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August 12, 2008

Ms. Jennifer Barr
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Subject: Installation Report for Wells on the Arizona Shore of the Colorado River at
Topock, Arizona
PG&E Topock Compressor Station, Needles, California

Dear Ms. Barr:

This letter transmits the Installation Report for Wells on the Arizona Shore of the Colorado River at Topock, Arizona. The report is submitted in conformance with the March 1, 2007 *Revised Work Plan for Well Installation and Groundwater Characterization on Arizona Shore of the Colorado River at Topock, Arizona, PG&E Topock Compressor Station, Needles, California*, as approved by the Arizona Department of Environmental Quality and the United States Department of the Interior. This report also contains the post-construction report required by Lease PRC 8737.1 between the California State Lands Commission and PG&E and the reporting requirements of Right of Way No. 14-112077 between the Arizona State Land Department and CH2M HILL.

PG&E appreciates your consideration of the attached report. Please contact me at (805) 234-2257 with any questions or concerns.

Sincerely,

Yvonne Meeks
Topock Project Manager

cc: Joey Pace/ADEQ
Kris Doebbler/DOI
Aaron Yue/DTSC
Susan Young/California State Lands Commission
Nancy Garcia/Arizona State Lands Department

Final Report

**Installation Report for Wells on
the Arizona Shore of the
Colorado River at
Topock, Arizona**

**PG&E Topock Compressor Station
Needles, California**

Prepared for
Arizona Department of Environmental Quality

On Behalf of
Pacific Gas and Electric Company

August 12, 2008

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155 Grand Avenue, Suite 1000
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PG&E Topock Compressor Station Needles, California

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Pacific Gas and Electric Company

August 12, 2008

This report was prepared under the supervision of an
Arizona Professional Geologist



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Senior Hydrogeologist



Jennifer Low
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Acronyms and Abbreviations

µg/L	micrograms per liter
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
bgs	below ground surface
Cr(T)	total dissolved chromium
Cr(VI)	hexavalent chromium
DOI	United States Department of the Interior
DTSC	California Department of Toxic Substances Control
GMP	Groundwater Monitoring Program
IM	Interim Measure
mg/L	milligrams per liter
mV	millivolt
MLABS®	Multilevel Angled Borehole System®
ORP	oxidation-reduction potential
PG&E	Pacific Gas and Electric Company
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act of 1976
RFI/RI	RCRA facility investigation/remedial investigation

1.0 Introduction

Pacific Gas and Electric Company (PG&E) is addressing chromium in groundwater at the Topock Compressor Station located in San Bernardino County, approximately 15 miles to the southeast of Needles, California, as shown in Figure 1-1. Investigative and remedial activities at the Topock Compressor Station are being performed under the Resource Conservation and Recovery Act (RCRA) corrective action process, as well as the Comprehensive Environmental Response, Compensation and Liability Act, under agreements with the California Department of Toxic Substances Control (DTSC), and the Department of the Interior (DOI), respectively. In Arizona, PG&E is implementing investigative activities under the Voluntary Remediation Program of the Arizona Department of Environmental Quality (ADEQ). The Voluntary Remediation Program is a streamlined process for investigation or cleanup of contaminated sites to address applicable cross-program remediation efforts.

This report documents the installation of groundwater monitoring wells near the Arizona shore of the Colorado River in the vicinity of the Topock Compressor Station and presents the results of hydraulic monitoring and the initial two rounds of groundwater sampling. Groundwater monitoring wells were installed at three locations in Arizona to provide additional groundwater characterization data for the RCRA facility investigation/remedial investigation (RFI/RI) for the Topock site. Well installation and development activities occurred during March and April 2008, and hydraulic monitoring and initial sampling activities continued through June 2008. The primary technical objectives of the groundwater investigation in Arizona were to:

- Assess chromium concentrations in groundwater near the Arizona shore of the Colorado River to bound the eastern limit of the plume in the Alluvial Aquifer.
- Assess chromium concentrations in the fluvial sediments beneath the Colorado River downstream from the chromium plume observed in the California floodplain.
- Characterize the extent of geochemical conditions that limit hexavalent chromium mobility near the Arizona shore and beneath the Colorado River.

The well installation was completed as outlined in the *Revised Work Plan for Well Installation and Groundwater Characterization on Arizona Shore of the Colorado River at Topock, Arizona* (CH2M HILL, 2007a) and the *Technical Addendum: Arizona Slant Well Design Modifications Based on Experience from California Slant Well Installation* (CH2M HILL, 2007b). The drilling, well installation, and associated activities are collectively referred to in this report as the Arizona Drilling Program.

1.1 Approvals and Authorizations

The Arizona Drilling Program was executed in conformance with the following approvals and authorizations:

- ADEQ approval of the Work Plan (ADEQ, 2007a) and ADEQ approval of the Technical Addendum (ADEQ, 2007b)
- DOI, United States Bureau of Land Management, United States Fish and Wildlife Service, and United States Bureau of Reclamation approval letter (DOI, 2008)
- Lease agreement amendment between the California State Lands Commission and PG&E (CSLC, 2007)
- Right of Entry agreement between the Arizona State Land Department and CH2M HILL (ASLD, 2007)
- Arizona Department of Water Resources (ADWR) approved Notices of Intent (Well Registration Nos. 55-215408, 55-215409, 55-215410, and 55-215411)

1.2 Report Organization

This report summarizes the work conducted as part of the Arizona Drilling Program and presents the results of the drilling, well installation, and initial groundwater sampling.

- Section 2.0 summarizes the drilling, well installation, hydraulic monitoring, groundwater sampling, and associated field activities performed.
- Section 3.0 presents the results of the drilling investigation, including lithologic observations, depth-discrete borehole groundwater sample data, initial groundwater monitoring well sample data, and hydraulic monitoring.
- Section 4.0 summarizes the work performed and results of the Arizona Drilling Program.
- Section 5.0 provides a list of works cited while compiling this report.

2.0 Summary of Field Activities

This section summarizes the drilling, well installation, and associated field activities performed in accordance with the Work Plan (CH2M HILL, 2007a) and the Technical Addendum (CH2M HILL, 2007b). Figure 2-1 presents the locations investigated during the Arizona Drilling Program. Primary tasks conducted during this program include:

- Site preparation, including a pre- and post-construction site survey.
- Drilling of two vertical boreholes at Site 1: one vertical borehole at Site 2, and one angled borehole at Site AB-2.
- Collection of lithologic core and depth-specific groundwater samples during borehole drilling.
- Installation and development of one or more groundwater monitoring wells in each borehole at Sites 1 (MW-54 well series), 2 (MW-55 well series), and AB-2 (MW-56 well series).
- Geophysical logging in the deepest wells at the vertical well sites (MW-54 and MW-55).
- Collection of initial two rounds of groundwater samples for laboratory analysis from each newly installed monitoring well.
- Monitoring of hydraulic response in wells located on both sides of the Colorado River during a May 2008 Interim Measure (IM) No. 3 groundwater extraction/injection shutdown.

The Work Plan also described that a contingency well may be installed if chromium concentrations exceed 50 micrograms per liter ($\mu\text{g/L}$) or are above natural background levels. Because these levels of chromium were not found during this investigation, the contingency well was not installed.

2.1 Site Access, Preparation, and Compliance Monitoring

An onsite biologist conducted a pre-construction survey of the drilling sites before the mobilization of equipment and a post-construction survey following the completion of well installation activities. Results of the pre- and post-construction surveys, as well as information collected during biological monitoring to assess compliance with the *Programmatic Biological Assessment for the Pacific Gas and Electric Topock Compressor Station Remedial and Investigative Action* (CH2M HILL, 2007c) and Havasu National Wildlife Refuge-required conditions for well installation are provided in the *Biological Resources Completion Report for the Arizona Drilling Project: Topock Compressor Station, Needles, California* (CH2M HILL 2008a).

The drilling sites were accessed by the approved, pre-existing routes identified in the Work Plan. No vegetation was cleared during this investigation. No listed species or nesting birds were observed during the pre-activity or post-activity surveys. All construction occurred

within previously disturbed areas. No additional areas were disturbed by the activities, and no habitat loss occurred. In addition, representatives of the Fort Mojave Indian Tribe and Colorado River Indian Tribe were present during portions of the work to observe borehole and well installation activities.

2.2 Drilling and Lithologic Logging

Borehole drilling was accomplished using a roto sonic drilling method, which involves advancing a steel drive casing and core barrel through the subsurface using a combination of rotation and vibration. This method was selected because it has the capability to drill vertically and at shallow angles; produces a continuous core from the land surface to the target drilling depth; generates minimal drilling wastes; and typically can drill through gravel, cobble, and softer bedrock formations. Water from the Colorado River was used as necessary to facilitate borehole drilling. River water has a chemical signature that is distinct from the groundwater in electrical conductivity, oxidation-reduction potential (ORP), and stable isotope ratio. Because the river water is distinctly different from the groundwater, by monitoring water chemistry during depth-specific sampling while the borehole is being drilled and during well development after the well is installed, it is possible to determine that all the water added during drilling and well installation has been removed.

The initial borehole at Site 1 and the boreholes at Sites 2¹ and AB-2² were drilled to the top of the consolidated Miocene Conglomerate. The continuous cores obtained from drilling were used to prepare the lithologic logs provided in Appendix A and subsequently were added to the Topock core archive. Lithologic descriptions for the initial borehole at Site 1 and the boreholes at Sites 2 and AB-2 were prepared under the supervision of an Arizona professional geologist based on visual inspection of the retrieved core.

Drilling activities for well installation at Sites 1 (MW-54 well series), 2 (MW-55 well series), and AB-2 (MW-56 well series) began on March 11, March 29, and April 9, 2008, respectively. Two vertical boreholes were drilled at Site 1 to 147 feet and 237 feet below ground surface (bgs), and one vertical borehole was drilled at Site 2 to 137 feet bgs. The deepest borehole at Site 1 and the borehole at Site 2 were drilled approximately 7 and 6 feet into consolidated Miocene Conglomerate bedrock, respectively. The vertical boreholes were drilled using a 6-inch-diameter core barrel followed by an 8-inch-diameter drive casing to total depth. A slant borehole at Site AB-2 was drilled at an angle of 30 degrees from horizontal with an azimuth of 270 degrees. The slant borehole was drilled to a vertical depth of 112 feet bgs, which is approximately 5 feet into consolidated Miocene Conglomerate bedrock, as referenced from the ground surface at the top of the borehole. The total drilled borehole length was 223 feet. The slant borehole was drilled using a 4-inch-diameter core barrel followed by a 6-inch-diameter drive casing to total depth. Drilling logs for each borehole are provided in Appendix A-1.

¹ The actual drilling site where work was conducted is referred to as "Site 2-Alternate" in the Work Plan; however, this site is referred to as "Site 2" throughout this document.

² The actual drilling site where work was conducted is referred to as "Site AB-2-Alternate" in the Work Plan; however, this site is referred to as "Site AB-2" throughout this document.

2.3 Depth-specific Groundwater Sampling

Depth-specific groundwater samples were collected during the installation of the deepest borehole at Site 1 and the boreholes at Sites 2 and AB-2 using the Isoflow® system. Specific sample zones and analytical results are discussed in Section 3.2.

Samples were obtained by installing the Isoflow® tools to the bottom of the borehole and retracting the drive casing to expose the Isoflow® sampling screen to the formation. Once exposed, an electric submersible pump was lowered into the Isoflow® system and was used to purge the sample interval and to obtain a sample.

To ensure the collection of a sample representative of formation groundwater, purging was conducted prior to sample collection to remove water that had been introduced during drilling. At a minimum, approximately twice the amount of water injected during the drilling of the subject interval was purged while monitoring field parameters (temperature, pH, specific conductance, and ORP). Once the minimum volume had been evacuated and field parameters had stabilized, final water quality parameters were recorded, and sample aliquots were collected for hexavalent chromium [Cr(VI)] and ferrous iron for analysis at the onsite IM No. 3 laboratory using the Hach colorimetric method. In addition, aliquots for dissolved total chromium [Cr(T)] and Cr(VI) were collected and held for confirmation laboratory analysis in the event that Cr(VI) was detected in the primary sample.

Water level in the cased borehole was monitored during purging for depth-discrete groundwater sample collection. By monitoring drawdown response with respect to the pumping rate, an estimate of borehole-specific capacity was obtained and was used as a relative measure of the permeability of the borehole at the depth of the sample. These data are considered qualitatively as screening-level data for use in selecting more permeable zones for well screens. These measurements are not considered suitable for more quantitative purposes such as model calibration.

2.4 Monitoring Well Installation and Development

The screen depth for each monitoring well was selected in consultation with ADEQ, DTSC, DOI, and other stakeholders. Screen depth selection was based on evaluation of lithologic logs and Isoflow® sample results from the initial (deepest) boreholes at each site. The materials and methods used for installation and development of vertical and slant groundwater monitoring wells are presented in the following subsections. Well installation details are summarized in Table 2-1. Well construction diagrams are provided in Appendix A-2. Notices of intent for well installation, which were filed with and approved by ADWR, and well completion reports filed with ADWR are provided in Appendix A-3 and A-4, respectively.

2.4.1 Vertical Monitoring Wells

Primary well construction activities were completed at Sites 1 and 2 on March 27 and April 2, 2008, respectively. A single monitoring well (MW-54-195) was installed in the deepest borehole at Site 1, and two nested monitoring wells (MW-54-85 and MW-54-140)

were installed in the shallower borehole. Two nested monitoring wells (MW-55-40 and MW-55-120) were installed in the borehole drilled at Site 2.

Vertical groundwater monitoring wells were installed and developed in accordance with the methods and procedures defined in the *Sampling, Analysis, and Field Procedures Manual* (CH2M HILL, 2005). The vertical monitoring wells are constructed of 2-inch-diameter polyvinyl chloride (PVC) casings and screens. The well casing and screens were installed in the borehole through the 8-inch-diameter outer rotosonic drive casing. Plastic centralizers (Kwik-Zip®) were used to center the well casing and to screen in the borehole and, for nested completions, to maintain casing separation.

Each MW-54 and MW-55 monitoring well, or nested-well pair, was completed with a protective well vault installed nearly flush with the existing ground surface. Each vault is accessible by a 10-inch-diameter steel vault cover that is secured by two bolts. To reduce the potential for vandalism, bolts with unconventional heads were used. Each vault was installed within a 3-foot by 3-foot by 4-inch-thick concrete pad. Following completion, each well was surveyed for location, ground surface elevation, and measurement reference elevation.

Following well construction and annular seal placement, the monitoring wells were developed using a surge block, bailer, and submersible pump. During development, temperature, pH, specific conductance, and turbidity were measured using field instruments. Well development was continued until the minimum purge volume had been removed, and field water quality parameters had stabilized in ranges indicative of groundwater (i.e., different water quality signature than that from the river water used during installation).

2.4.2 Slant Monitoring Wells

A multilevel groundwater monitoring well with three discrete sample collection points was installed in the angled boring at MW-56. The same slant well installation and development methods used during the installation of the California Slant Drilling Program (MW-52 and MW-53) were used for MW-56. Primary well construction activities were completed at MW-56 on April 20, 2008. As approved by ADEQ, the Multilevel Angled Borehole System® (MLABS®) well assembly, fabricated by BESST, Inc., was used to meet the technical requirements of the project (ADEQ, 2007b). The well was constructed with three polyethylene MLABS® sample filters installed at selected depths based on lithologic and depth-specific groundwater sample data collected during drilling. Each well sample filter was identified with a one-letter suffix after the well number (shallow [S], middle [M], and deep [D]). For example, the deep sampling interval at location MW-56 is identified as “MW-56D.”

The MLABS® is a modular system of 10-foot-long sections that were assembled sequentially and were inserted into the 6-inch drive casing. The individual sample filters were installed within a protective housing attached to the solid 1.5-inch-diameter PVC support riser. Sections of the riser and filter housing were joined together using specialized MLABS® centralizers and fiberglass pins. A 1.25-inch-outer-diameter steel tremmie pipe and 1-inch PVC conduit for a sounding device (used to “feel” material depths in the borehole) was inserted along with the well assembly (also in 10-foot sections), resting within grooves

machined into each centralizer. At the bottom of the assembly, the support riser was permanently pinned to an anchor centralizer, while the tremmie pipe and sounding conduit temporarily attach to the anchor centralizer via left-handed threaded adaptors.

Each sample filter was constructed of one continuous piece of porous polyethylene 3 feet long and 1 inch in diameter (mean pore diameter is 60 microns). The filter is capped on the bottom and is attached to nylon sample conveyance tubing at the top with a compression fitting. The tubing extends up the well assembly within a longitudinal recess in the support riser to a transition centralizer, at which point the tubing is fastened to a chamber with another compression fitting. Three continuous threaded, 1-inch PVC pipes are threaded into the transition centralizer (one for each chamber/sample filter) and extend to the ground surface with additional 10-foot sections. The 1-inch PVC pipes facilitate the collection of groundwater samples and the installation of pressure transducers to monitor the hydrostatic pressure in each monitoring zone.

Once the well assembly was installed to depth, the tremmie pipe and sounding conduit were unscrewed from the anchor centralizer (clockwise rotation unscrews the left-handed thread at bottom while individual joints remain tight). Prior to retracting the steel drive casing, the total depth of the borehole was verified by inserting a 0.5-inch solid PVC measurement rod through the sounding conduit. The steel drive casing, tremmie pipe, and sounding conduit were then retracted in 10-foot sections. During drive casing removal, borehole collapse around the well assembly was monitored with the measurement rod. Bentonite slurry grout seals were placed between sampling intervals. Because the slant borehole collapsed immediately upon withdrawal of the drive casing, the grout had to be injected into the collapsed section of the borehole through a tremmie pipe that extended beyond the end of the drive casing. Once the drive casing had been removed to a depth adequately above the shallowest sample filter, a surface seal was constructed by placing a continuous column of Portland cement grout via tremmie into the drive casing, and the remaining casing was removed.

MW-56 was completed with an aboveground, protective monument installed at an angle and surrounded a 3-foot by 3-foot by 4-inch-thick concrete pad with concrete-filled steel bollards at each corner. Consistent with other wells at the Topock site, each monument was secured with a padlock and was painted a pale beige color. Following completion, MW-56 was surveyed for location, ground surface elevation, and measurement reference elevation. A universal measuring point was installed within the protective monument. This measuring point is used as a reference for all depth measurements for the MW-56 well group.

Following well construction and annular seal placement, each sampling interval of the slant well was developed by pumping using a peristaltic pump. During development, temperature, pH, specific conductance, and turbidity were measured using field instruments. Well development was continued until field water quality parameters had stabilized in ranges indicative of groundwater (i.e., different water quality signature than that from the river water used during installation).

2.5 Geophysical Logging

Following well installation, cased well geophysical logs (natural gamma ray and induction) were collected in MW-54-195 and MW-55-120, which are the deepest wells installed at each vertical drilling location. Geophysical logging could not be conducted at MW-56 because of the angle of the borehole and the small diameter of the well risers and sample tubing. The geophysical logs for these drilling locations are included in Appendix B and were used to further assess the hydrogeologic characteristics of the hydrostratigraphic units in the investigation area. The induction log conducted at MW-54-195 correlates well with the sequence of fluvial sediments (fine sand, gravelly sand, and cobble-boulder gravel) that overlie the older alluvial deposits below 138 feet bgs, as observed in core samples. The induction log conducted at MW-55-120 shows an increasing conductivity with depth in the older alluvial deposits (below 47 feet bgs), which is consistent with the groundwater quality data collected during drilling and well sampling (Sections 3.2 and 3.3).

2.6 Monitoring Well Groundwater Sampling

Initial groundwater samples were collected from all newly installed monitoring wells a minimum of 3 days after the completion of well development activities. Initial samples from the vertical wells were collected on April 14 and April 15, 2008, and the initial samples from the slant well were collected on April 29, 2008. A second round of groundwater samples was collected from all newly installed wells on June 2 through June 4, 2008, approximately one month after the collection of the last initial sample. Per ADEQ (2007a), the wells are to be sampled monthly for the first 6 months after installation; however, only data from the first two events are presented in this report. Laboratory analysis and results of the groundwater samples are discussed in Section 3.3.

The monitoring wells were sampled using the methods and procedures described in the Work Plan, which are consistent with sampling procedures used by the Topock Groundwater Monitoring Program (GMP). Groundwater samples were collected from the vertical wells using a temporary adjustable-rate, electric submersible pump. Due to the small well diameter and shallow depth to groundwater, the slant wells were purged and sampled using a peristaltic pump. All wells were purged and sampled using the three-casing volume method to obtain representative groundwater samples from the aquifer zone and to be consistent with the existing monitoring wells at the site. Further, field water quality parameters (temperature, pH, specific conductance, ORP, dissolved oxygen, and turbidity) were measured and recorded during purging with an in-line water quality meter (within a flow cell) during each sampling event. Groundwater sampling activities followed the procedures, analytical methods, reporting limits, and quality control plan used for the Topock GMP, as described in the *Sampling, Analysis, and Field Procedures Manual* (CH2M HILL, 2005).

2.7 Hydraulic Monitoring

An aquifer recovery test was conducted on May 29 and May 30, 2008 and used extraction and injection wells associated with the IM No. 3 groundwater treatment facility. The purpose of the recovery test was to collect a comprehensive set of hydraulic data from site

wells, including in the newly installed wells on the Arizona side of the river, for subsequent groundwater model calibration. Groundwater extraction at wells PE-01 and TW-03D and treated groundwater injection at well IW-3 were systematically shut down and later were restarted. Forty monitoring wells were used as observation points during the test, including the five newly installed MW-54 and MW-55 vertical monitoring wells. Due to imprecision in the angle of the well casings, it is not possible to accurately determine the vertical depth of the transducers in the MW-56 wells. Therefore, the equivalent freshwater head cannot be calculated with the necessary degree of accuracy to tie the water level elevations at the slant wells into the rest of the monitoring network, and the wells were not included as monitoring wells for this recovery test. The schedule for extraction/injection shut-down and re-start is summarized as follows:

Date (2008)	Time	Event
May 29	07:06	IW-03 injection rate reduced from approximately 130 to 95 gpm PE-01 extraction rate reduced from approximately 32 to 0 gpm (off)
May 29	14:58	TW-03D extraction rate reduced from approximately 100 to 0 gpm (off)
May 29	21:58	IW-03 injection rate reduced from approximately 95 to 0 gpm (off)
May 30	07:15	TW-03D extraction restarted, pumping at approximately 100 gpm
May 30	13:55	IW-03 injection restarted, rate at approximately 130 gpm
May 30	21:15	PE-01 extraction restarted, pumping at approximately 32 gpm

gpm = gallons per minute.

Water levels in each observation well were monitored throughout the test with pressure transducers equipped with data loggers. Baseline data (i.e., data collected before the change in extraction and injection rates) were collected a minimum of 5 days before extraction/injection shutdown. Similarly, data were collected for several days following the re-start of extraction/injection. Data analysis methods and associated results, as they pertain to the Arizona Drilling Program, are presented in Section 3.4.

2.8 Investigation-derived Waste Management

Investigation-derived waste was managed in accordance with the procedures detailed in the Work Plan. Solid and liquid wastes generated during this investigation were temporarily stored at the work area in portable tanks (liquids) and hoppers (drill cuttings). As necessary, drill cuttings were transferred to lined roll-off bins located at the equipment staging area pending characterization sampling. Similarly, purge water was transferred to the IM No. 3 groundwater treatment facility for treatment and injection in compliance with California Regional Water Quality Control Board Order R7-2006-0060. Incidental trash was removed from the work area daily and transferred to a standard trash bin at the Topock Compressor Station for offsite disposal.

Approximately 10 cubic yards of drill cuttings were generated during this investigation and stored at the staging area located on the Topock Compressor Station. A composite soil characterization sample was collected following well construction activities. The sample

was collected on April 30, 2008 and was submitted to the laboratory for the same analyses used for disposal characterization of drill cuttings during previous drilling projects, including CAM metals (6010B), mercury, and percent moisture. Based on the laboratory results of the characterization sample, the soils were non-hazardous and were therefore managed onsite in accordance with previous drilling projects.

3.0 Investigation Results

This section presents the results of the lithologic and water quality sampling conducted for the Arizona Drilling Program. More detailed analysis and interpretation of the investigation results, as well as integration of the data in the Topock site hydrogeologic conceptual model, will be provided in the RFI/RI Report Volume 2 Addendum currently scheduled for submittal in late 2008.

3.1 Hydrogeology

A primary objective of the Arizona Drilling Program was to further characterize the hydrogeologic conditions near the Arizona shore of the Colorado River, as well as beneath the river channel, downstream of the chromium plume observed in the California floodplain. As discussed in Section 2.2, continuous core was collected from ground surface to several feet into consolidated Miocene Conglomerate bedrock at three locations near the Arizona shoreline.

Two hydrogeologic cross-sections – A-A', shown in Figure 3-1, and B-B', shown in Figure 3-2 – have been prepared to illustrate the drilling results and hydrogeologic data for the Arizona Drilling Program. Cross-section transect locations are illustrated in Figure 2-1. The cross-sections present the interpreted hydrostratigraphy, the installed well screen intervals, and the bedrock elevation data from Arizona drilling sites (MW-54 and MW-56) and several drilling sites on the California side of the river. Drilling data from within the channel (geotechnical CB-series borings drilled in 1962 by Caltrans) are also included on cross-section A-A'. The hydrogeologic information and bedrock elevation data from the Arizona Drilling Program will be incorporated in the site hydrogeologic conceptual model to be presented in the RFI/RI Report Volume 2 Addendum.

3.1.1 MW-54 Borehole

Both fluvial and alluvial sediments were observed in the core from the MW-54 borehole. Relatively fine-grained fluvial deposits, predominantly composed of poorly-graded fine to medium sand, were observed from ground surface to approximately 96 feet bgs. These relatively fine-grained fluvial sediments are representative of a low energy, over bank-type depositional environment; however, the sediments from the shallower portion of this interval have likely been re-deposited as dredge spoils from past efforts to widen/deepen the river channel. The deepest section of the fluvial sediments, from approximately 96 feet to 138 feet bgs (top of the alluvial sediments), are predominantly composed of cobbles, boulders, and well-graded gravels. These coarser deposits are representative of a higher-energy depositional environment (i.e., closer to the primary river channel). The alluvial sediments observed between the fluvial sequence and the underlying Miocene Conglomerate bedrock are predominantly well-graded sands that become finer-grained with depth. Approximately 35 feet of moderately consolidated sandy silt were logged above the Miocene bedrock surface (230 feet bgs). In contrast to the fluvial sediments, which are more rounded and largely yellowish-brown in color, the alluvial sediments observed are

more angular and reddish in color, likely indicating that alluvial sediments are locally derived from Miocene-age bedrock. Qualitative borehole specific capacity data collected during Isoflow® sample collection indicate that the fluvial sediments are more permeable than the underlying alluvial sediments.

3.1.2 MW-55 Borehole

The MW-55 borehole was drilled adjacent to a surface outcrop of Miocene Conglomerate bedrock and outside the primary depositional area of the river. The material observed from ground surface to approximately 97 feet bgs is predominantly locally-derived alluvial sands and gravels. The material from below 97 feet to the top of consolidated Miocene Conglomerate bedrock (131 feet bgs) is similar to that above but includes clasts of consolidated Miocene Conglomerate. Additionally, a profile of increasing specific conductance with depth was observed during the collection of Isoflow® samples below 97 feet, which is consistent with water quality trends observed in the older Tertiary alluvium at other site locations.

3.1.3 MW-56 Borehole

Beneath the Colorado River, in the area of MW-56, fluvial sediments overlie the surface of the Miocene Conglomerate bedrock. As observed in the majority of the core, sediments from ground surface to approximately 90 feet bgs are composed primarily of poorly-graded, fine-to-medium sands with little to no silt or clay. Intervals containing organic material (i.e., wood and various plant debris) were observed sporadically throughout the fluvial sediments. Well-graded fluvial sands and gravels were observed from below the fine-grained fluvial deposits to the top of the consolidated Miocene Conglomerate bedrock (107 feet bgs). No appreciable layers or thicknesses of low-permeability clay or silt (potential aquitards) were encountered in MW-56.

3.2 Depth-specific Groundwater Sample Results

As described in Section 2.3, depth-specific groundwater samples were collected during borehole drilling using the Isoflow® system for Cr(VI) and ferrous iron field laboratory analysis and for field water quality measurement. Because the groundwater samples were obtained from open boreholes during drilling (i.e., grab samples) and were analyzed by the field laboratory, the sampling results are considered screening-level data for qualitative assessment of water quality conditions in the aquifer.

During drilling, grab samples were collected as shallowly as possible and then were collected at the intervals specified in the Work Plan and as directly above bedrock as technically practicable. Thirteen grab samples were collected from the deepest borehole at MW-54, six grab samples were collected from the MW-55 borehole, and nine grab samples were collected from the MW-56 borehole. Table 3-1 summarizes the depth-discrete groundwater sample results and field water quality measurement data.

With the exception of one grab sample, Cr(VI) was not detected in any the grab groundwater samples analyzed by the IM No. 3 field laboratory. The grab sample collected from the MW-55 borehole at 57 to 67 feet bgs initially resulted in an apparent detection of Cr(VI) at the reporting limit (10 µg/L). However, upon re-analysis of the sample, Cr(VI) was

not detected at a concentration greater than or equal to the reporting limit. Ferrous iron was not detected in any of the grab samples collected at the MW-54 or MW-55 locations. However, ferrous iron was detected in seven of the nine grab samples collected below the river channel (MW-56 borehole) at concentrations ranging from 0.13 milligrams per liter (mg/L) to 2.67 mg/L. The most elevated concentrations of ferrous iron were observed at the vertical depth ranges of 22 to 27 and 52 to 57 feet bgs. Significant concentrations of ferrous iron are typical of the most geochemically reduced areas of the floodplain.

Field measurements of ORP were negative (i.e., indicative of reducing conditions) for every grab sample collected at each drilling location. Field measurements of ORP in grab groundwater samples from the vertical boreholes ranged from -65 millivolts (mV) to -244 mV. ORP measurements in grab samples from the slant MW-56 borehole ranged from -108 mV to -280 mV. Deeper grab samples generally had more negative ORP measurements (particularly in the MW-54 and MW-56 boreholes), indicating stronger reducing conditions with depth. Depth trends observed in the dissolved oxygen and specific conductance measurements also support this interpretation.

Estimations of specific capacity based on average pumping rates and drawdown measurements during grab sample collection are presented in Table 3-1. Several variables, including the degree of borehole collapse and the degree of formation disturbance induced by drilling, limit the precision of these data; however, in general, elevated specific capacity values correspond with zones of coarser-grained sediments, as observed in the core samples.

3.3 Multilevel Groundwater Monitoring Well Sampling

As discussed in Section 2.6, the initial groundwater samples were collected from each well at locations MW-54, MW-55, and MW-56 after the completion of well development. A second sample was collected approximately one month later. Results from the initial two sample events are presented in this section. Laboratory analytical results for chromium and field water quality measurement data are summarized in Table 3-2. In addition to Cr(VI) and Cr(T), groundwater samples collected during the first event (April 2008) were analyzed for a more comprehensive list of analytes including various cations and anions, total dissolved solids, and stable isotopes. The stable isotope data were useful in determining whether residual water from the Colorado River, which was used during drilling because it has an isotopic signature different than that of the groundwater, had been completely removed during well development. Results for the additional analyses are presented in Table 3-3.

Analytical results for Cr(VI) and Cr(T) for the newly installed wells from both initial sampling rounds were less than laboratory reporting limits. Concentrations of total dissolved solids increased with depth at each location, as was observed in the depth-specific samples during drilling. The cation and anion data indicate that the dissolved solids are predominantly sodium and chloride, with lesser sulfate concentrations.

Field measurements of ORP collected during the two initial groundwater sample collection events were all negative, ranging from -139 mV to -228 mV. Field measurements of specific conductance ranged from 1,580 to 24,500 microSiemens per centimeter. Generally, specific

conductance increased with depth, and the highest concentrations measured in the field were observed in MW-56D during both the sampling events.

3.4 Hydraulic Monitoring

Water level data collected from pressure transducers with data loggers during the May 29 and May 30, 2008 IM No. 3 extraction/injection shutdown (detailed in Section 2.7) were analyzed to estimate aquifer response. The data were analyzed using the deconvolution method of Halford (USGS, 2006) to screen out the hydraulic effects of fluctuations in river stage, which will obscure aquifer response in wells hydraulically connected to the river. As detailed in the *Summary Report for Hydraulic Testing in Bedrock Wells* (CH2M HILL 2008b), this analytical method has been applied for previous hydraulic evaluations at the site. For this evaluation, the deconvolution fitting period applied to most of the hydraulic data was from May 22 to May 29, which was prior to extraction/injection shutdown and most representative of background conditions. In addition, for some observation wells, background data collected after extraction/injection was re-started was used to conduct additional calculation of the river effects, and/or by the use of one of the MW-40 wells as a benchmark well representative of baseline hydraulic conditions.

After deconvolution analysis, the magnitude of aquifer response (draw-up/draw-down) at 40 observation wells was evaluated. In general, the detection limit for observable water level fluctuation was 0.2 foot. However, the detection limit for water level change in MW-26 was 0.6 foot due to an equipment malfunction. Figure 3-3 presents the hydraulic response estimated at each observation well at approximately 7:00 a.m. on May 30, 2008, which is immediately before extraction/injection was re-started and is coincident with the maximum extent of water level response observed during the shutdown. Hydraulic response attributable to the shutdown of groundwater extraction in wells PE-01 and TW-03D was observed in wells up to 1,600 feet away from the nearest extraction well. The hydraulic response attributable to the shutdown of injection well IW-3 was observed in wells up to approximately 1,300 feet away. Hydraulic response is likely present but not quantifiable on the Arizona side of the river. For the MW-54 and MW-55 monitoring well clusters, the lack of quantifiable response is likely due, in part, to the strong influence of river stage on groundwater levels due to the proximity of these wells to the river.

3.5 Data Quality Assessment

The laboratory analytical data generated from the first and second sampling events of the monitoring wells installed during the Arizona Drilling Program were independently reviewed by project chemists to assess data quality and identify deviations from analytical requirements. The quality assurance and quality control requirements are outlined in the Quality Assurance Project Plan for the PG&E Topock Program, which is Appendix D of the *Sampling, Analysis, and Field Procedures Manual, Revision 1* (CH2M HILL, 2005). A summary discussion of data quality for Arizona sampling data is presented below. Additional details are provided in the data validation reports, which are kept in the project file and are available upon request.

- **Matrix Interference:** Matrix interference was encountered in three groundwater samples that affected the sensitivity for Cr(VI) when using United States Environmental Protection Agency Method E218.6. Two Cr(VI) sample results from MW-54-195 and one result from MW-56D reflect an adjusted reporting limit of 1 µg/L as a result of the serial dilution that was required to overcome the matrix interference and provide an acceptable matrix spike recovery. No qualifier flags were applied.
- **Matrix Spike Sample:** All matrix spike acceptance criteria were met.
- **Quantitation and Sensitivity:** In addition to the matrix interference issues, a sample from MW-56D had dissolved iron and dissolved manganese reported as non-detect with elevated reporting limits. All other method and analyte combinations met the project reporting limit objectives.
- **Holding Time Data Qualification:** All method holding time requirements were met.
- **Method Blanks:** Dissolved sodium was detected at a concentration greater than the reporting limit in one method blank. However, due to the high concentrations reported in the samples, no qualifier flags were applied.
- **Equipment Blanks:** All equipment blank acceptance criteria were met.
- **Laboratory Duplicate Samples:** All laboratory duplicate acceptance criteria for the methods were met.
- **Calibration:** All initial and continuing instrument calibration criteria were met.
- **Laboratory Control Samples:** Results for three total dissolved solids samples were qualified because the relative percent difference between the laboratory control sample result and the laboratory control sample duplicate result were greater than the upper control limit of 10 percent. The detect results were “J” flagged.

For first and second sampling events at the monitoring wells installed during the Arizona Drilling Program, the completeness objectives were met for all method and analyte combinations. The analyses and data quality met the Quality Assurance Project Plan and laboratory method quality control criteria, except as noted above. Overall, the analytical data are considered acceptable for the purposes of the Arizona Drilling Program.

4.0 Summary

This report presents a summary of the installation of monitoring wells near the Arizona shore of Colorado River at Topock, Arizona. Additionally, the results of laboratory analysis of the two initial rounds of groundwater sample collection are presented. The primary objectives of the well installation program were to assess chromium concentrations and groundwater geochemical conditions beneath the Colorado River downstream from the chromium plume observed in the California floodplain and near the Arizona shore east of the Topock site for completion of the RFI/RI and for corrective measures planning.

The field investigation and sampling tasks completed included:

- Completing the necessary site preparation, including pre- and post-construction surveys.
- Performing drilling and lithologic logging of three vertical borings and one angled boring (beneath the Colorado River).
- Collecting 28 depth-discrete groundwater grab samples during drilling to provide a screening assessment of groundwater quality in the sediments adjacent and beneath the Colorado River.
- Installing five vertical groundwater monitoring wells in the three vertical borings and one multilevel groundwater monitoring well in the angled boring.
- Performing cased-hole geophysical logging in the deepest wells at the two vertical well locations (MW-54-195 and MW-55-120).
- Performing initial groundwater sampling and analyses for Cr(VI), Cr(T), and general chemistry parameters for water quality characterization at the new monitoring well locations.
- Monitoring hydraulic response in 40 wells (including the five newly installed vertical wells in Arizona) during a May 2008 IM No. 3 extraction/injection well shutdown.

The Work Plan identified a contingency well that may be installed if chromium concentrations in groundwater in the slant boring exceed the California maximum contaminant level of 50 µg/L or if concentrations of Cr(VI) are above natural background levels of 31.8 µg/L (CH2M HILL, 2008c). Because these levels of chromium were not found during this investigation, the contingency well was not installed.

Activities conducted during the Arizona Drilling Program accomplished the Work Plan objectives for characterizing chromium concentrations and natural geochemical groundwater conditions in groundwater in the Alluvial Aquifer near the Arizona shore and beneath the Colorado River. Further, monitoring points were installed for ongoing water quality and water level monitoring.

The drilling and lithologic data collected during this project have further characterized the sediment characteristics and hydrostratigraphy beneath and adjacent to the Colorado River and have confirmed the overall hydrogeologic framework. The new data confirm the following:

- At the MW-54 location, Miocene Conglomerate bedrock is overlain by older Tertiary alluvium, which is overlain by a relatively thick sequence of coarse-grained, cobble-boulder gravel, and fine-grained fluvial deposits.
- Sand and gravel of alluvial fan origin overlie Miocene Conglomerate bedrock at the MW-55 location. Fluvial sediments were not logged at this location and therefore were either not deposited or were not preserved at this drilling location.
- Predominantly fine-grained (low energy) fluvial deposits overlie Miocene Conglomerate bedrock at the MW-56 location.
- The depth of the Miocene Conglomerate bedrock encountered in the borings at each location is generally consistent with the interpretation of bedrock structure presented in the RFI/RI Report, Volume 2 (CH2M HILL, 2008d).

Groundwater quality data collected during drilling and two well sampling events indicate that a moderately to strongly reducing natural geochemical environment exists in the sediments encountered by the borings/wells. Cr(VI) would be reduced to trivalent chromium in this geochemical environment. Other than an unrepeatable Cr(VI) reading at the detection limit in one grab sample, Cr(VI) was not detected in any of the depth-specific groundwater grab samples from the borings (on-site laboratory analyses) nor in the samples collected from the developed monitoring wells during the two initial rounds of sampling (certified laboratory analyses).

The characterization data collected during the Arizona Drilling Program will be integrated into the hydrogeologic conceptual model for the PG&E Topock site and will be discussed in the RFI/RI Volume 2 Addendum. In addition, as required by ADEQ, the wells will be sampled monthly for an additional 4 months (through October 2008) following the two initial sampling events presented in this report. The results from these additional monthly monitoring events will be reported under separate covers, as the data become available, and in routine GMP monitoring reports.

5.0 References

- Arizona Department of Environmental Quality (ADEQ). 2007a. Letter to PG&E. "Review of Revised Work Plan received March 5, 2007 for Groundwater Characterization on Arizona Shore of the Colorado River at Topock, Arizona, Pacific Gas and Electric Company (PG&E) Topock Compressor Station, Needles, California." May 10.
- _____. 2007b. Letter to PG&E. "Review of Technical Memorandum: Arizona Slant Well Design Modifications Based on Experience from California Slant Well Installation, PG&E Topock Compressor Station, Needles California." July 19.
- Arizona State Land Department (ASLD). 2007. Right of Entry Agreement 14-112077 between the Arizona State Land Department and CH2M HILL. October 22.
- California State Lands Commission (CSLC). 2007. *Lease Agreement Amendment PRC 8737.1 between the California State Lands Commission and PG&E*. June 28.
- CH2M HILL. 2005. *Sampling, Analysis, and Field Procedures Manual, PG&E Topock Program, Revision 1, Topock Compressor Station, Needles, California*. March 31.
- _____. 2007a. *Revised Work Plan for Well Installation and Groundwater Characterization on Arizona Shore of the Colorado River at Topock, Arizona, PG&E Topock Compressor Station, Needles, California*. March 1.
- _____. 2007b. *Technical Addendum: Arizona Slant Well Design Modifications Based on Experience from California Slant Well Installation, PG&E Topock Compressor Station, Needles, California*. June 18.
- _____. 2007c. *Programmatic Biological Assessment for the Pacific Gas and Electric Topock Compressor Station Remedial and Investigative Action*. January.
- _____. 2008a. *Biological Resources Completion Report for the Arizona Drilling Project: Topock Compressor Station, Needles, California*. June 18.
- _____. 2008b. *Summary Report for Hydraulic Testing in Bedrock Wells. Topock Compressor Station, Needles, California*. January.
- _____. 2008c. *Groundwater Background Study Steps 3 and 4: Final Report of Results. Topock Compressor Station, Needles, California*. July 23.
- _____. 2008d. *Final RFI/RI Report, Volume 2, Topock Compressor Station, Needles, California*. July 2.
- United States Department of the Interior (DOI). 2008. Letter to Yvonne Meeks PG&E. "PG&E Topock Compressor Station Remediation Site - DOI Direction to PG&E to Implement Revised Work Plan for Well Installation and Groundwater Characterization on Arizona Shore of the Colorado River at Topock, Arizona, March 1, 2007." February 11.

United States Geological Survey (USGS). 2006. *Documentation of a Spreadsheet for Time-Series Analysis and Drawdown Estimation*. USGS Scientific Investigations Report 2006-5024.

TABLE 2-1
Summary of Well Installation Details
Installation Report for Wells on the Arizona Shore of the Colorado River at Topock, Arizona
PG&E Topock Compressor Station

Borehole Details										Well Details		
Site ID	Boring ID	Borehole Angle from Horizontal (degrees)	Azimuth (degrees)	Borehole Depth (feet drilled along slant)	Borehole Depth (feet bgs)	Lateral Projection	Ground Surface Northing	Ground Surface Eastings	Ground Surface Elevation (feet msl)	Wells Installed	Sample Filter Interval (feet drilled along slant)	Sample Filter Interval (feet bgs)
Site 1	MW-54S	---	---	---	147	---	2102958.94	7617082.61	466.39	MW-54-085	-	77-87
Site 1	MW-54S	---	---	---	147	---	2102958.94	7617082.61	466.39	MW-54-140	-	128-138
Site 1	MW-54D	---	---	---	237	---	2102951.91	7617089.25	466.28	MW-54-195	-	185-195
Site 2	MW-55	---	---	---	137	---	2102605.88	7618326.3	463.57	MW-55-045	-	37-47
Site 2	MW-55	---	---	---	137	---	2102605.88	7618326.3	463.57	MW-55-120	-	108-118
Site AB-2	MW-56	30	270	223	111.5	193	2101569	7617644.94	459.93	MW-56S	67-71	33.5-35.5
Site AB-2	MW-56	30	270	223	111.5	193	2101569	7617644.94	459.93	MW-56M	147-151	73.5-75.5
Site AB-2	MW-56	30	270	223	111.5	193	2101569	7617644.94	459.93	MW-56D	207-211	103.5-105.5

NOTES:

feet bgs feet below ground surface (datum is ground surface at top of borehole)
ft msl mean sea level

North edge of protective monument is being used as a general vertical datum for each well until universal measurement datum can be installed and surveyed.

Survey Datum: North American Datum 1983, California State Plane, Zone V, Feet

TABLE 3-1
Depth-Discrete Groundwater Sample Results and Field Measurements
PG&E Topock Compressor Station

Isoflow Sample Collection Date						Analysis Results			Isoflow Purge WQ Parameters (final reading)						Isoflow Purging Data				
Sample Interval Boring Depth (feet drilled)	Vertical Depth (ft)	Lateral Distance (ft)	Sample Date	Sample Time	Sample ID	Cr (VI) Analysis IM3 Lab (µg/L)	Ferrous Iron IM3 Lab (mg/L)	Cr(T) Analysis Certified Lab	ORP (mV)	DO (mg/L)	Specific Conduct. (µS/cm)	Temp. (°C)	pH (pHunits)	Turbidity (NTU)	Volume Purged (gallons)	Average Pumping Rate (gpm)	Drawdown (ft from TOC)	Specific Capacity (gpm/ft)	Remarks
MW-54																			
27-37	---	---	3/12/2008	1:30 PM	MW54-GGW-01	ND (10) S	ND (0.05) S	NA	-180	1.04	4,440	27.0	7.78	8.91	250	12	0.2	60.00	150 gal of water injected during drilling
37-47	---	---	3/12/2008	3:35 PM	MW54-GGW-02	ND (10) S	ND (0.05) S	NA	-169	0.30	6,140	27.1	7.65	18.6	309	13	10	1.30	180 gal of water injected during drilling
57-67	---	---	3/13/2008	9:31 AM	MW54-GGW-03	ND (10) S	ND (0.05) S	NA	-129	1.11	8,430	26.4	7.47	25.0	500	20	4.9	4.08	300 gal of water injected during drilling
77-87	---	---	3/13/2008	1:05 PM	MW54-GGW-04	ND (10) S	ND (0.05) S	NA	-112	1.68	9,570	25.7	7.48	26.7	430	20	4.5	4.44	300 gal of water injected during drilling
87-97	---	---	3/13/2008	3:50 PM	MW54-GGW-05	ND (10) S	ND (0.05) S	NA	-132	0.43	10,300	26.0	7.29	184	410	20	8.2	2.44	350 gal of water injected during drilling
97-107	---	---	3/14/2008	8:45 AM	MW54-GGW-06	ND (10) S	ND (0.05) S	NA	-130	0.29	10,600	26.0	7.40		450	10	9.6	1.04	400 gal of water injected during drilling
107-117	---	---	3/14/2008	12:55 PM	MW54-GGW-07	ND (10) S	ND (0.05) S	NA	-153	0.36	10,300	26.5	7.52	209	560	15	17.0	0.88	500 gal of water injected during drilling
127-137	---	---	3/14/2008	3:40 PM	MW54-GGW-08	ND (10) S	ND (0.05) S	NA	-117	0.79	12,000	25.1	7.87	171	560	20	4.7	4.26	500 gal of water injected during drilling
147-157	---	---	3/15/2008	9:10 AM	MW54-GGW-09	ND (10) S	ND (0.05) S	NA	-156	0.11	15,500	24.9	7.92	69.0	660	15	7.5	2.0	600 gal of water injected during drilling
167-177	---	---	3/15/2008	2:25 PM	MW54-GGW-10	ND (10) S	ND (0.05) S	NA	-181	1.66	18,700	24.8	8.13	38.0	1080	20	16	1.3	1000 gal of water injected during drilling
187-197	---	---	3/16/2008	7:55 AM	MW54-GGW-11	ND (10) S	ND (0.05) S	NA	-244	0.18	19,800	25.3	8.34	144	880	20	13.6	1.5	800 gal of water injected during drilling
207-217	---	---	3/17/2008	7:05 AM	MW54-GGW-12	ND (10) S	ND (0.05) S	NA	-243	0.36	25,100	25.5	8.06		330	10	70.4	0.1	250 gal of water injected during drilling
227-237	---	---	3/18/2008	9:25 AM	MW54-GGW-13	ND (10) S	ND (0.05) S	NA	-239	0.21	29,700	27.0	8.00	216	380	6	45.1	0.1	300 gal of water injected during drilling
MW-55																			
27-37	---	---	3/29/2008	3:55 PM	MW55-GGW-01	ND (10) S	ND (0.05) S	NA	-152	3.51	1,480	28.9	7.67	293	380	12	1.8	6.67	200 gal of water injected during drilling
37-47	---	---	3/30/2008	7:20 AM	MW55-GGW-02	ND (10) S	ND (0.05) S	NA	-96	0.36	1,790	28.1	7.64		280	15	1.7	8.82	200 gal of water injected during drilling
57-67	---	---	3/30/2008	10:35 AM	MW55-GGW-03	ND (10) S	ND (0.05) S	NA	-120	0.43	1,440	28.6	7.77	417	580	15	9	1.67	500 gal of water injected during drilling
77-87	---	---	3/30/2008	1:25 PM	MW55-GGW-04	ND (10) S	ND (0.05) S	NA	-65	1.05	1,520	28.6	8.14	65.0	555	12	9.5	1.26	450 gal of water injected during drilling
97-107	---	---	3/31/2008	10:20 AM	MW55-GGW-05	ND (10) S	ND (0.05) S	NA	-142	0.54	7,400	30.1	7.90		350	12	39.7	0.30	250 gal of water injected during drilling
117-127	---	---	3/31/2008	12:35 PM	MW55-GGW-06	ND (10) S	ND (0.05) S	NA	-77	0.60	9,340	30.5	7.88		280	12	21.7	0.55	200 gal of water injected during drilling
MW-56																			
43-53	27	46	4/10/2008	7:01 AM	MW56-GGW-01	ND (10) JS	2.67 S	NA	-237	0.42	1,890	23.2	7.26	11.9	106	2.0	NA	---	27 vertical depth, 46 horizontal
63-73	37	63	4/10/2008	9:00 AM	MW56-GGW-02	ND (10) S	ND (0.05) S	NA	-108	0.81	7,080	22.4	7.26	7.10	262	12	5	7.47	170 gal water injected; 37 vertical depth, 63 horizontal
83-93	47	81	4/10/2008	11:20 AM	MW56-GGW-03	ND (10) JS	0.375 S	NA	-174	0.34	10,300	24.7	7.22	4.00	178	4	9.5	1.31	150 gal of water injected; 47 vertical depth, 81 horizontal
103-113	57	98	4/10/2008	3:37 PM	MW56-GGW-04	ND (10) JS	2.56 S	NA	-198	0.27	13,600	29.3	7.13	63.0	159	0.5	14.4	0.11	150 gal of water injected; 57 vertical depth, 98 horizontal
123-133	67	115	4/11/2008	11:10 AM	MW56-GGW-05	ND (10) S	0.222 S	NA	-146	0.00	14,800	24.4	6.98	14.6	185	2	19.8	0.31	150 gal of water injected; 67 vertical depth, 115 horizontal
143-153	77	133	4/11/2008	2:22 PM	MW56-GGW-06	ND (10) S	0.75 S	NA	-175	0.00	14,700	24.2	7.13	15.4	178	1.7	14.4	0.37	150 gal of water injected; 77 vertical depth, 133 horizontal
163-173	87	150	4/12/2008	7:30 AM	MW56-GGW-07	ND (10) S	0.13 S	NA	-248	0.00	17,000	22.9	7.80	5.72	227	3.5	4.5	2.42	170 gal of water injected; 87 vertical depth, 150 horizontal
183-193	97	167	4/12/2008	10:18 AM	MW56-GGW-08	ND (10) S	0.148 S	NA	-254	0.00	18,600	24.2	7.92	8.26	275	4	15.8	0.79	220 gal of water injected; 97 vertical depth, 167 horizontal
203-213	107	184	4/12/2008	1:11 PM	MW56-GGW-09	ND (10) S	ND (0.05) S	NA	-280	0.00	18,700	25.5	8.07	4.66	350	4.5	12.7	1.10	300 gal of water injected; 107 vertical depth, 184 horizontal

NOTES:
µS/cm microSiemens per centimeter
°C degree centigrade
ORP oxidation reduction potential, results rounded off to whole point
mV millivolts
µg/L micrograms per liter
mg/L milligrams per liter
% percentage
NTU Nephelometric Turbidity Unit
ND not detected at listed reporting limit
J analyte was present, but reported value was estimated
S Screening level data
--- not collected

TABLE 3-2

Groundwater Analytical Results for New Arizona Monitoring Wells, Chromium and Field Water Quality Parameters
 Installation Report for Wells on the Arizona Shore of the Colorado River at Topock, Arizona
 PG&E Topock Compressor Station

Location	Sampling Date	Lab Data		Field Data						
		Chromium (µg/L)	Hexavalent Chromium (µg/L)	Specific Conductance (µS/cm)	Temperature (°C)	pH (pH units)	ORP (mV)	Dissolved Oxygen (mg/L)	Salinity (%)	Turbidity (NTU)
MW-54-085	15-Apr-08	ND (1.0)	ND (0.2)	10,100	25.9	7.67	-202	0.20	0.565	16.0
MW-54-085	03-Jun-08	ND (1.0)	ND (0.2)	11,500	25.8	7.45	-139	0.26	0.741	4.00
MW-54-140	14-Apr-08	ND (1.0)	ND (0.2)	12,400	25.0	7.66	-162	0.16	0.71	5.00
MW-54-140	03-Jun-08	ND (1.0)	ND (0.2)	13,900	24.9	7.70	-139	0.20	0.898	1.70
MW-54-195	14-Apr-08	ND (1.0)	ND (1.0)	21,800	25.1	8.18	-202	0.15	1.31	4.00
MW-54-195	03-Jun-08	ND (1.0)	ND (1.0)	21,500	24.9	8.22	-199	0.13	1.39	8.84
MW-55-045	15-Apr-08	ND (1.0)	ND (0.2)	1,580	22.9	8.08	-222	0.13	0.079	26.0
MW-55-045	03-Jun-08	ND (1.0)	ND (0.2)	1,700	27.6	7.66	-176	0.09	0.11	3.00
MW-55-120	15-Apr-08	ND (1.0)	ND (0.2)	8,940	28.6	8.10	-206	0.17	0.497	7.00
MW-55-120	03-Jun-08	ND (1.0)	ND (0.2)	9,810	28.5	7.91	-170	0.23	0.634	4.68
MW-56S	29-Apr-08	ND (1.0)	ND (0.2)	6,760	22.3	7.39	-214	0.00	0.37	0.60
MW-56S	04-Jun-08	ND (1.0)	ND (0.2)	7,220	22.1	7.95	-173	0.23	0.467	1.30
MW-56M	29-Apr-08	ND (1.0)	ND (0.2)	18,700	23.0	7.38	-228	0.30	1.15	0.70
MW-56M	04-Jun-08	ND (1.0)	ND (0.2)	18,900	22.3	7.56	-210	0.02	1.22	4.10
MW-56D	29-Apr-08	ND (5.0)	ND (1.0)	24,500	23.3	8.00	-181	3.50	1.50	0.70
MW-56D	04-Jun-08	ND (1.0)	ND (1.0)	21,900	22.7	7.91	-146	6.52	1.41	1.22

NOTES:

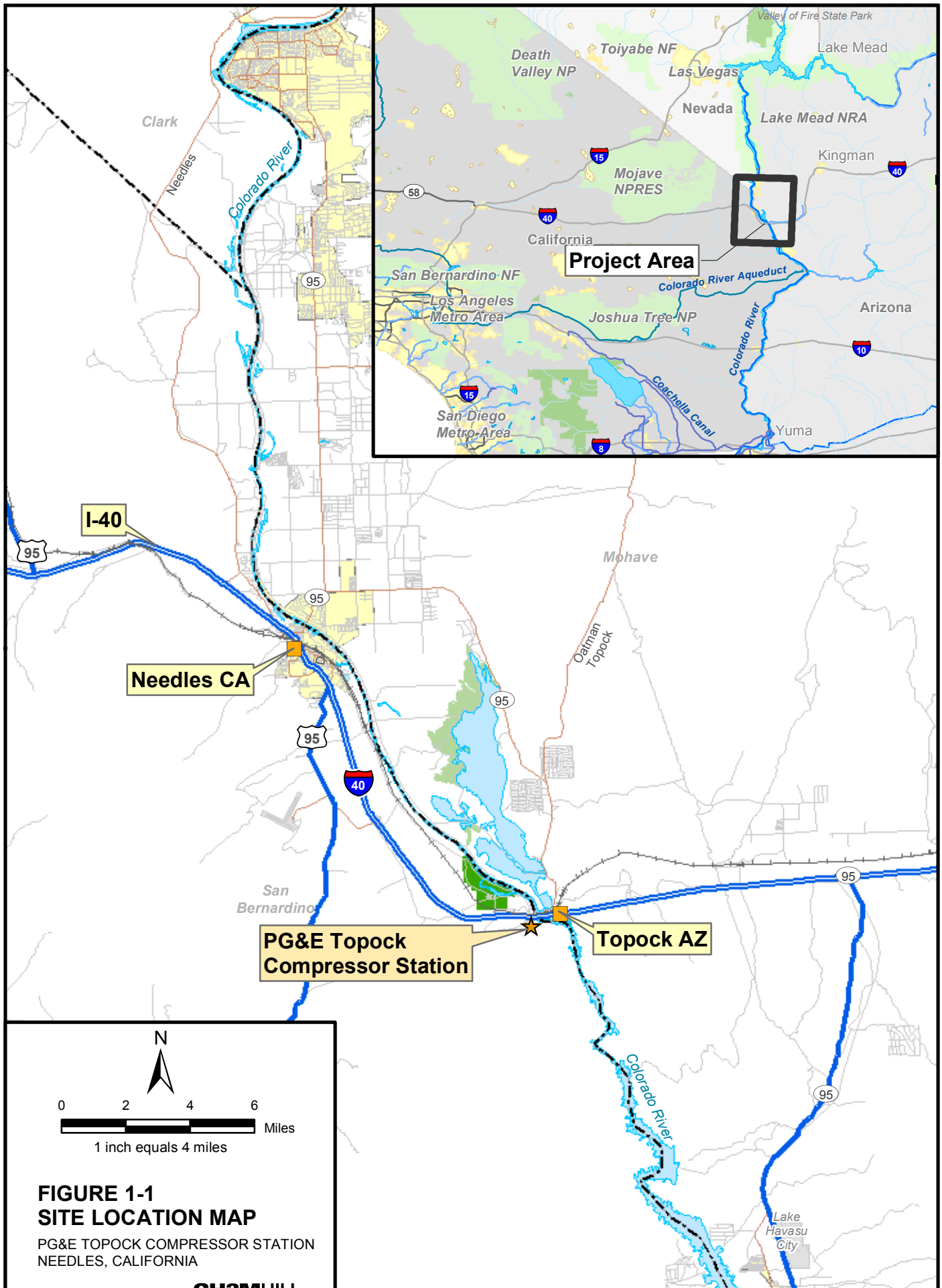
µg/L micrograms per liter
 µS/cm microSiemens per centimeter
 °C degree centigrade
 ORP oxidation reduction potential, results rounded off to whole point
 mV millivolts
 mg/L milligrams per liter
 % percentage
 NTU Nephelometric Turbidity Unit
 ND not detected at listed reporting limit

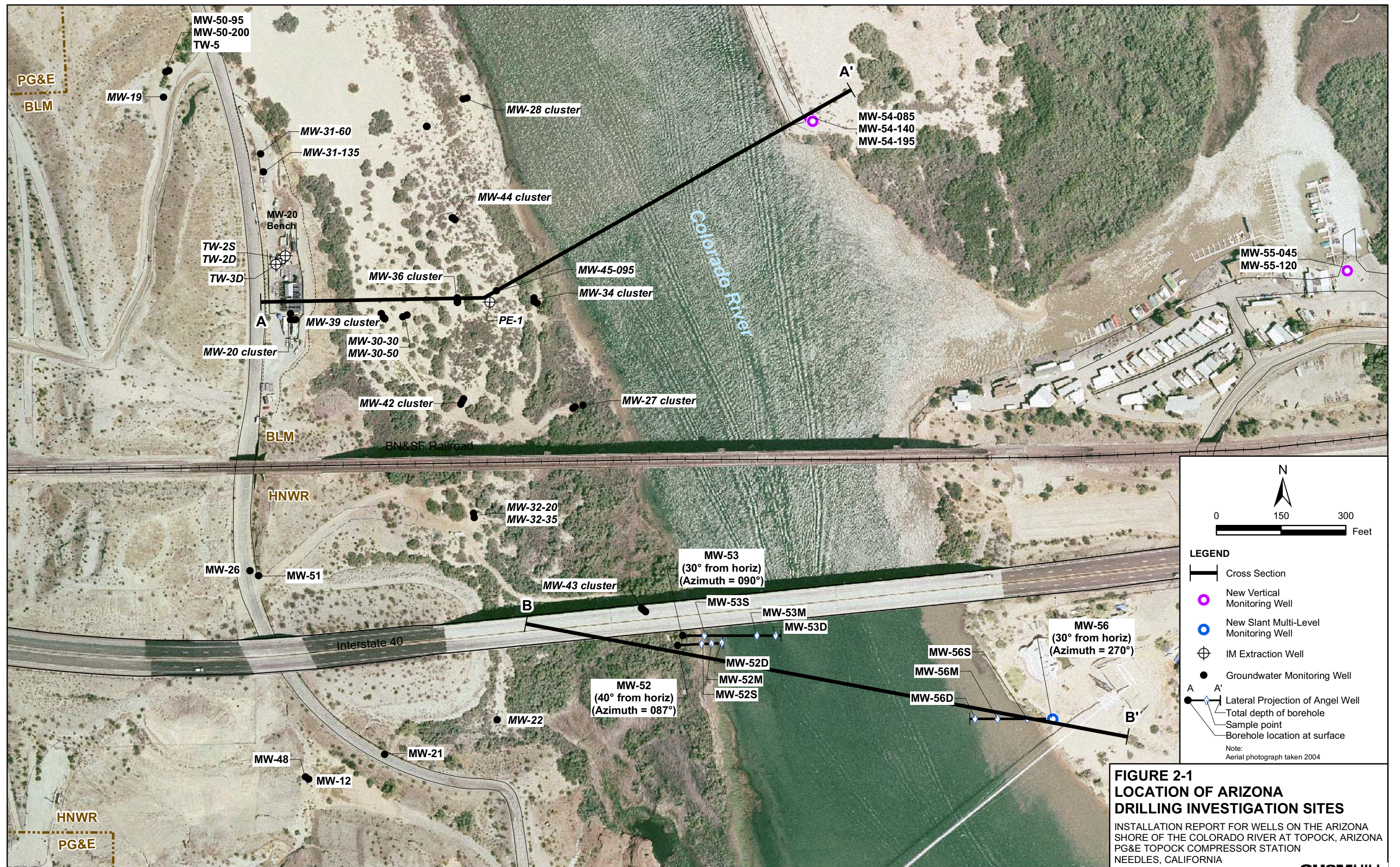
TABLE 3-3
Groundwater Analytical Results for New Arizona Monitoring Wells, General Chemistry Parameters
Installation Report for Wells on the Arizona Shore of the Colorado River at Topock, Arizona
PG&E Topock Compressor Station

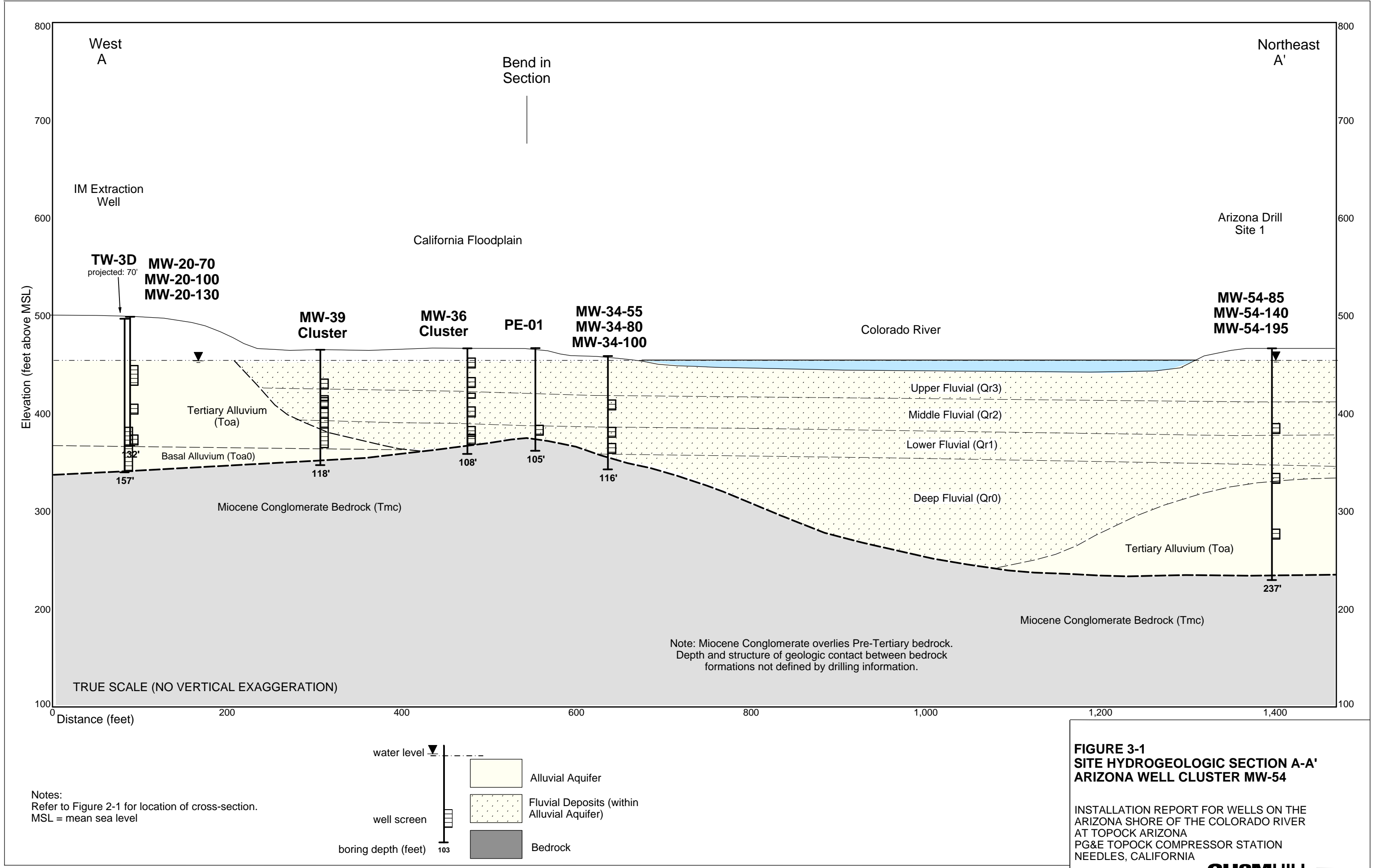
Loc ID	Sample Date	Dissolved Metal						Alkalinity, as carbonate (mg/L)	Alkalinity, bicarbonate as CaCO3 (mg/L)	Alkalinity, total as CaCO3 (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	Nitrate/Nitrite as nitrogen (mg/L)	Total Dissolved Solids (mg/L)	Total Organic Carbon (mg/L)	Ammonia as nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Deuterium (0/00)	Oxygen 18 (0/00)
		Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Manganese (mg/L)	Iron (mg/L)												
MW-54-085	15-Apr-08	1790	17.8	225	91.6	0.771	0.892	ND (5.0)	145	145	3140	351	ND (0.5)	5680 J	1.33	ND (0.5)	ND (0.5)	-82.8	-11.5
MW-54-140	14-Apr-08	2550	19.3	135	14.8	1.41	ND (0.5)	ND (5.0)	110	110	3920	498	ND (0.5)	6900	3.26	ND (0.5)	ND (0.5)	-85.3	-12
MW-54-195	14-Apr-08	5020	39.2	131	5.90	0.837	ND (0.5)	ND (5.0)	55.0	55.0	7150	1100	ND (0.5)	13000	5.01	ND (0.5)	ND (0.5)	-86.1	-12.4
MW-55-045	15-Apr-08	267	8.63	32.7	9.48	0.547	ND (0.5)	ND (5.0)	195	195	315	74.9	ND (0.5)	865 J	2.77	ND (0.5)	ND (0.5)	-80.1	-11.4
MW-55-120	15-Apr-08	1780	27.6	136	8.21	0.935	ND (0.5)	ND (5.0)	70.0	70.0	2750	290	ND (0.5)	4870 J	4.09	ND (0.5)	ND (0.5)	-81	-11.3
MW-56S	29-Apr-08	1240	13.6	88.9	34.5	0.787	2.59	ND (5.0)	520	520	1550	396	ND (0.5)	3770	6.97	ND (0.5)	ND (0.5)	-77.2	-10
MW-56M	29-Apr-08	2530	19.0	285	73.6	0.754	3.98	ND (5.0)	423	423	3690	931	ND (0.5)	8140	6.15	ND (0.5)	0.574	-84.3	-10.9
MW-56D	29-Apr-08	4360	35.5	343	65.5	ND (2.5)	ND (2.5)	ND (5.0)	105	105	6640	946	ND (0.5)	12400	4.79	ND (0.5)	ND (0.5)	-85.3	-11.2

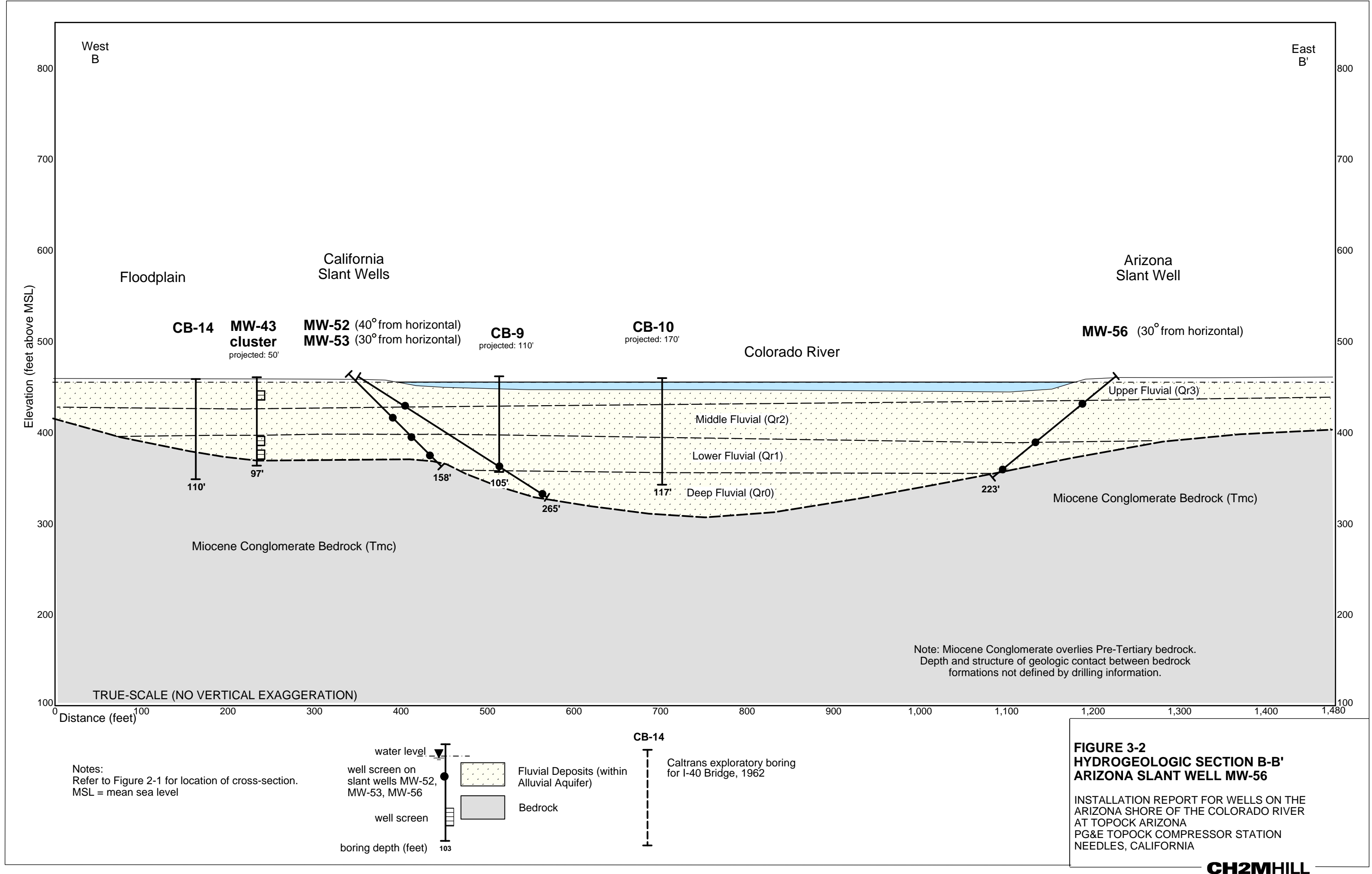
NOTES:
ND not detected at listed reporting limit
mg/L milligrams per liter
0/00 differences from global standard in parts per thousand

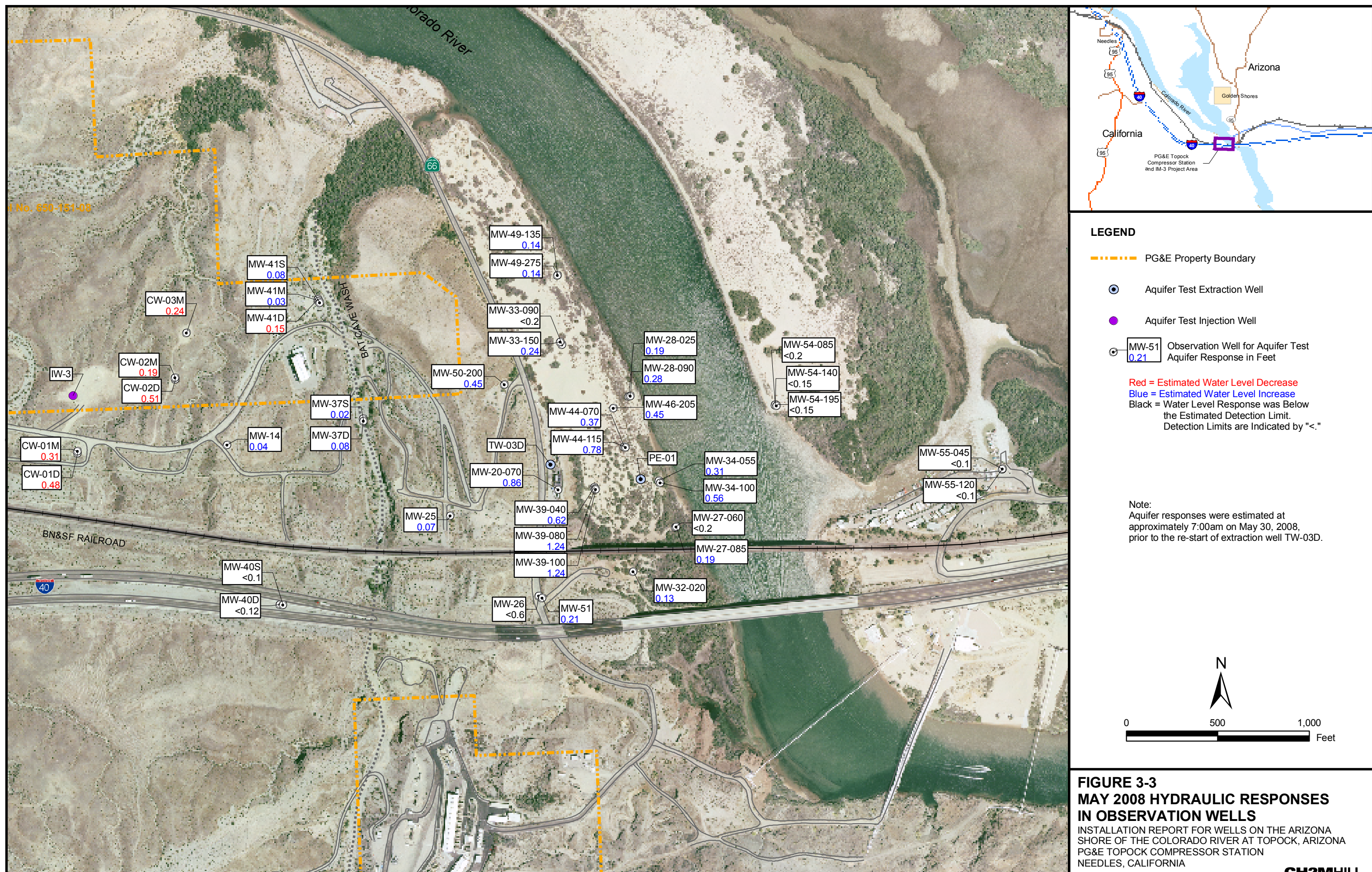
Figures











Appendix A
Drilling and Well Construction Records

Appendix A-1
Monitoring Well Drilling Logs

SHEET 1 of 8				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-54		
SOIL BORING LOG								
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Boart-Longyear (Dale Osteberg)		
SURFACE ELEVATION (NAVD88): 466.8 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,102,951.91		EASTING (CCS NAD 83 Z 5): 7,617,089.25		DATE STARTED: 3/12/2008		
						DATE COMPLETED: 3/18/2008		
DRILLING METHOD: Rotosonic - continuous core				DRILLING EQUIPMENT: 6" core barrel, 8" casing				
LOCATION: Site 1				LOGGED BY: A. Brewster				
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS	
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE		SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
5					SP	POORLY GRADED SAND (SP) - Pale brn (10YR 6/3), 95% subang to subrnd fn sand, 5% fines, poorly graded, predominantly qtz-based, loose, moist.	Soil descriptions based on observation of continuous Rotosonic core. See list of abbreviations at end of log. This log is from the deepest of two borings drilled at Site 1. Monitoring Well MW-54-195 was installed in the deeper boring and nested wells MW-54-85 and MW-54-140 were installed in the shallower boring.	
10		10						
15				CS		- SP AS ABOVE: lt yellowish brn (10YR 6/4)		Collect soil sample MW54-CS-15-17
20		10				- SP AS ABOVE: brn (10YR 5/3), sporadic gravel (max clast size = 3 cm); average grain size is larger but still predominantly fine-grained, sand predominantly qtz-based with minor presence of micas and feldspars.		Collect soil sample MW54-CS-25-27
25				CS				
30						- SP AS ABOVE: dk greyish brn (10YR 4/2)	Isoflow #1: 27-37' bgs Water used to drill: 150 gallons Sample ID: MW54-GGW-01	
35		10	MW54-GGW-01					

SHEET 2 of 8				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-54	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Boart-Longyear (Dale Osteberg)	
SURFACE ELEVATION (NAVD88): 466.8 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,102,951.91		EASTING (CCS NAD 83 Z 5): 7,617,089.25		DATE STARTED: 3/12/2008	
DATE COMPLETED: 3/18/2008		DRILLING METHOD: Rotosonic - continuous core		DRILLING EQUIPMENT: 6" core barrel, 8" casing			
LOCATION: Site 1				LOGGED BY: A. Brewster			
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
40				CS	SM	SILTY SAND (SM) - Yellowish brn (10YR 5/4), 85% subang to subrnd fn sand, 15% fines, poorly graded, sand is predominantly qtz-based with trace feldspar, loose, wet. - SM AS ABOVE: brn (10YR 4/3); 80% subang-subrnd fn sand, 20% fines, poorly graded, predominately quartz w/ trace feldspar, loose to med density, wet. - (at 52.5' bgs) SM AS ABOVE: increase in grain size in accordance with a fining-upwards sequence.	Collect soil sample MW54-CS-35-37
45		10	MW54-GGW-02	CS			Isoflow #2: 37-47' bgs Water used to drill 37-47': 150 gallons Sample ID: MW54-GGW-02
50		10					
55				CS	SP	WELL GRADED SAND (SW) - Yellowish brn (10YR 5/4), 5% gravel (up to 1 cm), 95% subrnd sand, well graded, predominantly qtz, 5% feldspars and 5% micas, loose, fining upwards, wet. POORLY GRADED SAND (SP) - Brn (10YR 5/3), 95% fn sand, 5% fines, poorly graded, subrnd to subang, predominantly qtz with trace feldspars and micas, loose to med density, no apparent structure, wet.	Collect soil sample MW54-CS-55-57
60		10	MW54-GGW-03				Isoflow #3: 57-67' bgs Water used to drill 47 - 67' bgs: 300 gallons Sample ID: MW54-GGW-03
65				CS	GW	WELL GRADED GRAVEL (GW) - Dk yellowish brn (10YR 4/4), 95% rnd-subrnd gravel (up to 11 cm), 5% fn sand, no fines, well graded, no dominant mineral type, loose, no apparent structure, sharp contact with SP sand at 59.75' bgs, wet.	Collect soil sample MW54-CS-65-67
70							

SHEET 3 of 8				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-54	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Boart-Longyear (Dale Osteberg)	
SURFACE ELEVATION (NAVD88): 466.8 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,102,951.91		EASTING (CCS NAD 83 Z 5): 7,617,089.25		DATE STARTED: 3/12/2008	
						DATE COMPLETED: 3/18/2008	
DRILLING METHOD: Rotosonic - continuous core				DRILLING EQUIPMENT: 6" core barrel, 8" casing			
LOCATION: Site 1				LOGGED BY: A. Brewster			
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
75		10			SP	POORLY GRADED SAND with trace GRAVEL (SP) - Pale brn (10YR 6/3) 3% gravel (up to 2 cm), 95% subrnd fn sand, 2% fines, poorly graded, predominantly qtz with trace feldspars and micas, loose, no structure, wet. - 2" clay lens encountered; trace silt content.	Collect soil sample MW54-CS-75-77 Isoflow #4: 77-87' bgs Water used to drill 67-87' bgs: 300 gallons Sample ID: MW54-GGW-04
80		10	MW54-GGW-04				
85				CS			
90		10	MW54-GGW-05		SP	POORLY GRADED SAND (SP) - Brn (10YR 5/3), 95% subang-subrnd fn sand, 5% fines, poorly graded, predominantly qtz, loose, no structure, wet.	Isoflow #5: 87-97' bgs. Water used to drill 87-97' bgs: 350 gallons Sample ID: MW54-GGW-05 Formation tougher to drill.
95				CS			
100					GW	WELL GRADED GRAVEL (GW) - Dk yellowish brn (10YR 4/4), 95% ang-subang gravel (up to 15 cm), 5% fn sand, well graded, no dominant mineral type, loose, no structure, wet.	Cobbles encountered at 95' bgs. Collect soil sample MW54-CS-95-97
105		10	MW54-GGW-06				
						COBBLES AND BOULDERS: Color N/A, 100% ang-rnd gravel, poorly graded, clast supported, largest clast unknown (cored through boulders), various mineralogy (basalt, granite, shocked qtz, feldspars)	Isoflow #6: 97-107' bgs Water used to drill 97-107' bgs: 400 gallons Sample ID: MW54-GGW-06 Drilling continues to be difficult. 97-107' bgs interval very tough drilling; boulders recovered Presence of carbide bits in samples.


SHEET 4 of 8				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-54	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Boart-Longyear (Dale Osteberg)	
SURFACE ELEVATION (NAVD88): 466.8 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,102,951.91		EASTING (CCS NAD 83 Z 5): 7,617,089.25		DATE STARTED: 3/12/2008	
						DATE COMPLETED: 3/18/2008	
DRILLING METHOD: Rotosonic - continuous core				DRILLING EQUIPMENT: 6" core barrel, 8" casing			
LOCATION: Site 1				LOGGED BY: A. Brewster			
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
110		10	MW54-GGW-07		--	COBBLES AND BOULDERS: Color N/A, 100% ang-rnd gravel, poorly graded, clast supported, largest clast unknown (cored through boulders), various mineralogy (basalt, granite, shocked qtz, feldspars)	Isoflow #7: 107-117' bgs Water used to drill 107-117' bgs: 500 gallons Sample ID: MW54-GGW-07
115				CS	GC	POORLY GRADED GRAVEL with CLAY (GC/CH) - Dk greyish brn (2.5Y 4/2), 50% subrnd-subang gravel (up to 10 cm), 10% fn sand, 40% soft clay, poorly graded, no dominant mineralogy, no apparent structure, wet.	
120					GP	POORLY GRADED GRAVEL with SAND (GP) - Brn (10YR 5/3), 50% subang-subrnd gravel (up to 10 cm), 40% med sand, 10% fines, poorly graded, no structure, matrix supported, predominantly qtz, loose, wet.	
125					GW	WELL GRADED GRAVEL (GW) - Color N/A, 95% subrnd gravel (> 6 in), 5% fn sand, no fines, well graded, mostly igneous rocks present, loose, no structure, wet.	Collect soil sample MW54-CS-125-127 Isoflow #8: 127-137' bgs Water used to drill 117-137' bgs: 500 gallons Sample ID: MW54-GGW-08
130		20		CS	CH	CLAY (CH) - Brn (10YR 4/3), 100% medium stiff clay, finely laminated, wet.	
135					SP	POORLY GRADED SAND with trace GRAVEL (SP) - Brn (10YR 4/3), 1% gravel (up to 5 cm), 96% subang med sand, 3% fines, poorly graded, predominantly qtz, trace feldspars and micas, loose, no structure, wet.	
140				CS	CH	CLAY (CH) - Brn (10YR 4/3), 100% medium stiff clay, finely laminated, wet.	Collect soil sample MW54-CS-135-137
					GP	POORLY GRADED GRAVEL with SAND (GP) - Color N/A, 50% subang-subrnd gravel (up to 8 cm), 30% fn sand, 20% fines, poorly graded, no dominant mineralogy, loose, clast supported, wet.	

SHEET 5 of 8				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-54	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Boart-Longyear (Dale Osteberg)	
SURFACE ELEVATION (NAVD88): 466.8 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,102,951.91		EASTING (CCS NAD 83 Z 5): 7,617,089.25		DATE STARTED: 3/12/2008	
						DATE COMPLETED: 3/18/2008	
DRILLING METHOD: Rotosonic - continuous core				DRILLING EQUIPMENT: 6" core barrel, 8" casing			
LOCATION: Site 1				LOGGED BY: A. Brewster			
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
145		20				WELL GRADED SAND (SW) - Reddish brn (5YR 4/3), 5% gravel (up to 2 cm), 90% subang sand, 5% fines, well graded, moderate density, no dominant mineral type, no apparent strucutre, wet. Intermittent intervals of sand and clay concentrated zones.	Drilling more difficult. Collect soil sample MW54-CS-145-147 Isoflow #9: 147-157' bgs Water used to drill 137-157' bgs: 600 gallons Sample ID: MW54-GGW-09 Drilling is easier
150							
155							Collect soil sample MW54-CS-155-157
160							
165		20			SW		Collect soil sample MW54-CS-165-167 Isoflow #10: 167-177' bgs Water used to drill 157-177' bgs: 1,000 gallons Sample ID: MW54-GGW-10
170							
175							


SHEET 6 of 8				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-54	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Boart-Longyear (Dale Osteberg)	
SURFACE ELEVATION (NAVD88): 466.8 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,102,951.91		EASTING (CCS NAD 83 Z 5): 7,617,089.25		DATE STARTED: 3/12/2008	
						DATE COMPLETED: 3/18/2008	
DRILLING METHOD: Rotosonic - continuous core				DRILLING EQUIPMENT: 6" core barrel, 8" casing			
LOCATION: Site 1				LOGGED BY: A. Brewster			
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
180				CS		WELL GRADED SAND (SW) - Reddish brn (5YR 4/3), 5% gravel (up to 2 cm), 90% subang sand, 5% fines, well graded, moderate density, no dominant mineral type, no apparent structure, wet. Intermittent intervals of sand and clay concentrated zones. - lens of lt green clay at 179.5' bgs - SW AS ABOVE: reddish brn (2.5YR 4/4)	Collect soil sample MW54-CS-175-177
185				CS			Drilling is difficult in this zone.
190		20					Collect soil sample MW54-CS-185-187
195			MW54-GGW-11				Isoflow #11: 187-197' bgs Water used to drill 177-197' bgs: 800 gallons Sample ID: MW54-GGW-11
200				CS		SILT (ML) - Dk reddish brn (5YR 3/4), 1% gravel, 4% subang sand, 95% silt, poorly graded, no dominant mineral type, moderate to hard density, no apparent structure, moist. - 205 to 207' bgs sections are dry and powdered, indicative of consolidated material broken apart by drilling. - more partially consolidated material, moist	Collect soil sample MW54-CS-195-197
205				CS			Increased rig chatter at 205' bgs.
210		20					Collect soil sample MW54-CS-205-207 Isoflow #12: 207-217' bgs Water used to drill 197-217' bgs: 250 gallons Sample ID: MW54-GGW-12

SHEET 7 of 8				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-54	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Boart-Longyear (Dale Osteberg)	
SURFACE ELEVATION (NAVD88): 466.8 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,102,951.91		EASTING (CCS NAD 83 Z 5): 7,617,089.25		DATE STARTED: 3/12/2008	
						DATE COMPLETED: 3/18/2008	
DRILLING METHOD: Rotosonic - continuous core				DRILLING EQUIPMENT: 6" core barrel, 8" casing			
LOCATION: Site 1				LOGGED BY: A. Brewster			

DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
215			MW54-GGW-12		ML	SILT (ML) - Dk reddish brn (5YR 3/4), 1% gravel, 4% subang sand, 95% silt, poorly graded, no dominant mineral type, moderate to hard density, no apparent structure, moist. - minor decomposed rock to clay. Matrix supported. Maximum gravel = 3.5 cm. Gravel is subangular to angular. - appearance of Miocene conglomerate cobble (max dia = 11 cm), matrix supported.	Collect soil sample MW54-CS-215-217
				CS			
220							
225							Drill rate 217-227' bgs = 4 minutes. Collect soil sample MW54-CS-225-227 Isoflow #13: 227-237' bgs Water used to drill: 300 gallons Sample ID: MW54-GGW-13
		20		CS			
230			MW54-GGW-13		BR	MIOCENE CONGLOMERATE (BR) - Reddish brn (2.5YR 4/4), subang-ang, clast composition predominantly metamorphic, consolidated, clast supported, dry. Max clast size = 8 cm.	Collect soil sample MW54-CS-230-232 Drill rate 227-232' bgs = 15 minutes
				CS			
235							
						Boring Terminated at 237 ft ABBREVIATIONS <i>cc</i> = continuous core run <i>brn</i> = brown <i>lt</i> = light <i>dk</i> = dark <i>vf</i> = very fine-grained <i>fn</i> = fine-grained <i>med</i> = medium-grained <i>cse</i> = coarse-grained	


CH2MHILL


SHEET 8 of 8					PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-54	
SOIL BORING LOG								
PROJECT NAME: Topock AZ Drilling					HOLE DEPTH (ft): 237.0		DRILLING CONTRACTOR: Boart-Longyear (Dale Osteberg)	
SURFACE ELEVATION (NAVD88): 466.8 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,102,951.91			EASTING (CCS NAD 83 Z 5): 7,617,089.25		DATE STARTED: 3/12/2008	
							DATE COMPLETED: 3/18/2008	
DRILLING METHOD: Rotosonic - continuous core					DRILLING EQUIPMENT: 6" core barrel, 8" casing			
LOCATION: Site 1					LOGGED BY: A. Brewster			
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	COMMENTS	
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
						<i>vc = very coarse-grained</i> <i>ang = angular</i> <i>subang = subangular</i> <i>subrnd = subrounded</i> <i>rnd = rounded</i> <i>br = bedrock formation</i> <i>ss = sandstone</i> <i>conglom = conglomerate</i> <i>comptd = compacted</i> <i>qtz = quartz</i>		


CH2MHILL

SHEET 1 of 5				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-55	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 137.0		DRILLING CONTRACTOR: Boart-Longyear (Dale Osteberg)	
SURFACE ELEVATION (NAVD88): 463.6 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,102,606.18		EASTING (CCS NAD 83 Z 5): 7,618,326.13		DATE STARTED: 3/29/2008	
DATE COMPLETED: 3/31/2008		DRILLING METHOD: Rotosonic - continuous core		DRILLING EQUIPMENT: 6" core barrel, 8" casing			
LOCATION: Site 2 - Alternate				LOGGED BY: R. Tweidt			
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
5					SM	SILTY SAND with GRAVEL (SM) - Brn (10YR 4/3), 15% gravel (up to 4 cm), 45% subang-ang fn sand, 40% fines, well graded, gravel is predominantly metamorphic, slightly moist.	Soil descriptions based on observation of continuous Rotosonic core. See list of abbreviations at end of log. Nested wells MW-55-45 and MW-55-120 installed in this borehole. Collect soil sample MW55-CS-6-7
10					GP	POORLY GRADED GRAVEL (GP) - Reddish black (2.5YR 2.5/1), 90% ang-subang gravel (up to 3 cm), 10% fn sand, no fines, poorly graded, semi-consolidated pieces of metamorphic material present, wet. - clayey silt layer present (ML), very dk greyish brn (10YR 3/2), slow dilatency, med plasticity	
15		12				SILTY SAND (SM) - Dk yellowish brn (10YR 3/4), 10% gravel (up to 2 cm), 60% fn sand, 30% fines, poorly graded, wet. - SM AS ABOVE: (at 12'bgs) dk brn (7.5YR 3/4), 5% rnd-subrnd gravel (up to 2 cm), 75% fn sand, 20% fines. Fluvial sediments. - SM AS ABOVE: 5% rnd-subrnd gravel, 60% fn sand, 35% fines - SM AS ABOVE: increased gravel size, alluvial and fluvial sediments present, gravel is subang. Max clast size = 5 cm. - SM AS ABOVE: gravel is subang, metamorphic and granitic. Max clast size = 11 cm. - SM AS ABOVE: pieces of consolidated sandstone present. 15% subang gravel, 75% fn-med sand, 10% fines	Collect soil sample MW55-CS-16-17 Drill rate 17' to 27' = 1.7 ft/min
20							
25							Collect soil sample MW55-CS-26-27 Drill rate 27' to 37' = 1.7 ft/min
30					SM	- SM AS ABOVE: Increased gravel size and content. 20% gravel, 45% fn-med sand, 35% fines. Max clast size = 12 cm. - SM AS ABOVE: 10% gravel, 70% sand, 20% fines - SM AS ABOVE: 10% gravel (up to 4 cm), 60% fn sand, 30% fines, gravel is predominantly sandstone and granitic.	
35		10	MW55-GGW-01				Isoflow #1: 27-37' bgs Water used to drill: 200 gallons Sample ID: MW55-GGW-01

SHEET 2 of 5				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-55	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 137.0		DRILLING CONTRACTOR: Boart-Longyear (Dale Osteberg)	
SURFACE ELEVATION (NAVD88): 463.6 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,102,606.18		EASTING (CCS NAD 83 Z 5): 7,618,326.13		DATE STARTED: 3/29/2008	
DATE COMPLETED: 3/31/2008		DRILLING METHOD: Rotosonic - continuous core		DRILLING EQUIPMENT: 6" core barrel, 8" casing			
LOCATION: Site 2 - Alternate				LOGGED BY: R. Tweidt			

DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
40	X	X	X	X	CS	SILTY SAND (SM) - Dk yellowish brn (10YR 3/4), 10% gravel (up to 2 cm), 60% fn sand, 30% fines, poorly graded, wet. - (at 35' bgs) SM AS ABOVE: 15% subrnd-subang gravel (up to 5 cm), 65% fn-med sand, 20% fines, gravel is predominantly metamorphic and granitic. - SM AS ABOVE: 10% subrnd-ang gravel (up to 3 cm), 50% fn-med sand, 40% fines.	Collect soil sample MW55-CS-36-37 Drill rate 37' to 47' = 1.7 ft/min Isoflow #2: 37-47' bgs Water used to drill: 200 gallons Sample ID: MW55-GGW-02
45	X	X	X	X			
50	X	X	X	X	CS	SANDY SILT with GRAVEL (ML) - Dk reddish brn (2.5YR 3/4), 5% subang-ang gravel (up to 8 cm), 20% fn sand, 75% fines, well graded, low to med strength, low plasticity, slow to rapid dilatency in pulverized sample, gravel composition is metamorphics and granitics, slightly moist. - ML AS ABOVE: section more cse, 5% gravel (up to 3 cm), 40% fn sand, 55% fines. - ML AS ABOVE: 5% gravel, 20% fn sand, 75% fines. 8 cm piece of Miocene conglomerate in cuttings. - ML AS ABOVE: section more cse, 5% gravel (up to 2.5 cm), 40% fn sand, 55% fines.	Collect soil sample MW55-CS-46-47 Drill rate 47' to 57' = 1.5 ft/min Isoflow #3: 57-67' bgs Water used to drill: 500 gallons Sample ID: MW55-GGW-03
55	X	X	X	X			
60	X	X	X	X	CS	Collect soil sample MW55-CS-56-57 Isoflow #3: 57-67' bgs Water used to drill: 500 gallons Sample ID: MW55-GGW-03	
65	X	X	X	X			
70	X	X	X	X	CS	Collect soil sample MW55-CS-66-67 - ML AS ABOVE: coarsening of soil. Increased gravel content and max clast size. 25% subang-ang gravel (up to 14 cm), 30% fn sand, 45% fines. Gravel is composed of metamorphics and granitic rocks. Abundant pieces of miocene conglomerate present.	Collect soil sample MW55-CS-66-67



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SHEET 3 of 5				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-55	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 137.0		DRILLING CONTRACTOR: Boart-Longyear (Dale Osteberg)	
SURFACE ELEVATION (NAVD88): 463.6 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,102,606.18		EASTING (CCS NAD 83 Z 5): 7,618,326.13		DATE STARTED: 3/29/2008	
DATE COMPLETED: 3/31/2008		DRILLING METHOD: Rotosonic - continuous core		DRILLING EQUIPMENT: 6" core barrel, 8" casing			
LOCATION: Site 2 - Alternate				LOGGED BY: R. Tweidt			


DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
75		10			ML	<p>SANDY SILT with GRAVEL (ML) - Dk reddish brn (2.5YR 3/4), 5% subang-ang gravel (up to 8 cm), 20% fn sand, 75% fines, well graded, low to med strength, low plasticity, slow to rapid dilatancy in pulverized sample, gravel composition is metamorphics and granitics, slightly moist.</p> <p>- ML AS ABOVE: increased concentration of gravel and small cobbles (up to 15 cm) (predominantly composed of Miocene conglomerate fragments and other metamorphic material).</p>	<p>Collect soil sample MW55-CS-76-77 Drill rate 77' to 87' = 1.3 ft/min</p> <p>Isoflow #4: 77-87' bgs Water used to drill: 450 gallons Sample ID: MW55-GGW-04</p>
80		10	MW55-GGW-04				
85							
90		10					
95					NR	<p>- ML AS ABOVE: Increased fines. 5% subang-ang gravel (up to 3 cm), 25% fn sand, 70% fines. Gravel comprised of metamorphics and minor granitics.</p> <p>NO RECOVERY (NR) - Sluff material is the same as core logged above and below this interval</p>	<p>Collect soil sample MW55-CS-86-87 Drill rate 87' to 97' = 0.8 ft/min</p> <p>Collect soil sample MW55-CS-96-97 Drill rate 97' to 107' = 0.8 ft/min</p> <p>Isoflow #5: 97-107' bgs Water used to drill: 250 gallons Sample ID: MW55-GGW-05</p>
100		0	MW55-GGW-05				
105							

SHEET 4 of 5				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-55	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 137.0		DRILLING CONTRACTOR: Boart-Longyear (Dale Osteberg)	
SURFACE ELEVATION (NAVD88): 463.6 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,102,606.18		EASTING (CCS NAD 83 Z 5): 7,618,326.13		DATE STARTED: 3/29/2008	
						DATE COMPLETED: 3/31/2008	
DRILLING METHOD: Rotosonic - continuous core				DRILLING EQUIPMENT: 6" core barrel, 8" casing			
LOCATION: Site 2 - Alternate				LOGGED BY: R. Tweidt			

DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
				CS		NO RECOVERY (NR) - Sluff material is the same as core logged above and below this interval	
110					ML	SANDY SILT with GRAVEL (ML) - Dk reddish brn (2.5YR 3/4), 5% subang-ang gravel (up to 3 cm), 25% fn sand, 70% fines, well graded, low to med strength, low plasticity, slow to rapid dilatency in pulverized sample, gravel composition is metamorphics and granitics, slightly moist. SILTY SAND WITH GRAVEL (SM) - Reddish brn (2.5YR 4/3), 10% gravel (up to 3 cm), 50% fn-med subrnd-ang sand, 40% fines, well graded, metamorphic and sedimentary rocks, wet. - SM AS ABOVE: decomposed gravel to clay present - SM AS ABOVE: Becomes more cse, 15% gravel (up to 8 cm), 60% med sand, 25% fines. Cemented sandstone clasts present.	Collect soil sample MW55-CS-106-107 Drill rate 107' to 117' = 1.1 ft/min
115		10			SM		
120				CS		SANDY SILT with GRAVEL (ML) - Reddish brn (2.5YR 4/4), 10% subang-ang gravel (up to 12 cm), 25 % fn sand, 65% fines, well graded, predominantly metamorphics, no apparent structure, moist. - 120.5' to 120.75' - clay layer, white (10R 8/1), no apparent structure.	Collect soil sample MW55-CS-116-117 Drill rate 117' to 127' = 1.1 ft/min
125		10	MW55-GGW-06		ML		
130				CS		MIOCENE CONGLOMERATE (BR) - Reddish brn (2.5YR 4/4), subang-ang, clast composition predominantly metamorphic. Max clast size = 7 cm, dry.	Collect soil sample MW55-CS-126-127
135		8			BR		
		2					Collect soil sample MW55-CS-134-135
Boring Terminated at 137 ft							
ABBREVIATIONS cc = continuous core run							


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SHEET 5 of 5					PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-55	
SOIL BORING LOG								
PROJECT NAME: Topock AZ Drilling					HOLE DEPTH (ft): 137.0		DRILLING CONTRACTOR: Boart-Longyear (Dale Osteberg)	
SURFACE ELEVATION (NAVD88): 463.6 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,102,606.18			EASTING (CCS NAD 83 Z 5): 7,618,326.13		DATE STARTED: 3/29/2008	
							DATE COMPLETED: 3/31/2008	
DRILLING METHOD: Rotosonic - continuous core					DRILLING EQUIPMENT: 6" core barrel, 8" casing			
LOCATION: Site 2 - Alternate					LOGGED BY: R. Tweidt			
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	COMMENTS	
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES , DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.	
						brn = brown lt = light dk = dark vf = very fine-grained fn = fine-grained med = medium-grained cse = coarse-grained vc = very coarse-grained ang = angular subang = subangular subrnd = subrounded rnd = rounded br = bedrock formation ss = sandstone conglom = conglomerate comptd = compacted qtz = quartz		


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SHEET 1 of 7				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-56	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 223.0		DRILLING CONTRACTOR: Boart-Longyear (Denzil Roberts)	
SURFACE ELEVATION (NAVD 88): 459.9 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,101,569.18		EASTING (CCS NAD 83 Z 5): 7,617,644.91		DATE STARTED: 4/9/2008	
						DATE COMPLETED: 4/13/2008	
DRILLING METHOD: Rotosonic - continuous core				DRILLING EQUIPMENT: 4" core barrel, 6" casing			
LOCATION: Site AB-2 - Alternate				LOGGED BY: C. Kreller			
DEPTH DRILLED (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
5					NR	No recovery	Soil descriptions based on observation of continuous Rotosonic core. See list of abbreviations at end of log. Boring drilled at azimuth 270 and dip of 30 degrees from horizontal. All depths expressed as length drilled and must be corrected for angle to derive elevation. Multi-level angle well MW-56 was installed in this boring. Collect soil sample MW56-CS-9-10
10		4			SW	<u>WELL GRADED SAND (SW)</u> - Dk yellowish brn (10YR 3/6), 5% subrnd-subang fn gravel, 95% subang-subrnd sand <u>POORLY GRADED SAND (SP)</u> - Yellowish brn (10YR 5/6), 100% fn sand, loose, slightly moist.	
15		10				- SP AS ABOVE: dk yellowish brn, iron oxide staining present, trace organic material - SP AS ABOVE: very dk greyish brn, 98% fn sand, 2% silt, wet.	
20					SP	- Very limited recovery from 20' - 30'; saturated fn sand as above,	
25		0					
30							
35							Collect soil sample MW56-CS-19-20 Drill rate from 20' to 40' = 1.1 ft/min

SHEET 2 of 7				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-56	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 223.0		DRILLING CONTRACTOR: Boart-Longyear (Denzil Roberts)	
SURFACE ELEVATION (NAVD 88): 459.9 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,101,569.18		EASTING (CCS NAD 83 Z 5): 7,617,644.91		DATE STARTED: 4/9/2008	
						DATE COMPLETED: 4/13/2008	
DRILLING METHOD: Rotosonic - continuous core				DRILLING EQUIPMENT: 4" core barrel, 6" casing			
LOCATION: Site AB-2 - Alternate				LOGGED BY: C. Kreller			
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
40		20			SP	POORLY GRADED SAND (SP)- Yellowish brn (10YR 5/6), 100% fn sand, loose, slightly moist.	Drilling observations and operations, daily start and end times, drill rate, refusals, sampling and testing notes. Isoflow sample #1: 43-53' bgs Sample ID: MW56-GGW-01
45							
50			MW56-GGW-01	CS		- SP AS ABOVE: yellowish brn (10YR 5/4), increase in med sand [10%med sand, 88% fn sand, 2% silt]	Collect soil sample MW56-CS-49-50
55		10					
60				CS	SP	- SP AS ABOVE: dk yellowish brn (10YR 4/4), wet.	Collect soil sample MW56-CS-59-60
65							Isoflow #2: 63-73' bgs Water used: 170 gallons Sample ID: MW56-GGW-02
70		13	MW56-GGW-02	CS		- POORLY GRADED SAND with GRAVEL (SP): yellowish brown (10YR5/4), 15% subrnd-rnd gravel, 85% fn-cse sand	Collect soil sample MW56-CS-69-70

SHEET 3 of 7				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-56	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 223.0		DRILLING CONTRACTOR: Boart-Longyear (Denzil Roberts)	
SURFACE ELEVATION (NAVD 88): 459.9 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,101,569.18		EASTING (CCS NAD 83 Z 5): 7,617,644.91		DATE STARTED: 4/9/2008	
						DATE COMPLETED: 4/13/2008	
DRILLING METHOD: Rotosonic - continuous core				DRILLING EQUIPMENT: 4" core barrel, 6" casing			
LOCATION: Site AB-2 - Alternate				LOGGED BY: C. Kreller			
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
75		0			SP	POORLY GRADED SAND (SP) - Yellowish brn (10YR 5/6), 100% fn sand, loose, slightly moist. - (at 70'bgs) SP AS ABOVE: 2% subrnd gravel, 98% subrnd sand [10% cse sand, 10% med sand, 78% fn sand], no fines, very moist. Iron oxide staining present.	DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES, DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES. Collect soil sample MW56-CS-79-80 Isoflow #3: 83-93' bgs Water used: 150 gallons Sample ID: MW56-GGW-03 Drill rate = 1.1 ft/min Collect MW56-WOOD-86 Collect soil sample MW56-CS-89-90
80		5		CS		- SP AS ABOVE: greyish brn (10YR 5/2)	
85		10				- POORLY GRADED SAND with GRAVEL (SP): dk greysih brn (10YR 4/2), composition change to 15% subrnd-rnd fn-cse gravel and 85% fn-cse sand, significant organic (wood) material present. - SP AS ABOVE: gravel content decreases, predominantly fn-cse sand with trace subrnd-rnd fn-cse gravel (up to 2.5 cm), very moist.	
90			MW56-GGW-03	CS		Collect soil sample MW56-CS-99-100	
95		10					
100				CS			
105						- SP AS ABOVE: Composition change to 85% fn sand, 10% cse sand, 5% fines. - SP AS ABOVE: dk grey (10YR 4/1) med sand layer Isoflow #4: 103-113' bgs Water used: 150 gallons Sample ID: MW56-GGW-04	

SHEET 4 of 7				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-56	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 223.0		DRILLING CONTRACTOR: Boart-Longyear (Denzil Roberts)	
SURFACE ELEVATION (NAVD 88): 459.9 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,101,569.18		EASTING (CCS NAD 83 Z 5): 7,617,644.91		DATE STARTED: 4/9/2008	
						DATE COMPLETED: 4/13/2008	
DRILLING METHOD: Rotosonic - continuous core				DRILLING EQUIPMENT: 4" core barrel, 6" casing			
LOCATION: Site AB-2 - Alternate				LOGGED BY: C. Kreller			
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
110		10	MW56-GGW-04	CS	SP	POORLY GRADED SAND (SP) - Yellowish brn (10YR 5/6), 100% fn sand, loose, slightly moist. - SP AS ABOVE: dk grey (10YR 4/1), 98% fn sand, 2% silt	Collect soil sample MW56-CS-109-110
115		10				- SP AS ABOVE: very dk greyish brn (10YR 3/2), 90% fn sand, 10% fines.	
120				CS		- SP AS ABOVE: very dk greyish brn (10YR 3/2), with very dk grey (10YR 4/1) mottling throughout, wet.	Collect soil sample MW56-CS-119-120
125		10	MW56-GGW-05			- SP AS ABOVE: less fines, presence of organic (wood) material, 85% fn sand, 10% med sand, 5% fines, very moist.	Isoflow #5: 123-133' bgs Water used: 150 gallons Sample ID: MW56-GGW-05
130				CS		- SP AS ABOVE: greysih brn (10YR 5/2)	Collect soil sample MW56-CS-129-130
135		10				- SP AS ABOVE: dk greyish brn (10YR 4/2), 5% subrnd gravel (up to 5 cm), 85% fn sand, 10% fines, organic (wood) material present, wet.	
140				CS		Collect soil sample MW56-CS-139-140	

SHEET 5 of 7				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-56	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 223.0		DRILLING CONTRACTOR: Boart-Longyear (Denzil Roberts)	
SURFACE ELEVATION (NAVD 88): 459.9 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,101,569.18		EASTING (CCS NAD 83 Z 5): 7,617,644.91		DATE STARTED: 4/9/2008	
						DATE COMPLETED: 4/13/2008	
DRILLING METHOD: Rotosonic - continuous core				DRILLING EQUIPMENT: 4" core barrel, 6" casing			
LOCATION: Site AB-2 - Alternate				LOGGED BY: C. Kreller			
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
145		13	MW56-GGW-06		SP	<p>POORLY GRADED SAND (SP)- Yellowish brn (10YR 5/6), 100% fn sand, loose, slightly moist.</p> <p>- SP AS ABOVE: dk greyish brn (10YR 4/2); very moist. Small lenses of very dk grey (2.5YR 3/1) present, wood present at 142' and 144'.</p> <p>- SP AS ABOVE: Increase in concentration of cse sand.</p> <p>- POORLY GRADED SAND with GRAVEL (SP): Composition change to 20% subrnd-rnd fn-cse gravel (up to 7.5 cm), 80% fn sand.</p> <p>- SP AS ABOVE: dk grey (10YR4/1)</p> <p>- Poor recovery from 153' to 155'</p> <p>- SP AS ABOVE: dk grey (10YR 3/1), 78% fn sand, 20% med sand, 2% subrnd-rnd gravel (up to 2.5 cm), moist.</p> <p>- 6-inch interval of organic material (wood)</p> <p>- SP AS ABOVE: very dk grey (10YR 3/1), 2% subrnd-rnd gravel (up to 6.5 cm), 98% fn-med sand, moist. 6-inch interval of organic material (wood) present.</p> <p>- 6-inch interval of black organic material (wood)</p>	<p>Collect MW-56-142 wood sample Sample ID: MW56-GGW-03 Collect MW-56-144 wood sample</p> <p>Isoflow #6: 143-153' bgs Water used: 150 gallons Sample ID: MW56-GGW-06</p> <p>Collect soil sample MW56-CS-149-150</p> <p>Collect MW-56-151 wood sample</p>
150				CS			Collect soil sample MW56-CS-149-150
155		0					
160		5		CS			Collect soil sample MW56-CS-159-160
165		13	MW56-GGW-07				<p>Isoflow #7: 163-173' bgs Water used: 170 gallons Sample ID: MW56-GGW-07 Collect MW-56-164 wood sample</p>
170				CS			Collect soil sample MW56-CS-169-170
175							Collect MW-56-172 wood sample
						No recovery	

SHEET 6 of 7				PROJECT NUMBER: 354948.FP.07.FW		BORING NUMBER: MW-56	
SOIL BORING LOG							
PROJECT NAME: Topock AZ Drilling				HOLE DEPTH (ft): 223.0		DRILLING CONTRACTOR: Boart-Longyear (Denzil Roberts)	
SURFACE ELEVATION (NAVD 88): 459.9 ft. MSL		NORTHING (CCS NAD 83 Z 5): 2,101,569.18		EASTING (CCS NAD 83 Z 5): 7,617,644.91		DATE STARTED: 4/9/2008	
						DATE COMPLETED: 4/13/2008	
DRILLING METHOD: Rotosonic - continuous core				DRILLING EQUIPMENT: 4" core barrel, 6" casing			
LOCATION: Site AB-2 - Alternate				LOGGED BY: C. Kreller			
DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE			
180		0			NR	No recovery	Drill rate = 1.5 ft/min Isoflow #8: 183-193' bgs Water used: 220 gallons Sample ID: MW56-GGW-08
185							
190		3	MW56-GGW-08	CS	SP	<u>POORLY GRADED SAND with GRAVEL (SP)</u> - Very dk greyish brn (2.5YR 3/2), 15% gravel (up to 6 cm), 80% fn sand, 5% fines, loose, slightly moist.	
195		10				<u>SILTY GRAVEL (GM)</u> - Very dk brn (10YR 2/2), 60% ang-subang gravel (up to 10 cm), 10% fn sand, 30% fines, poorly graded, gravel becomes well rnd with depth	Collect soil sample MW56-CS-189-190 Drill rate from 193-213' = 5.0 ft/min
200				CS			Collect soil sample MW56-CS-199-200
205		10	MW56-GGW-09	CS			Isoflow #9: 203-213' bgs Water used: 300 gallons Sample ID: MW56-GGW-09
210				CS			Collect soil sample MW56-CS-209-210

SOIL BORING LOG

PROJECT NAME: Topock AZ Drilling

HOLE DEPTH (ft):
223.0

DRILLING CONTRACTOR:
Boart-Longyear (Denzil Roberts)

SURFACE ELEVATION (NAVD 88): 459.9 ft. MSL	NORTHING (CCS NAD 83 Z 5): 2,101,569.18
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EASTING (CCS NAD 83 Z 5):
7,617,644.91

DATE STARTED: 4/9/2008

DATE COMPLETED: 4/13/2008

DRILLING METHOD:
Rotosonic - continuous core

DRILLING EQUIPMENT:
4" core barrel, 6" casing

LOCATION: Site AB-2 - Alternate

LOGGED BY: C. Kreller

DEPTH BGS (feet)	SAMPLE				USCS CODE	SOIL DESCRIPTION	COMMENTS
	INTERVAL	RECOVERY (ft)	ISOFLOW SAMPLE	SOIL SAMPLE		SOIL NAME, USCS SYMBOL, COLOR, PERCENT COMPOSITION, GRADING, GRAIN SHAPE, MINERALOGY, DENSITY/CONSISTENCY, STRUCTURE, MOISTURE.	DRILLING OBSERVATIONS AND OPERATIONS, DAILY START AND END TIMES , DRILL RATE, REFUSALS, SAMPLING AND TESTING NOTES.
					SW	<u>WELL GRADED SAND WITH GRAVEL (SW)</u> - Yellowish brn (10YR) , 10% gravel (up to 3 cm), 90% subang-subrnd sand, no fines, well graded, sand is fining upwards, wet.	Drill rate from 213-219' = 0.4 ft/min Drill rate from 219-223' = 0.2 ft/min Collect soil sample MW56-CS-219-220
215		10			BR	<u>MIOCENE CONGLOMERATE (BR)</u> - Reddish brn (2.5YR 4/4), consolidated, dry. - Pulverized by drilling.	
220				CS			
		3					
						<i>Boring Terminated at 223 ft</i> ABBREVIATIONS <i>cc = continuous core run</i> <i>brn = brown</i> <i>lt = light</i> <i>dk = dark</i> <i>vf = very fine-grained</i> <i>fn = fine-grained</i> <i>med = medium-grained</i> <i>cse = coarse-grained</i> <i>vc = very coarse-grained</i> <i>ang = angular</i> <i>subang = subangular</i> <i>subrnd = subrounded</i> <i>rnd = rounded</i> <i>br = bedrock formation</i> <i>ss = sandstone</i> <i>conglom = conglomerate</i> <i>comptd = compacted</i> <i>qtz = quartz</i>	

**CH2MHILL**

Appendix A-2
Monitoring Well Construction Logs

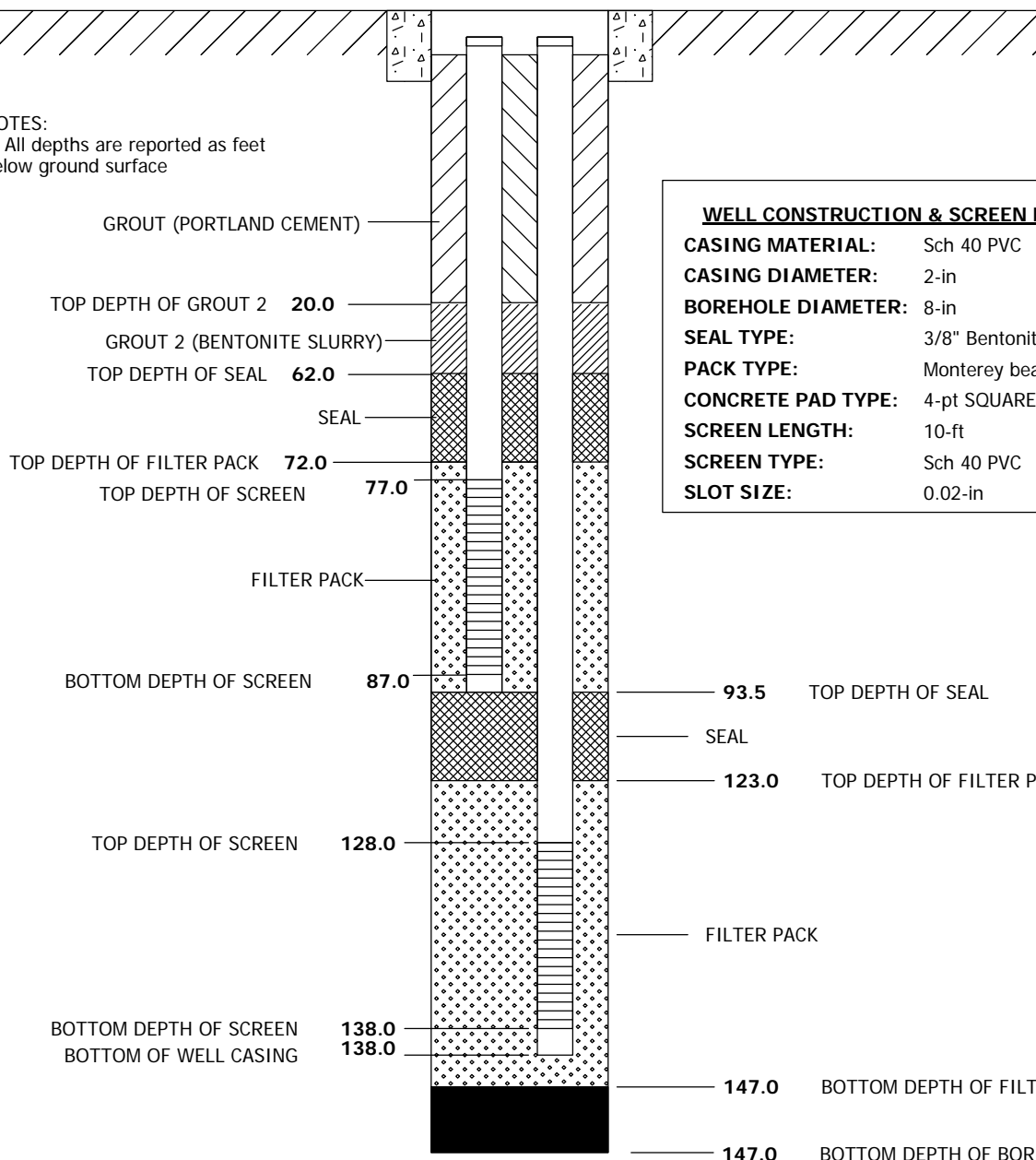
WELL COMPLETION DIAGRAM

PROJECT NO: 354948.FP.07.FW	PROJECT: Topock AZ Drilling	WELL NO: <i>MW-54-140</i>
LOCATION: Site 1		
DRILLING CONTRACTOR: Boart-Longyear		DRILLING START: 3/12/2008 08:10
DRILLING METHOD: Rotosonic		DRILLING END: 3/28/2008 17:30
LOGGER: A. Brewster		WELL COMPLETION DATE: 3/27/2008
GROUND SURFACE ELEVATION (NAVD 88): 466.76		GENERAL REMARKS: MW-54-85 shown as nested well.

LOCKING FLUSH COMPLETION

NOTES:

1. All depths are reported as feet below ground surface



WELL CONSTRUCTION & SCREEN DETAILS

CASING MATERIAL:	Sch 40 PVC
CASING DIAMETER:	2-in
BOREHOLE DIAMETER:	8-in
SEAL TYPE:	3/8" Bentonite Pellets
PACK TYPE:	Monterey beach sand # 3
CONCRETE PAD TYPE:	4-pt SQUARE
SCREEN LENGTH:	10-ft
SCREEN TYPE:	Sch 40 PVC
SLOT SIZE:	0.02-in

WELL DIAGRAM IS NOT TO SCALE

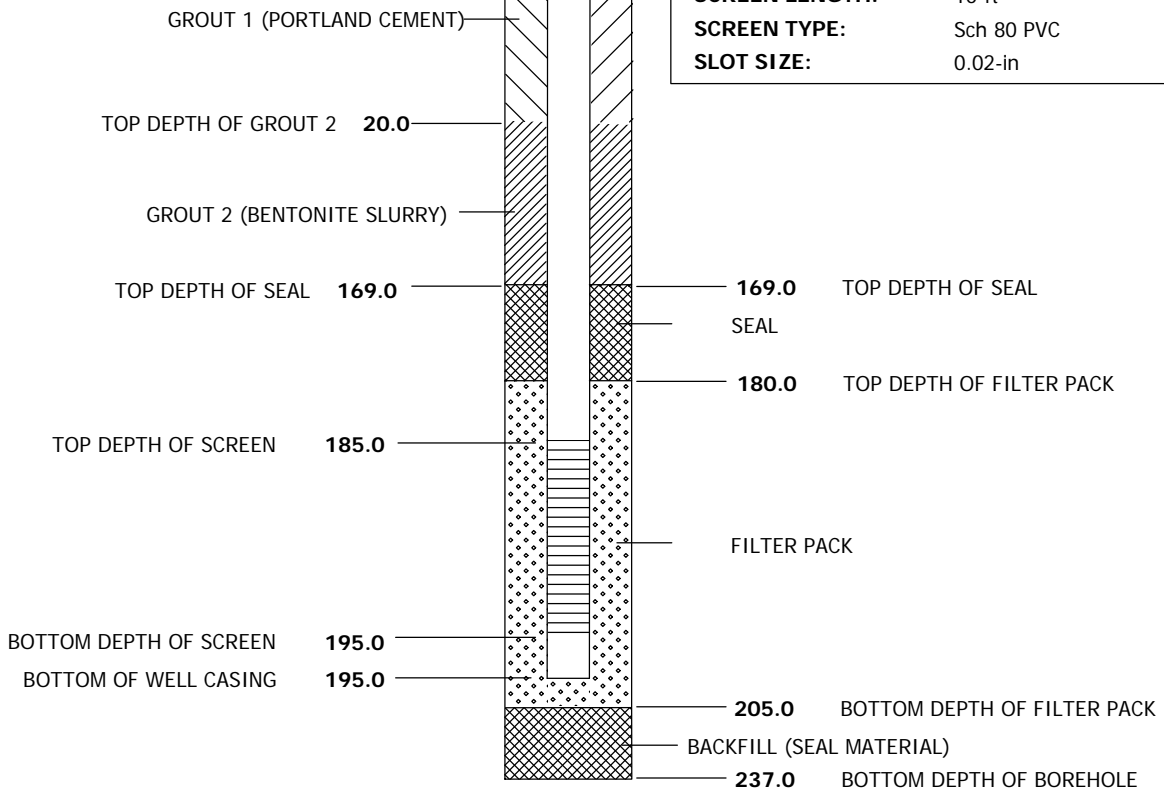
WELL COMPLETION DIAGRAM

PROJECT NO: 354948.FP.07.FW	PROJECT: Topock AZ Drilling	WELL NO: <i>MW-54-195</i>
LOCATION: Site 1		
DRILLING CONTRACTOR: Boart-Longyear	DRILLING START: 3/12/2008	
DRILLING METHOD: Rotosonic	DRILLING END: 3/18/2008	
LOGGER: A. Brewster	WELL COMPLETION DATE: 3/18/2008	
GROUND SURFACE ELEVATION (NAVD 88): 466.80	GENERAL REMARKS: ---	

LOCKING FLUSH COMPLETION

NOTES:

1. All depths are reported as feet below ground surface



WELL DIAGRAM IS NOT TO SCALE

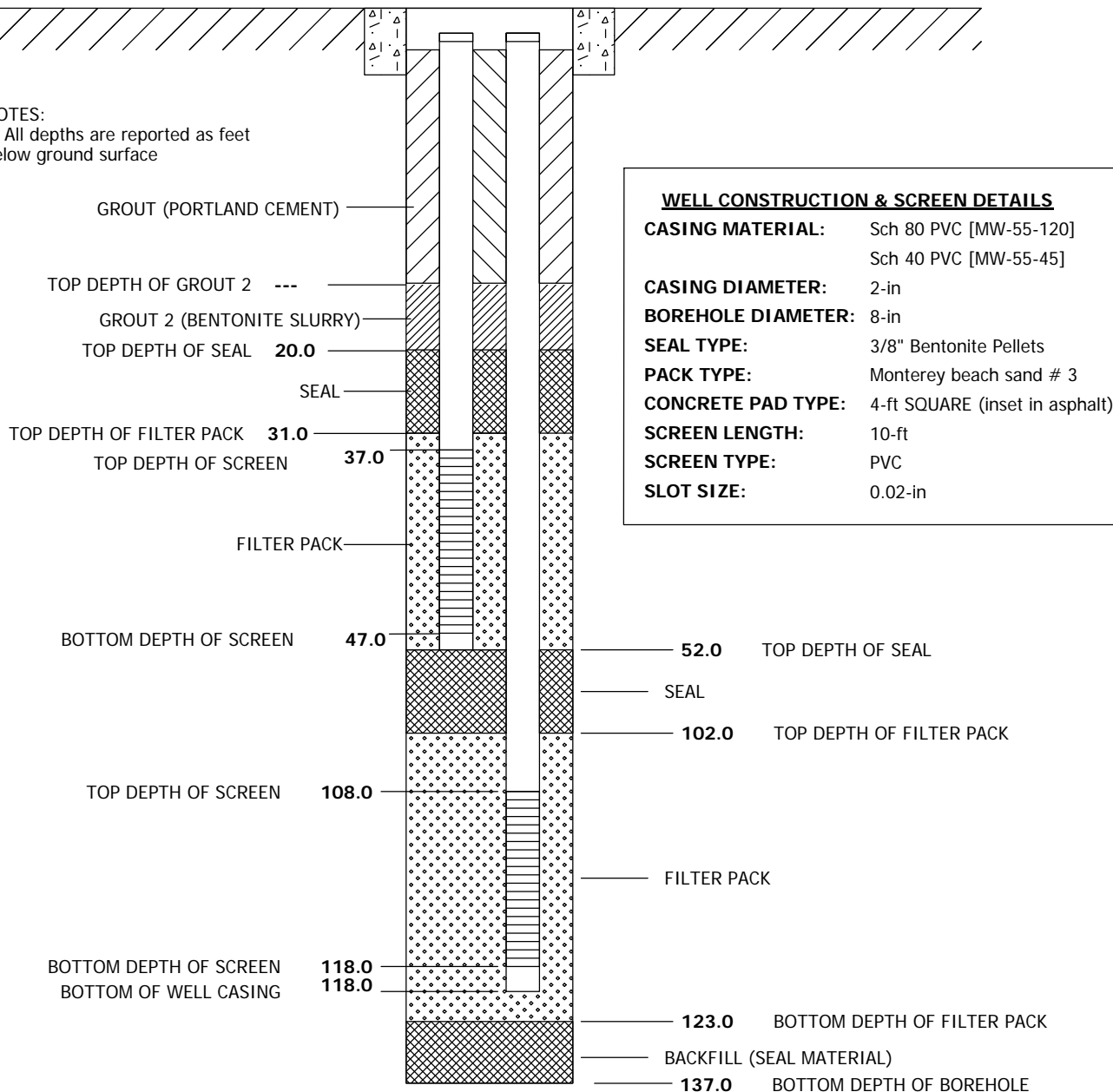
WELL COMPLETION DIAGRAM

PROJECT NO: 354948.FP.07.FW	PROJECT: Topock AZ Drilling	WELL NO: <i>MW-55-120</i> <i>MW-55-45</i>
LOCATION: Site 2 - Alternate		
DRILLING CONTRACTOR: Boart Longyear	DRILLING START: 3/29/2008	
DRILLING METHOD: Rotosonic	DRILLING END: 3/31/2008	
LOGGER: R.Tweidt	WELL COMPLETION DATE: 4/2/2008	
GROUND SURFACE ELEVATION (NAVD 88): 463.6	GENERAL REMARKS: Both wells constructed in one borehole.	
NORTHING (CCS NAD 83 Z 5): 2102606.18		
EASTING (CCS NAD 83 Z 5): 7618326.13		

12-in DIAMETER WELL VAULT (FLUSH WITH GRADE)

NOTES:

1. All depths are reported as feet below ground surface



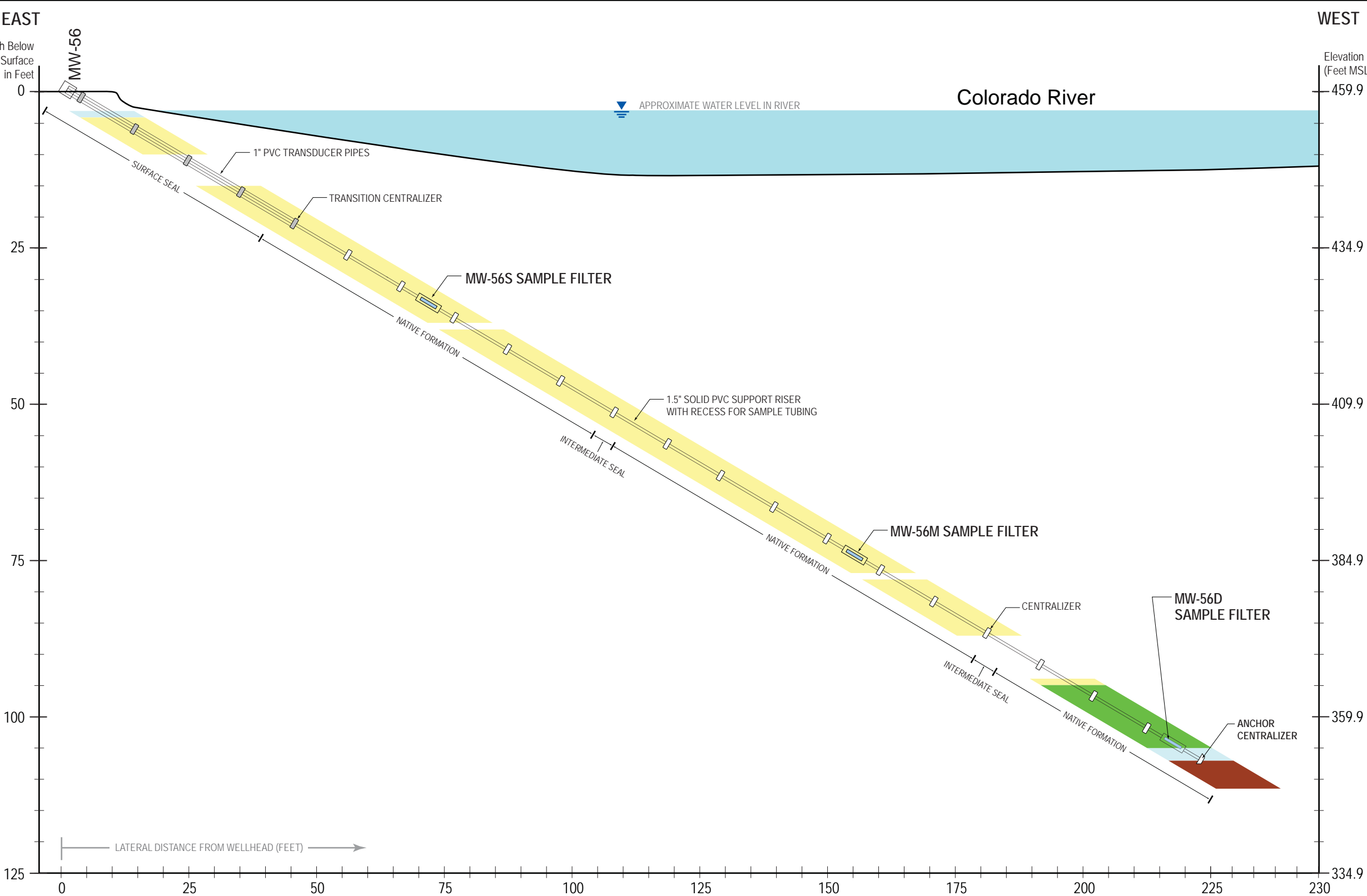
WELL DIAGRAM IS NOT TO SCALE

% Gravel	% Sand	% Sand	% Sand	% Fine	USCS
--	Cse	Med	Fne	--	
5	31	32	32		NR
			100		SW
					SP
			98	2	SP
					NR
			98	2	SP
		10	88	2	SP
15	10	10	85		SP
2	10	10	78		SP
	10		90		SP
	10		85	5	SP
		10	90	10	SP
			85	5	SP
5			85	10	SP
20			80		SP
2		20	78		SP
					NR
15			80	5	SP
60			10	30	GM
10	30	30	30		SW
					BR

Contacts are generalized.
Refer to boring log for precise depths and description.

LEGEND

SP	GM
SW	BR
	NR - No Recovery



Well Construction Information

Drilling Contractor: Prosonic/Boart-Longyear (Driller-Denzil Roberts)
Drilling Method: Rotosonic
Drilling Start: April 9, 2008
Drilling End: April 13, 2008
Well Installation Complete: April 20, 2008
Logged By: Rob Tweidt (Northstar)

Borehole Diameter: 6 inches
Borehole Angle: 30 Degrees from Horizontal
Borehole Azimuth: 270 Degrees
Drilled Borehole Depth: 223 feet
Annular Materials:
Native Formation – Native sands and gravels as logged.
Intermediate Seal – Native sands and gravels with bentonite slurry grout (10 gallons injected at depths indicated).
Surface Seal – Portland cement grout.
Completion Type: 10" steel monument casing placed at an angle within 3'x3'x4" concrete pad.

Notes:
1. Drawing scale is approximate.
2. Lithology is conceptual. Color bands should not be interpreted as laterally extensive stratigraphic units.
3. River bed depth estimated from "Transect B" of July 2005 Riverbed Survey.

MULTI-LEVEL MONITORING
WELL CONSTRUCTION DIAGRAM
MW-56 LOCATION
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

Appendix A-3
ADWR Notices of Intent

ARIZONA DEPARTMENT OF WATER RESOURCES

3550 N. Central Avenue, Phoenix, Arizona 85012
Telephone (602) 771-8500
Fax (602) 771-8691

January 07, 2008



Janet Napolitano
Governor

Herbert R. Guenther
Director

PACIFIC GAS AND ELECTRIC
4325 SOUTH HIGUERA ST
SAN LUIS OBISPO, CA 94305

Registration No. 55-215408
File No. B(15-21) 3 AAD

Dear Well Owner:

Enclosed for your records is an annotated copy of the Notice of Intention to Drill (NOI) a Monitor/Piezometer/Environmental Well, which you recently filed with this Department pursuant to A.R.S. § 45-596. This is to inform you that the Department has approved the NOI and has mailed a drilling card authorizing the drilling of the well to your designated well drilling contractor. The driller may not begin drilling until he has received the drilling card, which he must keep in his possession at the well site during drilling.

Well drilling activities must be completed within one year after the date the NOI was filed with the Department. If drilling is not completed within one year, you must file a new NOI before proceeding with further drilling. If it is necessary to change the location of the proposed well, you may not proceed with drilling until you file an amended NOI with the Department. A properly amended drilling card will then be issued and must be in the possession of the well drilling contractor before drilling begins.

Since this well is being drilled as a monitor or piezometer well, or for remediation purposes, our standard Well Driller Report and Well Log form (DWR form 55-55) is being furnished to the well drilling contractor. This form must be filed with the Department within 30 days after completion of the well. A Pump Installation Completion Report form (DWR form 55-56) is being furnished to the well owner for monitor wells where a pump installation is authorized. This must be completed within 30 days of installing a pump as required by A.R.S. § 45-600. During the drilling of a new well, if it is determined that it must be abandoned, then a Well Abandonment Completion Report (DWR form 55-58) must be submitted per R12-15-816(F).

Please be advised that A.R.S. § 45-593(C) requires the person to whom a well is registered to notify the Department of a change of ownership of the well and/or information pertaining to the physical characteristics of the well, in order to keep the well registration file current and accurate. Any change in well information or a request to change well driller must be filed on a Request to Change Well Information form (DWR form 55-71A), which is enclosed for your future use.

Sincerely,

Dianna Williams
NOI Unit
Water Management Support Section

Enclosures

**ARIZONA DEPARTMENT OF WATER RESOURCES
WATER MANAGEMENT SUPPORT SECTION**

3550 N. Central Avenue
Phoenix, Arizona 85012

Notice! This well is located in or near an area of groundwater contamination (WQARF/CERCLA/DOD or Other). Be advised that special requirements may apply. Please refer to the attached letter(s) to the well owner for details.

THIS AUTHORIZATION SHALL BE IN POSSESSION OF THE DRILLER DURING ALL DRILL OPERATIONS

WELL REGISTRATION NO: 55-215408

(MIL-55)

AUTHORIZED DRILLER: BOART LONGYEAR COMPANY

LICENSE NO: 83

NOTICE OF INTENTION TO DRILL A MONITOR WELL(S) HAS BEEN FILED WITH THE DEPARTMENT BY:

WELL OWNER: PACIFIC GAS AND ELECTRIC 4325 SOUTH HIGUERA ST SAN LUIS OBISPO, CA 94305

THE WELL(S) IS/ARE TO BE LOCATED IN THE:

SE ¼ OF THE NE ¼ OF THE NE ¼ SECTION 3 TOWNSHIP 15 NORTH RANGE 21 WEST

NO. OF WELLS IN THIS PROJECT: 1

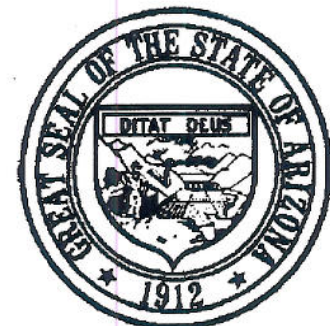
ASSESSOR PARCEL NO: 210-48-003

THIS AUTHORIZATION EXPIRES AT MIDNIGHT ON THE 4TH DAY OF JANUARY, 2009



WATER MANAGEMENT SUPPORT

**THE DRILLER MUST FILE A LOG OF THE WELL
WITHIN 30 DAYS OF COMPLETION OF DRILLING**



ARIZONA DEPARTMENT OF WATER RESOURCES

3550 N. Central Avenue, Phoenix, Arizona 85012

Telephone (602) 771-8500

Fax (602) 771-8691

February 26, 2008



Janet Napolitano
Governor

Herbert R. Guenther
Director

PACIFIC GAS AND ELECTRIC
4325 SOUTH HIGUERA ST
SAN LUIS OBISPO, CA 94305

Registration No. 55-215409
File No. B(15-21) 3 AAB

Dear Well Owner:

Enclosed for your records is an annotated copy of the Notice of Intention to Drill (NOI) a Monitor/Piezometer/Environmental Well, which you recently filed with this Department pursuant to A.R.S. § 45-596. This is to inform you that the Department has approved the NOI and has mailed a drilling card authorizing the drilling of the well to your designated well drilling contractor. The driller may not begin drilling until he has received the drilling card, which he must keep in his possession at the well site during drilling.

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Please be advised that A.R.S. § 45-593(C) requires the person to whom a well is registered to notify the Department of a change of ownership of the well and/or information pertaining to the physical characteristics of the well, in order to keep the well registration file current and accurate. Any change in well information or a request to change well driller must be filed on a Request to Change Well Information form (DWR form 55-71A), which is enclosed for your future use.

Sincerely,

Denae Schoonover

NOI Unit

Water Management Support Section

Enclosures



Printed on recycled paper. Each ton of recycled paper saves 7,000 gallons of water.

**ARIZONA DEPARTMENT OF WATER RESOURCES
WATER MANAGEMENT SUPPORT SECTION**

3550 N. Central Avenue
Phoenix, Arizona 85012

VARIANCE GRANTED

THIS AUTHORIZATION SHALL BE IN POSSESSION OF THE DRILLER DURING ALL DRILL OPERATIONS

WELL REGISTRATION NO: 55-215409

MW 54 M/S

AUTHORIZED DRILLER: BOART LONGYEAR COMPANY

LICENSE NO: 83

NOTICE OF INTENTION TO DRILL A MONITOR WELL(S) HAS BEEN FILED WITH THE DEPARTMENT BY:

WELL OWNER: PACIFIC GAS AND ELECTRIC 4325 SOUTH HIGUERA ST SAN LUIS OBISPO, CA 94305

THE WELL(S) IS/ARE TO BE LOCATED IN THE:

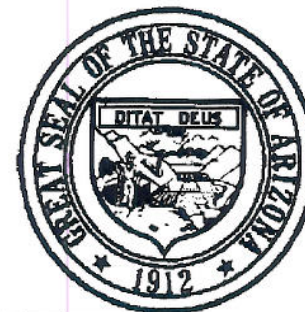
NW ¼ OF THE NE ¼ OF THE NE ¼ SECTION 3 TOWNSHIP 15 NORTH RANGE 21 WEST

NO. OF WELLS IN THIS PROJECT: 1

THIS AUTHORIZATION EXPIRES AT MIDNIGHT ON THE 13TH DAY OF FEBRUARY, 2009


WATER MANAGEMENT SUPPORT

THE DRILLER MUST FILE A LOG OF THE WELL
WITHIN 30 DAYS OF COMPLETION OF DRILLING



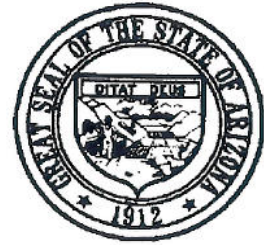
ARIZONA DEPARTMENT OF WATER RESOURCES

3550 N. Central Avenue, Phoenix, Arizona 85012

Telephone (602) 771-8500

Fax (602) 771-8691

February 26, 2008



Janet Napolitano
Governor

Herbert R. Guenther
Director

PACIFIC GAS AND ELECTRIC
4325 SOUTH HIGUERA ST
SAN LUIS OBISPO, CA 94305

Registration No. 55-215410
File No. B(15-21) 3 AAB

Dear Well Owner:

Enclosed for your records is an annotated copy of the Notice of Intention to Drill (NOI) a Monitor/Piezometer/Environmental Well, which you recently filed with this Department pursuant to A.R.S. § 45-596. This is to inform you that the Department has approved the NOI and has mailed a drilling card authorizing the drilling of the well to your designated well drilling contractor. The driller may not begin drilling until he has received the drilling card, which he must keep in his possession at the well site during drilling.

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Please be advised that A.R.S. § 45-593(C) requires the person to whom a well is registered to notify the Department of a change of ownership of the well and/or information pertaining to the physical characteristics of the well, in order to keep the well registration file current and accurate. Any change in well information or a request to change well driller must be filed on a Request to Change Well Information form (DWR form 55-71A), which is enclosed for your future use.

Sincerely,

Danae Schoonover

NOI Unit

Water Management Support Section

Enclosures



Printed on recycled paper. Each ton of recycled paper saves 7,000 gallons of water.

**ARIZONA DEPARTMENT OF WATER RESOURCES
WATER MANAGEMENT SUPPORT SECTION**

3550 N. Central Avenue
Phoenix, Arizona 85012

VARIANCE GRANTED

THIS AUTHORIZATION SHALL BE IN POSSESSION OF THE DRILLER DURING ALL DRILL OPERATIONS

WELL REGISTRATION NO: 55-215410 **MW - 54D**

AUTHORIZED DRILLER: BOART LONGYEAR COMPANY

LICENSE NO: 83

NOTICE OF INTENTION TO DRILL A MONITOR WELL(S) HAS BEEN FILED WITH THE DEPARTMENT BY:

WELL OWNER: PACIFIC GAS AND ELECTRIC 4325 SOUTH HIGUERA ST SAN LUIS OBISPO, CA 94305

THE WELL(S) IS/ARE TO BE LOCATED IN THE:

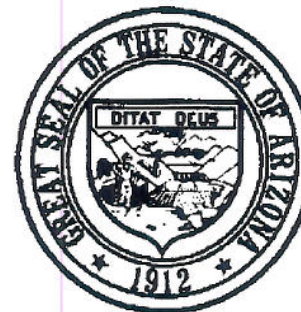
NW ¼ OF THE NE ¼ OF THE NE ¼ SECTION 3 TOWNSHIP 15 NORTH RANGE 21 WEST

NO. OF WELLS IN THIS PROJECT: 1

THIS AUTHORIZATION EXPIRES AT MIDNIGHT ON THE 13TH DAY OF FEBRUARY, 2009


WATER MANAGEMENT SUPPORT

THE DRILLER MUST FILE A LOG OF THE WELL
WITHIN 30 DAYS OF COMPLETION OF DRILLING



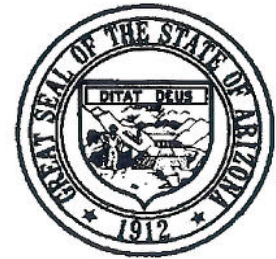
ARIZONA DEPARTMENT OF WATER RESOURCES

3550 N. Central Avenue, Phoenix, Arizona 85012

Telephone (602) 771-8500

Fax (602) 771-8691

June 13, 2007



Janet Napolitano
Governor

Herbert R. Guenther
Director

PACIFIC GAS AND ELECTRIC
4325 SOUTH HIGUERA ST
SAN LUIS OBISPO, CA 94305

Registration No. 55-215411
File No. B(15-21) 3 ADB

Dear Well Owner:

Enclosed for your records is an annotated copy of the Notice of Intention to Drill (NOI) a Monitor/Piezometer/Environmental Well, which you recently filed with this Department pursuant to A.R.S. § 45-596. This is to inform you that the Department has approved the NOI and has mailed a drilling card authorizing the drilling of the well to your designated well drilling contractor. The driller may not begin drilling until he has received the drilling card, which he must keep in his possession at the well site during drilling.

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Please be advised that A.R.S. § 45-593(C) requires the person to whom a well is registered to notify the Department of a change of ownership of the well and/or information pertaining to the physical characteristics of the well, in order to keep the well registration file current and accurate. Any change in well information or a request to change well driller must be filed on a Request to Change Well Information form (DWR form 55-71A), which is enclosed for your future use.

Sincerely,

A handwritten signature in black ink, appearing to read "Danita Haywood".

Danita Haywood
NOI Unit
Water Management Support Section

Enclosures

**ARIZONA DEPARTMENT OF WATER RESOURCES
WATER MANAGEMENT SUPPORT SECTION**

3550 N. Central Avenue
Phoenix, Arizona 85012

VARIANCE GRANTED

Notice! This well is located in or near an area of groundwater contamination (WQARF/CERCLA/DOD or Other). Be advised that special requirements may apply. Please refer to the attached letter(s) to the well owner for details.

THIS AUTHORIZATION SHALL BE IN POSSESSION OF THE DRILLER DURING ALL DRILL OPERATIONS

WELL REGISTRATION NO: 55-215411 (111V-56)

AUTHORIZED DRILLER: BOART LONGYEAR COMPANY

LICENSE NO: 83

NOTICE OF INTENTION TO DRILL A MONITOR WELL(S) HAS BEEN FILED WITH THE DEPARTMENT BY:

WELL OWNER: PACIFIC GAS AND ELECTRIC 4325 SOUTH HIGUERA ST SAN LUIS OBISPO, CA 94305

THE WELL(S) IS/ARE TO BE LOCATED IN THE:

NW ¼ OF THE SE ¼ OF THE NE ¼ SECTION 3 TOWNSHIP 15 NORTH RANGE 21 WEST

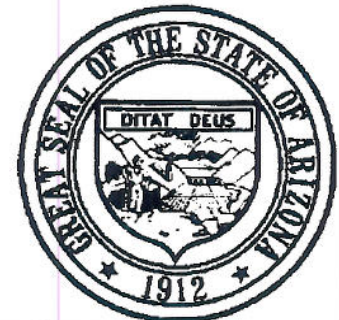
NO. OF WELLS IN THIS PROJECT: 1

ASSESSOR PARCEL NO: 210-48-001

THIS AUTHORIZATION EXPIRES AT MIDNIGHT ON THE 2ND DAY OF APRIL, 2008

WATER MANAGEMENT SUPPORT

**THE DRILLER MUST FILE A LOG OF THE WELL
WITHIN 30 DAYS OF COMPLETION OF DRILLING**



Appendix A-4
ADWR Well Completion Reports



Arizona Department of Water Resources
Information Management Unit
P.O. Box 33589 Phoenix, Arizona 85067-3589
(602) 771-8627 • (800) 352-8488
www.azwater.gov

Well Driller Report and Well Log

THIS REPORT MUST BE FILED WITHIN **30 DAYS** OF COMPLETING THE WELL.

PLEASE PRINT CLEARLY USING BLACK OR BLUE INK.

FILE NUMBER

WELL REGISTRATION NUMBER

55 - 215411

PERMIT NUMBER (IF ISSUED)

SECTION 1. DRILLING AUTHORIZATION

Drilling Firm

Mail To:	NAME	DWR LICENSE NUMBER
	BOART-LONGYEAR	83
	ADDRESS	TELEPHONE NUMBER
		480-635-9665
	CITY / STATE / ZIP	FAX
		480-635-9690

SECTION 2. REGISTRY INFORMATION

Well Owner		Location of Well					
FULL NAME OF COMPANY, ORGANIZATION, OR INDIVIDUAL		WELL LOCATION ADDRESS (IF ANY)					
PACIFIC GAS & ELECTRIC CO.							
MAILING ADDRESS		TOWNSHIP (NS)	RANGE (EW)	SECTION	160 ACRE	40 ACRE	10 ACRE
4325 S. MIGUEIRA ST.		15	21	003	NE 1/4	LTSE 1/4	NW 1/4
CITY / STATE / ZIP CODE		LATITUDE		LONGITUDE			
SAN LUIS OBISPO, CA 94305		34° 42' 59" N		114° 29' 7" W			
CONTACT PERSON NAME AND TITLE		METHOD OF LATITUDE/LONGITUDE (CHECK ONE)					
YVONNE MECKS, PM		<input type="checkbox"/> *GPS: Hand-Held <input checked="" type="checkbox"/> *GPS: Survey-Grade					
TELEPHONE NUMBER		LAND SURFACE ELEVATION AT WELL					
805-234-2257		459.93 Feet Above Sea Level					
FAX		METHOD OF ELEVATION (CHECK ONE)					
805-546-5232		<input type="checkbox"/> *GPS: Hand-Held <input checked="" type="checkbox"/> *GPS: Survey-Grade					
WELL NAME (e.g., MW-1, PZ-3, Lot 25 Well, Smith Well, etc.)		*GEOGRAPHIC COORDINATE DATUM (CHECK ONE)					
MW-56		<input checked="" type="checkbox"/> NAD-83 <input type="checkbox"/> Other (please specify):					
		COUNTY	ASSESSOR'S PARCEL ID NUMBER				
		MOHAVE	BOOK	MAP	PARCEL		
			210	48	001		

SECTION 3. WELL CONSTRUCTION DETAILS

Drill Method	Method of Well Development	Method of Sealing at Reduction Points
CHECK ALL THAT APPLY	CHECK ALL THAT APPLY	CHECK ONE
<input type="checkbox"/> Air Rotary	<input type="checkbox"/> Airlift	<input checked="" type="checkbox"/> None
<input type="checkbox"/> Bored or Augered	<input checked="" type="checkbox"/> Bail	<input type="checkbox"/> Packed
<input type="checkbox"/> Cable Tool	<input checked="" type="checkbox"/> Surge Block	<input type="checkbox"/> Swedged
<input type="checkbox"/> Dual Rotary	<input checked="" type="checkbox"/> Surge Pump	<input type="checkbox"/> Welded
<input type="checkbox"/> Mud Rotary	<input type="checkbox"/> Other (please specify):	<input type="checkbox"/> Other (please specify):
<input type="checkbox"/> Reverse Circulation		
<input type="checkbox"/> Driven		
<input type="checkbox"/> Jetted		
<input type="checkbox"/> Air Percussion / Odex Tubing		
<input checked="" type="checkbox"/> Other (please specify):	Condition of Well	Construction Dates
ROTOSONIC	CHECK ONE	DATE WELL CONSTRUCTION STARTED
	<input checked="" type="checkbox"/> Capped	9-17-2008
	<input type="checkbox"/> Pump Installed	DATE WELL CONSTRUCTION COMPLETED
		9-20-2008

I state that this notice is filed in compliance with A.R.S. § 45-596 and is complete and correct to the best of my knowledge and belief.

SIGNATURE OF QUALIFYING PARTY

DATE

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215411

SECTION 4. WELL CONSTRUCTION DESIGN (AS BUILT) (attach additional page if needed)

Depth

DEPTH OF BORING

223' DRILLED DEPTH (111.5' BGS)

Feet Below Land Surface

DEPTH OF COMPLETED WELL

220' DRILLED (105' BGS)

Feet Below Land Surface

Water Level Information

STATIC WATER LEVEL

Feet Below Land Surface

DATE MEASURED

TIME MEASURED

IF FLOWING WELL, METHOD OF FLOW REGULATION

☐ Valve ☐ Other:

Borehole			Installed Casing (NESTED - SEE ATTACHED)													
DEPTH FROM SURFACE		BOREHOLE DIAMETER (inches)	DEPTH FROM SURFACE		OUTER DIAMETER (inches)	MATERIAL TYPE (T)				PERFORATION TYPE (T)					SLOT SIZE IF ANY (inches)	
FROM (feet)	TO (feet)		FROM (feet)	TO (feet)		STEEL	PVC	ABS	IF OTHER TYPE, DESCRIBE	BLANK OR NONE	WIRE WRAP	SHUTTER SCREEN	MILLS KNIFE	SLOTTED		IF OTHER TYPE, DESCRIBE
0	223	6	0	67	0.25				NYLON							
			67	70	1.0		X		NYLON						BARCLAD FILTER	N/A
			0	147	0.25				NYLON							
			147	150	1.0		X								BARCLAD FILTER	N/A
			0	207	0.25				NYLON							
			207	210	1.0		X								BARCLAD FILTER	N/A

Installed Annular Material											
DEPTH FROM SURFACE		ANNULAR MATERIAL TYPE (T)							FILTER PACK		
FROM (feet)	TO (feet)	NONE	CONCRETE	NEAT CEMENT OR CEMENT GROUT	CEMENT-BENTONITE GROUT	BENTONITE				SAND	GRAVEL
						GROUT	CHIPS	PELLETS	IF OTHER TYPE OF ANNULAR MATERIAL, DESCRIBE		
0	24			X							
24	112								* FORMATION COLLAPSE W/ BENTONITE GROUT INJECTED AT 89 AND 54 FEET BGS. (SEE ATTACHED SCHEMATIC)		

* SEE ATTACHED WELL CONSTRUCTION SCHEMATIC

SECTION 5. GEOLOGIC LOG OF WELL

DEPTH FROM SURFACE*		Description Describe material, grain size, color, etc.	Check (T) every interval where water was encountered (if known)
FROM (feet)	TO (feet)		
0.0	3.0	Plant roots present, trace coarse sand. Max. clast size is 1.5cm	
3.0	4.0	Well-graded sand with 5% subrounded to rounded gravel and cobble. Soil becomes saturated to wet.	
4.0	9.0	Poorly graded sand, yellowish-brown, trace organics detected near 7ft	
9.0	10.0	Poorly graded sand with 2% fines, very dark grayish brown, trace silt	
10.0	15.0	Very limited recovery, material likely similar to that of 9 - 10 ft bgs.	
15.0	20.0	Poorly graded sand with 2% fines, very dark grayish brown, trace silt.	
20.0	33.0	Poorly graded sand (10% M, 88%F), 2% fines, color change to yellowish brown	
33.0	35.0	Poorly graded sand with 15% gravel, gravel (fine to coarse) is subrounded to rounded	
35.0	37.0	Poorly graded sand with 2% subrounded gravel (fine to coarse)	
37.0	38.0	No recovery	
38.0	41.0	Poorly graded sand with 2% subrounded gravel (fine to coarse)	
41.0	43.0	Poorly graded sand with 2% gravel, color change to grayish brown	
43.0	51.0	Poorly graded sand, color change to dark grey	
51.0	58.0	Poorly graded sand, 5% silt	
58.0	63.0	Poorly graded sand, 10% fines, color change to very dark grayish brown	
63.0	68.0	Poorly graded sand, 5% fines, presence of organic matter	
68.0	74.0	Poorly graded sand, 10% fines, 5% gravel, largest clast is 2 inches organics near 71 ft bgs	
74.0	77.0	Poorly graded sand with 20% subrounded to rounded gravel, largest clast is 3 inches	
77.0	78.0	No recovery	
78.0	87.0	Poorly graded sand with 2% gravel with 6-inch intervals of organic material (wood)	
87.0	94.0	No recovery	
94.0	95.0	Poorly graded sand with gravel, gravel is angular with no dominant mineralogy, largest clast is 2.3 inches	
95.0	105.0	Well-graded gravel with 30% fines, 10% sand, very dark brown, gravel is angular/subangular at top of interval and becomes well rounded with depth.	
105.0	107.0	Well-graded sand with 10% gravel, yellowish brown, fining upwards	
107.0	112.0	Bedrock, Consolidate Miocene conglomerate bedrock, dry	

* Boring drilled at 30° angle from horizontal; depths represent depth below ground surface, not drilled depth. Drilled depth for each interval can be provided upon request. Ground surface defined as elevation at wellhead. Actual ground surface elevation along the

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215411

SECTION 6. WELL SITE PLAN

NAME OF WELL OWNER

PACIFIC GAS & ELEC. CO.

COUNTY ASSESSOR'S PARCEL ID NUMBER

BOOK

210

MAP

48

PARCEL

001

- ❖ Please draw the following: (1) the boundaries of property on which the well was located; (2) the well location; (3) the locations of all septic tank systems and sewer systems on the property or within 100 feet of the well location, even if on neighboring properties; and (4) any permanent structures on the property that may aid in locating the well.
- ❖ Please indicate the distance between the well location and any septic tank system or sewer system.

SEE ATTACHED WELL
LOCATION FIGURE FOR
"MW-56"



1" = _____ ft



Arizona Department of Water Resources
Information Management Unit
P.O. Box 33589 Phoenix, Arizona 85067-3589
(602) 771-8627 • (800) 352-8488
www.azwater.gov

Well Driller Report and Well Log

THIS REPORT MUST BE FILED WITHIN **30 DAYS** OF COMPLETING THE WELL.

PLEASE PRINT CLEARLY USING BLACK OR BLUE INK.

FILE NUMBER

WELL REGISTRATION NUMBER

55 - 215408

PERMIT NUMBER (IF ISSUED)

SECTION 1. DRILLING AUTHORIZATION

Drilling Firm

Mail To:	NAME <i>BOART- LONG-YEAR</i>	DWR LICENSE NUMBER <i>83</i>
	ADDRESS	TELEPHONE NUMBER <i>480-635-9665</i>
	CITY / STATE / ZIP	FAX <i>480-635-9690</i>

SECTION 2. REGISTRY INFORMATION

Well Owner

FULL NAME OF COMPANY, ORGANIZATION, OR INDIVIDUAL

PACIFIC GAS & ELECTRIC COMPANY

MAILING ADDRESS

4325 S. HIGUERA ST.

CITY / STATE / ZIP CODE

SAN LUIS OBISPO, CA 94305

CONTACT PERSON NAME AND TITLE

Yvonne Meeks, PM

TELEPHONE NUMBER

805-234-2257

FAX

805-546-5232

WELL NAME (e.g., MW-1, PZ-3, Lot 25 Well, Smith Well, etc.)

MW-55-120 AND MW-55-45 (NESTED COMPLETION)

Location of Well

WELL LOCATION ADDRESS (IF ANY)

TOWNSHIP (N/S) <i>15</i>	RANGE (E/W) <i>31</i>	SECTION <i>3</i>	160 ACRE <i>NE 1/4</i>	40 ACRE <i>LIN 1/4</i>	10 ACRE <i>SE 1/4</i>
--------------------------------	-----------------------------	---------------------	---------------------------	---------------------------	--------------------------

LATITUDE

<i>34</i> °	<i>43</i> '	<i>9</i> "	N	<i>114</i> °	<i>28</i> '	<i>54</i> "	W
Degrees		Minutes	Seconds	Degrees		Minutes	Seconds

METHOD OF LATITUDE/LONGITUDE (CHECK ONE)

☐ *GPS: Hand-Held ☒ *GPS: Survey-Grade

LAND SURFACE ELEVATION AT WELL

463.57 Feet Above Sea Level

METHOD OF ELEVATION (CHECK ONE)

☐ *GPS: Hand-Held ☒ *GPS: Survey-Grade

*GEOGRAPHIC COORDINATE DATUM (CHECK ONE)

☒ NAD-83 ☐ Other (please specify):

COUNTY

MONROVIE

ASSESSOR'S PARCEL ID NUMBER

BOOK <i>210</i>	MAP <i>48</i>	PARCEL <i>003</i>
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SECTION 3. WELL CONSTRUCTION DETAILS

Drill Method

CHECK ALL THAT APPLY

- ☐ Air Rotary
☐ Bored or Augered
☐ Cable Tool
☐ Dual Rotary
☐ Mud Rotary
☐ Reverse Circulation
☐ Driven
☐ Jetted
☐ Air Percussion / Odex Tubing
☒ Other (please specify):
ROTOSONIC

Method of Well Development

CHECK ALL THAT APPLY

- ☐ Airlift
☒ Bail
☒ Surge Block
☒ Surge Pump
☐ Other (please specify):

Condition of Well

CHECK ONE

- ☒ Capped
☐ Pump Installed

Method of Sealing at Reduction Points

CHECK ONE

- ☒ None
☐ Packed
☐ Swedged
☐ Welded
☐ Other (please specify):

Construction Dates

DATE WELL CONSTRUCTION STARTED

4-1-2008

DATE WELL CONSTRUCTION COMPLETED

4-2-2008

I state that this notice is filed in compliance with A.R.S. § 45-596 and is complete and correct to the best of my knowledge and belief.

SIGNATURE OF QUALIFYING PARTY

DATE

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215408

SECTION 4. WELL CONSTRUCTION DESIGN (AS BUILT) (attach additional page if needed)**Depth**

DEPTH OF BORING

137 Feet Below Land Surface

DEPTH OF COMPLETED WELL
47' AND 118'

Feet Below Land Surface

Water Level Information

STATIC WATER LEVEL

10.6 Feet Below Land Surface

DATE MEASURED

3/29/08

TIME MEASURED

IF FLOWING WELL, METHOD OF FLOW REGULATION

☐ Valve ☐ Other:

Borehole			Installed Casing (NESTED - SEE ATTACHED)													
DEPTH FROM SURFACE		BOREHOLE DIAMETER (inches)	DEPTH FROM SURFACE		OUTER DIAMETER (inches)	MATERIAL TYPE (T)				PERFORATION TYPE (T)					SLOT SIZE IF ANY (inches)	
FROM (feet)	TO (feet)		FROM (feet)	TO (feet)		STEEL	PVC	ABS	IF OTHER TYPE, DESCRIBE	BLANK OR NONE	WIRE WRAP	SHUTTER SCREEN	MILLS KNIFE	SLOTTED		IF OTHER TYPE, DESCRIBE
0	137	8	0	37	2		X		SCM 40	X						
			37	47	2		X		SCM 40					X		0.02
			0	108	2		X		SCM 80	X						
			108	118	2		X		SCM 80					X		0.02

Installed Annular Material

DEPTH FROM SURFACE		ANNULAR MATERIAL TYPE (T)							FILTER PACK		
FROM (feet)	TO (feet)	NONE	CONCRETE	NEAT CEMENT OR CEMENT GROUT	CEMENT-BENTONITE GROUT	BENTONITE				SAND	GRAVEL
						GROUT	CHIPS	PELLETS			SIZE
0	22			✓							
22	32							✓			
32	52								100		#3
52	103							✓			
103	123								100		#3
123	137							✓			

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215408

SECTION 5. GEOLOGIC LOG OF WELL

[illegible]

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215408

SECTION 6. WELL SITE PLAN

NAME OF WELL OWNER

PACIFIC GAS & ELECT. CO.

COUNTY ASSESSOR'S PARCEL ID NUMBER

BOOK

210

MAP

48

PARCEL

003

- ❖ Please draw the following: (1) the boundaries of property on which the well was located; (2) the well location; (3) the locations of all septic tank systems and sewer systems on the property or within 100 feet of the well location, even if on neighboring properties; and (4) any permanent structures on the property that may aid in locating the well.
- ❖ Please indicate the distance between the well location and any septic tank system or sewer system.

SEE ATTACHED

WELL LOCATION

FIGURE FOR "MW-55-045/
MW-55-120"



1" = ____ ft



Arizona Department of Water Resources
Information Management Unit
P.O. Box 33589 Phoenix, Arizona 85067-3589
(602) 771-8627 • (800) 352-8488
www.azwater.gov

Well Driller Report and Well Log

THIS REPORT MUST BE FILED WITHIN **30 DAYS** OF COMPLETING THE WELL.

PLEASE PRINT CLEARLY USING BLACK OR BLUE INK.

FILE NUMBER

WELL REGISTRATION NUMBER

55 - 215410

PERMIT NUMBER (IF ISSUED)

SECTION 1. DRILLING AUTHORIZATION

Drilling Firm

Mail To:

NAME <i>BOART - LONG-YEAR</i>	DWR LICENSE NUMBER <i>83</i>
ADDRESS	TELEPHONE NUMBER <i>480-635-9665</i>
CITY / STATE / ZIP	FAX <i>480-635-9690</i>

SECTION 2. REGISTRY INFORMATION

Well Owner

FULL NAME OF COMPANY, ORGANIZATION, OR INDIVIDUAL

PACIFIC GAS & ELECTRIC CO.

MAILING ADDRESS

4325 S. HIGUERA ST.

CITY / STATE / ZIP CODE

SAN LUIS OBISPO, CA 94305

CONTACT PERSON NAME AND TITLE

YVONNE MEEKS, PM

TELEPHONE NUMBER

805-234-2257

FAX

805-546-5232

WELL NAME (e.g., MW-1, PZ-3, Lot 25 Well, Smith Well, etc.)

MW-54-195

Location of Well

WELL LOCATION ADDRESS (IF ANY)

HAVASU NATIONAL WILDLIFE REFUGE

TOWNSHIP (N/S) <i>15</i>	RANGE (E/W) <i>21</i>	SECTION <i>003</i>	160 ACRE <i>NE 1/4</i>	40 ACRE <i>NE 1/4</i>	10 ACRE <i>NW 1/4</i>
--------------------------------	-----------------------------	-----------------------	---------------------------	--------------------------	--------------------------

LATITUDE <i>34° 43' 13" N</i> Degrees Minutes Seconds	LONGITUDE <i>114° 29' 13" W</i> Degrees Minutes Seconds
---	---

METHOD OF LATITUDE/LONGITUDE (CHECK ONE)

☐ *GPS: Hand-Held ☒ *GPS: Survey-Grade

LAND SURFACE ELEVATION AT WELL

466.80 Feet Above Sea Level

METHOD OF ELEVATION (CHECK ONE)

☐ *GPS: Hand-Held ☒ *GPS: Survey-Grade

*GEOGRAPHIC COORDINATE DATUM (CHECK ONE)

☒ NAD-83 ☐ Other (please specify):

COUNTY

MOHAVE

ASSESSOR'S PARCEL ID NUMBER

BOOK MAP PARCEL

SECTION 3. WELL CONSTRUCTION DETAILS

Drill Method

CHECK ALL THAT APPLY

- ☐ Air Rotary
☐ Bored or Augered
☐ Cable Tool
☐ Dual Rotary
☐ Mud Rotary
☐ Reverse Circulation
☐ Driven
☐ Jetted
☐ Air Percussion / Odex Tubing
☒ Other (please specify):
ROTO SONIC

Method of Well Development

CHECK ALL THAT APPLY

- ☐ Airlift
☒ Bail
☒ Surge Block
☒ Surge Pump
☐ Other (please specify):

Condition of Well

CHECK ONE

- ☒ Capped
☐ Pump Installed

Method of Sealing at Reduction Points

CHECK ONE

- ☒ None
☐ Packed
☐ Swedged
☐ Welded
☐ Other (please specify):

Construction Dates

DATE WELL CONSTRUCTION STARTED

3-19-2008

DATE WELL CONSTRUCTION COMPLETED

3-20-2008

I state that this notice is filed in compliance with A.R.S. § 45-596 and is complete and correct to the best of my knowledge and belief.

SIGNATURE OF QUALIFYING PARTY

DATE

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215410

SECTION 4. WELL CONSTRUCTION DESIGN (AS BUILT) (attach additional page if needed)

Depth

DEPTH OF BORING

237 Feet Below Land Surface

DEPTH OF COMPLETED WELL

195 Feet Below Land Surface

Water Level Information

STATIC WATER LEVEL

15 Feet Below Land Surface

DATE MEASURED

3/12/08

TIME MEASURED

1113

IF FLOWING WELL, METHOD OF FLOW REGULATION

☐ Valve ☐ Other:

Borehole			Installed Casing													
DEPTH FROM SURFACE		BOREHOLE DIAMETER (inches)	DEPTH FROM SURFACE		OUTER DIAMETER (inches)	MATERIAL TYPE (T)				PERFORATION TYPE (T)					SLOT SIZE IF ANY (inches)	
FROM (feet)	TO (feet)		FROM (feet)	TO (feet)		STEEL	PVC	ABS	IF OTHER TYPE, DESCRIBE	BLANK OR NONE	WIRE WRAP	SHUTTER SCREEN	MILLS KNIFE	SLOTTED		IF OTHER TYPE, DESCRIBE
0	187	8"	0	185	2.3		✓		Sch 80							
187	237	7"	185	195	2.3		✓		Sch 80					✓		0.020

Installed Annular Material										
DEPTH FROM SURFACE		ANNULAR MATERIAL TYPE (T)							FILTER PACK	
FROM (feet)	TO (feet)	NONE	CONCRETE	NEAT CEMENT OR CEMENT GROUT	CEMENT-BENTONITE GROUT	BENTONITE			SAND	GRAVEL
						GROUT	CHIPS	PELLETS		
0.0	20.0			✓						
20.0	169.0					✓				
169.0	180.0							✓		
180.0	205.0								100	# 3
205.0	237.0							✓		

SECTION 5. GEOLOGIC LOG OF WELL

DEPTH FROM SURFACE		Description Describe material, grain size, color, etc.	Check (T) every interval where water was encountered (if known)
FROM (feet)	TO (feet)		
0.0	34.0	Poorly graded sand, subangular to subrounded	Saturated at 15 ft
34.0	53.0	Silty sand with gravel, subangular to subrounded	depth to top of
53.0	54.0	Well-graded sand, subrounded, largest clast is 10-mm	bedrock (230.0 ft bgs)
54.0	60.0	Poorly graded sand, subangular to subrounded	
60.0	64.0	Well-graded gravel, rounded to subrounded, various mineralogy, no structure, sharp contact with SP above, largest clast is 110-mm	
64.0	65.5	Well-graded sand, rounded to subrounded, no structure, largest clast 30-mm	
65.5	67.0	Poorly graded sand, subrounded, no structure	
67.0	69.0	Well-graded gravel, rounded to subrounded, various mineralogy, no structure, largest clast is 70-mm	
69.0	87.0	Poorly graded sand, subrounded, no structure, largest clast is 20-mm	
87.0	95.5	Poorly graded sand (5% fines), subrounded to subangular, no apparent structure	
95.5	97.0	Well-graded gravel, angular to subangular, various mineralogy, no structure, largest clast is 150-mm	
97.0	116.0	Cobbles with boulders, angular to rounded, clast supported, various mineralogy	
116.0	117.0	Clayey gravel, subrounded to subangular, clay is soft, largest clast is 100-mm	
117.0	120.0	Poorly graded gravel with silt and sand, subrounded to subangular, matrix supported, largest clast is 100-mm	
120.0	126.0	Well-graded gravel, subrounded, largest clast is greater than 6 inches	
126.0	131.0	Inorganic clay, medium stiff, finely laminated	
131.0	135.0	Poorly graded sand, subangular, largest clast is 50-mm	
135.0	136.6	Inorganic clay, medium stiff, finely laminated	
136.0	138.0	Poorly graded gravel with silt and sand, subangular to subrounded, clast supported, largest clast is 80-mm	
138.0	195.0	Well-graded sand, subangular, no structure, largest clast is 20-mm reddish brown (first occurrence of this color)	
195.0	230.0		
230.0	237.0	Bedrock, Consolidate Miocene Conglomerate, dr v	

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215410

SECTION 6. WELL SITE PLAN

NAME OF WELL OWNER

PACIFIC GAS & ELEC. CO.

COUNTY ASSESSOR'S PARCEL ID NUMBER

BOOK

MAP

PARCEL

- ❖ Please draw the following: (1) the boundaries of property on which the well was located; (2) the well location; (3) the locations of all septic tank systems and sewer systems on the property or within 100 feet of the well location, even if on neighboring properties; and (4) any permanent structures on the property that may aid in locating the well.
- ❖ Please indicate the distance between the well location and any septic tank system or sewer system.

SEE ATTACHED WELL
LOCATION FIGURE FOR
"NW-54-195"



1" = ____ ft



Arizona Department of Water Resources
Information Management Unit
P.O. Box 33589 Phoenix, Arizona 85067-3589
(602) 771-8627 • (800) 352-8488
www.azwater.gov

Well Driller Report and Well Log

THIS REPORT MUST BE FILED WITHIN **30 DAYS** OF COMPLETING THE WELL.

PLEASE PRINT CLEARLY USING BLACK OR BLUE INK.

FILE NUMBER

WELL REGISTRATION NUMBER

55 - 215409

PERMIT NUMBER (IF ISSUED)

SECTION 1. DRILLING AUTHORIZATION

Drilling Firm

Mail To:	NAME <i>BOART-Longyear</i>	DWR LICENSE NUMBER <i>83</i>
	ADDRESS	TELEPHONE NUMBER <i>480-635-9665</i>
	CITY / STATE / ZIP	FAX <i>480-635-9690</i>

SECTION 2. REGISTRY INFORMATION

Well Owner		Location of Well					
FULL NAME OF COMPANY, ORGANIZATION, OR INDIVIDUAL <i>Pacific Gas & Electric Co.</i>		WELL LOCATION ADDRESS (IF ANY) <i>MAVASU NATIONAL WILDLIFE REFUGE</i>					
MAILING ADDRESS <i>4325 S. HIGUERA ST.</i>		TOWNSHIP (N/S) <i>15</i>	RANGE (E/W) <i>21</i>	SECTION <i>003</i>	160 ACRE <i>NE 1/4</i>	40 ACRE <i>NE 1/4</i>	10 ACRE <i>NW 1/4</i>
CITY / STATE / ZIP CODE <i>SAN LUIS OBISPO, CA 94305</i>		LATITUDE <i>34° 43' 13" N</i> Degrees Minutes Seconds			LONGITUDE <i>114° 29' 13" W</i> Degrees Minutes Seconds		
CONTACT PERSON NAME AND TITLE <i>Yvonne Meeks, PM</i>		METHOD OF LATITUDE/LONGITUDE (CHECK ONE) <input type="checkbox"/> *GPS: Hand-Held <input checked="" type="checkbox"/> *GPS: Survey-Grade					
TELEPHONE NUMBER <i>805-234-2257</i>	FAX <i>805-546-5232</i>	LAND SURFACE ELEVATION AT WELL <i>466.39</i> Feet Above Sea Level					
WELL NAME (e.g., MW-1, PZ-3, Lot 25 Well, Smith Well, etc.) <i>MW-54-140 AND MW-54-85 (NESTED COMPLETION)</i>		METHOD OF ELEVATION (CHECK ONE) <input type="checkbox"/> *GPS: Hand-Held <input checked="" type="checkbox"/> *GPS: Survey-Grade					
		*GEOGRAPHIC COORDINATE DATUM (CHECK ONE) <input checked="" type="checkbox"/> NAD-83 <input type="checkbox"/> Other (please specify):					
		COUNTY <i>MOHAVE</i>	ASSESSOR'S PARCEL ID NUMBER BOOK MAP PARCEL				

SECTION 3. WELL CONSTRUCTION DETAILS

Drill Method	Method of Well Development	Method of Sealing at Reduction Points
CHECK ALL THAT APPLY <input type="checkbox"/> Air Rotary <input type="checkbox"/> Bored or Augered <input type="checkbox"/> Cable Tool <input type="checkbox"/> Dual Rotary <input type="checkbox"/> Mud Rotary <input type="checkbox"/> Reverse Circulation <input type="checkbox"/> Driven <input type="checkbox"/> Jetted <input type="checkbox"/> Air Percussion / Odex Tubing <input checked="" type="checkbox"/> Other (please specify): <i>ROTARY SONIC</i>	CHECK ALL THAT APPLY <input type="checkbox"/> Airlift <input checked="" type="checkbox"/> Bail <input checked="" type="checkbox"/> Surge Block <input checked="" type="checkbox"/> Surge Pump <input type="checkbox"/> Other (please specify): Condition of Well CHECK ONE <input checked="" type="checkbox"/> Capped <input type="checkbox"/> Pump Installed	CHECK ONE <input checked="" type="checkbox"/> None <input type="checkbox"/> Packed <input type="checkbox"/> Swedged <input type="checkbox"/> Welded <input type="checkbox"/> Other (please specify): Construction Dates DATE WELL CONSTRUCTION STARTED <i>3-27-2008</i> DATE WELL CONSTRUCTION COMPLETED <i>3-28-2008</i>

I state that this notice is filed in compliance with A.R.S. § 45-596 and is complete and correct to the best of my knowledge and belief.

SIGNATURE OF QUALIFYING PARTY

DATE

55 - 215409

SECTION 5. GEOLOGIC LOG OF WELL

DEPTH FROM SURFACE		Description Describe material, grain size, color, etc.	Check (T) every interval where water was encountered (if known)
FROM (feet)	TO (feet)		
0.0	34.0	Poorly graded sand, subangular to subrounded	Saturated at 15 ft
34.0	53.0	Silty sand with gravel, subangular to subrounded	depth to top of
53.0	54.0	Well-graded sand, subrounded, largest clast is 10 mm	bedrock (230.0 ft bgs)
54.0	60.0	Poorly graded sand, subangular to subrounded	
60.0	64.0	Well-graded gravel, rounded to subrounded, various mineralogy, no structure, sharp contact with SP above, largest clast is 16 mm	
64.0	65.5	Well-graded sand, rounded to subrounded, no structure, largest clast 30 mm	
65.5	67.0	Poorly graded sand, subrounded, no structure	
67.0	69.0	Well-graded gravel, rounded to subrounded, various mineralogy, no structure, largest clast is 70 mm	
69.0	87.0	Poorly graded sand, subrounded, no structure, largest clast is 20 mm	
87.0	95.5	Poorly graded sand (5% fines), subrounded to subangular, no apparent structure	
95.5	97.0	Well-graded gravel, angular to subangular, various mineralogy, no structure, largest clast is 150 mm	
97.0	116.0	Cobbles with boulders, angular to rounded, clast supported, various mineralogy	
116.0	117.0	Clayey gravel, subrounded to subangular, clay is soft, largest clast is 100 mm	
117.0	120.0	Poorly graded gravel with silt and sand, subrounded to subangular, matrix supported, largest clast is 100 mm	
120.0	126.0	Well-graded gravel, subrounded, largest clast is greater than 6 inches	
126.0	131.0	Inorganic clay, medium stiff, finely laminated	
131.0	135.0	Poorly graded sand, subangular, largest clast is 50 mm	
135.0	136.0	Inorganic clay, medium stiff, finely laminated	
136.0	138.0	Poorly graded gravel with silt and sand, subangular to subrounded, clast supported, largest clast is 80 mm	
138.0	195.0	Well-graded sand, subangular, no structure, largest clast is 20 mm reddish brown (first occurrence of this color)	
195.0	230.0		
230.0	237.0	Bedrock, Consolidate Miocene Conglomerate, dr v/	

* Lithology of (55-215409) corresponds to lithology of (55-215410) for depth interval 0 - 147 ft bgs. These two boreholes are positioned adjacent.

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215409

SECTION 6. WELL SITE PLAN

NAME OF WELL OWNER

PACIFIC GAS & ELECTRIC CO.

COUNTY ASSESSOR'S PARCEL ID NUMBER

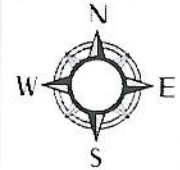
BOOK

MAP

PARCEL

- ❖ Please draw the following: (1) the boundaries of property on which the well was located; (2) the well location; (3) the locations of all septic tank systems and sewer systems on the property or within 100 feet of the well location, even if on neighboring properties; and (4) any permanent structures on the property that may aid in locating the well.
- ❖ Please indicate the distance between the well location and any septic tank system or sewer system.

SEE ATTACHED
WELL LOCATION
FIGURE FOR "MN-54-085/
NW-54-140"



1" = ____ ft



Arizona Department of Water Resources
Information Management Unit
P.O. Box 33589 Phoenix, Arizona 85067-3589
(602) 771-8627 • (800) 352-8488
www.azwater.gov

Well Driller Report and Well Log

THIS REPORT MUST BE FILED WITHIN **30 DAYS** OF COMPLETING THE WELL.

PLEASE PRINT CLEARLY USING BLACK OR BLUE INK.

FILE NUMBER

WELL REGISTRATION NUMBER

55 - 215411

PERMIT NUMBER (IF ISSUED)

SECTION 1. DRILLING AUTHORIZATION

Drilling Firm

Mail To:	NAME	DWR LICENSE NUMBER
	BOART- LONG-YEAR	83
	ADDRESS	TELEPHONE NUMBER
		480-635-9665
	CITY / STATE / ZIP	FAX
		480-635-9690

SECTION 2. REGISTRY INFORMATION

Well Owner		Location of Well					
FULL NAME OF COMPANY, ORGANIZATION, OR INDIVIDUAL		WELL LOCATION ADDRESS (IF ANY)					
PACIFIC GAS & ELECTRIC CO.							
MAILING ADDRESS		TOWNSHIP (NS)	RANGE (EW)	SECTION	160 ACRE	40 ACRE	10 ACRE
4325 S. MIGUEIRA ST.		15	21	003	NE 1/4	LTSE 1/4	NW 1/4
CITY / STATE / ZIP CODE		LATITUDE		LONGITUDE			
SAN LUIS OBISPO, CA 94305		34 ° 42 ' 59 " N		114 ° 29 ' 7 " W			
		Degrees Minutes Seconds		Degrees Minutes Seconds			
CONTACT PERSON NAME AND TITLE		METHOD OF LATITUDE/LONGITUDE (CHECK ONE)					
YVONNE MECKS, PM		<input type="checkbox"/> *GPS: Hand-Held <input checked="" type="checkbox"/> *GPS: Survey-Grade					
TELEPHONE NUMBER		FAX		LAND SURFACE ELEVATION AT WELL			
805-234-2257		805-546-5232		459.93 Feet Above Sea Level			
WELL NAME (e.g., MW-1, PZ-3, Lot 25 Well, Smith Well, etc.)		METHOD OF ELEVATION (CHECK ONE)					
MW-56		<input type="checkbox"/> *GPS: Hand-Held <input checked="" type="checkbox"/> *GPS: Survey-Grade					
		*GEOGRAPHIC COORDINATE DATUM (CHECK ONE)					
		<input checked="" type="checkbox"/> NAD-83 <input type="checkbox"/> Other (please specify):					
		COUNTY		ASSESSOR'S PARCEL ID NUMBER			
		MOHAVE		BOOK 210 MAP 48 PARCEL 001			

SECTION 3. WELL CONSTRUCTION DETAILS

Drill Method	Method of Well Development	Method of Sealing at Reduction Points
CHECK ALL THAT APPLY	CHECK ALL THAT APPLY	CHECK ONE
<input type="checkbox"/> Air Rotary	<input type="checkbox"/> Airlift	<input checked="" type="checkbox"/> None
<input type="checkbox"/> Bored or Augered	<input checked="" type="checkbox"/> Bail	<input type="checkbox"/> Packed
<input type="checkbox"/> Cable Tool	<input checked="" type="checkbox"/> Surge Block	<input type="checkbox"/> Swedged
<input type="checkbox"/> Dual Rotary	<input checked="" type="checkbox"/> Surge Pump	<input type="checkbox"/> Welded
<input type="checkbox"/> Mud Rotary	<input type="checkbox"/> Other (please specify):	<input type="checkbox"/> Other (please specify):
<input type="checkbox"/> Reverse Circulation		
<input type="checkbox"/> Driven		
<input type="checkbox"/> Jetted		
<input type="checkbox"/> Air Percussion / Odex Tubing		
<input checked="" type="checkbox"/> Other (please specify):	Condition of Well	Construction Dates
ROTOSONIC	CHECK ONE	DATE WELL CONSTRUCTION STARTED
	<input checked="" type="checkbox"/> Capped	9-17-2008
	<input type="checkbox"/> Pump Installed	DATE WELL CONSTRUCTION COMPLETED
		9-20-2008

I state that this notice is filed in compliance with A.R.S. § 45-596 and is complete and correct to the best of my knowledge and belief.

SIGNATURE OF QUALIFYING PARTY

DATE

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215411

SECTION 4. WELL CONSTRUCTION DESIGN (AS BUILT) (attach additional page if needed)

Depth

DEPTH OF BORING

223' DRILLED DEPTH (111.5' BGS)

Feet Below Land Surface

DEPTH OF COMPLETED WELL

220' DRILLED (105' BGS)

Feet Below Land Surface

Water Level Information

STATIC WATER LEVEL

Feet Below Land Surface

DATE MEASURED

TIME MEASURED

IF FLOWING WELL, METHOD OF FLOW REGULATION

☐ Valve ☐ Other:

Borehole			Installed Casing (NESTED - SEE ATTACHED)													
DEPTH ^{DRILLED} FROM SURFACE		BOREHOLE DIAMETER (inches)	DEPTH ^{DRILLED} FROM SURFACE		OUTER DIAMETER (inches)	MATERIAL TYPE (T)				PERFORATION TYPE (T)					SLOT SIZE IF ANY (inches)	
FROM (feet)	TO (feet)		FROM (feet)	TO (feet)		STEEL	PVC	ABS	IF OTHER TYPE, DESCRIBE	BLANK OR NONE	WIRE WRAP	SHUTTER SCREEN	MILLS KNIFE	SLOTTED		IF OTHER TYPE, DESCRIBE
0	223	6	0	67	0.25				NYLON							
			67	70	1.0		X		BRASS						BARLAD FILTER	N/A
			0	147	0.25				NYLON							
			147	150	1.0		X								BARLAD FILTER	N/A
			0	207	0.25				NYLON							
			207	210	1.0		X								BARLAD FILTER	N/A

Installed Annular Material											
DEPTH FROM SURFACE		ANNULAR MATERIAL TYPE (T)								FILTER PACK	
FROM (feet)	TO (feet)	NONE	CONCRETE	NEAT CEMENT OR CEMENT GROUT	CEMENT-BENTONITE GROUT	BENTONITE	IF OTHER TYPE OF ANNULAR MATERIAL, DESCRIBE				SIZE
						GROUT	CHIPS	PELLETS		SAND	GRAVEL
0	24			X							
24	112						* FORMATION COLLAPSE W/ BENTONITE GROUT INJECTED AT 89 AND 54 FEET BGS. (SEE ATTACHED SCHEMATIC)				

* SEE ATTACHED WELL CONSTRUCTION SCHEMATIC

SECTION 5. GEOLOGIC LOG OF WELL

DEPTH FROM SURFACE*		Description Describe material, grain size, color, etc.	Check (T) every interval where water was encountered (if known)
FROM (feet)	TO (feet)		
0.0	3.0	Plant roots present, trace coarse sand. Max. clast size is 1.5cm	
3.0	4.0	Well-graded sand with 5% subrounded to rounded gravel and cobble. Soil becomes saturated to wet.	
4.0	9.0	Poorly graded sand, yellowish-brown, trace organics detected near 7ft	
9.0	10.0	Poorly graded sand with 2% fines, very dark grayish brown, trace silt	
10.0	15.0	Very limited recovery, material likely similar to that of 9 - 10 ft bgs.	
15.0	20.0	Poorly graded sand with 2% fines, very dark grayish brown, trace silt.	
20.0	33.0	Poorly graded sand (10% M, 88%F), 2% fines, color change to yellowish brown	
33.0	35.0	Poorly graded sand with 15% gravel, gravel (fine to coarse) is subrounded to rounded	
35.0	37.0	Poorly graded sand with 2% subrounded gravel (fine to coarse)	
37.0	38.0	No recovery	
38.0	41.0	Poorly graded sand with 2% subrounded gravel (fine to coarse)	
41.0	43.0	Poorly graded sand with 2% gravel, color change to grayish brown	
43.0	51.0	Poorly graded sand, color change to dark grey	
51.0	58.0	Poorly graded sand, 5% silt	
58.0	63.0	Poorly graded sand, 10% fines, color change to very dark grayish brown	
63.0	68.0	Poorly graded sand, 5% fines, presence of organic matter	
68.0	74.0	Poorly graded sand, 10% fines, 5% gravel, largest clast is 2 inches organics near 71 ft bgs	
74.0	77.0	Poorly graded sand with 20% subrounded to rounded gravel, largest clast is 3 inches	
77.0	78.0	No recovery	
78.0	87.0	Poorly graded sand with 2% gravel with 6-inch intervals of organic material (wood)	
87.0	94.0	No recovery	
94.0	95.0	Poorly graded sand with gravel, gravel is angular with no dominant mineralogy, largest clast is 2.3 inches	
95.0	105.0	Well-graded gravel with 30% fines, 10% sand, very dark brown, gravel is angular/subangular at top of interval and becomes well rounded with depth.	
105.0	107.0	Well-graded sand with 10% gravel, yellowish brown, fining upwards	
107.0	112.0	Bedrock, Consolidate Miocene conglomerate bedrock, dry	

* Boring drilled at 30° angle from horizontal; depths represent depth below ground surface, not drilled depth. Drilled depth for each interval can be provided upon request. Ground surface defined as elevation at wellhead. Actual ground surface elevation along the

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215411

SECTION 6. WELL SITE PLAN

NAME OF WELL OWNER

PACIFIC GAS & ELEC. CO.

COUNTY ASSESSOR'S PARCEL ID NUMBER

BOOK

210

MAP


48

PARCEL

001

- ❖ Please draw the following: (1) the boundaries of property on which the well was located; (2) the well location; (3) the locations of all septic tank systems and sewer systems on the property or within 100 feet of the well location, even if on neighboring properties; and (4) any permanent structures on the property that may aid in locating the well.
- ❖ Please indicate the distance between the well location and any septic tank system or sewer system.

SEE ATTACHED WELL
LOCATION FIGURE FOR
"MW-56"



1" = _____ ft



Arizona Department of Water Resources
Information Management Unit
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(602) 771-8627 • (800) 352-8488
www.azwater.gov

Well Driller Report and Well Log

THIS REPORT MUST BE FILED WITHIN **30 DAYS** OF COMPLETING THE WELL.

PLEASE PRINT CLEARLY USING BLACK OR BLUE INK.

FILE NUMBER

WELL REGISTRATION NUMBER

55 - 215408

PERMIT NUMBER (IF ISSUED)

SECTION 1. DRILLING AUTHORIZATION

Drilling Firm

Mail To:	NAME <i>BOART- LONG-YEAR</i>	DWR LICENSE NUMBER <i>83</i>
	ADDRESS	TELEPHONE NUMBER <i>480-635-9665</i>
	CITY / STATE / ZIP	FAX <i>480-635-9690</i>

SECTION 2. REGISTRY INFORMATION

Well Owner

FULL NAME OF COMPANY, ORGANIZATION, OR INDIVIDUAL

PACIFIC GAS & ELECTRIC COMPANY

MAILING ADDRESS

4325 S. HIGUERA ST.

CITY / STATE / ZIP CODE

SAN LUIS OBISPO, CA 94305

CONTACT PERSON NAME AND TITLE

Yvonne Meeks, PM

TELEPHONE NUMBER

805-234-2257

FAX

805-546-5232

WELL NAME (e.g., MW-1, PZ-3, Lot 25 Well, Smith Well, etc.)

MW-55-120 AND MW-55-45 (NESTED COMPLETION)

Location of Well

WELL LOCATION ADDRESS (IF ANY)

TOWNSHIP (N/S) <i>15</i>	RANGE (E/W) <i>31</i>	SECTION <i>3</i>	160 ACRE <i>NE 1/4</i>	40 ACRE <i>LIN 1/4</i>	10 ACRE <i>SE 1/4</i>
--------------------------------	-----------------------------	---------------------	---------------------------	---------------------------	--------------------------

LATITUDE

<i>34</i> °	<i>43</i> '	<i>9</i> "	N	<i>114</i> °	<i>28</i> '	<i>54</i> "	W
Degrees		Minutes	Seconds	Degrees		Minutes	Seconds

METHOD OF LATITUDE/LONGITUDE (CHECK ONE)

☐ *GPS: Hand-Held ☒ *GPS: Survey-Grade

LAND SURFACE ELEVATION AT WELL

463.57 Feet Above Sea Level

METHOD OF ELEVATION (CHECK ONE)

☐ *GPS: Hand-Held ☒ *GPS: Survey-Grade

*GEOGRAPHIC COORDINATE DATUM (CHECK ONE)

☒ NAD-83 ☐ Other (please specify):

COUNTY

MONROVIE

ASSESSOR'S PARCEL ID NUMBER

BOOK <i>210</i>	MAP <i>48</i>	PARCEL <i>003</i>
--------------------	------------------	----------------------

SECTION 3. WELL CONSTRUCTION DETAILS

Drill Method

CHECK ALL THAT APPLY

- ☐ Air Rotary
☐ Bored or Augered
☐ Cable Tool
☐ Dual Rotary
☐ Mud Rotary
☐ Reverse Circulation
☐ Driven
☐ Jetted
☐ Air Percussion / Odex Tubing
☒ Other (please specify):
ROTOSONIC

Method of Well Development

CHECK ALL THAT APPLY

- ☐ Airlift
☒ Bail
☒ Surge Block
☒ Surge Pump
☐ Other (please specify):

Condition of Well

CHECK ONE

- ☒ Capped
☐ Pump Installed

Method of Sealing at Reduction Points

CHECK ONE

- ☒ None
☐ Packed
☐ Swedged
☐ Welded
☐ Other (please specify):

Construction Dates

DATE WELL CONSTRUCTION STARTED

4-1-2008

DATE WELL CONSTRUCTION COMPLETED

4-2-2008

I state that this notice is filed in compliance with A.R.S. § 45-596 and is complete and correct to the best of my knowledge and belief.

SIGNATURE OF QUALIFYING PARTY

DATE

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215408

SECTION 4. WELL CONSTRUCTION DESIGN (AS BUILT) (attach additional page if needed)**Depth**

DEPTH OF BORING

137 Feet Below Land Surface

DEPTH OF COMPLETED WELL
47' AND 118'

Feet Below Land Surface

Water Level Information

STATIC WATER LEVEL

10.6 Feet Below Land Surface

DATE MEASURED

3/29/08

TIME MEASURED

IF FLOWING WELL, METHOD OF FLOW REGULATION

☐ Valve ☐ Other:

Borehole			Installed Casing (NESTED - SEE ATTACHED)													
DEPTH FROM SURFACE		BOREHOLE DIAMETER (inches)	DEPTH FROM SURFACE		OUTER DIAMETER (inches)	MATERIAL TYPE (T)				PERFORATION TYPE (T)					SLOT SIZE IF ANY (inches)	
FROM (feet)	TO (feet)		FROM (feet)	TO (feet)		STEEL	PVC	ABS	IF OTHER TYPE, DESCRIBE	BLANK OR NONE	WIRE WRAP	SHUTTER SCREEN	MILLS KNIFE	SLOTTED		IF OTHER TYPE, DESCRIBE
0	137	8	0	37	2		X		SCH. 40	X						
			37	47	2		X		SCH. 40					X		0.02
			0	108	2		X		SCH. 80	X						
			108	118	2		X		SCH. 80					X		0.02

Installed Annular Material										
DEPTH FROM SURFACE		ANNULAR MATERIAL TYPE (T)							FILTER PACK	
FROM (feet)	TO (feet)	NONE	CONCRETE	NEAT CEMENT OR CEMENT GROUT	CEMENT-BENTONITE GROUT	BENTONITE	IF OTHER TYPE OF ANNULAR MATERIAL, DESCRIBE		SAND	GRAVEL
						GROUT CHIPS PELLETS				SIZE
0	22			✓						
22	32						✓			
32	52								100	#3
52	103						✓			
103	123								100	#3
123	137						✓			

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215408

SECTION 5. GEOLOGIC LOG OF WELL

[illegible]

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215408

SECTION 6. WELL SITE PLAN

NAME OF WELL OWNER

PACIFIC GAS & ELEC. CO.

COUNTY ASSESSOR'S PARCEL ID NUMBER

BOOK

210

MAP

48

PARCEL

003

- ❖ Please draw the following: (1) the boundaries of property on which the well was located; (2) the well location; (3) the locations of all septic tank systems and sewer systems on the property or within 100 feet of the well location, even if on neighboring properties; and (4) any permanent structures on the property that may aid in locating the well.
- ❖ Please indicate the distance between the well location and any septic tank system or sewer system.

SEE ATTACHED

WELL LOCATION

FIGURE FOR "MW-55-045/
MW-55-120"



1" = ____ ft



Arizona Department of Water Resources
Information Management Unit
P.O. Box 33589 Phoenix, Arizona 85067-3589
(602) 771-8627 • (800) 352-8488
www.azwater.gov

Well Driller Report and Well Log

THIS REPORT MUST BE FILED WITHIN **30 DAYS** OF COMPLETING THE WELL.

PLEASE PRINT CLEARLY USING BLACK OR BLUE INK.

FILE NUMBER

WELL REGISTRATION NUMBER

55 - 215410

PERMIT NUMBER (IF ISSUED)

SECTION 1. DRILLING AUTHORIZATION

Drilling Firm

Mail To:

NAME <i>BOART - LONG-VEAR</i>	DWR LICENSE NUMBER <i>83</i>
ADDRESS	TELEPHONE NUMBER <i>480-635-9665</i>
CITY / STATE / ZIP	FAX <i>480-635-9690</i>

SECTION 2. REGISTRY INFORMATION

Well Owner

FULL NAME OF COMPANY, ORGANIZATION, OR INDIVIDUAL

PACIFIC GAS & ELECTRIC CO.

MAILING ADDRESS

4325 S. HIGUERA ST.

CITY / STATE / ZIP CODE

SAN LUIS OBISPO, CA 94305

CONTACT PERSON NAME AND TITLE

YVONNE MEERS, PM

TELEPHONE NUMBER

805-234-2257

FAX

805-546-5232

WELL NAME (e.g., MW-1, PZ-3, Lot 25 Well, Smith Well, etc.)

MW-54-195

Location of Well

WELL LOCATION ADDRESS (IF ANY)

HAVASU NATIONAL WILDLIFE REFUGE

TOWNSHIP (N/S) <i>15</i>	RANGE (E/W) <i>21</i>	SECTION <i>003</i>	160 ACRE <i>NE 1/4</i>	40 ACRE <i>NE 1/4</i>	10 ACRE <i>NW 1/4</i>
--------------------------------	-----------------------------	-----------------------	---------------------------	--------------------------	--------------------------

LATITUDE <i>34</i> ° <i>43</i> ' <i>13</i> " N Degrees Minutes Seconds	LONGITUDE <i>114</i> ° <i>29</i> ' <i>13</i> " W Degrees Minutes Seconds
--	--

METHOD OF LATITUDE/LONGITUDE (CHECK ONE)

☐ *GPS: Hand-Held ☒ *GPS: Survey-Grade

LAND SURFACE ELEVATION AT WELL

466.80 Feet Above Sea Level

METHOD OF ELEVATION (CHECK ONE)

☐ *GPS: Hand-Held ☒ *GPS: Survey-Grade

*GEOGRAPHIC COORDINATE DATUM (CHECK ONE)

☒ NAD-83 ☐ Other (please specify):

COUNTY

MOHAVE

ASSESSOR'S PARCEL ID NUMBER

BOOK MAP PARCEL

SECTION 3. WELL CONSTRUCTION DETAILS

Drill Method

CHECK ALL THAT APPLY

- ☐ Air Rotary
☐ Bored or Augered
☐ Cable Tool
☐ Dual Rotary
☐ Mud Rotary
☐ Reverse Circulation
☐ Driven
☐ Jetted
☐ Air Percussion / Odex Tubing
☒ Other (please specify):
ROTO SONIC

Method of Well Development

CHECK ALL THAT APPLY

- ☐ Airlift
☒ Bail
☒ Surge Block
☒ Surge Pump
☐ Other (please specify):

Condition of Well

CHECK ONE

- ☒ Capped
☐ Pump Installed

Method of Sealing at Reduction Points

CHECK ONE

- ☒ None
☐ Packed
☐ Swedged
☐ Welded
☐ Other (please specify):

Construction Dates

DATE WELL CONSTRUCTION STARTED

3-19-2008

DATE WELL CONSTRUCTION COMPLETED

3-20-2008

I state that this notice is filed in compliance with A.R.S. § 45-596 and is complete and correct to the best of my knowledge and belief.

SIGNATURE OF QUALIFYING PARTY

DATE

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215410

SECTION 4. WELL CONSTRUCTION DESIGN (AS BUILT) (attach additional page if needed)**Depth**

DEPTH OF BORING

237 Feet Below Land Surface

DEPTH OF COMPLETED WELL

195 Feet Below Land Surface

Water Level Information

STATIC WATER LEVEL

15 Feet Below Land Surface

DATE MEASURED

3/12/08

TIME MEASURED

1113

IF FLOWING WELL, METHOD OF FLOW REGULATION

☐ Valve ☐ Other:

Borehole			Installed Casing													
DEPTH FROM SURFACE		BOREHOLE DIAMETER (inches)	DEPTH FROM SURFACE		OUTER DIAMETER (inches)	MATERIAL TYPE (T)				PERFORATION TYPE (T)					SLOT SIZE IF ANY (inches)	
FROM (feet)	TO (feet)		FROM (feet)	TO (feet)		STEEL	PVC	ABS	IF OTHER TYPE, DESCRIBE	BLANK OR NONE	WIRE WRAP	SHUTTER SCREEN	MILLS KNIFE	SLOTTED		IF OTHER TYPE, DESCRIBE
0	187	8"	0	185	2.3		✓		Sch 80							
187	237	7"	185	195	2.3		✓		Sch 80					✓		0.020

Installed Annular Material												
DEPTH FROM SURFACE		ANNULAR MATERIAL TYPE (T)							FILTER PACK			
FROM (feet)	TO (feet)	NONE	CONCRETE	NEAT CEMENT OR CEMENT GROUT	CEMENT-BENTONITE GROUT	BENTONITE			IF OTHER TYPE OF ANNULAR MATERIAL, DESCRIBE	SAND	GRAVEL	SIZE
						GROUT	CHIPS	PELLETS				
0.0	20.0			✓								
20.0	169.0					✓						
169.0	180.0							✓				
180.0	205.0									100		# 3
205.0	237.0							✓				

SECTION 5. GEOLOGIC LOG OF WELL

DEPTH FROM SURFACE		Description Describe material, grain size, color, etc.	Check (T) every interval where water was encountered (if known)
FROM (feet)	TO (feet)		
0.0	34.0	Poorly graded sand, subangular to subrounded	Saturated at 15 ft
34.0	53.0	Silty sand with gravel, subangular to subrounded	depth to top of
53.0	54.0	Well-graded sand, subrounded, largest clast is 10-mm	bedrock (230.0 ft bgs)
54.0	60.0	Poorly graded sand, subangular to subrounded	
60.0	64.0	Well-graded gravel, rounded to subrounded, various mineralogy, no structure, sharp contact with SP above, largest clast is 110-mm	
64.0	65.5	Well-graded sand, rounded to subrounded, no structure, largest clast 30-mm	
65.5	67.0	Poorly graded sand, subrounded, no structure	
67.0	69.0	Well-graded gravel, rounded to subrounded, various mineralogy, no structure, largest clast is 70-mm	
69.0	87.0	Poorly graded sand, subrounded, no structure, largest clast is 20-mm	
87.0	95.5	Poorly graded sand (5% fines), subrounded to subangular, no apparent structure	
95.5	97.0	Well-graded gravel, angular to subangular, various mineralogy, no structure, largest clast is 150-mm	
97.0	116.0	Cobbles with boulders, angular to rounded, clast supported, various mineralogy	
116.0	117.0	Clayey gravel, subrounded to subangular, clay is soft, largest clast is 100-mm	
117.0	120.0	Poorly graded gravel with silt and sand, subrounded to subangular, matrix supported, largest clast is 100-mm	
120.0	126.0	Well-graded gravel, subrounded, largest clast is greater than 6 inches	
126.0	131.0	Inorganic clay, medium stiff, finely laminated	
131.0	135.0	Poorly graded sand, subangular, largest clast is 50-mm	
135.0	136.6	Inorganic clay, medium stiff, finely laminated	
136.0	138.0	Poorly graded gravel with silt and sand, subangular to subrounded, clast supported, largest clast is 80-mm	
138.0	195.0	Well-graded sand, subangular, no structure, largest clast is 20-mm reddish brown (first occurrence of this color)	
195.0	230.0		
230.0	237.0	Bedrock, Consolidate Miocene Conglomerate, dr v	

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215410

SECTION 6. WELL SITE PLAN

NAME OF WELL OWNER

PACIFIC GAS & ELEC. CO.

COUNTY ASSESSOR'S PARCEL ID NUMBER

BOOK

MAP

PARCEL

- ❖ Please draw the following: (1) the boundaries of property on which the well was located; (2) the well location; (3) the locations of all septic tank systems and sewer systems on the property or within 100 feet of the well location, even if on neighboring properties; and (4) any permanent structures on the property that may aid in locating the well.
- ❖ Please indicate the distance between the well location and any septic tank system or sewer system.

SEE ATTACHED WELL
LOCATION FIGURE FOR
"NW-54-195"



1" = _____ ft



Arizona Department of Water Resources
Information Management Unit
P.O. Box 33589 Phoenix, Arizona 85067-3589
(602) 771-8627 • (800) 352-8488
www.azwater.gov

Well Driller Report and Well Log

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PLEASE PRINT CLEARLY USING BLACK OR BLUE INK.

FILE NUMBER

WELL REGISTRATION NUMBER

55 - 215409

PERMIT NUMBER (IF ISSUED)

SECTION 1. DRILLING AUTHORIZATION

Drilling Firm

Mail To:	NAME <i>BOART-Longyear</i>	DWR LICENSE NUMBER <i>83</i>
	ADDRESS	TELEPHONE NUMBER <i>480-635-9665</i>
	CITY / STATE / ZIP	FAX <i>480-635-9690</i>

SECTION 2. REGISTRY INFORMATION

Well Owner		Location of Well					
FULL NAME OF COMPANY, ORGANIZATION, OR INDIVIDUAL <i>Pacific Gas & Electric Co.</i>		WELL LOCATION ADDRESS (IF ANY) <i>MAVASU NATIONAL WILDLIFE REFUGE</i>					
MAILING ADDRESS <i>4325 S. HIGUERA ST.</i>		TOWNSHIP (N/S) <i>15</i>	RANGE (E/W) <i>21</i>	SECTION <i>003</i>	160 ACRE <i>NE 1/4</i>	40 ACRE <i>NE 1/4</i>	10 ACRE <i>NW 1/4</i>
CITY / STATE / ZIP CODE <i>SAN LUIS OBISPO, CA 94305</i>		LATITUDE <i>34° 43' 13" N</i> Degrees Minutes Seconds			LONGITUDE <i>114° 29' 13" W</i> Degrees Minutes Seconds		
CONTACT PERSON NAME AND TITLE <i>Yvonne Meeks, PM</i>		METHOD OF LATITUDE/LONGITUDE (CHECK ONE) <input type="checkbox"/> *GPS: Hand-Held <input checked="" type="checkbox"/> *GPS: Survey-Grade					
TELEPHONE NUMBER <i>805-234-2257</i>	FAX <i>805-546-5232</i>	LAND SURFACE ELEVATION AT WELL <i>466.39</i> Feet Above Sea Level					
WELL NAME (e.g., MW-1, PZ-3, Lot 25 Well, Smith Well, etc.) <i>MW-54-140 AND MW-54-85 (NESTED COMPLETION)</i>		METHOD OF ELEVATION (CHECK ONE) <input type="checkbox"/> *GPS: Hand-Held <input checked="" type="checkbox"/> *GPS: Survey-Grade					
		*GEOGRAPHIC COORDINATE DATUM (CHECK ONE) <input checked="" type="checkbox"/> NAD-83 <input type="checkbox"/> Other (please specify):					
		COUNTY <i>MOHAVE</i>	ASSESSOR'S PARCEL ID NUMBER BOOK MAP PARCEL				

SECTION 3. WELL CONSTRUCTION DETAILS

Drill Method	Method of Well Development	Method of Sealing at Reduction Points
CHECK ALL THAT APPLY <input type="checkbox"/> Air Rotary <input type="checkbox"/> Bored or Augered <input type="checkbox"/> Cable Tool <input type="checkbox"/> Dual Rotary <input type="checkbox"/> Mud Rotary <input type="checkbox"/> Reverse Circulation <input type="checkbox"/> Driven <input type="checkbox"/> Jetted <input type="checkbox"/> Air Percussion / Odex Tubing <input checked="" type="checkbox"/> Other (please specify): <i>ROTARY SONIC</i>	CHECK ALL THAT APPLY <input type="checkbox"/> Airlift <input checked="" type="checkbox"/> Bail <input checked="" type="checkbox"/> Surge Block <input checked="" type="checkbox"/> Surge Pump <input type="checkbox"/> Other (please specify): Condition of Well CHECK ONE <input checked="" type="checkbox"/> Capped <input type="checkbox"/> Pump Installed	CHECK ONE <input checked="" type="checkbox"/> None <input type="checkbox"/> Packed <input type="checkbox"/> Swedged <input type="checkbox"/> Welded <input type="checkbox"/> Other (please specify): Construction Dates DATE WELL CONSTRUCTION STARTED <i>3-27-2008</i> DATE WELL CONSTRUCTION COMPLETED <i>3-28-2008</i>

I state that this notice is filed in compliance with A.R.S. § 45-596 and is complete and correct to the best of my knowledge and belief.

SIGNATURE OF QUALIFYING PARTY

DATE

55 - 215409

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215409

SECTION 5. GEOLOGIC LOG OF WELL

DEPTH FROM SURFACE		Description Describe material, grain size, color, etc.	Check (T) every interval where water was encountered (if known)
FROM (feet)	TO (feet)		
0.0	34.0	Poorly graded sand, subangular to subrounded	Saturated at 15 ft
34.0	53.0	Silty sand with gravel, subangular to subrounded	depth to top of
53.0	54.0	Well-graded sand, subrounded, largest clast is 10 mm	bedrock (230.0 ft bgs)
54.0	60.0	Poorly graded sand, subangular to subrounded	
60.0	64.0	Well-graded gravel, rounded to subrounded, various mineralogy, no structure, sharp contact with SP above, largest clast is 16 mm	
64.0	65.5	Well-graded sand, rounded to subrounded, no structure, largest clast 30 mm	
65.5	67.0	Poorly graded sand, subrounded, no structure	
67.0	69.0	Well-graded gravel, rounded to subrounded, various mineralogy, no structure, largest clast is 70 mm	
69.0	87.0	Poorly graded sand, subrounded, no structure, largest clast is 20 mm	
87.0	95.5	Poorly graded sand (5% fines), subrounded to subangular, no apparent structure	
95.5	97.0	Well-graded gravel, angular to subangular, various mineralogy, no structure, largest clast is 150 mm	
97.0	116.0	Cobbles with boulders, angular to rounded, clast supported, various mineralogy	
116.0	117.0	Clayey gravel, subrounded to subangular, clay is soft, largest clast is 100 mm	
117.0	120.0	Poorly graded gravel with silt and sand, subrounded to subangular, matrix supported, largest clast is 100 mm	
120.0	126.0	Well-graded gravel, subrounded, largest clast is greater than 6 inches	
126.0	131.0	Inorganic clay, medium stiff, finely laminated	
131.0	135.0	Poorly graded sand, subangular, largest clast is 50 mm	
135.0	136.0	Inorganic clay, medium stiff, finely laminated	
136.0	138.0	Poorly graded gravel with silt and sand, subangular to subrounded, clast supported, largest clast is 80 mm	
138.0	195.0	Well-graded sand, subangular, no structure, largest clast is 20 mm reddish brown (first occurrence of this color)	
195.0	230.0		
230.0	237.0	Bedrock, Consolidate Miocene Conglomerate, dr v/	

* Lithology of (55-215409) corresponds to lithology of (55-215410) for depth interval 0 - 147 ft bgs. These two boreholes are positioned adjacent.

Well Driller Report and Well Log

WELL REGISTRATION NUMBER

55 - 215409

SECTION 6. WELL SITE PLAN

NAME OF WELL OWNER

PACIFIC GAS & ELECTRIC CO.

COUNTY ASSESSOR'S PARCEL ID NUMBER

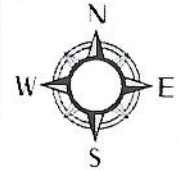
BOOK

MAP

PARCEL

- ❖ Please draw the following: (1) the boundaries of property on which the well was located; (2) the well location; (3) the locations of all septic tank systems and sewer systems on the property or within 100 feet of the well location, even if on neighboring properties; and (4) any permanent structures on the property that may aid in locating the well.
- ❖ Please indicate the distance between the well location and any septic tank system or sewer system.

SEE ATTACHED
WELL LOCATION
FIGURE FOR "MN-54-085/
NW-54-140"



1" = ____ ft

Appendix B

Geophysical Logs

welenco

5201 Woodmere Drive, Bakersfield, CA 93313-- www.welenco.com--(800) 445-9914
California Contractor's License No. 722373

INDUCTION-GAMMA RAY LOG

FILING NO.	COMPANY <u>CH2M Hill</u>		
	WELL <u>MW 54-195</u>		
	FIELD <u>PG&E Topock</u>		
	STATE <u>Arizona</u>	COUNTY <u>Mohave</u>	
JOB NO. 8972	LOCATION:		OTHER SERVICES:
	SEC: <u>5</u> TWP: <u>7N</u> RGE: <u>24E</u> LAT.: <u>34° 43' 13.1"</u> LONG.: <u>114° 29' 13.8"</u> MERIDIAN.: <u>San Bernardino</u>		
Permanent Datum: <u>Ground Level</u> , Elev. _____ Ft. Elev.: K.B. _____ Ft.			
Log Measured From: _____, _____ Ft. Above Perm. Datum D.F. _____ Ft.			
Drilling Measured From: _____ G.L. _____ Ft.			
Date	<u>Mar. 25, 2008</u>	<u>Mar. 25, 2008</u>	<u>Mar. 25, 2008</u>
Type Of Log	<u>Resistivity</u>	<u>Induction</u>	<u>Gamma Ray</u>
Run	<u>One</u>		
Depth-Driller	<u>237.3</u> Ft	<u>237.3</u> Ft	<u>237.3</u> Ft
Depth-Logger	<u>194</u> Ft	<u>194</u> Ft	<u>194</u> Ft
Top Logged Interval	<u>0</u> Ft	<u>0</u> Ft	<u>0</u> Ft
Btm. Logged Interval	<u>194</u> Ft	<u>194</u> Ft	<u>194</u> Ft
Type Fluid In Hole	<u>water</u>	<u>water</u>	<u>water</u>
Fluid Level	<u>15</u> Ft	<u>15</u> Ft	<u>15</u> Ft
Max Temp	°F	°F	°F
Operating Rig Time	Hr	Hr	Hr
Van No.	<u>L-15</u>	<u>Bfld</u>	<u>L-15</u> <u>Bfld</u>
Recorded By	<u>Z. Bobinski</u>	<u>Z. Bobinski</u>	
Witnessed By	<u>Barry Collom</u>	<u>Barry Collom</u>	
RUN	BOREHOLE RECORD		CASING RECORD
NO.	BIT	FROM TO	SIZE TYPE FROM TO
<u>1</u>	<u>In</u>	<u>Ft</u> <u>Ft</u>	<u>In</u> <u>Ft</u> <u>Ft</u>
<u>2</u>	<u>In</u>	<u>Ft</u> <u>Ft</u>	<u>2</u> <u>In</u> <u>PVC</u> <u>0</u> <u>Ft</u> <u>199</u> <u>Ft</u>
<u>3</u>	<u>In</u>	<u>Ft</u> <u>Ft</u>	<u>In</u> <u>Ft</u> <u>Ft</u>

Miscellaneous Information

Remarks:

A recreational GPS accurate to +/- 45 feet set for Datum NAD27 was used to calculate Latitude, Longitude & Elevation values. The Section, Township, and Range then determined using the TRS program (TRS accuracy is not guaranteed). The TRS program converts Latitude and Longitude to Section, Township, and Range. The NOTICE at the bottom of this heading also applies.

Perforated Intervals:

Line Speed:

	Run #7: , Down FPM, _____
Run #2: , Down FPM, _____	Run #8: , Down FPM, _____
Run #3: , Down FPM, _____	Run #9: , Down FPM, _____
Run #4: , Down FPM, _____	Run #10: , Down FPM, _____
Run #5: , Down FPM, _____	Run #11: , Down FPM, _____
Run #6: , Down FPM, _____	Run #12: , Down FPM, _____

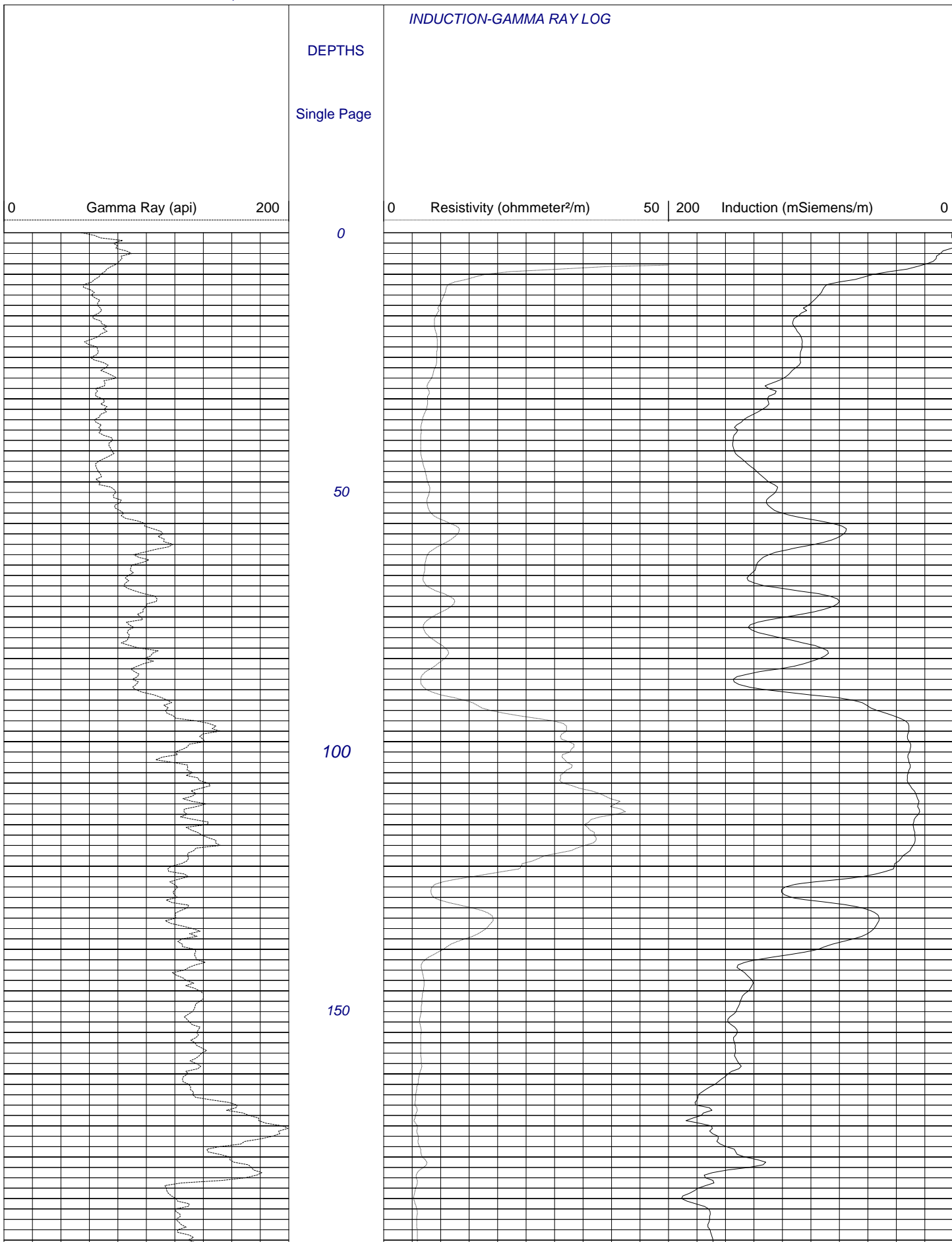
Borehole Volume Calculations:

Other Information:

: Bottom of Access Pipe Ft.	

NOTICE: All interpretations are opinions based on inferences from electrical and other measurements and we do not guarantee the accuracy or correctness of any verbal or written interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by one of our officers, agents or employees. These interpretations are also subject to our General Terms and Conditions as set out in our current Price Schedule.

welenco, inc. July 10, 2008



INDUCTION LOG GAMMA-RAY

Job No. 13982	Company CH2M HILL	State AZ
	Well MW-55-120	
	Field TOPOCK	
	County MOJAVE	

Location: MW-55 TOPOCK MARINA PARKING LOT	Other Services: NONE
--	-------------------------

Sec. Twp.	Rge.	Elevation above perm. datum	Elevation K.B. D.F. G.L.
Permanent Datum Log Measured From Drilling Measured From	G.L. G.L.	0'	G.L.
Date 6/19/2008			
Run Number	ONE		
Depth Driller	120'		
Depth Logger	120'		
Bottom Logged Interval	119'		
Top Log Interval	0'		
Pump Set @	NA		
Time Pumping Prior to Survey	NA		
Density / Viscosity	NA		
Max. Recorded Temp.	NA		
Pump Rate (GPM)	NA		
Time Well Ready	12:00 PM		
Time Logger on Bottom	12:30 PM		
Equipment Number	PS-3		
Location	L.A.		
Recorded By	ABREAU		
Witnessed By	COLLOM		

Borehole Record			Tubing Record				
Run Number	Bit	From	To	Size	Weight	From	To

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String				
Prot. String				
Production String	2"	SCH 80	0'	120'
Liner				

<<< Fold Here >>>

All interpretations are opinions based on inferences from electrical or other measurements and Pacific Surveys cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to Pacific Surveys' general terms and conditions set out in our current Price Schedule.

Comments

20	Gamma-Ray (GAPI)	80
0	Line Speed (ft/min)	-50

600	EM39 (mmho-m)	200
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