O'Mara	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	E. Huellmantel / J. Campbell	Depth to First Water:	N/A		
Logger:	Sean McGrane	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	78 to 84° Partly Cloudy	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
81	120		MW-L-VAS-76-81 (31 ppb)	Deposits			reddish brown(2.5YR 4/3) with reddish brown (5YR 5/3); no plasticity, no dilatency; some very fine to very coarse grained sand, subangular to subround; little granule to very large pebbles, subround to round; wet		
82				Topock - Alluvium Deposits	SM		(80.0 - 82.5') Topock - Alluvium Deposits; Silty sand with gravel (SM); dark grayish brown / dark yellowish brown(10YR 4/2); very fine grained to very coarse grained, angular to subangular; some granule to large pebbles, angular to subround; some silt; wet		
83				Topock - Alluvium Deposits	SM		(82.5 - 86.0') Topock - Alluvium Deposits; Silty sand (SM); grayish brown (10YR 5/2); very fine grained to very coarse grained, angular to subangular; and silt; trace granule to very large pebbles, angular to subangular; trace cobbles, angular; trace clay; some caliche; dry; strong cementation		60 gal of water used
84									
85									
86									
87	120			Topock - Alluvium Deposits	SM		(86.0 - 93.5') Topock - Alluvium Deposits; Silty sand with gravel (SM); dark grayish brown / dark yellowish brown(10YR 4/2); very fine grained to very coarse grained, angular to subangular; some silt; little granule to very large pebbles, angular to subangular; little clay; moist; moderate cementation		
88									
89									
90							(89.5'); decrease in ganules to large pebbles, increase in silt		
91									20 gal of water used
92									
93									
94				Topock - Alluvium Deposits	ML		(93.5 - 94.0') Topock - Alluvium Deposits; Sandy silt with gravel (ML); grayish brown (2.5Y 5/2); no plasticity, no dilatency; some very fine to very coarse grained sand, angular to subround; little granule to large pebbles, angular to subround; little silt; little clay; wet; weak cementation		
95				Topock - Alluvium Deposits	SM		(94.0 - 95.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); dark grayish brown / dark yellowish brown(10YR 4/2); very fine grained to very coarse grained, angular to subangular; some silt; little granule to large pebbles, angular to subangular; little clay; trace cobbles, angular to subangular; moist; moderate cementation		
96									
97				Topock - Alluvium Deposits	ML		(95.0 - 112.0') Topock - Alluvium Deposits; Sandy silt with gravel (ML); grayish brown (2.5Y 5/2); no plasticity, no dilatency; some very fine to very coarse grained sand, angular to subangular; little granule to very large pebbles, angular to subangular; trace clay; trace mica; wet; strong cementation		
98							(96'); moist to dry; increase in granules to very large pebbles, decrease in sand, increase in silt, decrease in clay		50 gal of water used
99									
100									

Notes: NR = No Recovery, USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: MW-Ld

Date Started:	10/03/2018	Surface Elevation:	N/A		
Date Completed:	12/02/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	315 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Dan O'Mara	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	E. Huellmantel / J. Campbell	Depth to First Water:	N/A		
Logger:	Sean McGrane	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	78 to 84° Partly Cloudy	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
101									
102									
103									50 gal of water used
104									
105									
106	120			Topock - Alluvium Deposits	ML		(106'); wet; moderate cementation; decrease in granules to large pebbles, increase in sand		
107							(107'); moist to dry; strong cementation; increase in granules to large pebbles, decrease in sand		
108			MW-L-VAS-106-111 (<0.84 ppb)						
109									
110									
111									100 gal of water used
112									
113				Topock - Alluvium Deposits	ML		(112.0 - 114.0') Topock - Alluvium Deposits; Sandy silt with gravel (ML); brown (10YR 5/3) little dark reddish brown (2.5YR 3/4); no plasticity, no dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; trace clay; trace mica; little caliche; moist to dry; strong cementation		
114									
115				Topock - Alluvium Deposits	ML		(114.0 - 121.0') Topock - Alluvium Deposits; Sandy silt with gravel (ML); grayish brown (2.5Y 5/2); no plasticity, no dilatency; some very fine to very coarse grained sand, angular to subangular; little granule to very large pebbles, angular to subangular; trace clay; trace mica; with caliche; moist; moderate cementation; iron oxide staining		
116							(116') brown (10YR 4/3); no caliche; iron oxide staining		
117									
118									130 gal of water used
119									
120									

Notes: NR = No Recovery, USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: MW-Ld

Date Started:	10/03/2018	Surface Elevation:	N/A		
Date Completed:	12/02/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	315 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Dan O'Mara	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	E. Huellmantel / J. Campbell	Depth to First Water:	N/A		
Logger:	Sean McGrane	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	78 to 84° Partly Cloudy	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
121	108			Topock - Alluvium Deposits	ML				
122							(121.0 - 126.0') Topock - Alluvium Deposits; Sandy silt with gravel (ML); brown (10YR 4/3) and reddish brown / moderate brown(5YR 4/4); no plasticity, no dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; trace mica; trace caliche; moist; strong cementation; iron oxide staining		
123				Topock - Alluvium Deposits	ML				130 gal of water used
124									
125									
126									
127	182.4						(126.0 - 131.0') Topock - Alluvium Deposits; Sandy silt with gravel (ML); dark grayish brown / dark yellowish brown(10YR 4/2); no plasticity, no dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; trace clay; little mica; moist; weak cementation; iron oxide staining		
128				Topock - Alluvium Deposits	ML				
129									
130									
131							(131.0 - 139.5') Topock - Alluvium Deposits; Sandy silt with gravel (ML); dark yellowish brown (10YR 4/4); no plasticity, slow dilatency; some very fine to very coarse grained sand, angular to subangular; little granule to large pebbles, angular to subangular; little clay; little mica; wet; iron oxide staining		140 gal of water used
132									
133									
134									
135				Topock - Alluvium Deposits	ML				
136							(132'); no dilatency; some granule to large pebbles, angular to subangular; trace clay; iron oxide staining; decrease sand, increase silt		
137									
138							(136'); iron oxide staining; increase gravel, decrease silt		60 gal of water used
139									
140					ML		(139.5 - 146.0') Topock - Alluvium Deposits; Gravelly silt with sand		

Notes: NR = No Recovery, USCS = Unified Soil Classification System

Date Started: 10/03/2018
Date Completed: 12/02/2018
Drilling Co.: Cascade
Drilling Method: Sonic Drilling
Driller Name: Dan O'Mara
Drilling Asst: E. Huellmantel / J. Campbell
Logger: Sean McGrane
Editor: Sean McGrane
Weather: 78 to 84° Partly Cloudy

Surface Elevation: N/A
Northing (NAD83): N/A
Easting (NAD83): N/A
Total Depth: 315 ft bgs
Borehole Diameter: 10 in
Depth to First Water: N/A
Sampling Method: 10 ft Core Barrel
Sampling Interval: Continuous
Converted to Well: ☒ Yes ☐ No

Boring No.: MW-Ld

Client: PG&E
Location: Groundwater Remedy Phase I
Needles, California
Project Number: Topock

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
141									
142									
143			MW-L-VAS-141-146 (<0.33 ppb)	Topock - Alluvium Deposits	ML		(ML); brown (10YR 4/3); no plasticity, no dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; trace mica; wet; iron oxide staining		60 gal of water used
144									
145									
146									
147	120			Topock - Alluvium Deposits	SM		(146.0 - 151.0') Topock - Alluvium Deposits; Sandy silt with gravel (SM); dark grayish brown / dark yellowish brown(10YR 4/2); very fine grained to very coarse grained, angular to subangular; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; little silt; trace cobbles, angular; trace mica; dry; weak cementation; iron oxide staining; (0,70,30,0)	seepage from outside conductor casing. pull 6" casing and 7" conductor casing and install 12" conductor casing. while reinstalling 6" casing to 146` bgs, 100 gallons of water added from 116` to 126` bgs, 100 gallons added from 126` to 136` bgs and 60 gall	40 gal of water used
148									
149									
150									
151				Topock - Alluvium Deposits	SM		(151.0 - 153.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (10YR 4/3); very fine grained to very coarse grained, angular to subround; some granule to very large pebbles, angular to subangular; some silt; little clay; trace cobbles, angular; trace mica; wet; weak cementation; iron oxide staining; (25,30,25,20)		
152									
153				Topock - Alluvium Deposits	GM		(153.0 - 154.0') Topock - Alluvium Deposits; Silty gravel with sand (GM); brown (10YR 4/3); granules to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; some silt; trace mica; moist; weak cementation; iron oxide staining		
154				Topock - Alluvium Deposits	SM		(154.0 - 155.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (10YR 4/3); very fine grained to very coarse grained, angular to subround; some granule to very large pebbles, angular to subangular; some silt; little clay; trace cobbles, angular; trace mica; wet; moderate cementation		
155									
156				Topock - Alluvium Deposits	ML				
157				Topock - Alluvium Deposits	GM		(155.0 - 156.0') Topock - Alluvium Deposits; Sandy silt with gravel (ML); brown (10YR 4/3); low plasticity, no dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; little clay; trace mica; moist; strong cementation	refill casing (110 gallons) after sampling from 261-266ft bgs	
158				Topock - Alluvium Deposits	SM		(156.0 - 157.0') Topock - Alluvium Deposits; Silty gravel with sand (GM); brown (10YR 4/3); granules to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; little silt; little clay; trace mica; wet; weak cementation; iron oxide staining		50 gal of water used
159							(157.0 - 163.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (10YR 4/3); very fine grained to very coarse grained, angular to subround; some granule to very large pebbles, angular to subangular; some silt; little clay; trace mica; moist; strong		
160									

Notes: NR = No Recovery, USCS = Unified Soil Classification System

Date Started: 10/03/2018
Date Completed: 12/02/2018
Drilling Co.: Cascade
Drilling Method: Sonic Drilling
Driller Name: Dan O'Mara
Drilling Asst: E. Huellmantel / J. Campbell
Logger: Sean McGrane
Editor: Sean McGrane
Weather: 78 to 84° Partly Cloudy

Surface Elevation: N/A
Northing (NAD83): N/A
Easting (NAD83): N/A
Total Depth: 315 ft bgs
Borehole Diameter: 10 in
Depth to First Water: N/A
Sampling Method: 10 ft Core Barrel
Sampling Interval: Continuous
Converted to Well: ☒ Yes ☐ No

Boring No.: MW-Ld

Client: PG&E
Location: Groundwater Remedy Phase I
Needles, California
Project Number: Topock

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
161	120			Topock - Alluvium Deposits	SM		cementation; iron oxide staining		
162									
163									50 gal of water used
164				Topock - Alluvium Deposits	SM		(163.0 - 166.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); reddish brown (5YR 5/4); very fine grained to very coarse grained, angular to subangular; some granule to very large pebbles, angular to subangular; some silt; little clay; little mica; wet; weak cementation; iron oxide staining		
165									
166									
167	120			Topock - Alluvium Deposits	GM		(166.0 - 167.5') Topock - Alluvium Deposits; Silty gravel with sand (GM); brown (10YR 4/3); granules to boulders, angular to subangular; some very fine to very coarse grained sand, angular to subangular; little silt; little clay; some mica; wet; strong cementation; iron oxide staining		
168				Topock - Alluvium Deposits	SM		(167.5 - 170.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (10YR 4/3); very fine grained to very coarse grained, angular to subround; some granule to very large pebbles, angular to subangular; some silt; little clay; trace mica; wet; strong cementation; iron oxide staining		
169									
170									
171				Topock - Alluvium Deposits	GM		(170.0 - 174.0') Topock - Alluvium Deposits; Silty gravel with sand (GM); brown (10YR 5/3); granules to boulders, angular to subangular; some very fine to very coarse grained sand, angular to subangular; little silt; trace clay; some mica; wet; strong cementation; iron oxide staining		45 gal of water used
172									
173									
174									
175				Topock - Alluvium Deposits	GM		(174.0 - 176.0') Topock - Alluvium Deposits; Silty gravel with sand (GM); dark grayish brown / dark yellowish brown(10YR 4/2); granules to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; some silt; little clay; some mica; wet; strong cementation; iron oxide staining		
176									
177				Topock - Alluvium Deposits	SM		(176.0 - 177.5') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 5/3); very fine grained to very coarse grained, angular to subangular; some small to very large pebbles, angular to subangular; some silt; little clay; little mica; wet; strong cementation; iron oxide staining		
178				Topock - Alluvium Deposits	SM		(177.5 - 181.5') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 5/3); very fine grained to very coarse grained, angular to subangular; some silt; little small to very large pebbles, angular to subangular; trace clay; little mica; wet; moderate cementation; iron oxide staining		20 gal of water used
179									
180									

Notes: NR = No Recovery, USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: MW-Ld

Date Started:	10/03/2018	Surface Elevation:	N/A		
Date Completed:	12/02/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	315 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Dan O'Mara	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	E. Huellmantel / J. Campbell	Depth to First Water:	N/A		
Logger:	Sean McGrane	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	78 to 84° Partly Cloudy	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
181	134.4			Topock - Alluvium Deposits	SM				
182			MW-L-VAS-181-186 (3.3 ppb)	Topock - Alluvium Deposits	ML		(181.5 - 184.5') Topock - Alluvium Deposits; Sandy silt with gravel (ML); brown (10YR 5/3); medium plasticity, slow dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subround; wet; iron oxide staining		20 gal of water used
183									
184									
185				Topock - Alluvium Deposits	SM		(184.5 - 186.5') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (10YR 5/3); very fine grained to very coarse grained, angular to subround; some small to very large pebbles, angular to subangular; some silt; trace clay; some mica; wet; weak cementation		
186									
187	120			Topock - Alluvium Deposits	ML		(186.5 - 188.5') Topock - Alluvium Deposits; Sandy silt with gravel (ML); brown (7.5YR 4/3); no plasticity, no dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; little clay; moist; strong cementation; iron oxide staining		
188									
189				Topock - Alluvium Deposits	SM		(188.5 - 195.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 5/4); very fine grained to very coarse grained, angular to subangular; some granule to very large pebbles, angular to subangular; some silt; little clay; some mica; dry to moist; strong cementation; iron oxide staining		35 gal of water used
190									
191									
192									
193									
194									
195									
196				Topock - Alluvium Deposits	ML		(195.0 - 201.0') Topock - Alluvium Deposits; Sandy silt with gravel (ML); reddish brown / moderate brown(5YR 4/4) and brown (10YR 4/3); low plasticity, no dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; trace clay; some mica; wet; stiff; mottled; weak cementation; iron oxide staining		
197									
198									20 gal of water used
199									
200									

Notes: NR = No Recovery, USCS = Unified Soil Classification System

Boring Log

Boring No.: MW-Ld

Date Started:	10/03/2018	Surface Elevation:	N/A		
Date Completed:	12/02/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	315 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Dan O'Mara	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	E. Huellmantel / J. Campbell	Depth to First Water:	N/A		
Logger:	Sean McGrane	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	78 to 84° Partly Cloudy	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
201	120			Topock - Alluvium Deposits	ML				
202				Topock - Alluvium Deposits	SM		(201.0 - 205.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); brown (10YR 5/3); very fine grained to very coarse grained, angular to subround; some granule to very large pebbles, angular to subround; some silt; trace clay; some mica; dry to moist; moderate cementation; iron oxide staining		20 gal of water used
203									
204									
205				Topock - Alluvium Deposits	ML		(205.0 - 206.5') Topock - Alluvium Deposits; Sandy silt with gravel (ML); brown (10YR 5/3) and reddish brown / moderate brown(5YR 4/4); no plasticity, no dilatency; some granule to very large pebbles; some very fine to very coarse grained sand, angular to subangular; trace clay; little mica; wet; medium stiff; mottled; weak cementation; iron oxide staining		
206									
207				Topock - Alluvium Deposits	GM		(206.5 - 208.0') Topock - Alluvium Deposits; Silty gravel with sand (GM); dark grayish brown / dark yellowish brown(10YR 4/2); granules to very large pebbles, angular to subangular; some silt; little very fine to very coarse grained sand, angular to subangular; little clay; trace mica; moist; moderate cementation; iron oxide staining		
208									
209				Topock - Alluvium Deposits	GM		(208.0 - 215.0') Topock - Alluvium Deposits; Silty gravel with sand (GM); dark grayish brown / dark yellowish brown(10YR 4/2); granules to very large pebbles, angular to subangular; no plasticity, no dilatency; some very fine to very coarse grained sand, angular to subangular; some silt; little clay; trace mica; moist; moderate cementation; iron oxide staining		
210									
211	133.2								40 gal of water used
212									
213									
214									
215									
216				Topock - Older Alluvium Deposits	SM		(215.0 - 216.0') Topock - Older Alluvium Deposits; Silty sand with gravel (SM); brown (7.5YR 4/4) and reddish brown (5YR 5/4); very fine grained to very coarse grained, angular to subangular; some granule to very large pebbles, angular to subangular; some silt; trace mica; moist; mottled; weak cementation; iron oxide staining		
217				Topock - Older Alluvium Deposits	SM		(216.0 - 219.5') Topock - Older Alluvium Deposits; Silty sand with gravel (SM); reddish brown / moderate brown(5YR 4/4); very fine grained to very coarse grained, angular to subangular; some granule to very large pebbles, angular to subangular; some silt; little mica; wet; iron oxide staining		
218									20 gal of water used
219			MW-L-VAS-218-223 (66 ppb)						
220					GM		(219.5 - 222.0') Topock - Older Alluvium Deposits; Silty gravel with		

Notes: NR = No Recovery, USCS = Unified Soil Classification System

Date Started: 10/03/2018
Date Completed: 12/02/2018
Drilling Co.: Cascade
Drilling Method: Sonic Drilling
Driller Name: Dan O'Mara
Drilling Asst: E. Huellmantel / J. Campbell
Logger: Sean McGrane
Editor: Sean McGrane
Weather: 78 to 84° Partly Cloudy

Surface Elevation: N/A
Northing (NAD83): N/A
Easting (NAD83): N/A
Total Depth: 315 ft bgs
Borehole Diameter: 10 in
Depth to First Water: N/A
Sampling Method: 10 ft Core Barrel
Sampling Interval: Continuous
Converted to Well: ☒ Yes ☐ No

Boring No.: MW-Ld

Client: PG&E
Location: Groundwater Remedy Phase I
Needles, California
Project Number: Topock

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
221	111.6		MW-L-VAS-218-223 (66 ppb)	Topock - Older Alluvium Deposits	GM		sand (GM); reddish brown / moderate brown(5YR 4/4); granules to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subround; some silt; little mica; wet; iron oxide staining		
222									
223				Topock - Older Alluvium Deposits	ML		(222.0 - 227.5') Topock - Older Alluvium Deposits; Sandy silt with gravel (ML); reddish brown (5YR 5/4) with gray / light olive gray(5Y 6/1); no plasticity, no dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; trace clay; little mica; moist; stiff to very stiff; mottled; moderate cementation; iron oxide staining		20 gal of water used
224									
225									
226									
227									
228				Topock - Older Alluvium Deposits	ML		(227.5 - 236.0') Topock - Older Alluvium Deposits; Sandy silt with gravel (ML); reddish brown (5YR 5/4); no plasticity, no dilatency; some granules to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; little clay; little mica; moist; stiff to very stiff; moderate cementation; iron oxide staining		
229									
230							(230') yellowish red (5YR 4/6); dry; very stiff; strong cementation; iron oxide staining		
231	120								
232									
233									1125 gal used
234							(233.5'); trace clay; iron oxide staining; increase in sand and silt		
235									
236									
237				Topock - Older Alluvium Deposits	ML		(236.0 - 240.0') Topock - Older Alluvium Deposits; Sandy silt with gravel (ML); reddish brown (5YR 5/4); no plasticity, no dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; trace cobbles, subangular; trace clay; little mica; moist to wet; weak cementation; iron oxide staining		
238									
239									
240									

Notes: NR = No Recovery, USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Date Started: 10/03/2018
Date Completed: 12/02/2018
Drilling Co.: Cascade
Drilling Method: Sonic Drilling
Driller Name: Dan O'Mara
Drilling Asst: E. Huellmantel / J. Campbell
Logger: Sean McGrane
Editor: Sean McGrane
Weather: 78 to 84° Partly Cloudy

Surface Elevation: N/A
Northing (NAD83): N/A
Easting (NAD83): N/A
Total Depth: 315 ft bgs
Borehole Diameter: 10 in
Depth to First Water: N/A
Sampling Method: 10 ft Core Barrel
Sampling Interval: Continuous
Converted to Well: ☒ Yes ☐ No

Boring No.: MW-Ld

Client: PG&E
Location: Groundwater Remedy Phase I
Needles, California
Project Number: Topock

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
241	120			Topock - Older Alluvium Deposits	SM		(240.0 - 244.0') Topock - Older Alluvium Deposits; Silty sand with gravel (SM); reddish brown / moderate brown(5YR 4/4); very fine grained to very coarse grained, angular to subangular; some granule to very large pebbles, angular to subround; some silt; trace cobbles, subangular; little mica; wet; iron oxide staining		
242									
243									
244									
245				Topock - Older Alluvium Deposits	ML		(244.0 - 254.0') Topock - Older Alluvium Deposits; Sandy silt with gravel (ML); reddish brown / moderate brown(5YR 4/4); no plasticity, no dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; little mica; moist to wet; medium stiff to stiff; iron oxide staining		1125 gal used 1100 gal of water used 1100 gal of water used
246									
247									
248									
249									
250									
251	114								
252									
253									40 gal of water used
254									
255				Topock - Older Alluvium Deposits	ML		(254.0 - 258.0') Topock - Older Alluvium Deposits; Sandy silt with gravel (ML); reddish brown / moderate brown(5YR 4/4); no plasticity, no dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; trace cobbles, angular; trace clay; little mica; moist; medium stiff to stiff; weak cementation; iron oxide staining		
256									
257									
258									140 gal of water used
259				Topock - Older Alluvium Deposits	ML		(258.0 - 262.5') Topock - Older Alluvium Deposits; Sandy silt with gravel (ML); reddish brown / moderate brown(5YR 4/4); medium plasticity, no dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; little clay; little mica; moist; medium stiff to stiff; weak cementation; iron oxide staining		
260									

Notes: NR = No Recovery, USCS = Unified Soil Classification System

Date Started: 10/03/2018
Date Completed: 12/02/2018
Drilling Co.: Cascade
Drilling Method: Sonic Drilling
Driller Name: Dan O'Mara
Drilling Asst: E. Huellmantel / J. Campbell
Logger: Sean McGrane
Editor: Sean McGrane
Weather: 78 to 84° Partly Cloudy

Surface Elevation: N/A
Northing (NAD83): N/A
Easting (NAD83): N/A
Total Depth: 315 ft bgs
Borehole Diameter: 10 in
Depth to First Water: N/A
Sampling Method: 10 ft Core Barrel
Sampling Interval: Continuous
Converted to Well: ☒ Yes ☐ No

Boring No.: MW-Ld

Client: PG&E
Location: Groundwater Remedy Phase I
Needles, California
Project Number: Topock

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
261	108			Topock - Older Alluvium Deposits	ML		(261'); dry to moist; moderate cementation; iron oxide staining		
262									
263			MW-L-VAS-261-266 (<0.17 ppb)				(262.5 - 283.0') Topock - Older Alluvium Deposits; Sandy silt with gravel (ML); dark reddish brown (2.5YR 3/4); medium plasticity, no dilatency; some granule to very large pebbles, angular to subangular; some very fine to very coarse grained sand, angular to subangular; little clay; little mica; wet; medium stiff; iron oxide staining		140 gal of water used
264									
265									
266									
267									30 gal of water used
268							(268'); some clay; little granule to very large pebbles, angular to subangular; little very fine to very coarse grained sand, angular to subangular; moist; stiff; weak cementation; iron oxide staining		
269									
270									
271	138			Topock - Older Alluvium Deposits	ML				40 gal of water used
272									
273									
274									
275									
276									
277									
278									
279									
280									

Notes: NR = No Recovery, USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: MW-Ld

Date Started:	10/03/2018	Surface Elevation:	N/A		
Date Completed:	12/02/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	315 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Dan O'Mara	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	E. Huellmantel / J. Campbell	Depth to First Water:	N/A		
Logger:	Sean McGrane	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	78 to 84° Partly Cloudy	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
281	120			Topock - Older Alluvium Deposits	ML				
282									
283							(283.0 - 299.0') Topock - Older Alluvium Deposits; Gravelly silt with sand (ML); reddish brown / moderate brown(5YR 4/4); medium plasticity, no dilatency; some granule to very large pebbles, angular to subangular; little very fine to very coarse grained sand, angular to subangular; little silt; little clay; trace mica; moist; stiff; strong cementation; iron oxide staining		
284									
285									
286									
287	120			Topock - Older Alluvium Deposits	ML				
288									
289									
290									
291									
292									
293									
294									
295									
296								lost core down hole.	
297									
298									
299			MW-L-VAS-299-304 (Did not		NR		(299.0 - 306.0') (NR); No Recovery, sample fell out of core barrel.	Attempted to collect GW sample but formation was	
300									

Notes: NR = No Recovery, USCS = Unified Soil Classification System

Boring Log

Sheet: 16 of 16

Date Started:	10/03/2018	Surface Elevation:	N/A	**Boring No.:**	**MW-Ld**
Date Completed:	12/02/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	315 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Dan O'Mara	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	E. Huellmantel / J. Campbell	Depth to First Water:	N/A		
Logger:	Sean McGrane	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	78 to 84° Partly Cloudy	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
301	36		produce) MW-L-VAS-299-304 (Did not produce)		NR			non-permeable and produced no water.	
302									
303									
304									
305								Drill rods chattering	
306									
307	18			Topock - Weathered Bedrock - conglomerate	ML		(306.0 - 311.0') Topock - Weathered Bedrock - conglomerate; Sandy silt (ML); dark reddish brown(2.5YR 3/3); medium plasticity, no dilatency; some fine to medium grained sand, subangular to subround; trace granule to small pebbles, angular to subround; trace coarse-grained sand; trace mica; dry; very stiff; strong cementation; iron oxide staining		
308									
309	84								
310									
311								Rough drilling	
312				Topock - Bedrock - metadiorite			(311.0 - 315.0') Topock - Bedrock - metadiorite; dry; Partially Weathered Metadiorite		
313									
314								Core barrel stuck down hole. Pulled both core barrel and 6" casing.	
315									
316							End of Boring at 315.0 'bgs.		
317									
318									
319									
320									

Notes: NR = No Recovery, USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: IRZ-20 Pilot

Date Started:	10/18/2018	Surface Elevation:	N/A		
Date Completed:	11/30/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	187 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	E. Ramos/S. Vasquez	Borehole Diameter:	6 in		Needles, California
Drilling Asst:	T. Alymer/C.Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	Sunny Warm to hot	Converted to Well:	☐ Yes ☒ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
1–4	60			Topock - Fluvial Deposits	GW-GM		(0.0 - 4.0') Topock - Fluvial Deposits; Well graded gravel with silt and sand (GW-GM); very pale brown (10YR 8/3); granules to very large pebbles, angular to subround; and very fine to very coarse grained sand, angular to round; little silt; trace cobbles, angular to subangular; dry		
4–5				Topock - Fluvial Deposits	SP-SM		(4.0 - 5.5') Topock - Fluvial Deposits; Poorly graded sand with silt (SP-SM); very pale brown (10YR 8/3); very fine grained to fine grained, angular to subround; little silt; dry; homogeneous		
6–7				Topock - Fluvial Deposits	SM		(5.5 - 7.0') Topock - Fluvial Deposits; Silty sand (SM); very pale brown (10YR 8/3); very fine grained to very coarse grained, angular to round; and silt; trace granule to small pebbles, angular to subround; dry		
7–12	66			Topock - Fluvial Deposits	SM		(7.0 - 13.0') Topock - Fluvial Deposits; Silty sand (SM); very pale brown (10YR 8/3); fine grained to fine grained, angular to round; little silt; dry		
13–15				Topock - Fluvial Deposits	SM		(13.0 - 15.0') Topock - Fluvial Deposits; Silty sand (SM); very pale brown (10YR 8/3); very fine grained to very coarse grained, angular to subround; little silt; trace granules to very large pebbles, angular to subround; trace cobbles, angular to subround; dry		
15–17				Topock - Fluvial Deposits	SM		(15.0 - 17.0') Topock - Fluvial Deposits; Silty sand (SM); very pale brown (10YR 8/3); very fine grained to fine grained, angular to subround; little silt; dry		
17–20				Topock - Fluvial Deposits	GM		(17.0 - 33.0') Topock - Fluvial Deposits; Silty gravel with sand (GM); grayish brown (10YR 5/2); very fine grained to coarse grained, angular to round; some fine to very coarse grained sand, angular to round; little silt; little clay; trace cobbles, angular to subangular; dry		

Notes: USCS = Unified Soil Classification System

Boring Log

ARCADIS Design & Consultancy for natural and built assets

Date Started:	10/18/2018	Surface Elevation:	N/A	**Boring No.:**	**IRZ-20 Pilot**
Date Completed:	11/30/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	187 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	E. Ramos/S. Vasquez	Borehole Diameter:	6 in		Needles, California
Drilling Asst:	T. Alymer/C.Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	Sunny Warm to hot	Converted to Well:	☐ Yes ☒ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
21									
22									
23									
24									
25									
26									
27	120			Topock - Fluvial Deposits	GM				
28									
29									
30									
31									
32									
33									
34				Topock - Fluvial Deposits	SM		(33.0 - 36.0') Topock - Fluvial Deposits; Silty sand with gravel (SM); brown (10YR 5/3); very fine grained to coarse grained, angular to round; some silt; little clay; trace granules to very large, angular to subround; dry		
35									
36									
37				Topock - Fluvial Deposits	SM		(36.0 - 39.0') Topock - Fluvial Deposits; Silty sand with gravel (SM); brown (10YR 4/3); very fine grained to very coarse grained, angular to subangular; little granule to very large pebbles, angular to subround; little silt; dry; strong cementation		
38									
39									
40				Topock - Alluvium Deposits	SM		(39.0 - 47.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); grayish brown (10YR 5/2); very fine grained to very coarse grained, angular to subangular; and granule to very large pebbles, angular to		

Notes: USCS = Unified Soil Classification System

Boring Log

ARCADIS Design & Consultancy for natural and built assets

Date Started:	10/18/2018	Surface Elevation:	N/A	**Boring No.:**	**IRZ-20 Pilot**
Date Completed:	11/30/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	187 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	E. Ramos/S. Vasquez	Borehole Diameter:	6 in		Needles, California
Drilling Asst:	T. Alymer/C.Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	Sunny Warm to hot	Converted to Well:	☐ Yes ☒ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
41							subround; little silt; trace clay; dry		
42	96			Topock - Alluvium Deposits	SM				
43									
44									
45									
46									
47									
48		IRZ-20-SS-45-50					(47.0 - 56.0') Topock - Alluvium Deposits; Silty gravel with sand (GM); brown (10YR 4/3); granules to large pebbles, angular to subangular; some very fine to coarse grained sand, angular to subround; little silt; moist	Soil starts getting moist	
49									
50									
51				Topock - Alluvium Deposits	GM				
52	114	IRZ-20-SS-50-55							
53									
54			IRZ-20-VAS-51-56 (150 ppb)						
55									
56							(54'); wet	Approximate depth of water table	
57				Topock - Alluvium Deposits	SM		(56.0 - 57.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); dark grayish brown / dark yellowish brown(10YR 4/2); very fine grained to coarse grained, angular to subround; some granule to large pebbles, angular to subangular; some silt; wet		
58		IRZ-20-SS-55-60		Topock - Alluvium Deposits	SM		(57.0 - 65.0') Topock - Alluvium Deposits; Silty sand (SM); yellowish brown / moderate yellowish brown(10YR 5/4); very fine grained to fine grained, angular to subround; and silt; trace granule to medium pebbles, angular to subround; moist		
59									
60									

Notes: USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Date Started: 10/18/2018
Date Completed: 11/30/2018
Drilling Co.: Cascade
Drilling Method: Sonic Drilling
Driller Name: E. Ramos/S. Vasquez
Drilling Asst: T. Alymer/C.Alverez
Logger: Connor Mills
Editor: Sean McGrane
Weather: Sunny Warm to hot

Surface Elevation: N/A
Northing (NAD83): N/A
Easting (NAD83): N/A
Total Depth: 187 ft bgs
Borehole Diameter: 6 in
Depth to First Water: N/A
Sampling Method: 10 ft Core Barrel
Sampling Interval: Continuous
Converted to Well: ☐ Yes ☒ No

Boring No.: IRZ-20 Pilot

Client: PG&E
Location: Groundwater Remedy Phase I
Needles, California
Project Number: Topock

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
61									
62	96	IRZ-20-SS-60-65		Topock - Alluvium Deposits	SM				
63									
64									
65									
66				Topock - Alluvium Deposits	ML		(65.0 - 69.0') Topock - Alluvium Deposits; Sandy silt (ML); brown (10YR 5/3); no plasticity; some very fine to coarse grained sand, angular to subround; little small pebbles, angular to subangular; moist		
67		IRZ-20-SS-65-70							
68									
69				Topock - Alluvium Deposits	ML		(69.0 - 71.0') Topock - Alluvium Deposits; Sandy silt (ML); brown (7.5YR 4/4); no plasticity; some fine to coarse grained sand, angular to subround; little granule to small pebbles, angular to subangular; moist		
70									
71				Topock - Alluvium Deposits	CL		(71.0 - 77.0') Topock - Alluvium Deposits; Sandy lean clay (CL); brown (7.5YR 4/4); no plasticity; and silt; little very fine to coarse grained sand, angular to subround; trace granule to medium pebbles, angular to subangular; moist		
72		IRZ-20-SS-70-75							
73									
74									
75									
76									
77									
78		IRZ-20-SS-75-80		Topock - Alluvium Deposits	ML		(77.0 - 83.0') Topock - Alluvium Deposits; Sandy silt (ML); brown (7.5YR 4/4); no plasticity; some very fine to medium grained sand, angular to subround; trace granule, angular to subangular; wet		
79									
80									

Notes: USCS = Unified Soil Classification System

Date Started: 10/18/2018
Date Completed: 11/30/2018
Drilling Co.: Cascade
Drilling Method: Sonic Drilling
Driller Name: E. Ramos/S. Vasquez
Drilling Asst: T. Alymer/C.Alverez
Logger: Connor Mills
Editor: Sean McGrane
Weather: Sunny Warm to hot

Surface Elevation: N/A
Northing (NAD83): N/A
Easting (NAD83): N/A
Total Depth: 187 ft bgs
Borehole Diameter: 6 in
Depth to First Water: N/A
Sampling Method: 10 ft Core Barrel
Sampling Interval: Continuous
Converted to Well: ☐ Yes ☒ No

Boring No.: IRZ-20 Pilot

Client: PG&E
Location: Groundwater Remedy Phase I
Needles, California
Project Number: Topock

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
81				Topock - Alluvium Deposits	ML				
82	114	IRZ-20-SS-80-85							
83							(83.0 - 107.0') Topock - Older Alluvium Deposits; Silty sand (SM); brown (10YR 4/3); very fine grained to coarse grained, angular to subround; and silt; little granule to small pebbles, angular to subangular; wet		
84			IRZ-20-VAS-82-87 (<0.33 ppb)						
85		IRZ-20-SS-85-90							
86									
87									
88									
89									
90									
91				Topock - Older Alluvium Deposits	SM				
92	132	IRZ-20-SS-90-95							
93									
94									
95									
96									
97									
98		IRZ-20-SS-95-100							
99									
100									

Notes: USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: IRZ-20 Pilot

Date Started:	10/18/2018	Surface Elevation:	N/A		
Date Completed:	11/30/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	187 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	E. Ramos/S. Vasquez	Borehole Diameter:	6 in		Needles, California
Drilling Asst:	T. Alymer/C.Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	Sunny Warm to hot	Converted to Well:	☐ Yes ☒ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
101									
102	120	IRZ-20-SS-100-105		Topock - Older Alluvium Deposits	SM				
103									
104									
105									
106									
107									
108		IRZ-20-SS-105-110		Topock - Older Alluvium Deposits	SM		(107.0 - 109.0') Topock - Older Alluvium Deposits; Sandy silt with gravel (SM); brown (7.5YR 4/3); fine grained to coarse grained, angular to subround; and silt; little granule to small pebbles, angular to subangular; wet		
109									
110							(109.0 - 117.0') Topock - Older Alluvium Deposits; Sandy silt (ML); brown (10YR 4/3); no plasticity; some fine to coarse grained sand, angular to subround; trace granule, angular to subround; trace clay; wet		
111									
112	103.2	IRZ-20-SS-110-115	IRZ-20-VAS-112-117 (<0.17 ppb)	Topock - Older Alluvium Deposits	ML				
113									
114									
115									
116									
117									
118		IRZ-20-SS-115-120		Topock - Older Alluvium Deposits	ML		(117.0 - 123.0') Topock - Older Alluvium Deposits; Sandy silt (ML); strong brown (7.5YR 4/6); no plasticity; little granule to medium pebbles, angular to subangular; little fine to coarse grained sand, angular to subround; wet		
119									
120									

Notes: USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: IRZ-20 Pilot

Date Started:	10/18/2018	Surface Elevation:	N/A		
Date Completed:	11/30/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	187 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	E. Ramos/S. Vasquez	Borehole Diameter:	6 in		Needles, California
Drilling Asst:	T. Alymer/C.Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	Sunny Warm to hot	Converted to Well:	☐ Yes ☒ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
121				Topock - Older Alluvium Deposits	ML				
122	132	IRZ-20-SS-120-125							
123				Topock - Older Alluvium Deposits	GM		(123.0 - 124.5') Topock - Older Alluvium Deposits; Silty gravel with sand (GM); yellowish brown / moderate yellowish brown(10YR 5/4); granules to very large pebbles, angular to subangular; some silt; little very fine to coarse grained sand, angular to subangular; moist		
124									
125				Topock - Older Alluvium Deposits	ML		(124.5 - 127.0') Topock - Older Alluvium Deposits; Sandy silt (ML); brown (7.5YR 4/3); no plasticity; little granule to medium pebbles, angular to subangular; little fine to coarse grained sand, angular to subround; moist		
126		IRZ-20-SS-125-130							
127									
128				Topock - Older Alluvium Deposits	ML		(127.0 - 131.0') Topock - Older Alluvium Deposits; Sandy silt (ML); reddish brown / moderate brown(5YR 4/4); no plasticity; some fine grained sand, angular to subround; trace granule to small pebbles, angular to subangular; wet		
129									
130									
131									
132	132	IRZ-20-SS-130-135	IRZ-20-SS-131-136 (<0.17 ppb)	Topock - Older Alluvium Deposits	SM		(131.0 - 136.5') Topock - Older Alluvium Deposits; Silty sand (SM); brown (7.5YR 5/3); fine grained to coarse grained, angular to subround; some silt; little granule to medium pebbles, subangular to round; wet		
133									
134									
135									
136									
137		IRZ-20-SS-135-140		Topock - Older Alluvium Deposits	SM		(136.5 - 157.0') Topock - Older Alluvium Deposits; Silty sand (SM); reddish brown (5YR 5/4); very fine grained to coarse grained, angular to subangular; and silt; little granule to very large pebbles, angular to subangular; wet; Granules and pebbles throughout the core are composed of metadiorite 50-60 mm)		
138									
139									
140									

Notes: USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: IRZ-20 Pilot

Date Started:	10/18/2018	Surface Elevation:	N/A		
Date Completed:	11/30/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	187 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	E. Ramos/S. Vasquez	Borehole Diameter:	6 in		Needles, California
Drilling Asst:	T. Alymer/C.Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	Sunny Warm to hot	Converted to Well:	☐ Yes ☒ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
141									
142	132	IRZ-20-SS-140-145							
143									
144									
145									
146									
147									
148		IRZ-20-SS-145-150		Topock - Older Alluvium Deposits	SM				
149									
150									
151									
152	132	IRZ-20-SS-150-155							
153									
154									
155									
156									
157		IRZ-20-SS-155-160		Topock - Weathered Bedrock - conglomerate	ML		(157.0 - 160.0') Topock - Weathered Bedrock - conglomerate; Sandy silt (ML); brown (7.5YR 5/4); no plasticity; and fine to coarse grained sand, angular to subround; trace granule, angular to subangular; trace clay; moist		
158									
159									
160									

Notes: USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Date Started:	10/18/2018	Surface Elevation:	N/A	**Boring No.:**	**IRZ-20 Pilot**
Date Completed:	11/30/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	187 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	E. Ramos/S. Vasquez	Borehole Diameter:	6 in		Needles, California
Drilling Asst:	T. Alymer/C.Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	Sunny Warm to hot	Converted to Well:	☐ Yes ☒ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
161							(160.0 - 166.0') Topock - Weathered Bedrock - conglomerate; Lean clay with sand (CL); brown (10YR 4/3); low plasticity; some small to medium pebbles, angular to subangular; some fine to coarse grained sand, angular to subround; little silt; trace cobbles, angular to subangular; dry	Rough drilling, had to go back down again with core barell to get remaining 2 ft. of core	
162	132	IRZ-20-SS-160-165		Topock - Weathered Bedrock - conglomerate	CL				
163									
164									
165									
166									
167							(166.0 - 179.5') Topock - Weathered Bedrock - conglomerate; Sandy silt with gravel (ML); dark yellowish brown (10YR 3/6); medium plasticity; some fine to coarse grained sand, angular to subround; little granule to small pebbles, angular to subangular; wet		
168		IRZ-20-SS-165-170							
169									
170									
171									
172	87.6	IRZ-20-SS-170-175		Topock - Weathered Bedrock - conglomerate	ML				
173									
174									
175			IRZ-20-VAS-173-178 (<0.83 ppb)						
176									
177									
178		IRZ-20-SS-175-180							
179									
180	79.2						(179.5 - 182.0') Topock - Competent Bedrock - conglomerate; dark		

Notes: USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: IRZ-20 Pilot

Date Started:	10/18/2018	Surface Elevation:	N/A		
Date Completed:	11/30/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	187 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	E. Ramos/S. Vasquez	Borehole Diameter:	6 in		Needles, California
Drilling Asst:	T. Alymer/C.Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	Sunny Warm to hot	Converted to Well:	☐ Yes ☒ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
181		IRZ-20-SS-180-187		Topock - Competent Bedrock - conglomerate			yellowish brown (10YR 4/4); granules to very large pebbles, angular to subangular; some fine to coarse grained sand, angular to subangular; some silt; dry; moderate cementation		
182									
183	58.8			Topock - Competent Bedrock - conglomerate			(182.0 - 187.0') Topock - Competent Bedrock - conglomerate; yellowish red (5YR 4/6); and silt; some granule to small pebbles, angular to subangular; little fine to coarse grained sand, angular to round; trace cobbles, angular to subangular; moist; weak cementation	very rough drilling, couldnt advance past 182'. Had to pull it out and make another run for 182-187'.	
184									
185									
186									
187									
							End of Boring at 187.0 'bgs.		
188									
189									
190									
191									
192									
193									
194									
195									
196									
197									
198									
199									
200									

Notes: USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: MW-E

Date Started:	11/02/2018	Surface Elevation:	N/A		
Date Completed:	11/27/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	150 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Steve Vasques	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	N. Dominguez/C. Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	63 to 88° Sunny	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
1–4	72			Topock - Fluvial Deposits	SW-SM		(0.0 - 4.5') Topock - Fluvial Deposits; Well graded sand with silt and gravel (SW-SM); brown (7.5YR 4/3); fine grained to coarse grained, angular to subround; some small to very large pebbles, angular to subround; little silt; trace cobbles, angular to subrounded; dry; no odor		
5–7				Topock - Fluvial Deposits	SP-SM		(4.5 - 8.0') Topock - Fluvial Deposits; Poorly graded sand with silt and gravel (SP-SM); brown (7.5YR 4/3); fine grained to medium grained, subangular to round; some small to very large pebbles, angular to subround; little silt; trace cobbles, angular to subangular; trace coarse grained grained sand, subangular to round; dry; no odor		
8–11	85.2			Topock - Fluvial Deposits	GM		(8.0 - 12.5') Topock - Fluvial Deposits; Silty gravel with sand (GM); yellowish brown / moderate yellowish brown(10YR 5/4); granules to very large pebbles, angular to subround; some fine to coarse grained sand, subangular to round; some silt; trace cobbles, subround to round; dry		
12–14				Topock - Fluvial Deposits	SM		(12.5 - 15.0') Topock - Fluvial Deposits; Silty sand (SM); yellowish brown / moderate yellowish brown(10YR 5/4); very fine grained to medium grained, angular to subround; little granule to large pebbles, angular to round; little silt; trace cobbles, subangular to subrounded; dry		
15–20				Topock - Fluvial Deposits	GP-GM		(15.0 - 32.0') Topock - Fluvial Deposits; Poorly graded gravel with silt (GP-GM); light brownish gray / pale yellowish brown(10YR 6/2); granules to very large pebbles, angular to subangular; some cobbles, angular to subangular; little silt; trace boulders, angular to subround; trace fine to medium grained sand, angular to subrounded; dry; boulders 10 inch cores of metadiorite rock.	Rough drilling. Drilled through a boulder, rock was pulverized into a fine powder.	

Notes: USCS = Unified Soil Classification System

Boring Log

ARCADIS Design & Consultancy for natural and built assets

Date Started:	11/02/2018	Surface Elevation:	N/A	**Boring No.: MW-E**	
Date Completed:	11/27/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	150 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Steve Vasques	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	N. Dominguez/C. Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	63 to 88° Sunny	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
21	93.6			Topock - Fluvial Deposits	GP-GM				
22									
23									
24									
25									
26									
27									
28	54								
29									
30									
31									
32				Topock - Fluvial Deposits	SM		(32.0 - 34.5') Topock - Fluvial Deposits; Silty sand with gravel (SM); pale brown (10YR 6/3); very fine grained to medium grained, angular to subround; and granule to very large pebbles, angular to subround; little silt; trace cobbles, angular to subangular; dry	Rough drilling	150 gal of water used
33									
34									
35	51.6			Topock - Fluvial Deposits	SM		(34.5 - 37.0') Topock - Fluvial Deposits; Silty sand with gravel (SM); light yellowish brown (10YR 6/4); fine grained to coarse grained, angular to round; and granules to small pebbles, angular to subangular; little cobbles, angular to subround; little silt; trace clay; dry		
36									
37				Topock - Fluvial Deposits	GM		(37.0 - 42.5') Topock - Fluvial Deposits; Silty gravel with sand (GM); light yellowish brown (10YR 6/4); granules to very large pebbles, angular to round; some fine to coarse grained sand, angular to well-rounded; some silt; trace cobbles, angular to subangular; trace boulders, subround; dry; one boulder is a 10 inch core of basalt with yelliwish green olivine crystals and a frothy texture.		
38									
39									
40	48								

Notes: USCS = Unified Soil Classification System

Boring Log

ARCADIS Design & Consultancy for natural and built assets

Date Started:	11/02/2018	Surface Elevation:	N/A	**Boring No.:**	**MW-E**
Date Completed:	11/27/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	150 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Steve Vasques	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	N. Dominguez/C. Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	63 to 88° Sunny	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
41				Topock - Fluvial Deposits	GM				
42									
43				Topock - Alluvium Deposits	SM		(42.5 - 47.0') Topock - Alluvium Deposits; Silty sand with gravel (SM); light yellowish brown (10YR 6/4); fine grained to coarse grained, angular to subround; some granules to very large pebbles, angular to subangular; little silt; trace clay; dry		
44									
45									
46									
47				Topock - Alluvium Deposits	ML		(47.0 - 54.5') Topock - Alluvium Deposits; Silt with sand (ML); light brown (7.5YR 6/4); low plasticity; little fine to coarse grained sand, angular to subangular; little clay; trace granule to medium pebbles, angular to subround; moist	Approximate depth of water table.	
48									
49									
50									
51									
52	120								
53									
54			MW-E-VAS-52-57 (7.0 ppb)						
55				Topock - Alluvium Deposits	GM		(54.5 - 64.0') Topock - Alluvium Deposits; Silty gravel with sand (GM); pale brown (10YR 6/3); granules to large pebbles, angular to subangular; some fine to medium grained sand, angular to subangular; some silt; trace clay; dry		
56									
57								Core came out hot and dry	
58									
59									
60									

Notes: USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: MW-E

Date Started:	11/02/2018	Surface Elevation:	N/A		
Date Completed:	11/27/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	150 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Steve Vasques	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	N. Dominguez/C. Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	63 to 88° Sunny	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
61									
62	120			Topock - Alluvium Deposits	GM				
63									
64									
65				Topock - Older Alluvium Deposits	ML		(64.0 - 67.0') Topock - Older Alluvium Deposits; Sandy silt (ML); reddish brown (5YR 5/4); no plasticity; some fine to coarse grained sand, subangular to subround; little granule to medium pebbles, angular to subangular; trace clay; moist; no staining		
66									
67									
68	108			Topock - Older Alluvium Deposits	SM		(67.0 - 87.0') Topock - Older Alluvium Deposits; Silty sand (SM); reddish brown (5YR 5/4); very fine grained to coarse grained, angular to subround; some silt; little granule to large pebbles, angular to subangular; wet		
69									
70									
71									
72									
73									
74									
75									
76									
77									
78									
79									
80									

Notes: USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: MW-E

Date Started:	11/02/2018	Surface Elevation:	N/A		
Date Completed:	11/27/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	150 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Steve Vasques	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	N. Dominguez/C. Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	63 to 88° Sunny	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
81									
82	102								
83				Topock - Older Alluvium Deposits	SM				
84			MW-E-VAS-82-87.0 (200 ppb)						
85									
86									
87									
88							(87.0 - 94.5') Topock - Older Alluvium Deposits; Sandy silt (ML); reddish brown (5YR 5/4); low plasticity; some fine to coarse grained sand, angular to subangular; some clay; little granule to medium pebbles, angular to subangular; wet		
89									
90									
91				Topock - Older Alluvium Deposits	ML				
92	105.6								
93									
94									
95							(94.5 - 97.0') Topock - Older Alluvium Deposits; Silty sand (SM); reddish brown (5YR 5/4); medium grained to coarse grained, angular to subround; some silt; little granule to medium pebbles, angular to subangular; wet		
96				Topock - Older Alluvium Deposits	SM				
97									
98							(97.0 - 109.5') Topock - Older Alluvium Deposits; Silt with sand (ML); reddish brown (5YR 5/4); no plasticity; little granule to large pebbles, angular to subangular; little fine to coarse grained sand, angular to subround; wet; no odor		
99				Topock - Older Alluvium Deposits	ML				
100									

Notes: USCS = Unified Soil Classification System

ARCADIS Design & Consultancy for natural and built assets

Boring Log

Boring No.: MW-E

Date Started:	11/02/2018	Surface Elevation:	N/A		
Date Completed:	11/27/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	150 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Steve Vasques	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	N. Dominguez/C. Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	63 to 88° Sunny	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
101				Topock - Older Alluvium Deposits	ML				
102	104.4								
103									
104									
105									
106									
107									
108									
109									
110				Topock - Older Alluvium Deposits	SM		(109.5 - 118.0') Topock - Older Alluvium Deposits; Silty sand with gravel (SM); reddish brown (5YR 5/4); fine grained to coarse grained, angular to subangular; and silt; little granule to large pebbles, angular to subangular; wet; some green staining in spots within the core.		
111									
112	102								
113									
114			MW-E-VAS-112.0-117.0 (3100 ppb)						
115									
116									
117									
118				Topock - Older Alluvium Deposits	ML		(118.0 - 122.0') Topock - Older Alluvium Deposits; Sandy silt (ML); reddish brown (5YR 5/3); no plasticity; some fine to coarse grained sand, angular to subround; little granule to large pebbles, angular to subangular; moist; very weathered.		
119									
120									

Notes: USCS = Unified Soil Classification System

Date Started: 11/02/2018
Date Completed: 11/27/2018
Drilling Co.: Cascade
Drilling Method: Sonic Drilling
Driller Name: Steve Vasques
Drilling Asst: N. Dominguez/C. Alverez
Logger: Connor Mills
Editor: Sean McGrane
Weather: 63 to 88° Sunny

Surface Elevation: N/A
Northing (NAD83): N/A
Easting (NAD83): N/A
Total Depth: 150 ft bgs
Borehole Diameter: 10 in
Depth to First Water: N/A
Sampling Method: 10 ft Core Barrel
Sampling Interval: Continuous
Converted to Well: ☒ Yes ☐ No

Boring No.: MW-E

Client: PG&E
Location: Groundwater Remedy Phase I
Needles, California
Project Number: Topock

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
121				Topock - Older Alluvium Deposits	ML				
122	108								
123				Topock - Older Alluvium Deposits	SM		(122.0 - 127.0') Topock - Older Alluvium Deposits; Silty sand with gravel (SM); light reddish brown / light brown(5YR 6/4); very fine grained to coarse grained, angular to subround; and silt; little granule to large pebbles, angular to subangular; wet; trace 1-4 inch pieces of metadiorite.		
124									
125									
126									
127									
128	120			Topock - Weathered Bedrock - conglomerate	SM		(127.0 - 137.0') Topock - Weathered Bedrock - conglomerate; Silty sand (SM); reddish brown (5YR 5/4); very fine grained to coarse grained, angular to subround; some silt; little granule to large pebbles, angular to subangular; wet		
129									
130									
131									
132									
133									
134									
135									
136									
137									
138			MW-E-VAS-137-142 (7300 ppb)	Topock - Weathered Bedrock - conglomerate	SM		(137.0 - 138.5') Topock - Weathered Bedrock - conglomerate; Silty sand (SM); reddish brown / moderate brown(5YR 4/4); fine grained to coarse grained, angular to subround; some silt; little granule to medium pebbles, angular to subangular; wet	Rough drilling	
139				Topock - Weathered Bedrock - conglomerate	ML		(138.5 - 139.5') Topock - Weathered Bedrock - conglomerate; Silt (ML); reddish brown / moderate brown(5YR 4/4); no plasticity; trace granule to medium pebbles, angular to subangular; trace fine grained sand, angular to subround; dry; very weathered rock, cemented.		
140					SM		(139.5 - 142.0') Topock - Weathered Bedrock - conglomerate; Silty sand		

Notes: USCS = Unified Soil Classification System

Boring Log

ARCADIS Design & Consultancy for natural and built assets

Date Started:	11/02/2018	Surface Elevation:	N/A	**Boring No.: MW-E**	
Date Completed:	11/27/2018	Northing (NAD83):	N/A		
Drilling Co.:	Cascade	Easting (NAD83):	N/A	Client:	PG&E
Drilling Method:	Sonic Drilling	Total Depth:	150 ft bgs	Location:	Groundwater Remedy Phase I
Driller Name:	Steve Vasques	Borehole Diameter:	10 in		Needles, California
Drilling Asst:	N. Dominguez/C. Alverez	Depth to First Water:	N/A		
Logger:	Connor Mills	Sampling Method:	10 ft Core Barrel	Project Number:	Topock
Editor:	Sean McGrane	Sampling Interval:	Continuous		
Weather:	63 to 88° Sunny	Converted to Well:	☒ Yes ☐ No		

Depth (ft)	Recovery (in)	Sieve Sample ID	Groundwater Sample ID	Geologic Formation	USCS Code	USCS Class	Description	Drilling Notes	Drilling Fluid
141			MW-E-VAS-137-142 (7300 ppb)	Topock - Weathered Bedrock - conglomerate	SM		(SM); reddish brown (5YR 5/4); fine grained to coarse grained, angular to subangular; some silt; little granule to medium pebbles, angular to subangular; wet		
142	114							Rough drilling	
143							(142.0 - 150.0') Topock - Competent Bedrock - conglomerate; brown (7.5YR 5/4); very fine grained to medium pebbles, angular to subangular; and silt; trace granule to medium pebbles, angular to subangular; trace fine grained sand, angular to subround; dry; strong cementation; hard.		
144									
145									
146				Topock - Competent Bedrock - conglomerate					
147									
148	36								
149									
150							End of Boring at 150.0 'bgs.		
151									
152									
153									
154									
155									
156									
157									
158									
159									
160									

Notes: USCS = Unified Soil Classification System

JACOBS®

PROJECT NUMBER	BORING NUMBER:
707614CH.01.01	AOC13-GRBS-B-01 SHEET 1 OF 2

SOIL BORING LOG

PROJECT : PG&E Topock; Pipeline F Retaining Wall — LOCATION : 34° 42' 50.64", - 114° 29' 31.92"

ELEVATION : 608.0 — DRILLING CONTRACTOR : Cascade Drilling

DRILLING METHOD AND EQUIPMENT : CME95 HSA with 140# autohammer, 30-inch drop

WATER LEVELS : Not Encountered — START: 10/8/2018 — END: 10/8/2018 — LOGGER : D. Jankly

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
	1.0				4" Asphalt Concrete	
	4.0	4.0	1		**Poorly-graded SAND with GRAVEL (SP)** light brown; dry; fine to coarse grained, ~10% GRAVEL to 2" diameter. [FILL]	CR, M=4% (Bulk), Hand Auger to 5'
5	5.0					
	6.5	1.2	2	3-5-7 (12)	Loose.	M=2%, PA (Ring)
10	10.0					
	11.5	1.0	3	2-4-8 (12)	~20% GRAVEL to 1" diameter	M=4% (SPT)
15	15.0				**Poorly-graded SAND (SP)** light brown; moist; medium dense; fine grained; micaceous; homogenous. [NATIVE]	
	16.5		4	8-10-14 (24)		PA (SPT)
20	20.0				**Fat CLAY with SAND (CH)** brown; moist; very stiff; ~ 25% fine to medium SAND. horizontal laminations.	
	21.5	1.5	5	6-10-10 (20)	**Poorly-graded SAND (SP)** light brown; moist; medium dense; fine grained; micaceous; homogenous.	(SPT), PP = 4.0 tsf
25	25.0					
	26.5	0.1	6	6-7-10 (17)		(SPT)
30					**Fat CLAY (CH)** reddish brown; moist; hard; horizontal laminations.	

SOIL BORING LOG; JACOBS-GEOTECH_SG.GLB; TOPOCK BORINGS.GPJ; CH2M GEOTECH.GDT; 11/9/18

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PROJECT NUMBER	BORING NUMBER:
707614CH.01.01	AOC13-GRBS-B-01 SHEET 2 OF 2

SOIL BORING LOG

PROJECT : PG&E Topock; Pipeline F Retaining Wall LOCATION : (34° 42' 50.64", - 114° 29' 31.92")

ELEVATION : 608.0 DRILLING CONTRACTOR : Cascade Drilling

DRILLING METHOD AND EQUIPMENT : CME95 HSA with 140# autohammer, 30-inch drop

WATER LEVELS : Not Encountered START: 10/8/2018 END: 10/8/2018 LOGGER : D. Jankly

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
30.0		7	5-7-9 (16)			(SPT), PP > 4.5 tsf
31.5					Total Depth: 31.5', No Groundwater Encountered, Backfilled with Portland Cement Grout, Concrete Patch at Surface.	
35						
40						
45						
50						
55						
60						

SOIL BORING LOG; JACOBS-GEOTECH_SG.GLB; TOPOCK BORINGS.GPJ; CH2M GEOTECH.GDT; 11/9/18

JACOBS®

PROJECT NUMBER	BORING NUMBER:
707614CH.01.01	AOC13-GRBS-B-02 SHEET 1 OF 2

SOIL BORING LOG

PROJECT : PG&E Topock; Pipeline F Retaining Wall LOCATION : (34° 42' 50.68", -114° 29' 30.59")

ELEVATION : 597.0 DRILLING CONTRACTOR : Cascade Drilling

DRILLING METHOD AND EQUIPMENT : CME95 HSA with 140# autohammer, 30-inch drop

WATER LEVELS : Not Encountered START: 10/8/2018 END: 10/8/2018 LOGGER : D. Jankly

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
	1.0				4" Asphalt Concrete	
		4.0	1		**Poorly-graded SAND with SILT and GRAVEL (SP-SM)** brown; dry; fine sand, ~37% GRAVEL; ~ 10% COBBLES to 12" diameter. [FILL]	CR, PA (Bulk); Hand Auger to 5'
					Many COBBLES at 3 to 5 feet.	
5	5.0					
	6.5	1.0	2	5-10-15 (25)	Medium Dense.	(Ring)
					SANDY SILTY CLAY (CL-ML) brown; medium dense; moist. [NATIVE]	DS, PI, M=17%, UW=100 pcf
					Fat CLAY (CH) brown; moist; very stiff; homogenous.	
10	10.0					
	11.5	1.5	3	3-6-11 (17)		M=24%, PI (SPT); PP=3.5 tsf.
					Poorly-graded Sand (SP) Light brown; moist; fine grained; homogenous.	
					Fat CLAY (CH) brown; moist; very stiff; homogenous; few fine SAND; laminations <1/8" thick.	
15	15.0					
	16.5	1.3	4	6-6-10 (16)		DS, M=23%, UW=102 pcf (Ring); PP=3.5 tsf.
20	20.0					
	21.5	1.5	5	5-6-7 (13)		M=24% (SPT)
					SILTY CLAY (CL-ML) brown; wet; soft; saturated; homogenous.	
					Fat CLAY (CH) brown; moist; very stiff; homogenous; few fine SAND; laminations <1/8" thick.	
25	25.0					
	26.5	1.5	6	4-6-12 (18)	Hard.	PI (SPT); PP=4.0 tsf.
30						

SOIL BORING LOG; JACOBS-GEOTECH_SG.GLB; TOPOCK BORINGS.GPJ; CH2M GEOTECH.GDT; 11/9/18

JACOBS®

PROJECT NUMBER	BORING NUMBER:
707614CH.01.01	AOC13-GRBS-B-02 SHEET 2 OF 2

SOIL BORING LOG

PROJECT : PG&E Topock; Pipeline F Retaining Wall LOCATION : (34° 42' 50.68", -114° 29' 30.59")

ELEVATION : 597.0 DRILLING CONTRACTOR : Cascade Drilling

DRILLING METHOD AND EQUIPMENT : CME95 HSA with 140# autohammer, 30-inch drop

WATER LEVELS : Not Encountered START: 10/8/2018 END: 10/8/2018 LOGGER : D. Jankly

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
30.0		7	7-10-20 (30)			(SPT); PP=4.5 tsf.
31.5					Total Depth: 31.5', No Groundwater Encountered, Backfilled with Portland Cement Grout, Concrete Patch at Surface.	
35						
40						
45						
50						
55						
60						

SOIL BORING LOG; JACOBS-GEOTECH_SG.GLB; TOPOCK BORINGS.GPJ; CH2M GEOTECH.GDT; 11/9/18

JACOBS®

PROJECT NUMBER	BORING NUMBER:
707614CH.01.01	AOC13-GRBS-B-03 SHEET 1 OF 2

SOIL BORING LOG

PROJECT : PG&E Topock; Pipeline F Retaining Wall LOCATION : (34° 42' 50.82", -114° 29' 29.34")

ELEVATION : 587.0 DRILLING CONTRACTOR : Cascade Drilling

DRILLING METHOD AND EQUIPMENT : CME95 HSA with 140# autohammer, 30-inch drop

WATER LEVELS : Not Encountered START: 10/9/2018 END: 10/9/2018 LOGGER : D. Jankly

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
1.0					4" Asphalt Concrete	
	3.0	1			**Poorly-graded SAND with GRAVEL (SP)** brown; moist; medium dense; mostly fine to medium sand, GRAVEL to 3" diameter. [FILL]	(Bulk), Hand Auger to 5'
4.0						
5 5.0						
6.5	1.3	2	6-7-15 (22)		**SILTY SAND (SM)** light brown; moist; medium dense; fine grained; homogeneous. [NATIVE]	(Ring) PA, M=9%, UW=99 pcf DS, M=14%, UW=111 psf, PP=4.0 tsf
					Fat CLAY (CH) brown; moist; hard; massive; homogeneous	
10 10.0						
11.5	1.5	3	3-5-6 (11)			CR, M=23%, PI (SPT); PP=4.0 tsf
					SANDY SILTY CLAY (CL-ML) brown; wet; very soft; some fine SAND.	PI
					Fat CLAY (CH) brown; moist; hard; massive; homogeneous	
15 15.0						
16.5	1.5	4	3-5-6 (11)		**SANDY SILTY CLAY (CL-ML)** brown; wet; very soft; some fine sand.	(SPT); PP=4.25 tsf.
					Fat CLAY (CH) brown; moist; hard; massive; homogeneous	
20 20.0						
21.5	1.5	5	4-5-10 (15)			(SPT); PP=4.5 tsf.
25 25.0						
26.5	1.5	6	4-10-20 (30)		Interbedded with SILTY SAND (SM); moist; medium dense; fine grained; homogeneous. Beds are 2 to 4 inches thick.	(SPT)
30						

SOIL BORING LOG; JACOBS-GEOTECH_SG.GLB; TOPOCK BORINGS.GPJ; CH2M GEOTECH.GDT; 11/9/18

JACOBS®

PROJECT NUMBER	BORING NUMBER:
707614CH.01.01	AOC13-GRBS-B-03 SHEET 2 OF 2

SOIL BORING LOG

PROJECT : PG&E Topock; Pipeline F Retaining Wall LOCATION : (34° 42' 50.82", -114° 29' 29.34")

ELEVATION : 587.0 DRILLING CONTRACTOR : Cascade Drilling

DRILLING METHOD AND EQUIPMENT : CME95 HSA with 140# autohammer, 30-inch drop

WATER LEVELS : Not Encountered START: 10/9/2018 END: 10/9/2018 LOGGER : D. Jankly

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
30.0						(SPT)
	30.0 - 31.5	1.0	7	8-16-32 (48)		
31.5					**Poorly-graded GRAVEL with SAND and COBBLES (GP)** gray; moist; dense; fine to coarse GRAVEL; medium to coarse SAND.	
					Total Depth: 31.5', No Groundwater Encountered, Backfilled with Portland Cement Grout, Concrete Patch at Surface.	
35						
40						
45						
50						
55						
60						

SOIL BORING LOG; JACOBS-GEOTECH_SG.GLB; TOPOCK BORINGS.GPJ; CH2M GEOTECH.GDT; 11/9/18

JACOBS®

PROJECT NUMBER:	TEST PIT NUMBER:
707614CH.01.01	AOC13-GRBS-TP-1 SHEET 1 OF 1

TEST PIT LOG

PROJECT: PG&E Topock; Pipeline F Retaining Wall — LOCATION: (34° 42' 50.82", -114° 29' 30.58")

ELEVATION: 601.0 ft — CONTRACTOR: Phillips Excavating Inc.

EXCAVATION EQUIPMENT: Backhoe with 24-inch bucket — DATE EXCAVATED: 10/8/2018 — LOGGER: D. Jankly

WATER LEVELS: Not Encountered — LENGTH: — WIDTH: — DEPTH:

DEPTH BELOW SURFACE	#TYPE	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	GRAPHIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
1–3	1	**Poorly-graded SAND with GRAVEL (SP)** light brown; dry; very loose; massive; GRAVEL ~ 30% to 3" diameter; COBBLES to 12" diameter ~ 20%. Local areas of poorly-graded GRAVEL with SAND and COBBLES; unit has occassional rootlets to 1 ft below bgs. [FILL]		CP, DS, PA (Bulk)
4		Total Depth=3 feet. No Groundwater Encountered Backfilled with soil cuttings		
5–30				

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PROJECT NUMBER:	TEST PIT NUMBER:
707614CH.01.01	AOC13-GRBS-TP-2 SHEET 1 OF 1

TEST PIT LOG

PROJECT: PG&E Topock; Pipeline F Retaining Wall — LOCATION: (34° 42' 50.96", -114° 29' 29.39")

ELEVATION: 589.0 ft — CONTRACTOR: Phillips Excavating Inc.

EXCAVATION EQUIPMENT: Backhoe with 24-inch bucket — DATE EXCAVATED: 10/8/2018 — LOGGER: D. Jankly

WATER LEVELS: Not Encountered — LENGTH: — WIDTH: — DEPTH:

DEPTH BELOW SURFACE	#TYPE	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	GRAPHIC LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
1		At 0 to 0.3 feet: **Poorly-graded GRAVEL with SAND and COBBLES (GP)** brown; dry; very loose. Predominantly coarse gravel and cobbles to 8-inch diameter. [FILL]		
2	1	At 0.3 to 3.5 feet: **Poorly-graded SAND (SP)** light brown; dry; loose; fine grained with 1-2" thick poorly-graded, fine GRAVEL with SAND (GP) interbeds; horizontally dipping. [NATIVE]		CP, DS, PA (Bulk)
3				
4		Total Depth=3.5 feet. No Groundwater Encountered Backfilled with soil cuttings		
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
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17				
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29				
30				

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PROJECT NUMBER:	BORING NUMBER: SHEET 1 OF 1

BORING LOG EXPLANATION

PROJECT: PG&E Topock; Pipeline F Retaining Wall LOCATION :

ELEVATION : DRILLING CONTRACTOR :

DRILLING METHOD AND EQUIPMENT :

WATER LEVELS : -- START : END : LOGGER :

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (ft)	#TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
	1.0				Sample Interval: Top/Bottom (ft. bgs) Amount of Sample Recovered (ft)	Comments
	2.5	1.5			bgs = below ground surface	Comments and observations regarding drilling or sampling made by the driller or field personnel.
	3.5				Sample Type - Sample Number	PP=Pocket Penetrometer in tons/sqft
5	5.0		1		(SPT) Standard split-spoon drive sampler, 2.0-inch (51-mm) outside diameter, 1.4-inch (35-mm) inside diameter, (without liners)	Laboratory tests include the following:
					(Ring) Modified California split-spoon drive sampler, 3.0-inch (76-mm) outside diameter, 2.4-inch (64-mm) inside diameter (with ring liners)	M Moisture Content (ASTM D-2216)
10					(B) Bulk sample collected from drill cuttings	UW Dry Unit Weight (ASTM D-2937) in pounds per cubic foot (pcf)
						PA Grain Size analysis (ASTM D-422) with or without hydrometer analysis
						PI Atterberg Limits (ASTM D-4318)
						DS Direct Shear (ASTM D-3080)
						CR Corrosion Suite (California Test Methods 532, 643, 417, 422)
15	15.0					CP Max Density/Opt Moisture (ASTM D-1557)
	16.5			3-5-6 (11)		
20						
25						
30						

Standard Penetration Test Results

Number of blows required to advance driven sampler over three 6-inch (152-mm) increments. Number in parenthesis is the total number of blows required to advance the sampler 12-inch (305 mm) beyond the first 6-inch (152-mm) interval. Drive samplers advanced using a 140 lb (63.5 kg) Hammer with the 30-inch (762-mm) drop. The blow counts given have not been modified to account for field and/or depth conditions.

General Notes

1) Soil classifications are based on the Unified Soil Classification System. Classifications and descriptions made in the field have been modified based on the results of laboratory testing. The relative density / consistency presented on the logs are based on blow counts corrected for the Cal Modified sampler, and for N60

2) Boring logs depict subsurface conditions only at the specific locations and times the boring was made. Logs do not necessarily reflect strata variations that may exist between boring locations.

Attachment C
Soil Sampling Locations and Available Soil Analytical Results
(Soil Data Presented in Excel File)

LEGEND

- Soil Sample Location

N

0 100 200

Feet

Baseline and Opportunistic Soil Sampling Locations

November 2018 Monthly Progress Report
Groundwater Remedy Phase 1 Construction
PG&E Topock Compressor Station, Needles, California

Attachment D
Perimeter Air Sampling Analytical Results

Attachment D. Perimeter Air Sampling Analytical Results

In conformance with the approved *Construction/Remedial Action Work Plan for the Final Groundwater Remedy, PG&E Topock Compressor Station, Needles, California* (CH2M, 2015), air monitoring has been conducted during construction to evaluate the ongoing effectiveness of the dust control program, to guide modifications to field activities and engineering control measures, if necessary, and to document that construction activities do not result in the migration of soil contaminants beyond the work area boundaries.

Perimeter air monitoring has been performed if construction activities have the potential to generate visible dust. The air monitoring program consists of both real-time fugitive dust monitoring and perimeter air sampling for select soil contaminants. Locations to be monitored and sampled are as follows:

- Real-time fugitive dust monitoring is performed at the perimeter of the work areas (outside of the exclusion zone) that have the potential to generate visible dust, including the Construction Headquarters (CHQ) and the Soil Processing Yard (SPY).
- Perimeter air sampling for hexavalent chromium is performed at the perimeter of the work areas (outside of the exclusion zone) that are inside Areas of Concern (AOCs) within the construction footprint where hexavalent chromium concentrations in soil have been historically reported. Air sampling for hexavalent chromium in the SPY will be performed when soil from AOCs with reported concentrations of hexavalent chromium is actively being processed. Air sampling may also be performed at other work areas at the site based on hexavalent chromium concentrations reported from new soil data or based on field observations during construction activities.
- Air sampling for asbestos will be limited to work areas where Asbestos Containing Material (ACM) has been observed in prior field investigations, including two areas in AOC 12 and one area in AOC 4. Perimeter air monitoring may also be performed at other work areas at the site if ACM is discovered during construction activities.

Project-specific levels of concern (LOC) and action levels were developed as an indicator to determine whether additional dust control measures, as presented in the project's Dust Control Plan required by the Mojave Desert Air Quality Management District (MDAQMD), are necessary.

- The LOCs, which represent conservative concentrations of compounds that receptors outside the work area could be safely exposed to during construction, have been evaluated for all compounds that have been detected in soil samples collected at the site in the prior investigations. The LOCs were developed using standard U.S. Environmental Protection Agency (USEPA) and California Environmental Protection Agency risk assessment methodology, toxicology data, and exposure assumptions (USEPA, 2009, 2017; California Department of Toxic Substances Control [DTSC], 2018). Both cancer and noncancer health effects were considered. For each type of health effect, the LOC was back-calculated from an established target or from acceptable cancer risk or noncancer hazard where USEPA or DTSC toxicity values are available. The LOCs for cancer effects are based on a target excess cancer risk of one in a million (1×10^{-6}). The LOCs for noncancer effects are based on a target hazard quotient of 1. The LOCs were developed using these assumptions:
  - Receptors are present outside the perimeter of the work areas
  - Exposure via inhalation is 10 hours per day for a 10 days on /4 days off schedule
  - Duration of Phase 1 of the final groundwater remedy construction is 20 months
- The action level for fugitive dust monitoring is 100 micrograms per cubic meter ($\mu g/m^3$) for a net (downwind minus upwind) dust concentration. This action level is based on MDAQMD Rule 403, Part C. A 10-hour time-weighted average of readings collected throughout the work day will be used to document compliance with MDAQMD Rule 403.
- For analytes detected in soil, the following equation was used to calculate maximum allowable airborne particulate concentrations for receptor exposure outside the work area (based on the approach presented by Marlowe (1999):

$$AL = \frac{LOC\ x\ 1{,}000{,}000\ mg/kg}{CS}$$

Where:

AL = action level for airborne particulates (µg/m^3)

LOC = Project specific risk-based level of concern (µg/m^3)

CS = maximum detected concentration of compound in site soil (milligrams per kilogram [mg/kg])

Action levels were determined as follows:

- Soil data from prior investigations were gathered for the entire site.
- Sample locations within the maximum construction footprint were evaluated. Some sample locations were removed from evaluation as they were within the compressor station in locations where no construction activities will actually occur.
- The maximum reported soil concentration for each compound was determined and then used to calculate an airborne particulate action level.
- All compounds had allowable airborne particulate action levels greater than 100 µg/m^3 except for hexavalent chromium at a few locations.
- Lead does not have USEPA or DTSC toxicity values; however, an action level was calculated using the DTSC (2011) LeadSpread 8 model. This is based on the maximum reported soil concentration for lead of 1,400 mg/kg from samples collected within the construction footprint and a blood level of concern through inhalation of 1 microgram per deciliter. The resulting action level for lead is 548 µg/m^3.
- Therefore, keeping fugitive dust below the action level 100 µg/m^3 will result in airborne particulate concentrations of contaminants (other than hexavalent chromium) remaining below their respective LOCs.
- Fugitive dust monitoring will be used to evaluate airborne contaminants in dust for all compounds except for hexavalent chromium.

In November 2018, real time dust monitoring was conducted at the perimeter of the work areas (outside of the exclusion zone). On November 12, 2018, during the excavation associated with the CHQ access road, temporary exceedance of the action level for fugitive dust monitoring (100 µg/m^3) was observed and additional water was applied to control fugitive dust.

No perimeter air sampling for hexavalent chromium was conducted in November 2018.

References Cited:

California Department of Toxic Substances Control (DTSC). 2011. LeadSpread 8. https://www.dtsc.ca.gov/AssessingRisk/LeadSpread8.cfm.

California Department of Toxic Substances Control (DTSC). 2018. Human Health Risk Assessment Note 3 – DTSC-Modified Screening Levels (DTSC-SLs), California Department of Toxic Substances Control, Human and Ecological Risk Office (HERO). January.

Marlowe, C. 1999. *Safety Now! Controlling Chemical Exposures at Hazardous Waste Sites with Real-Time Measurements*. Fairfax, Va.: American Industrial Hygiene Association Press.

U.S. Environmental Protection Agency (USEPA). 2009. *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment)*. Final. OSWER 9285.7-82. January.

U.S. Environmental Protection Agency (USEPA). 2017. Regional Screening Levels (RSLs)—Generic Tables. November.

Table 1
Perimeter Air Sampling Results
Groundwater Remediation Phase 1 Construction
PG&E Topock Compressor Station, Needles, California

Location ID	Location	Date	Sample Type	Hexavalent Chromium (ug/m3)
AOC13-D1	AOC13 Downwind 1	10/09/18	N	0.000732 J
AOC13-D2	AOC13 Downwind 2	10/09/18	N	0.000709 J
AOC13-U	AOC13 Upwind	10/09/18	N	ND (0.000172)

Notes:

ug/m3	field duplicate
J	concentration or reporting limit estimated by laboratory or data validation
N	primary sample
ND	not detected at the listed reporting limit

Attachment E
Noise Monitoring Results
(SEIR NOISE-2 Requirement)

Attachment E. Noise Monitoring Results

In conformance with the SEIR Mitigation Measure NOISE-2, noise monitoring has been conducted with ANSI S1.4 Type 1, precision sound level meters when construction activities are within the specified distance (e.g., 1,850 feet from sensitive receptors in California) at approved monitoring locations previously determined in coordination with the Tribes and land owners/managers (refer to Figures 1, 2 and 3). The goal of the noise monitoring is to identify if noise levels from project construction activities exceed applicable standards of the San Bernardino and Mohave County codes. Exceedance of standards would require coordination with the Tribes and land owners/managers to evaluate the potential constraints and locations for temporary engineered acoustical barriers. Consistent with the request of the Tribes, monitoring equipment is not left at the approved monitoring locations, rather it is mounted on a tripod for attended representative measurements and removed when the monitoring event is complete.

When a new construction activity is conducted or a previously monitored construction activity is conducted closer to a noise-sensitive area, monitoring is conducted at more frequent intervals to evaluate the potential need for an acoustical barrier. As the activities continue in the same location and multiple attended measurements indicate that the applicable standard has not been exceeded by the construction activity, periodic attending monitoring events are conducted to confirm continued compliance.

The attended monitoring events document the A-weighted L_{eq} sound level at periodic intervals (e.g., 5-, 10-, 15-, 20-, 30-, 40-, 50- and 60-minutes). The trend of the data at these intervals is evaluated in the field to assess the stability in the sound level to determine the duration of the monitoring event. When this interval data is relatively stable or clearly below the standard, the attended monitoring event will typically be 15- to 30-minutes in duration. As the applicable standards are in terms of the 24-hour average L_{dn} which is based on the L_{eq} metric, the measured L_{eq} is compared to the applicable L_{dn} standard for mobile noise sources (i.e., 60 dBA for Park Moabi, 65 dBA at all other locations). This results in a reasonable and conservative assessment given construction activities are not emitting noise continuously over a 24-hour period nor are they occurring during the nighttime hours (10 p.m. to 7 a.m.).

Over 40 monitoring events have been conducted at the Park Moabi monitoring location (Figure 1). These measurements were occasionally contaminated by high winds, which results in elevated levels of pseudo-noise on the microphone. Outside of these events, the sound level typically varied between 45 to 55 dBA, with 60 dBA being marginally exceed less than 5 times from vehicular or train traffic rather than construction activities.

Over 60 monitoring events have been conducted at Maze B-Combined Area 1/2 (Figure 2) and the associated alternate location for MW-L drilling activities. While some of these measurements are contaminated by high winds, others are influenced by periodic train pass-by's, clean samples of drilling noise have not identified exceedances of 65 dBA. One monitoring event resulted in 65 dBA which included train and aircraft overflight noise while the remainder were generally less than 62 dBA.

Over 15 monitoring events have been conducted at Maze C-Area 1 (Figure 2). One measurement resulted in 60 dBA while the remainder were generally less than 55 dBA.

Less than 10 monitoring events have been conducted at Maze A-Area 2 (Figure 3). Four measurements were 61 dBA and the remainder were typically less than 54 dBA.

Less than 10 monitoring events have been conducted at Maze A-Area 3 (Figure 3). Five measurements were between 59 and 62 dBA and noted not to be associated with construction activities while the remainder were typically less than 52 dBA.

Noise monitoring conducted through November 2018 had not identified that construction activities exceed the applicable standards. In addition, there has no complaints resulting from project construction-related noise. Therefore, the temporary acoustical barriers have not been necessary. Monitoring will continue as work progresses and moves into new areas to identify when an acoustical barrier needs to be considered.

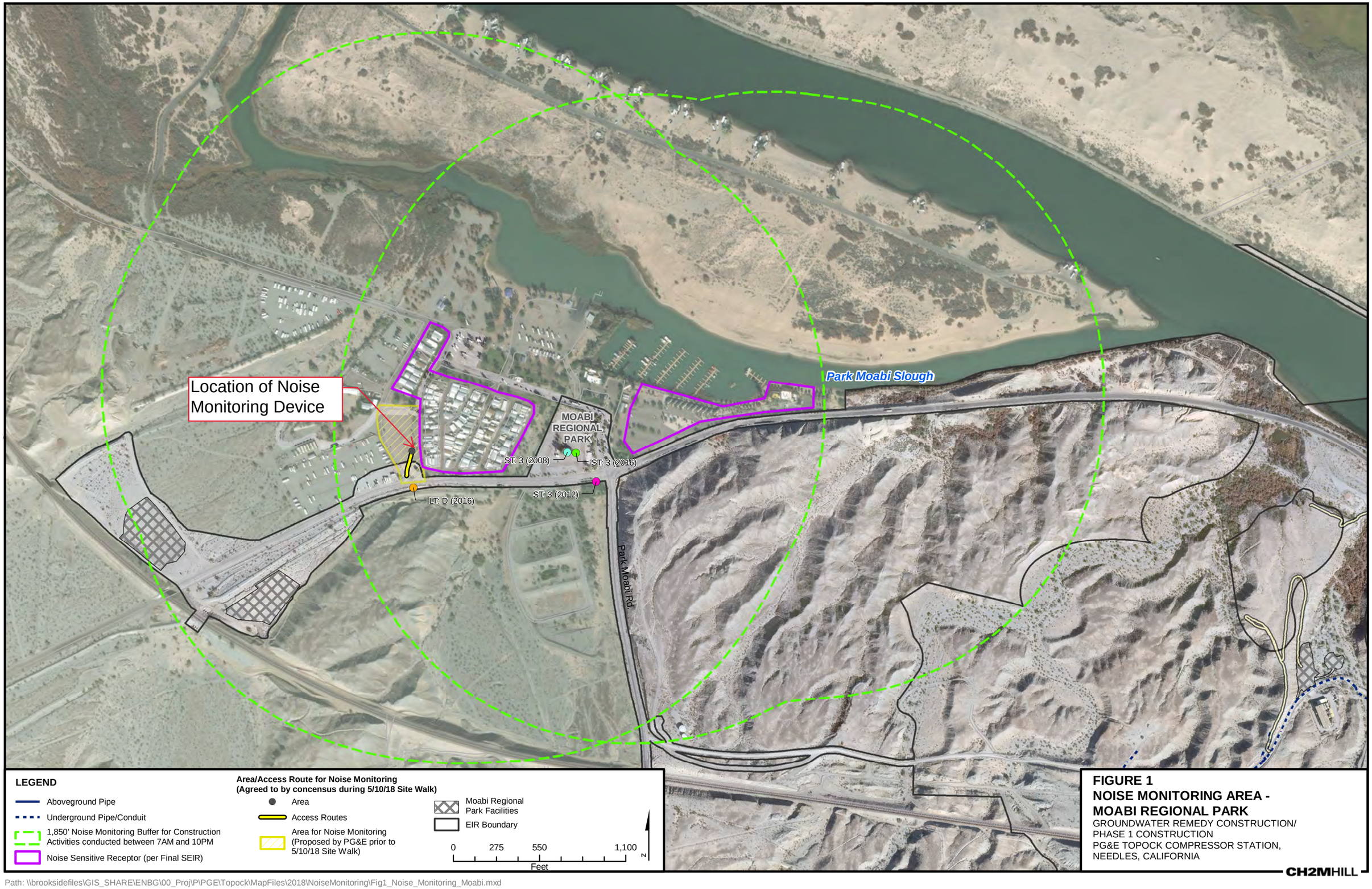

FIGURE 1
NOISE MONITORING AREA - MOABI REGIONAL PARK
GROUNDWATER REMEDY CONSTRUCTION/
PHASE 1 CONSTRUCTION
PG&E TOPOCK COMPRESSOR STATION,
NEEDLES, CALIFORNIA

CH2MHILL

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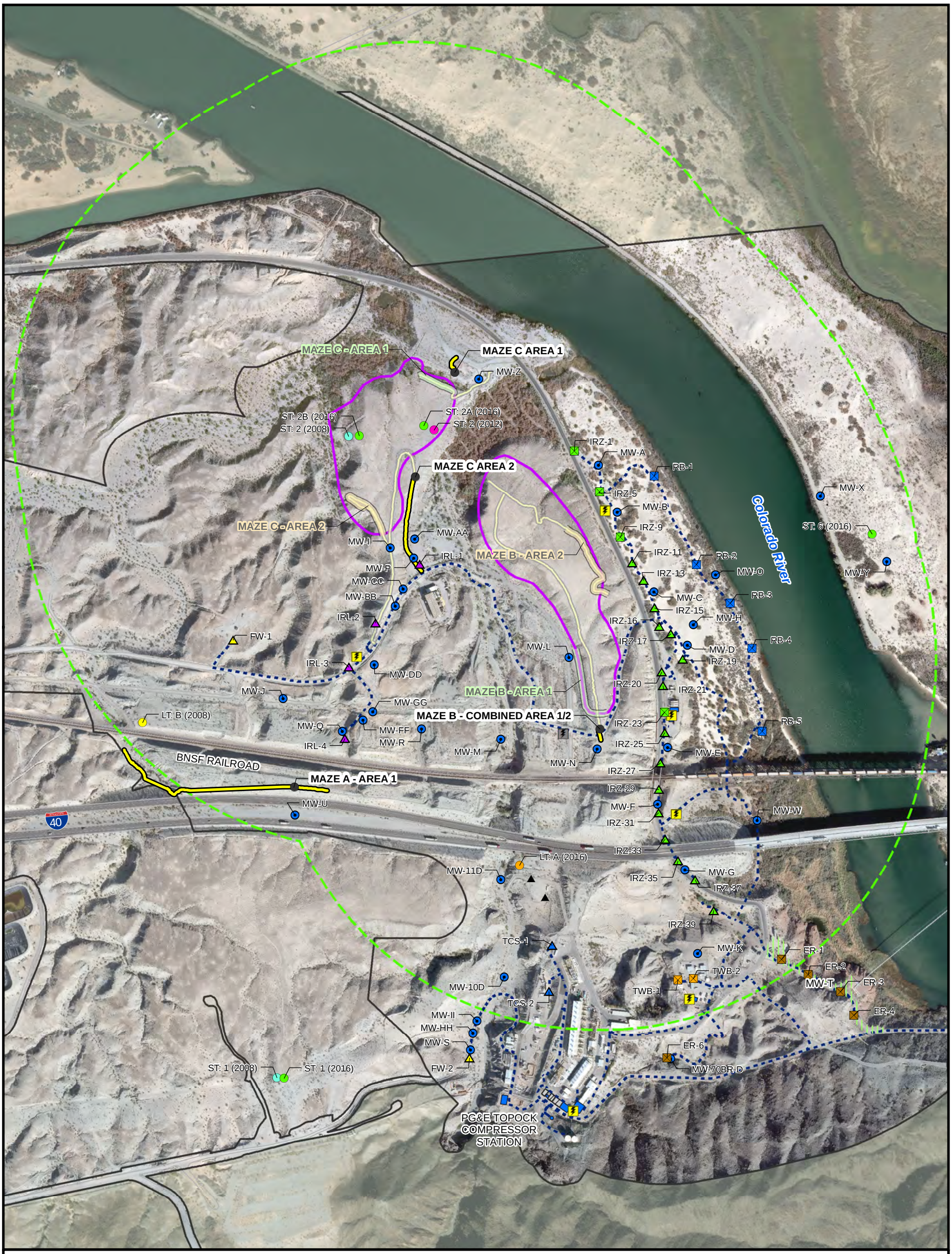

LEGEND

Planned Wells:
- Extraction, East Ravine
- Extraction, NTH IRZ
- Extraction, Riverbank
- Extraction, Transwestern Bench
- Injection, Freshwater
- Injection, Inner Recirculation Loop
- Injection, NTH IRZ
- Injection, Topock Compressor Station
- Remedy Monitoring Well
- Recirculation Well
- Area for Monitoring Well MW-T

Pipeline Corridor for Remedy
- Underground Pipe/Conduit

Remedy Facilities
- Planned Transformer
- Future Provisional Transformer
- Proposed Remedy Structure
- Contingent Freshwater Pre-injection Treatment System
- 1,850' Noise Monitoring Buffer for Construction Activities conducted between 7AM and 10PM
- Noise Sensitive Receptor (per Final SEIR)
- EIR Boundary

Areas/Access Routes for Noise Monitoring (Agreed to by concensus during 5/10/18 Site Walk)
- Area
- Access Route

Areas for Noise Monitoring (Proposed by PG&E Prior to 5/10/18 Site Walk)
- Area 1
- Area 2
- Access Route

N

0 275 550 1,100
Feet

FIGURE 2
NOISE MONITORING AREAS- NORTH OF I-40
GROUNDWATER REMEDY CONSTRUCTION/ PHASE 1 CONSTRUCTION
PG&E TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

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MW-Z
ST: 2B (2016)
ST: 2 (2008)
ST: 2A (2016)
ST: 2 (2012)
IRZ-1
MW-A
RB-1
IRZ-03
IRZ-5
MW-B
IRZ-9
Colorado River
MW-AA
MW-I
IRL-1
MW-P
IRZ-11
RB-2
MW-O
MW-CC
IRZ-13
MW-C
RB-3
MW-BB
IRZ-15
IRL-2
IRZ-16
MW-H
RB-4
FW-1
IRZ-17
MW-L
MW-D
IRL-3
IRZ-19
MW-DD
LT: B (2016)
IRZ-20
MW-J
IRZ-21
MW-GG
LT: B (2008)
RB-5
MW-Q
IRZ-23
MW-FF
MW-R
IRL-4
IRZ-25
MW-E
MW-M
MW-N
BNSF RAILROAD
IRZ-27
IRZ-29
MW-U
MW-F
MAZE A - AREA 2
IRZ-31
MW-W
MAZE A - AREA 1
LT: A (2016)
IRZ-33
IRZ-35
MW-G
MW-11D
IRZ-37
MAZE A - AREA 2
IRZ-39
TCS-1
MW-K
ER-1
TWB-2
MW-T
MW-10D
TWB-1
TCS-2
MW-II
MW-HH
MW-S
ER-6
FW-2
MW-70BR-D
ST: 1 (2008)
ST: 1 (2016)
MAZE A - AREA 3
PG&E TOPOCK
COMPRESSOR
STATION
MAZE A - AREA 3

LEGEND

Planned Wells:
- Extraction, East Ravine
- Extraction, NTH IRZ
- Extraction, Riverbank
- Extraction, Transwestern Bench
- Injection, Freshwater
- Injection, Inner Recirculation Loop
- Injection, NTH IRZ
- Injection, Topock Compressor Station
- Remedy Monitoring Well
- Recirculation Well

Area for Monitoring Well MW-T

Pipeline Corridor for Remedy
- Underground Pipe/Conduit

Remedy Facilities
- Planned Transformer
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- Noise Sensitive Receptor (per Final SEIR)
- EIR Boundary

Areas/Access Routes for Noise Monitoring (Agreed to by concensus during 5/10/18 Site Walk)
- Area
- Access Route

Areas for Noise Monitoring (Proposed by PG&E Prior to 5/10/18 Site Walk)
- Area 1
- Area 2
- Area 3
- Access Route

N

0 275 550 1,100
Feet

FIGURE 3
NOISE MONITORING AREAS - SOUTH OF I-40
GROUNDWATER REMEDY CONSTRUCTION/
PHASE 1 CONSTRUCTION
PG&E TOPOCK COMPRESSOR STATION,
NEEDLES, CALIFORNIA

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Attachment F
Six-Week Look-Ahead Schedule
(December 11, 2018 through January 19, 2019)

Topock Final Groundwater Remedy Construction
Field Work Look-ahead Schedule

PG&E Topock Final Groundwater Remedy	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Primary Planned Activities	**12/9/2018**	**12/10/2018**	**12/11/2018**	**12/12/2018**	**12/13/2018**	**12/14/2018**	**12/15/2018**
Start Time (PST)	No Work	6:30 AM	6:30 AM	6:30 AM	6:30 AM	6:30 AM	6:30 AM
Construction Headquarters Access Road E1		Excavation for footings	Form installation	Forms & rebar installation	Forms & rebar installation	Forms & rebar installation	Forms & rebar installation (tentative)
Well Installation		--	MW-L (E5), IRZ-09 (E5), IRZ-25 (F5), IRZ-21 (F5) site prep, MW-B site prep (E5)	MW-L (E5), IRZ-25 (F5), MW-B site prep (E5), IRZ-21 (F5) site prep	IRZ-25 (F5), MW-B (E5), MW-L (E5), IRZ-21 (F5) site prep	MW-L (F5), IRZ-21 (F5), MW-B (E5), IRZ-27 site prep (F5)	MW-L (F5), IRZ-21 (F5), MW-B (E5), IRZ-27 site prep (F5)
Other site activities			Goundwater sampling at MW-15 (G4)				
Primary Planned Activities	**12/16/2018**	**12/17/2018**	**12/18/2018**	**12/19/2018**	**12/20/2018**	**12/21/2018**	**12/22/2018**
Start Time (PST)	6:30 AM	6:30 AM	6:30 AM	6:30 AM	6:30 AM	6:30 AM	No Work
Construction Headquarters Access Road E1	Forms & rebar installation (tentative)	Forms & rebar installation	Concrete placement	Water stop installation	Concrete placement	Strip forms	
Well Installation	MW-N (F5), IRZ-21 (F5), MW-B (E5), IRZ-27 site prep (F5)	MW-N (F5), IRZ-21 (F5), MW-B (E5), IRZ-27 site prep (F5)	MW-N (F5), IRZ-21 (F5), MW-B (E5), IRZ-27 site prep (F5)	MW-N (F5), IRZ-21 (F5), MW-B (E5), IRZ-27 site prep (F5)	MW-N (F5), IRZ-21 (F5), MW-B (E5), IRZ-27 site prep (F5)	--	
Well Development & Testing		MW-L (E5)	MW-L (E5)	MW-L (E5)	--	--	
Primary Planned Activities	**12/23/2018**	**12/24/2018**	**12/25/2018**	**12/26/2018**	**12/27/2018**	**12/28/2018**	**12/29/2018**
Start Time (PST)	No Work	No Work	No Work	No Work	No Work	No Work	No Work
Construction Headquarters E1							
Well Installation							
Primary Planned Activities	**12/30/2018**	**12/31/2018**	**1/1/2019**	**1/2/2019**	**1/3/2019**	**1/4/2019**	**1/5/2019**
Start Time (PST)	No Work	No Work	No Work	No planned intrusive work - remobilization to the site from the holiday break.	6:30 AM	6:30 AM	6:30 AM
Soil Processing Yard (D1)					Perimeter Fence Install	Perimeter Fence Install	
Pre-Trenching/Excavation Potholling and Characterization (F5), (G5)					Potholing, Air-vac (tentative)	Potholing, Air-vac (tentative)	
Well Installation					MW-N (F5), IRZ-27 (F5), MW-B (E5), MW-O site prep (E5), MW-F site prep (F5)	MW-N (F5), IRZ-27 (F5), MW-B (E5), MW-O site prep (E5), MW-F site prep (F5)	MW-N (F5), IRZ-27 (F5), MW-B (E5), MW-O site prep (E5)
Other site activities					Site walk at MW-X and MW-Y'		
Primary Planned Activities	**1/6/2019**	**1/7/2019**	**1/8/2019**	**1/9/2019**	**1/10/2019**	**1/11/2019**	**1/12/2019**
Start Time (PST)	6:30 AM	6:30 AM	6:30 AM	6:30 AM	6:30 AM	6:30 AM	No Work
Soil Processing Yard (D1)		Perimeter Fence Install	Perimeter Fence Install	Perimeter Fence Install	Perimeter Fence Install	Perimeter Fence Install	
Pre-Trenching/Excavation Potholling and Characterization (F5), (G5)		Potholing, Air-vac (tentative)	Potholing, Air-vac (tentative)	Potholing, Air-vac (tentative)	Potholing, Air-vac (tentative)	Potholing, Air-vac (tentative)	
Well Installation	MW-N (F5), IRZ-27 (F5), IRZ-09 (E5), MW-O (E5)	MW-N (F5), IRZ-27 (F5), MW-O (E5)	MW-N (F5), IRZ-27 (F5), MW-O (E5),	MW-N (F5), IRZ-27 (F5), MW-O (E5),	MW-F (F5), MW-N (F5), MW-O (E5),	--	
Primary Planned Activities	**1/13/2019**	**1/14/2019**	**1/15/2019**	**1/16/2019**	**1/17/2019**	**1/18/2019**	**1/19/2019**
Start Time (PST)	No Work	6:30 AM	6:30 AM	6:30 AM	6:30 AM	6:30 AM	6:30 AM
Soil Processing Yard (D1)		Perimeter Fence Install	Perimeter Fence Install	Perimeter Fence Install	Perimeter Fence Install	Perimeter Fence Install	
Construction Headquarters E1		Site-wide clearing & grading Rip Rap installation	Site-wide clearing & grading Rip Rap installation	Site-wide clearing & grading Rip Rap installation	Site-wide clearing & grading	Site-wide clearing & grading	
Pipeline Alignment grubbing and clearing E5, F5, C5, F6		Pending ERTC 'Pipeline C1, C2, C3, C4, C5, C7, C8, C9, C10, C14, C17, F1	Pending ERTC 'Pipeline C1, C2, C3, C4, C5, C7, C8, C9, C10, C14, C17, F1	Pending ERTC 'Pipeline C1, C2, C3, C4, C5, C7, C8, C9, C10, C14, C17, F1	Pending ERTC 'Pipeline C1, C2, C3, C4, C5, C7, C8, C9, C10, C14, C17, F1	Pending ERTC 'Pipeline C1, C2, C3, C4, C5, C7, C8, C9, C10, C14, C17, F1	
Pre-Trenching/Excavation Potholling and Characterization (F5), (G5)		Potholing, Air-vac (tentative)	Potholing, Air-vac (tentative)	Potholing, Air-vac (tentative)	Potholing, Air-vac (tentative)	Potholing, Air-vac (tentative)	
Well Installation		--	MW-N (F5), MW-O (E5), MW-F (F5), MW-M site prep (F5)	MW-N (F5), MW-O (E5), MW-F (F5), MW-M site prep (F5)	MW-N (F5), MW-O (E5), MW-F (F5), MW-M site prep (F5)	MW-N (F5), MW-O (E5), MW-F (F5), MW-M site prep (F5)	MW-N (F5), MW-O (E5), MW-F (F5), MW-M site prep (F5)

Note - The timing of field activities are estimated and may change day-to-day based on site conditions, field progress, or other factors.
When planning to visit the site to observe a specific activity or area, please contact Curt Russell (760-791-5884) for the latest schedule information.


C1
C2
C4
D1
D2
D3
D4
D5
D6
E1
E2
E3
E4
E5
F2
F3
F5
F6
G2
G3
G4
G6
H3
H4
Provisional Wall
Existing Wall
Planned Wall
Aboveground Pipe
Underground Pipe/Conduit
Future Provisional Pipe
Other Structures or Areas
0 250 500 1,000 Feet
0 50 100 200 300 400 Meters
1:10,000

Attachment G
Available Groundwater Monitoring Data
(DTSC Condition of Approval xi)

Attachment G. Available Groundwater Monitoring Data

Pursuant to Condition of Approval # xi in DTSC's approval letter dated August 24, 2018 (DTSC, 2018a), PG&E is required to report data from samples collected as part of the sitewide groundwater monitoring program within 60 days of sample collection. In compliance with this requirement, PG&E has submitted validated data to DTSC via monthly emails. For ease of recordkeeping and to minimize the number of ad-hoc compliance reports/emails, PG&E will include validated data in each monthly progress report starting with this November 2018 report.

ARCADIS Design & Consultancy for natural and built assets

GMP 2018-10 GMP Sampling

				Filtered:	F	N	N	N	N	N	N	N	F	F	F	F	F	F
				Lab:	ASSET	ASSET	ASSET	ASSET	ASSET	ASSET	ASSET	ASSET	ASSET	ASSET	ASSET	ASSET	ASSET	ASSET
				Description:	Hexavalent Chromium	Alkalinity, Total as CaCO3	Chloride	pH	Specific Conductance	Sulfate	Total Dissolved Solids	Nitrate/Nitrite as Nitrogen	Calcium, Dissolved	Total Dissolved Chromium	Iron, Dissolved	Magnesium, Dissolved	Manganese, Dissolved	Sodium, Dissolved
				Units:	µg/L	mg/L	mg/L	SU	uS/cm	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg/L	µg/L	mg/L
				Method:	EPA 218.6	SM 2320 B	EPA 300.0	SM4500-HB	EPA 120.1	EPA 300.0	SM 2540 C	SM 4500-NO3 F	EPA 200.7	EPA 200.8	EPA 200.7	EPA 200.7	EPA 200.8	EPA 200.7
Location ID	**Sample Type**	**Sample ID**	**Matrix**	**Date Collected**														
PE-01	N	PE-01-1018	GW	10/2/2018	7.6	260	1,100	7.4	4,400	360	2,600	0.33	180	5.6	ND (20)	41	30	670
TW-03D	N	TW-03D-1018	GW	10/2/2018	480	150	2,100	7.3	7,500	500	4,300	2.6	210	500	ND (20)	25	12	1,300

ARCADIS Design & Consultancy for natural and built assets

RMP 2018-09 GMP Sampling

				Filtered:	F	N	N	F	F	F	F	F
				Lab:	ASSET	ASSET	ASSET	ASSET	ASSET	ASSET	ASSET	ASSET
				Description:	Hexavalent Chromium	Specific Conductance	Nitrate/Nitrite as Nitrogen	Arsenic, Dissolved	Total Dissolved Chromium	Manganese, Dissolved	Molybdenum, Dissolved	Selenium, Dissolved
				Units:	µg/L	uS/cm	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
				Method:	EPA 218.6	EPA 120.1	SM 4500-NO3 F	SW 6020	SW 6020	SW 6020	SW 6020	SW 6020
Location ID	**Sample Type**	**Sample ID**	**Matrix**	**Date Collected**								
MW-34-100	N	MW-34-100-Q318	GW	10/1/2018	ND (1)	10,000	3.6	1.6	ND (1)	200	49	ND (0.5)
MW-44-115	N	MW-44-115-Q318	GW	10/1/2018	6.4	11,000	ND (0.05)	5.4	7	17	75	ND (0.5)
MW-46-175	N	MW-46-175-Q318	GW	10/2/2018	6.5	18,000	1		7		190	ND (2.5)
MW-46-175	FD	MW-900-Q318	GW	10/2/2018	6.5	18,000	1		7		180	ND (2.5)