



Pacific Gas and Electric Company

**THIRD QUARTER 2021 INTERIM
MEASURES PERFORMANCE
MONITORING AND SITE-WIDE
GROUNDWATER AND SURFACE
WATER MONITORING REPORT**

Topock Compressor Station,
Needles, California

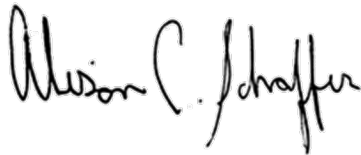
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Needles, California

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THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE
GROUNDWATER AND SURFACE WATER MONITORING REPORT

CONTENTS

Acronyms and Abbreviations.....	iv
Executive Summary.....	1
1 Introduction.....	1
1.1 Third Quarter 2021 Regulatory Communication	1
1.2 History of Groundwater Impact at the Site.....	2
1.2.1 Chromium-6 Impacts to Groundwater	2
1.2.2 Background Concentrations of Chromium-6	2
1.3 Site-wide Groundwater and Surface Water Monitoring Programs.....	3
1.3.1 Basis for GMP and RMP Programs.....	3
1.3.2 GMP and RMP Monitoring Networks	3
1.4 Interim Measure Performance Monitoring Program.....	4
1.4.1 Basis for PMP Program	4
1.4.2 PMP Monitoring Network.....	5
1.5 Sustainability	7
2 Third Quarter 2021 Monitoring Activities.....	9
2.1 Groundwater Monitoring Program	9
2.1.1 Monthly Groundwater Monitoring	9
2.1.2 Quarterly Groundwater Monitoring	9
2.2 Surface Water Monitoring Program	10
2.3 IM Performance Monitoring Program.....	10
2.3.1 Chromium Monitoring	10
2.3.2 IM Extraction System Operation.....	10
2.3.3 IM Hydraulic Monitoring.....	11
2.3.4 IM Contingency Plan Monitoring.....	11
3 Site-Wide Groundwater and Surface Water Monitoring Results.....	12
3.1 Groundwater Monitoring Results	12
3.1.1 Chromium-6 and Dissolved Chromium	12
3.1.2 Contaminants of Potential Concern and In-Situ Byproducts	12
3.1.3 Well Maintenance	12

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE
GROUNDWATER AND SURFACE WATER MONITORING REPORT

3.2	Surface Water Monitoring Results	13
3.2.1	Chromium-6 and Dissolved Chromium	13
3.2.2	Contaminants of Potential Concern and In-Situ Byproducts	13
3.3	Data Validation and Completeness	13
4	Third Quarter 2021 IM Performance Monitoring Program Evaluation	15
4.1	Distribution of Hexavalent Chromium in the Floodplain	15
4.2	IM Extraction System Operation	15
4.2.1	Chromium Concentrations in Wells Monitored for Conditional Shutdown of PE-01	16
4.3	IM Hydraulic Monitoring Results	16
4.3.1	Hydraulic Gradient Evaluation: California Floodplain	16
4.3.2	Hydraulic Gradient Evaluation: Arizona Side of the Colorado River	17
4.4	IM Contingency Plan Monitoring Results	17
4.5	Projected River Levels During Next Quarter	17
4.6	Third Quarter 2021 Performance Monitoring Program Evaluation Summary	18
5	Upcoming Operation and Monitoring Events	19
6	References	20

TABLES

1-1	Topock Monitoring Reporting Schedule
1-2	GMP, RMP, and PMP Monitoring Summary
3-1	Groundwater Sampling Results, Third Quarter 2021
3-2	Surface Water Sampling Results, Third Quarter 2021
4-1	Pumping Rate and Extracted Volume for IM-3 System, Third Quarter 2021
4-2	Wells Monitored for Conditional Shutdown of PE-01, Third Quarter 2021
4-3	Groundwater Elevation Results, Third Quarter 2021
4-4	Average Hydraulic Gradients Measured at Well Pairs, Third Quarter 2021
4-5	Interim Measure Contingency Plan Trigger Levels and Results, Third Quarter 2021
4-6	Predicted and Actual Monthly Average Davis Dam Discharge and Colorado River Elevation at I-3

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE GROUNDWATER AND SURFACE WATER MONITORING REPORT

FIGURES

- 1-1 Locations of IM-3 Facilities and Monitoring Locations
- 1-2 Monitoring Locations and Sampling Frequency for GMP
- 1-3 Monitoring Locations and Sampling Frequency for RMP
- 1-4 Locations of Wells and Cross-Sections Used for IM Performance Monitoring
- 3-1a Chromium-6 Sampling Results, Shallow Wells in Alluvial Aquifer and Bedrock, Third Quarter 2021
- 3-1b Chromium-6 Sampling Results, Deep Wells in Alluvial Aquifer and Bedrock, Third Quarter 2021
- 4-1 Chromium-6 Concentrations in Alluvial Aquifer and Bedrock, Third Quarter 2021
- 4-2 Chromium-6 Concentrations Floodplain Cross-Section B, Third Quarter 2021
- 4-3a Average Groundwater Elevations in Shallow Wells and River Elevations, Third Quarter 2021
- 4-3b Average Groundwater Elevations in Mid-depth Wells, Third Quarter 2021
- 4-3c Average Groundwater Elevations in Deep Wells, Third Quarter 2021
- 4-4 Average Groundwater Elevations for Wells in Floodplain Cross-Section A, Third Quarter 2021
- 4-5 Measured Hydraulic Gradients, River Elevation, and Pumping Rate, Third Quarter 2021
- 4-6 Past and Predicted Future River Levels at Topock Compressor Station

APPENDICES

- Appendix A Lab Reports, Third Quarter 2021
- Appendix B Historical Chromium-6 and Dissolved Chromium Concentrations, January 2020 through October 2021
- Appendix C Well Inspection and Maintenance Log, Third Quarter 2021
- Appendix D Concentration Time Series Charts, Third Quarter 2021
- Appendix E Interim Measures Extraction System Operations Log, Third Quarter 2021
- Appendix F Hydrographs, Third Quarter 2021

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE
GROUNDWATER AND SURFACE WATER MONITORING REPORT

ACRONYMS AND ABBREVIATIONS

δ2H	deuterium
δ18O	oxygen-18
µg/L	microgram per liter
chromium-6	hexavalent chromium
COPC	constituent of potential concern
DTSC	California Environmental Protection Agency, Department of Toxic Substances Control
ft/ft	foot per foot
GMP	Groundwater Monitoring Program
gpm	gallon per minute
ID	identification
IM	interim measure
IM-3	Interim Measures number 3
IMCP	Interim Measures Contingency Plan
mg/L	milligram per liter
MS	matrix spike
MSD	matrix spike duplicate
ORP	oxidation-reduction potential
PARCC	precision, accuracy, representativeness, comparability, and completeness
PG&E	Pacific Gas and Electric Company
PMP	Performance Monitoring Program
RCRA	Resource Conservation and Recovery Act
RMP	Surface Water Monitoring Program
RRB	Red Rock Bridge
TDS	total dissolved solids
TSS	total suspended solids
USBR	United States Bureau of Reclamation
UTL	upper tolerance limit

EXECUTIVE SUMMARY

This quarterly report documents the monitoring activities and performance evaluation of the interim measure (IM) hydraulic containment system under the Groundwater Monitoring Program (GMP), Surface Water Monitoring Program (RMP), and IM Performance Monitoring Program (PMP) for Pacific Gas and Electric Company's (PG&E's) Topock Compressor Station (the site), located near Needles, California. The reporting period for this report is July 1 through October 31, 2021 (Third Quarter 2021). Chemical and hydraulic monitoring data collected during this reporting period were used to determine if site conditions have changed and to evaluate the IM hydraulic containment system performance based on a set of standards approved by the California Department of Toxic Substances Control (DTSC).

Key items included in this report are: (1) GMP and RMP activities conducted and analytical results from this reporting period; (2) hexavalent chromium analytical data for monitoring wells in the floodplain area; (3) measured groundwater elevations and hydraulic gradient data at compliance well pairs; and (4) pumping rates and volumes from the IM extraction system.

During Third Quarter 2021, IM extraction wells TW-02D and TW-03D were operated to support hydraulic control. Well TW-01 was also operated as part of an aquifer test at the Topock Compressor Station; extracted water was routed to the IM extraction system for treatment. Hydraulic gradient data indicate that the minimum landward gradient target of 0.001 foot per foot was exceeded each month, except in July and August, when the northern and southern gradient pairs were slightly below the target due to the TW-01 aquifer test. Overall, hexavalent chromium concentrations greater than 20 micrograms per liter in the floodplain area were contained for removal and treatment. Based on the data and evaluation presented in this report, the IM performance standard has been met for the Third Quarter 2021. This is the last quarterly report for the IM hydraulic containment system and site-wide GMP and RMP for the site. In Fourth Quarter 2021 (November and December), the final groundwater remedy for the site is anticipated to start up, and quarterly reporting will transition to a Quarterly Progress Report.

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE GROUNDWATER AND SURFACE WATER MONITORING REPORT

1 INTRODUCTION

Pacific Gas and Electric Company (PG&E) is implementing interim measures (IMs) to address chromium concentrations in groundwater at the Topock Compressor Station (the site). The Topock Compressor Station is in eastern San Bernardino County, 15 miles southeast of the City of Needles, California, as shown on Figure 1-1.

This report presents the monitoring data from three PG&E monitoring programs:

- Site-wide Groundwater Monitoring Program (GMP);
- Site-wide Surface Water Monitoring Program (RMP); and
- Interim Measures (currently Interim Measure Number 3 [IM-3]) Performance Monitoring Program (PMP).

This report presents the monitoring data collected from PG&E's GMP, RMP, and PMP programs between July 1 through October 31, 2021 (hereafter referred to as "Third Quarter 2021"). Table 1-1 shows the current reporting schedule for these programs.

This report is divided into eight sections:

Section 1 introduces the site; the GMP, RMP, and PMP programs; and the regulatory framework.

Section 2 describes the Third Quarter 2021 monitoring and site operations conducted in support of these programs.

Section 3 presents GMP and RMP monitoring results for the Third Quarter 2021.

Section 4 presents PMP monitoring results and the IM evaluation for the Third Quarter 2021.

Section 5 describes upcoming monitoring events for the Fourth Quarter 2021.

Section 8 lists the references cited throughout this report.

This combined GMP, RMP, and PMP reporting format was approved by the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) in May 2009 (DTSC 2009). This is the last quarterly IM performance monitoring and site-wide groundwater and surface water monitoring report (PMP-GMP Report) for the site. In Fourth Quarter 2021 (November and December 2021), the final groundwater remedy for the site is anticipated to start up, and quarterly reporting will transition to a Quarterly Progress Report.

1.1 Third Quarter 2021 Regulatory Communication

PG&E communications with the DTSC in Third Quarter 2021 associated with the GMP, RMP, and/or PMP programs are identified below:

- The Second Quarter 2021 Interim Measures Performance Monitoring and Site-Wide Groundwater and Surface Water Monitoring Report (PMP-GMP Report) was submitted to the DTSC on August 15, 2021 (Arcadis 2021b).

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE GROUNDWATER AND SURFACE WATER MONITORING REPORT

- Required GMP, RMP, and PMP notifications submitted for Third Quarter 2021 included:
 - On November 1, 2021, Arcadis sent a quarterly email notification to PG&E providing hexavalent chromium (chromium-6) and dissolved chromium results from the August 2021 shoreline and in-channel surface water sampling event. During the sampling, chromium-6 and dissolved chromium concentrations were lower than the respective reporting limits.
 - On November 15, 2021, Arcadis, on behalf of PG&E, sent a quarterly email notification to the DTSC providing chromium-6 and dissolved chromium analytical results from four subject floodplain wells (MW-34-100, MW-44-115, MW-46-175, and MW-44-125).
 - As part of the conditional approval for the shutoff of extraction well PE-01, GMP monitoring results for monitoring wells listed in the July 20, 2015 DTSC approval letter (DTSC 2015) are compared to the maximum chromium-6 and dissolved chromium concentrations measured in 2014 (or for biennial sampling frequency, the 2013 maximum concentrations). Results that exceed the previous maximum are required to be reported to the DTSC within 40 days after the end of the quarterly GMP sampling event. In Third Quarter 2021, chromium-6 and/or dissolved chromium concentrations were below the notification levels; therefore, a notification email was not submitted to the DTSC.

1.2 History of Groundwater Impact at the Site

1.2.1 Chromium-6 Impacts to Groundwater

The Topock Compressor Station began operations in 1951. Remediation efforts are ongoing to address chromium-6 in soil and groundwater resulting from the historical water discharge practices. A comprehensive library documenting the history of remediation at the Topock Compressor Station is available on the DTSC website at <http://dtsc-topock.com/> (DTSC 2021).

1.2.2 Background Concentrations of Chromium-6

Based on a regional study of naturally occurring metals in groundwater and a statistical evaluation of these data, naturally occurring chromium-6 in groundwater was calculated to exhibit an upper tolerance limit (UTL) concentration of 32 micrograms per liter ($\mu\text{g/L}$; CH2M Hill 2009). This concentration is used as the background concentration for remedial activities. At the site, the chromium-6 plume is mostly present within unconsolidated alluvial fan and fluvial deposits within the Alluvial Aquifer and, to a lesser extent, in fractured bedrock. Natural groundwater gradients are generally west-to-east at most of the site. The depth to groundwater and the thicknesses of the saturated sediments vary significantly across the site based on surface topography and the paleo-topography of the top-of-bedrock surface underneath the site.

1.3 Site-wide Groundwater and Surface Water Monitoring Programs

1.3.1 Basis for GMP and RMP Programs

Routine groundwater and surface water monitoring at the site began in 1998 following a Resource Conservation and Recovery Act (RCRA) facility investigation and are ongoing (CH2M Hill 2005). The main objective of the GMP and RMP programs is to monitor concentrations of chromium-6 and other site constituents in groundwater and surface water to determine if site conditions have changed and to make decisions about remedial options and future monitoring (CH2M Hill 2005). In accordance with the 2005 Monitoring Plan for Groundwater and Surface Water Monitoring (CH2M Hill 2005), quarterly monitoring reports document groundwater and surface water monitoring performed at the site during each reporting period. Monitoring reports submitted to date are available on the DTSC website. This report documents the GMP and RMP monitoring conducted in Third Quarter 2021.

1.3.2 GMP and RMP Monitoring Networks

The GMP monitoring well network and RMP surface water monitoring network are shown on Figures 1-2 and 1-3, respectively, and are summarized in the table here. The complete GMP network includes 145 wells that monitor groundwater in the Alluvial Aquifer and bedrock. Well construction details for wells in the GMP monitoring well network are summarized in Table 1-2. The RMP network consists of 16 surface water monitoring locations, nine of which are sampled at multiple depths.

Groundwater and Surface Water Monitoring Wells

Groundwater Monitoring Wells	Surface Water Monitoring Wells
133 monitoring wells in California, including two normally dry wells	10 river channel locations (9 of which are sampled at two different depths)
8 monitoring wells in Arizona	4 shoreline locations
4 IM-3 extraction wells	2 other surface water sampling locations (adjacent to the shoreline)

GMP and RMP monitoring consists of collecting groundwater and surface water samples, inspecting the monitoring wells, and taking corrective actions as needed. GMP and RMP monitoring is performed quarterly, although the monitoring wells included in each GMP event vary by quarter. In addition, GMP monitoring is performed monthly at two extraction wells (TW-03D and PE-01). Table 1-2 provides a list of the monitoring wells and surface water monitoring locations included in the GMP and RMP and the monitoring frequency at each location. Monitoring frequency at GMP wells is also shown on Figure 1-2.

Another component of GMP monitoring is the Bat Cave Wash, an incised ephemeral stream adjacent to the Topock Compressor Station that flows following rainfall events and drains into the Colorado River (Figures 1-1 and 1-2). If a storm causes surface water flow in Bat Cave Wash, additional groundwater samples are collected from monitoring wells MW-09, MW-10, and MW-11.

1.4 Interim Measure Performance Monitoring Program

1.4.1 Basis for PMP Program

Operation of the current IM-3 system began in July 2005. The IM-3 system is intended to maintain hydraulic control of the groundwater chromium-6 plume until the final corrective action is in place at the site (CH2M Hill 2007). The IM-3 system consists of a groundwater extraction system (four extraction wells: TW-02D, TW-03D, TW-02S, and PE-01), conveyance piping, a groundwater treatment plant, and an injection well field (for the discharge of the treated groundwater). Figure 1-1 shows the locations of the IM-3 extraction, conveyance, treatment, and injection facilities.

In a letter dated February 14, 2005, the DTSC issued an IM performance directive that established the operational requirements for the IM and methods for evaluating the performance of the IM (DTSC 2005). As defined by the DTSC, the performance standard for the IM is to, *“establish and maintain a net landward hydraulic gradient, both horizontally and vertically, that ensures that Cr(VI) concentrations at or greater than 20 micrograms per liter [$\mu\text{g}/\text{L}$] in the floodplain are contained for removal and treatment”* (DTSC 2005). The IM is required to maintain a landward hydraulic gradient of at least 0.001 foot per foot (ft/ft) within the lower portion of the Alluvial Aquifer (DTSC 2005).

In accordance with the February 2005 DTSC directive, the following conditions must be met to demonstrate achievement of the IM performance standard (DTSC 2005):

- Demonstrate that a landward hydraulic gradient is maintained within the lower portion of the Alluvial Aquifer in the floodplain by:
 - Providing potentiometric surface contour maps of the Alluvial Aquifer within the floodplain area;
 - Providing calculated hydraulic gradients using established gradient well pairs.
- Demonstrate that chromium-6 concentrations greater than 20 $\mu\text{g}/\text{L}$ in the floodplain area are contained for removal and treatment by:
 - Depicting the 20 and 50 $\mu\text{g}/\text{L}$ isoconcentration contours for chromium-6 within the floodplain on potentiometric surface maps and hydrogeologic cross-sections;
 - Providing maps and cross-sections of the chromium-6 concentration for the upper, middle, and lower portions of the Alluvial Aquifer in the floodplain area;
 - Providing time-versus-concentration graphs for chromium-6 measured in floodplain wells.

The February 2005 DTSC directive also defined the reporting requirements for the IM (DTSC 2005). In October 2007, the DTSC approved modifications to the reporting requirements, discontinuing monthly performance monitoring reports, and continuing with quarterly and annual reports (DTSC 2007). The DTSC approved additional updates and modifications to the PMP in letters dated October 12, 2007; July 14, 2008; July 16, 2008; March 3, 2010; April 28, 2010; and June 27, 2014 (DTSC 2007, 2008a, 2008b, 2010a, 2010b, 2014).

1.4.2 PMP Monitoring Network

The PMP consists of a network of monitoring wells used to demonstrate achievement of the IM performance standard. Subsets of wells within the PMP network (including chromium monitoring network, IM extraction wells, IM hydraulic monitoring network, IM Contingency Plan [IMCP] monitoring wells, and IM chemical performance monitoring network) focus on different methods for evaluating performance of the IM. The PMP monitoring network is presented in the table in this section and shown on Figure 1-4.

PMP Monitoring Network (145 monitoring wells included in the GMP)

Type of Well	Wells Included in Network
IM Extraction Wells (4 wells)	<ul style="list-style-type: none"> • TW-02D; • TW-03D; • TW-02S; • PE-01.
IM Hydraulic Monitoring Network (57 monitoring wells and 2 river monitoring locations)	<ul style="list-style-type: none"> • 16 shallow monitoring wells; • 15 mid-depth monitoring wells; • 26 deep monitoring wells; • 2 river monitoring locations: I-3 and Red Rock Bridge (RRB).
IMCP Monitoring Network (24 wells)	<ul style="list-style-type: none"> • 6 shallow monitoring wells; • 5 mid-depth monitoring wells; • 13 deep monitoring wells.
IM Chemical Performance Monitoring Network (10 monitoring wells and 1 river monitoring location)	<ul style="list-style-type: none"> • 5 shallow monitoring wells; • 2 mid-depth monitoring wells; • 3 deep monitoring wells; • 1 river monitoring location: R-28.

The subsets of monitoring well networks within the PMP are described in the following subsections.

1.4.2.1 Chromium Monitoring Network

Chromium-6 data, collected as part of the GMP, are used to generate maps, cross-sections, and time-versus-concentration charts that demonstrate containment of chromium-6 concentrations greater than 20 µg/L in the floodplain area for removal and treatment. As described in Section 1.3.2, groundwater is sampled quarterly; however, the monitoring wells included in each sampling event vary by quarter. In addition, groundwater is sampled monthly at extraction wells TW-03D and PE-01. Table 1-2 provides a list of monitoring wells included in the chromium monitoring network (i.e., the GMP monitoring network) and the monitoring frequency of each location.

1.4.2.2 IM Extraction Wells

The PMP includes four IM extraction wells used to ensure a landward hydraulic gradient via groundwater extraction (Figure 1-4). The operation of the IM extraction system, including pumping rates, planned/unplanned downtime, and volume of groundwater extracted from each extraction well, is documented to demonstrate proper operation of the extraction system. In addition, the wells are sampled

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE GROUNDWATER AND SURFACE WATER MONITORING REPORT

as part of the GMP: extraction wells TW-03D and PE-01 are sampled monthly, TW-02D is sampled quarterly, and TW-02S is sampled annually.

Wells Monitored for Conditional Shutdown of PE-01

On July 20, 2015, the DTSC conditionally approved a proposal to modify the IM-3 pumping regime by allowing PE-01 to be shut off and pumping to be shifted to TW-03D and TW-02D or TW-02S, so long as gradient targets are maintained and contingency is not triggered based on chromium concentrations in select floodplain wells (DTSC 2015). Because PE-01 pumps water with low concentrations of chromium (typically less than 5 µg/L), shifting more pumping to a higher concentration extraction well can increase the rate of chromium removal from the floodplain.

As part of the conditional approval for PE-01 shutoff, GMP monitoring results from 47 monitoring wells listed in the July 20, 2015 DTSC approval letter (i.e., wells within approximately 800 feet of TW-03D; Table 1-2) are compared to the maximum detected chromium-6 and dissolved chromium concentrations from 2014 (or 2013 for wells sampled biennially). If results from any of the wells exceed the 2014 maximum concentration, then the DTSC must be notified within 40 days after completion of the field sampling event to determine if PE-01 pumping should be reinitiated (DTSC 2015).

1.4.2.3 IM Hydraulic Monitoring Network

The IM hydraulic monitoring network consists of 52 monitoring wells located on the California side of the Colorado River and two river monitoring locations (I-3 and RRB) used to evaluate the performance of the IM-3 system by demonstrating compliance of the required hydraulic gradient of 0.001 ft/ft (Figure 1-4, Table 1-2). In addition, five groundwater monitoring wells located on the Arizona side of the Colorado River (MW-54-085, MW-54-140, MW-54-195, MW-55-045, and MW-55-120; not formally part of the PMP) also provide groundwater elevation data that demonstrate hydraulic gradients on the Arizona side of the river (Figure 1-4). Groundwater and surface water elevation data from these locations are collected monthly using pressure transducers installed at each location.

Groundwater elevation data collected from the IM hydraulic monitoring network are used to develop potentiometric maps of shallow, mid-depth, and deep groundwater and measure hydraulic gradients of three well pairs (northern, central, and southern) to demonstrate compliance with the required 0.001 ft/ft landward hydraulic gradient. On August 18, 2017, the DTSC approved use of monitoring well MW-20-130 in place of well MW-45-095 in the central and southern gradient well pairs during months when extraction well PE-01 is not pumped for hydraulic control at the site (DTSC 2017). The current gradient well pairs are:

- Northern Gradient Pair: MW-31-135 and MW-33-150.
- When PE-01 is operated for hydraulic control:
 - Central Gradient Pair: MW-45-095 and MW-34-100;
 - Southern Gradient Pair: MW-45-095 and MW-27-085.
- When PE-01 is not operated for hydraulic control:
 - Central Gradient Pair: MW-20-130 and MW-34-100;

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE GROUNDWATER AND SURFACE WATER MONITORING REPORT

- Southern Gradient Pair: MW-20-130 and MW-27-085.

1.4.2.4 IM Contingency Plan Monitoring Wells

The IMCP was developed to detect and control possible migration of the chromium-6 plume toward the Colorado River (DTSC 2005). Twenty-four IMCP wells were selected as part of an early detection system to detect any increases in chromium concentrations at areas of interest across the site (Figure 1-4, Table 1-2). The IMCP wells are sampled quarterly as part of the GMP monitoring program (note that not all 24 wells are sampled each quarter) to determine if any increasing trends in chromium-6 concentrations are observed. If chromium-6 concentrations exceed the established trigger levels (based on historical chromium-6 concentrations), then a contingency plan must be implemented in accordance with the Revised Contingency Plan Flow Chart (DTSC 2005; PG&E 2008).

1.4.2.5 IM Chemical Performance Monitoring Network

Eleven IM chemical performance monitoring wells are sampled annually or biennially to help evaluate performance of the future remedy (Figure 1-4, Table 1-2). Wells are sampled for an expanded chemistry suite (dissolved boron, bromide, dissolved calcium, chloride, dissolved magnesium, nitrate/nitrite as nitrogen, dissolved potassium, dissolved sodium, sulfate, total alkalinity [as calcium carbonate], total dissolved solids [TDS], and stable isotopes [oxygen-18 { $\delta^{18}\text{O}$ } and deuterium { $\delta^2\text{H}$ }]), which was last amended in 2008 (DTSC 2008b; PG&E 2008). Currently, nine monitoring wells and one river monitoring location (R-28) are sampled annually, and one well is sampled biennially (MW-26). Results of IM chemical performance monitoring were last reported in the Fourth Quarter 2020 and Annual PMP-GMP Report (Arcadis 2021a).

1.5 Sustainability

The GMP, RMP, and PMP programs strive to use sustainable sampling and data collection practices. This section briefly describes some of the sustainability practices now in use, which aim to reduce emissions from travel, reduce waste, conserve resources, and reduce potential impacts to nesting habitat and culturally sensitive areas.

- Groundwater sampling purge water is disposed on site via the IM-3 treatment plant and injection process.
- The RMP boat contractor is employed locally.
- Laboratory services are provided by a California-certified, Las Vegas-based lab.
- Chromium-6 and nitrate analytical methods were revised to methods with longer holding times.
- Reports are submitted via the DTSC website and electronically, and the number of hard copy quarterly report submittals has been reduced over time.
- Solar-powered data telemetry systems were installed at six key gradient compliance wells located in floodplain areas with nesting habitat for sensitive avian species.

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE GROUNDWATER AND SURFACE WATER MONITORING REPORT

- Low-flow sampling methods are used at most wells screened in the Alluvial Aquifer, reducing the volume of purge water generated.
- For wells still using the three-volume purge sampling methods, the pumps and tubing are sized for the optimum purge technique at each well.
- Utility vehicles (e.g., Polaris Ranger or Kawasaki Mule) and a quiet electric four-wheel-drive utility vehicle are used to access wells on the floodplain and in some culturally sensitive areas rather than the full-size pickup truck.
- The IM-3 pumping regime was modified to allow PE-01 to be periodically shut off with pumping shifted to TW-03D and TW-02D or TW-02S. When applied, this modification allows for an increase in the rate of chromium removal from the floodplain.

2 THIRD QUARTER 2021 MONITORING ACTIVITIES

This section summarizes the monitoring completed during Third Quarter 2021 for the GMP, RMP, and PMP programs.

2.1 Groundwater Monitoring Program

The Third Quarter 2021 GMP consisted of monthly and quarterly groundwater monitoring.

2.1.1 Monthly Groundwater Monitoring

Monthly GMP monitoring (groundwater sampling) was performed at IM extraction wells TW-02D in July, August, and September and TW-03D in October 2021. IM extraction well PE-01 was not sampled in Third Quarter 2021 due to construction associated with the final groundwater remedy at the site. The well locations are shown on Figure 1-2 and listed in Table 1-2. Samples at TW-02D and TW-03D were collected from the taps of the extraction wells (see Table 1-2). During collection of each groundwater sample, field parameters were recorded (i.e., temperature, pH, specific conductivity, oxidation-reduction potential [ORP], turbidity, TDS, and salinity). Samples were sent to Asset Laboratories in Las Vegas, Nevada and analyzed for the following constituents:

- Chromium-6 and dissolved chromium;
- General chemistry parameters: specific conductivity, pH, alkalinity, chloride, sulfate, and TDS;
- Constituent of potential concern (COPC): nitrate/nitrite as nitrogen;
- In-situ byproducts: dissolved iron and dissolved manganese;
- Cations: dissolved calcium, dissolved magnesium, and dissolved sodium.

2.1.2 Quarterly Groundwater Monitoring

The quarterly GMP monitoring event, performed in August and September 2021, consisted of groundwater sampling and inspection of 17 monitoring wells. Monitoring wells MW-57-050 and MW-58-065 were dry during the monitoring event, and well TW-02D was sampled monthly rather than quarterly as it was in use as part of a long-term pumping test associated with TW-01. The monitoring well locations are shown on Figure 1-2 and listed in Table 1-2. Samples were collected using the low-flow sampling method. During collection of each groundwater sample, field parameters were recorded (i.e., temperature, pH, specific conductivity, ORP, turbidity, TDS, and salinity). Samples were sent to Asset Laboratories in Las Vegas, Nevada and were analyzed for the following constituents (note that not all samples were analyzed for the complete analytical suite listed here):

- Chromium-6 and dissolved chromium;
- General chemistry parameters: Specific conductivity;
- COPCs: dissolved molybdenum, dissolved selenium, and nitrate/nitrite as nitrogen;
- In-situ byproducts: dissolved arsenic and dissolved manganese.

2.2 Surface Water Monitoring Program

Third Quarter 2021 RMP monitoring was performed on August 18 and 19, 2021. The RMP monitoring event consisted of collecting 25 surface water samples from 16 locations. At nine of the 16 locations, samples were collected from two depth intervals: shallow (1 foot below water surface) and deep (1 foot above the river bottom). The surface water monitoring locations are shown on Figure 1-3 and listed in Table 1-2. During collection of each surface water sample, field parameters were recorded (i.e., temperature, pH, specific conductivity, ORP, turbidity, TDS, and salinity). Samples were sent to Asset Laboratories in Las Vegas, Nevada for analysis of the following constituents:

- Chromium-6 and dissolved chromium;
- General chemistry parameters: Specific conductivity and pH;
- COPCs: dissolved molybdenum, dissolved selenium, and nitrate/nitrite as nitrogen;
- In-situ byproducts: dissolved arsenic, total and dissolved iron, and dissolved manganese;
- Geochemical parameters: dissolved barium and total suspended solids (TSS).

2.3 IM Performance Monitoring Program

IM performance monitoring in Third Quarter 2021 consisted of groundwater chromium monitoring within the floodplain area, a review of IM extraction system operation, and IM hydraulic monitoring. In addition, chromium-6 and dissolved chromium data collected during chromium monitoring were used to monitor shutdown of extraction well PE-01 and evaluate the need to implement the IMCP.

2.3.1 Chromium Monitoring

Chromium monitoring was performed as part of the monthly and quarterly GMP monitoring. Seventeen monitoring wells were sampled for chromium-6 in August and September 2021. Extraction well TW-02D was sampled monthly in July, August, and September, and extraction well TW-03D was sampled in October 2021. The monitoring well locations are shown on Figure 1-4 and listed in Table 1-2. Chromium-6 analytical results were used to evaluate chromium-6 distribution in the floodplain area.

2.3.2 IM Extraction System Operation

The IM extraction system was operated in July, August, September, and October 2021. Pumping rates, planned or unplanned downtime, and the volume of groundwater extracted from each IM extraction well were documented. Daily IM-3 inspections were performed including general facility inspections, flow measurements, and site security monitoring. Daily logs with documentation of inspections are maintained on site.

2.3.2.1 Wells Monitored for Conditional Shutdown of PE-01

Three GMP monitoring wells were sampled for chromium-6 and dissolved chromium in Third Quarter 2021 as part of the conditional approval for PE-01 shutdown. IM extraction well PE-01 was not sampled due to construction associated with the final groundwater remedy at the site. The monitoring well

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE GROUNDWATER AND SURFACE WATER MONITORING REPORT

locations are shown on Figure 1-2 and listed in Table 1-2. Results were evaluated against the maximum detected chromium-6 and dissolved chromium concentrations from 2014.

2.3.3 IM Hydraulic Monitoring

Groundwater elevation data from monitoring wells and river monitoring locations within the IM hydraulic monitoring network are measured using pressure transducers, which record continuous water levels at 30-minute intervals. Pressure transducer data were downloaded in Third Quarter 2021 during the first two weeks of each month (July, August, September, and October) from the 52 monitoring wells in the IM hydraulic monitoring network, two river monitoring locations (I-3 and RRB), and five wells located on the Arizona side of the Colorado River. The monitoring well and river monitoring locations are shown on Figure 1-4 and listed in Table 1-2. Pressure transducers at the six gradient control monitoring wells (MW-27-085, MW-31-135, MW-33-150, MW-34-100, MW-45-095, and MW-20-130) were downloaded via a cellular telemetry system.

2.3.4 IM Contingency Plan Monitoring

Three IMCP monitoring wells were sampled for chromium-6 as part of the Third Quarter 2021 GMP program. The monitoring well locations are shown on Figure 1-4 and listed in Table 1-2. Results were evaluated against established trigger levels (based on historical chromium-6 concentrations).

3 SITE-WIDE GROUNDWATER AND SURFACE WATER MONITORING RESULTS

This section summarizes results from the groundwater and surface water monitoring performed during Third Quarter 2021 for the GMP and RMP programs.

3.1 Groundwater Monitoring Results

3.1.1 Chromium-6 and Dissolved Chromium

Table 3-1 presents the Third Quarter 2021 groundwater sample results for chromium-6 and dissolved chromium, as well as general chemistry parameters (specific conductivity, ORP, pH, and turbidity). The laboratory reports for samples analyzed during Third Quarter 2021 are provided in Appendix A. Historical chromium-6 and dissolved chromium concentration data are presented in Appendix B.

Figures 3-1a and 3-1b show the distribution of chromium-6 concentrations across the site in wells monitoring the upper-depth (shallow) and lower-depth (deep) intervals of the Alluvial Aquifer and bedrock. These figures also show the interpreted extent of groundwater chromium-6 concentrations higher than 32 µg/L for each depth interval. The value of 32 µg/L is based on the calculated natural background UTL for chromium-6 in groundwater from the background study (CH2M Hill 2009).

During Third Quarter 2021, the maximum detected chromium-6 and dissolved chromium concentrations were 49,000 µg/L and 60,000 µg/L (both at MW-68-180), respectively.

3.1.2 Contaminants of Potential Concern and In-Situ Byproducts

Table 3-1 presents the Third Quarter 2021 groundwater sample results for COPCs (dissolved molybdenum, dissolved selenium, and nitrate/nitrite as nitrogen) and in-situ byproducts (dissolved arsenic and dissolved manganese). Maximum concentrations for each constituent are:

- Dissolved molybdenum: 200 µg/L (MW-46-175);
- Dissolved selenium: 25 µg/L (MW-68-180);
- Nitrate/nitrite as nitrogen: 34 milligrams per liter (mg/L; MW-68-180);
- Dissolved arsenic: 6.5 µg/L (MW-38S);
- Dissolved manganese: 970 µg/L (MW-68BR).

3.1.3 Well Maintenance

Monitoring wells were inspected during groundwater sampling in Third Quarter 2021. No corrective or maintenance actions were needed. Appendix C provides a summary of the inspection results.

3.2 Surface Water Monitoring Results

3.2.1 Chromium-6 and Dissolved Chromium

Table 3-2 presents the Third Quarter 2021 surface water sample results for chromium-6 and dissolved chromium, as well as general chemistry parameters (pH and specific conductivity). Chromium-6 and dissolved chromium from the August 2021 sampling event were not detected at concentrations higher than reporting limits at any surface water monitoring location. The laboratory reports for samples analyzed during Third Quarter 2021 are provided in Appendix A.

3.2.2 Contaminants of Potential Concern and In-Situ Byproducts

Table 3-2 presents the Third Quarter 2021 surface water results for COPCs (dissolved molybdenum, dissolved selenium, and nitrate/nitrite as nitrogen), in-situ byproducts (dissolved arsenic, total iron, dissolved iron, and dissolved manganese), and other geochemical indicator parameters (dissolved barium and TSS). Maximum concentrations for each constituent are (with associated locations):

- Dissolved molybdenum: 4.4 µg/L (C-CON-S);
- Dissolved selenium: 1.6 µg/L (C-I-3-D, C-NR4-S, R-28);
- Nitrate/nitrite as nitrogen: 0.39 mg/L (C-NR4-D);
- Dissolved arsenic: 2.6 µg/L (C-MAR-S);
- Total iron: 190 µg/L (C-MAR-D);
- Dissolved iron: 21 µg/L (C-R27-D);
- Dissolved manganese: 6.4 µg/L (RRB);
- Dissolved barium: 110 µg/L (C-NR4-D, RRB);
- TSS: 10 mg/L (C-MAR-D).

3.3 Data Validation and Completeness

Project chemists reviewed laboratory analytical data from the Third Quarter 2021 sampling events to assess data quality and to identify deviations from analytical requirements. Data validation flags were assigned according to the quality assurance project plans (CH2M Hill 2014; Critigen 2020). Data validation qualifiers for groundwater and surface water analytical results are shown in Tables 3-1 and 3-2, respectively.

The Third Quarter 2021 analytical results were evaluated using the criteria of precision, accuracy, representativeness, comparability, and completeness (PARCC) to demonstrate that a sufficient number of representative samples was collected, and the resulting analytical data can be used to support the decision-making process as measured by the PARCC findings. The following summary highlights the PARCC findings:

- Precision of the data was verified through the review of the laboratory data quality indicators that include matrix spike/matrix spike duplicate (MS/MSD) and field duplicate relative percent differences.

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE GROUNDWATER AND SURFACE WATER MONITORING REPORT

Precision was generally acceptable for all analytes with some exceptions; data validation qualifiers were applied for results that did not meet quality control criteria.

- Accuracy of the data was verified through the review of the calibration, laboratory control samples, MS/MSDs, as well as the evaluation of method/field blank data. Accuracy was acceptable for all analyses with some exceptions; data validation qualifiers were applied for results that did not meet quality control criteria. A large quantity of the iron, dissolved iron, and dissolved arsenic data was considered estimated results due to matrix interference.
- Representativeness of the data was verified through the samples' collection, storage, and preservation procedures and the verification of holding-time compliance. The laboratory did not note any problems with the samples' collection, holding time, and storage. Chain-of-custody issues were minor and were resolved and documented in the data packages.
- Comparability of the data was ensured using standard analytical procedures and standard units for reporting. Results obtained are comparable to industry standards, in that the collection and analytical techniques followed approved, documented procedures.
- Completeness is a measure of the number of valid measurements obtained in relation to the total number of measurements planned. Completeness is expressed as the percentage of valid or usable measurements compared to planned measurements. Valid data are defined as all data that are not rejected for project use and flagged "R" for rejected during validation. All data are considered valid. The completeness goal of 90 percent was met for all method/analyte combinations.

4 THIRD QUARTER 2021 IM PERFORMANCE MONITORING PROGRAM EVALUATION

This section summarizes the results of the Third Quarter 2021 PMP evaluation.

4.1 Distribution of Hexavalent Chromium in the Floodplain

Chromium-6 data collected as part of the Third Quarter 2021 GMP monitoring were used to generate maps, cross-sections, and concentration time series charts to demonstrate that chromium-6 concentrations greater than 20 µg/L in the floodplain area are contained for removal and treatment.

Distribution of chromium-6 concentrations in the upper-depth (shallow wells) and lower-depth (deep wells) intervals of the Alluvial Aquifer is shown in plan view and cross-section view (cross-section A) on Figure 4-1. Figure 4-2 presents chromium-6 concentrations for cross-section B, oriented parallel to the Colorado River. The locations of cross-sections A and B are shown on Figure 4-1. The figures demonstrate that chromium-6 concentrations decrease from west to east along the floodplain (cross-section A), and that concentrations greater than 20 µg/L are contained in the floodplain area.

Appendix D provides chromium-6 time-versus-concentration charts for wells sampled in Third Quarter 2021 including for six deep monitoring wells in the floodplain area (MW-34-100, MW-36-090, MW-36-100, MW-44-115, MW-44-125, and MW-46-175) historically monitored for chromium encroachment. These six wells are located between the IM extraction wells and the Colorado River; therefore, they show the distribution of chromium-6 concentrations at the toe of the chromium-6 plume. As shown by the time-versus-concentration charts, chromium-6 concentrations have decreased since initiation of the IM extraction system in 2005 and have remained relatively steady over the past few years. In Third Quarter 2021, chromium-6 concentrations at the six wells were below 20 µg/L (Appendices B and D). In general, wells showing marked decreases in chromium-6 concentrations are located in the floodplain area where IM pumping is removing chromium in groundwater.

4.2 IM Extraction System Operation

During Third Quarter 2021, IM extraction wells TW-03D and TW-02D were operated to support hydraulic control, and well TW-01 was operated for aquifer testing. The TW-01 aquifer test was initiated in June 2021. Consequently, extraction from TW-03D was suspended, and TW-02D was solely operated through July 2021 (pumping rate of 24.2 gallons per minute [gpm]) to allow water extracted from TW-01 to be introduced into the pipeline and routed to the IM-3 system for treatment. In August 2021, extraction from TW-03D resumed; TW-02D and TW-03D were both operated to support hydraulic control at average pumping rates of 15.9 and 16.3 gpm, respectively. In September and October 2021, extraction from TW-02D ceased, and TW-03D was operated at an average pumping rate of 41.7 gpm in September and 43.8 gpm in October 2021. Extraction wells PE-01 and TW-02S were not operated during Third Quarter 2021.

The IM-3 system extracted and treated 21,431,482 gallons of groundwater during Third Quarter 2021, and an estimated 184 pounds (83.4 kilograms) of chromium were removed from the aquifer between June 1 and September 30, 2021 (Table 4-1). Note that groundwater extraction is reported on a different schedule than chromium removal reporting (i.e., July through October and June through September,

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE GROUNDWATER AND SURFACE WATER MONITORING REPORT

respectively; Table 4-1). The operational runtime percentage for the IM-3 system during Third Quarter 2021 was 96 percent. Appendix E provides the operations log for the IM-3 system including planned and unplanned downtime.

4.2.1 Chromium Concentrations in Wells Monitored for Conditional Shutdown of PE-01

During Third Quarter 2021, three of the 47 wells monitored to support the conditional shutdown of PE-01 were sampled for chromium-6 and dissolved chromium. Concentrations in MW-34-100, MW-44-115, and MW-46-175 were lower than the 2014 maximum concentrations (i.e., notification levels). Table 4-2 presents the chromium-6 and dissolved chromium concentrations and their associated notification levels.

4.3 IM Hydraulic Monitoring Results

Table 4-3 presents the Third Quarter 2021 average monthly and quarterly groundwater and river elevations, calculated from the pressure transducer data. Average daily groundwater and river elevations are provided as hydrographs in Appendix F. Groundwater elevations were adjusted for temperature and salinity differences among wells (i.e., adjusted to a common freshwater equivalent).

4.3.1 Hydraulic Gradient Evaluation: California Floodplain

Figures 4-3a, 4-3b, and 4-3c present the average Third Quarter 2021 groundwater elevations and associated groundwater contours for the shallow, mid-depth, and deep wells, respectively. Figure 4-4 presents the average groundwater elevations and associated groundwater contours for wells located in the floodplain along cross-section A. Due to complex vertical gradients present at portions of the Topock site, water levels for some wells are not considered in the contouring on Figures 4-3a, 4-3b, 4-3c, or 4-4.

During Third Quarter 2021, hydraulic gradients were measured for three gradient well pairs selected for performance monitoring of the IM-3 system (shown on Figure 1-4; note that PE-01 was not operated for hydraulic control):

- Northern Gradient Pair: MW-31-135 and MW-33-150;
- Central Gradient Pair: MW-20-130 and MW-34-100;
- Southern Gradient Pair: MW-20-130 and MW-27-085.

As discussed in Section 1.4.2.3, a landward hydraulic gradient of 0.001 ft/ft must be maintained to demonstrate compliance with the performance standard. Table 4-4 presents the monthly average hydraulic gradients measured for each of the gradient well pairs in Third Quarter 2021 as well as the overall average of all well pairs. The overall monthly average gradients for all well pairs were 0.0011, 0.0010, 0.0015, and 0.0013 ft/ft for July, August, September, and October 2021, respectively. Landward gradients measured each month exceeded the 0.001 ft/ft requirement, except at the northern and southern gradient pairs, which were slightly below the target gradient in July and August due to the TW-01 aquifer test. Although these monthly hydraulic gradients were below the target gradient, Cr6 concentrations greater than 20 µg/L in the floodplain area were hydraulically controlled. Figure 4-5

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE GROUNDWATER AND SURFACE WATER MONITORING REPORT

illustrates the measured hydraulic gradients during Third Quarter 2021 with the concurrent Colorado River elevations and IM-3 pumping rates.

4.3.2 Hydraulic Gradient Evaluation: Arizona Side of the Colorado River

During Third Quarter 2021, pressure transducer data were recorded in five wells located on the Arizona side of the Colorado River. The average quarterly groundwater elevations for monitoring wells MW-54-085, MW-54-140, MW-54-195, MW-55-045, and MW-55-120 are presented on Figures 4-3b and 4-3c and are used for contouring where appropriate. Except for well MW-55-045, all wells in the MW-54 and MW-55 clusters are screened in the deep interval of the Alluvial Aquifer. Well MW-55-045 is screened across portions of the shallow and middle intervals (Figure 4-3b). Average quarterly water levels at the MW-54 and MW-55 well clusters indicate that water elevations in monitoring wells in Arizona are higher than those in wells across the river on the California floodplain. This indicates that the apparent hydraulic gradient on the Arizona side of the river is westward and, as a result, groundwater flow would also be toward the west in that area. This is consistent with the site conceptual model and with the current numerical groundwater flow model.

4.4 IM Contingency Plan Monitoring Results

During Third Quarter 2021, chromium-6 concentrations in the three IMCP monitoring wells sampled were lower than the established trigger levels; therefore, implementation of the contingency plan was not needed. Chromium-6 concentrations for the IMCP wells and their associated trigger levels are presented in Table 4-5.

4.5 Projected River Levels During Next Quarter

Colorado River water level projections provide river level information useful for anticipating IM-3 extraction requirements for the upcoming quarter. The Colorado River stage near the site is measured at river monitoring location I-3. Water levels are directly influenced by releases from Davis Dam, and, to a lesser degree, from Lake Havasu elevations, both of which are controlled by the United States Bureau of Reclamation (USBR). Total releases from Davis Dam follow a predictable annual cycle, with the largest monthly releases typically in spring and early summer and the smallest monthly releases in late fall/winter (November and December). Superimposed on this annual cycle is a diurnal cycle determined primarily by daily fluctuations in electric power demand. Releases within a given 24-hour period often fluctuate over a wider range of flows than that of monthly average flows over an entire year. Figure 4-6 shows the river stage measured at location I-3 superimposed on the projected I-3 river levels.

Projected river levels for future months are based on the USBR projections of Davis Dam discharge and Lake Havasu levels from the preceding month. For example, the projected river level for November 2021 is based on the October 2021 USBR projections of Davis Dam release and Lake Havasu level. Future projections of Colorado River stage, shown on Figure 4-6, are based on USBR long-range projections of Davis Dam releases and Lake Havasu levels from October 2021. There is more uncertainty in these projections at longer times in the future because water demand is based on various factors including climate.

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE GROUNDWATER AND SURFACE WATER MONITORING REPORT

Current USBR projections, presented in Table 4-6, show that the projected Davis Dam release for November 2021 is 9,200 cubic feet per second, and the predicted Colorado River elevation at the I-3 gauge is 454.02 feet above mean sea level.

4.6 Third Quarter 2021 Performance Monitoring Program Evaluation Summary

The Third Quarter 2021 PMP evaluation is summarized below.

- Chromium-6 isoconcentration maps indicate that chromium-6 concentrations greater than 20 µg/L in the floodplain area are hydraulically controlled.
- In June 2021, the TW-01 aquifer test was initiated, extraction from TW-03D was suspended, and pumping from TW-02D was initiated to allow water extracted from TW-01 to be routed to the IM-3 system for treatment (combined with water from TW-02D). TW-02D was solely operated in July 2021 to support hydraulic control. In August 2021, extraction from TW-03D resumed, and TW-03D was solely operated to support hydraulic control in September and October 2021. A total of 21,431,482 gallons of groundwater were extracted by the IM-3 system, and an estimated 184 pounds (83.4 kilograms) of chromium were removed from groundwater.
- Chromium-6 and dissolved chromium concentrations in monitoring wells located within 800 feet of extraction well TW-03D were lower than their established notification levels. The shutdown of extraction well PE-01 was continued through the end of the reporting period.
- Groundwater potentiometric surface maps and the gradient analysis from designated well pairs provide evidence of hydraulic containment of the chromium-6 plume. The overall monthly average landward gradients in Third Quarter 2021 were approximately 1 to 1.5 times the required minimum magnitude of 0.001 ft/ft.
- Chromium-6 concentrations in the IMCP monitoring wells were lower than their established trigger levels, indicating that chromium concentrations did not increase at areas of interest across the site.

5 UPCOMING OPERATION AND MONITORING EVENTS

In accordance with the Basis of Design Report (CH2M Hill 2015) and Groundwater Remedy Phase 1 Interim Monitoring Plan (Arcadis 2021c), the final groundwater remedy for the site is anticipated to start up in Fourth Quarter 2021. Therefore, GMP, RMP, and PMP monitoring will transition to monitoring of Phase 1 of the groundwater remedy.

This report is the last quarterly PMP-GMP Report for the site. A Fourth Quarter 2021 Quarterly Progress Report will be developed to document operation and monitoring performed at the site in November and December 2021.

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE
GROUNDWATER AND SURFACE WATER MONITORING REPORT

6 REFERENCES

- Arcadis. 2021a. Fourth Quarter 2020 and Annual Interim Measures Performance Monitoring and Site-Wide Groundwater and Surface Water Monitoring Report, PG&E Topock Compressor Station, Needles, California. March 15.
- Arcadis. 2021b. Second Quarter 2021 Interim Measures Performance Monitoring and Site-Wide Groundwater and Surface Water Monitoring Report, PG&E Topock Compressor Station, Needles, California. August 15.
- Arcadis. 2021c. Groundwater Remedy Phase 1 Interim Monitoring Plan, PG&E Topock Compressor Station, Needles, California. October 1.
- CH2M Hill. 2005. Monitoring Plan for Groundwater and Surface Water Monitoring Program. PG&E Topock Compressor Station, Needles, California. April 11.
- CH2M Hill. 2007. RCRA Facility Investigation/Remedial Investigation Report, Volume 1 – Site Background and History. PG&E Topock Compressor Station, Needles, California. August.
- CH2M Hill. 2009. Groundwater Background Study, Steps 3 and 4: Revised Final Report of Results, PG&E Topock Compressor Station, Needles, California. November 6.
- CH2M Hill. 2014. Final PG&E Program Quality Assurance Project Plan. November.
- CH2M Hill. 2015. Basis of Design Report/Final [100%] Design Submittal for the Final Groundwater Remedy. November.
- California Department of Toxic Substances Control (DTSC). 2005. Letter to PG&E. Criteria for Evaluating Interim Measures Performance Requirements to Hydraulically Contain Chromium Plume in Floodplain Area, PG&E Topock Compressor Station, Needles, California (EPA ID No. CAT080011729). February 14.
- DTSC. 2007. Letter to PG&E. Approval of Updates and Modifications to the Interim Measures Performance Monitoring Program. PG&E Topock Compressor Station. October 12.
- DTSC. 2008a. Letter to PG&E. Modifications to Hydraulic Data Collection for the Interim Measures Performance Monitoring Program at PG&E Topock Compressor Station, Needles, California. July 14.
- DTSC. 2008b. Letter to Geology and Remediation Engineering. Updates to the Interim Measures Chemical Performance Monitoring Program. PG&E Topock Compressor Station, Needles, California. July 16.
- DTSC. 2009. Email. Re: Request for Combined Reporting of Topock GMP and PMP. May 26.
- DTSC. 2010a. Email. Re: Topock GMP Monitoring Frequency Modification. March 3.
- DTSC. 2010b. Letter to PG&E. Arizona Monitoring Well Sampling Frequency Modification. PG&E Topock Compressor Station, Needles, California. April 28.
- DTSC. 2014. Email from Chris Guerre/DTSC to Yvonne Meeks/PG&E. PG&E Topock: DTSC response to Section 7 2013 Annual Report Recommendations. June 27.

THIRD QUARTER 2021 INTERIM MEASURES PERFORMANCE MONITORING AND SITE-WIDE
GROUNDWATER AND SURFACE WATER MONITORING REPORT

DTSC. 2015. Letter from Aaron Yue/DTSC to Yvonne Meeks/PG&E. Conditional Approval of Proposal to Modify Interim Measures 3 (IM3) Extraction Well Pumping at PG&E Topock Compressor Station, Needles, California (USEPA ID No. CAT080011729). July 20.

DTSC. 2017. Email from Chris Guerre/DTSC to Jay Piper/CH2M and Curt Russell/PG&E. Re: PG&E Topock – Letter Requesting Modified Key Gradient Well Pairs When PE-01 Is Not Pumping. August 18.

DTSC. 2021. PG&E Topock Compressor Station: Environmental Investigation and Cleanup Activities. Web page. Located at: <http://dtsc-topock.com/>.

Critigen. 2020. Addendum to the PG&E Program Quality Assurance Project Plan for Groundwater and Surface Water Sampling at the Topock Chromium Site. April.

PG&E. 2008. Approved Modifications to the Topock IM Performance Monitoring Program PG&E Topock Compressor Station, Needles, California. August 4.

TABLES

FIGURES

APPENDIX A

Lab Reports, Third Quarter 2021 (Provided on CD with Hard Copy Submittal)

For additional help with the information provided in the lab reports, please contact Alison Schaffer, Arcadis Report Lead, at 303.471.3575.

APPENDIX B

**Historical Chromium-6 and Dissolved Chromium Concentrations,
January 2020 through October 2021**

APPENDIX C

Well Inspection and Maintenance Log, Third Quarter 2021

APPENDIX D

Concentration Time Series Charts, Third Quarter 2021

APPENDIX E

**Interim Measures Extraction System Operations Log, Third Quarter
2021**

APPENDIX F

Hydrographs, Third Quarter 2021

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