CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2015-0012-063

FOR
IN-SITU GROUNDWATER REMEDIATION AND DISCHARGE OF TREATED GROUNDWATER TO LAND

PG&E DAVIS SERVICE CENTER
316 L STREET,
DAVIS, YOLO COUNTY

This Monitoring and Reporting Program (MRP) describes requirements for monitoring the progress of a focused in-situ chemical reduction (ISCR) groundwater remediation using injection of EHC® to treat volatile organic compounds (VOCs), mainly tetrachloroethene (PCE) pollution in the groundwater at the PG&E Davis Center at 316 L Street, Davis, CA (Site) as shown on Figure 1. This MRP is issued pursuant to Water Code Section 13267.

The Discharger shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer. As appropriate, California Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board) staff shall approve specific sample station locations prior to implementation of sampling activities.

All samples should be representative of the volume and nature of the discharge or matrix of material sampled. The time, date, and location of each grab sample shall be recorded on the sample chain of custody form.

GROUNDWATER MONITORING

Monitoring wells associated with the ISCR groundwater remediation at the Site are shown on Figure 2 and listed in Table 1 below. Groundwater wells MW-4 and MW-10 are the upgradient wells and will be used for monitoring upgradient background groundwater quality conditions prior to injections. Temporary injection points IP-1 through IP-17 IP are the injection wells. Wells MW-7, MW-7D, MW-11 are the treatment zone performance monitoring wells. Wells MW-8, MW-9, MW-1, and MW-1D are the transition zone monitoring wells, and well MW-12 is the compliance monitoring well. All wells must also be sampled for baseline conditions. The groundwater monitoring program for these wells and any treatment system wells installed subsequent to the issuance of this MRP shall follow the schedule below. Sample collection and analysis shall follow standard EPA protocol and sample analyses shall be conducted by a California State certified laboratory.

The monitoring wells shall be sampled according to the schedule in Table 1 and the samples analyzed by the methods in Table 2. Any sampling done more frequently than specified in Table 1 shall also be reported to Central Valley Water Board.

Table 1: Sampling Frequency and Constituent Suite

Well Number[1,2]	Constituent[3]	Frequency[2]	Monitoring Objective
MW-4, MW-10	Suite A, B, C, D	Baseline (pre-injection), annually thereafter	Upgradient Background
MW-7, MW-7D, MW-11	Suite A, C, D	Quarterly for one year after injection, annually thereafter	Treatment Zone[4]
MW-1, MW-1D, MW-8, MW-9	Suite A, C, D	Quarterly for one year after injections, semi-annually[5] thereafter	Transition Zone
MW-12	Suite A, C, D	Quarterly for one year after injections, semi-annually[5] thereafter	Compliance Zone[6]

[1] Well numbers as shown on Figure 2.

[2] All existing and future wells must be sampled for baseline conditions for constituent suites A, B, C, and D listed in Table 2.

[3] Constituent suite components listed in Table 2.

[4] Wells sampled to evaluate remediation progress inside the treatment zone.

[5] After two years of post-injections monitoring, with Central Valley Water Board staff concurrence, sampling frequency can be reduced to annual sampling in the Transition and Compliance Zone well(s), if Suite A, C, and D constituents listed in Table 2 are detected at or below their respective Practical Quantitation Limit or background concentrations, whichever is greater. For total chromium this limit is set at the ambient concentration range of 120-140 µg/L. All new future wells installed in the Transition and Compliance Zone must also be sampled quarterly for one year and then semi-annually for at least two years for constituents suites A, C, and D before requesting switching to annual sampling.

[6] Wells used to determine compliance with groundwater limitations.

Table 2: Analytical Methods

Constituent	Method[1]	Practical Quantitation Limit[2] (µg/L)
Suite A		
Volatile Organic Compounds	EPA 8260B	0.5
Suite B		
TPH-g	EPA 8015/8260	50
Suite C[4]		
Title 22 Metals[3], Total and Dissolved	EPA 200.7, 200.8	Various
Suite D[4]		
Total Dissolved Solids	EPA 160.1	10,000
Cations (Ca, Mg, Na, K, Fe, Mn, Si)	EPA 200.8	Varies

Constituent	Method[1]	Practical Quantitation Limit[2] (µg/L)
Ferrous and Ferric Iron	EPA 200, 6020 or SM 3000	100
Anions (Cl, SO_4, NO_2, NO_3, F, PO_4)	EPA 300.0	Various
Total Organic Carbon	EPA 415	300

1 Analytical method substitutions may be made with Central Valley Water Board staff concurrence, provided the method achieves the Maximum Practical Quantitation Limit.

2 All concentrations between the Method Detection Limit and the Practical Quantitation Limit shall be reported as trace.

3 Metals include aluminum, antimony, arsenic, barium, cadmium, calcium, total chromium, copper, iron, lead, manganese, magnesium, mercury, molybdenum, nickel, selenium, silver, vanadium, silica, and zinc.

4 If concentrations of salts, total dissolved solids, metals, or electrical conductivity are detected more than 20% greater than their respective baseline/background concentrations at the Compliance Zone well(s), the Discharger shall immediately submit one or more contingency measures for Central Valley Water Board approval to revert the groundwater conditions to the baseline conditions as proposed in the Corrective Action Work Plan, and as deemed necessary by the Central Valley Water Board. Once approved by the Central valley Water Board staff, the discharger shall immediately implement the contingency plan.

FIELD SAMPLING

In addition to the above sampling and laboratory analyses, field sampling and analysis shall be conducted each time a monitor well or injection well is sampled. The sampling and analysis of field parameter shall be as specified in Table 3.

Table 3: Field Sampling Requirements

Parameters	Analytical Method	Units
Groundwater Elevation	Measurement	Feet, Mean Sea Level
Oxidation-Reduction Potential	Field Meter	Millivolts
Electrical Conductivity	Field Meter	µmhos/cm
Dissolved Oxygen	Field Meter	mg/L
pH	Field Meter	pH Units (to 0.1 units)
Temperature	Field Meter	$^oF/^oC$

All wells that are purged shall be purged until pH, temperature, conductivity, and dissolved oxygen are within 10% of the previous value.

Field test instruments (such as those used to test pH and dissolved oxygen) may be used provided that:

1. The operator is trained in proper use and maintenance of the instruments;
2. The instruments are calibrated prior to each monitoring event;
3. Instruments are serviced and/or calibrated by the manufacturer at the recommended frequency; and
4. Field calibration reports are submitted as described in item (b) of the "Reporting" section of this MRP.

IN-SITU DISCHARGE MONITORING

The Discharger shall monitor the discharge of water and amendments that are injected into the groundwater according to the requirements specified in Table 4. Each amendment addition shall be recorded individually, along with information regarding the time period over which the amendment was injected into the aquifer.

Table 4: Field Sampling Requirements

Parameters	Units	Type of Sample
Injected Volume	Gallons per day	Meter or Measured
Amendment(s) Added	pounds per day	Measured

AMENDMENT ANALYSIS

Prior to use, amendments shall be analyzed for the constituents listed in Table 2 and Table 3 (except groundwater elevation). The analysis should be done on a mixture of the amendment and deionized water at the estimated concentration that would be injected during the remediation project.

ESTABLISHMENT OF BACKGROUND CONCENTRATION VALUES

The Discharger shall develop background values for concentrations of general minerals, dissolved metals, total dissolved solids, and electrical conductivity in groundwater following the procedures found in CCR Section 20415(e)(10). The Discharger shall complete a baseline monitoring event to establish background concentrations prior to implementation of the remediation event.

REPORTING

When reporting data, the Discharger shall arrange the information in tabular form so that the date, constituents, and concentrations are readily discernible. The data shall be summarized in such a manner as to illustrate clearly the compliance with this Order. In addition, the Discharger shall notify the Central Valley Water Board within 48 hours of any unscheduled shutdown of the system. The results of any monitoring done more frequently than required at the locations specified in the Monitoring and Reporting Program, and results of any additional

constituents analyzed from the groundwater samples shall also be reported to the Central Valley Water Board.

As required by the California Business and Professions Code sections 6735, 7835, and 7835.1, all reports shall be prepared by a registered professional Civil Engineer or Geologist or their subordinate and shall be signed by the registered professional.

The Discharger shall submit quarterly electronic data reports by the 1st day of the second month following the end of each calendar quarter by **1 February, 1 May, 1 August, and 1 November** until such time as the Executive Officer determines that the reports are no longer necessary. Starting from 2021, the Discharger shall submit semi-annual groundwater reports, which conform to the requirements of the California Code of Regulations, Title 23, Division 3, Chapter 30. The semi-annual reports shall be submitted electronically over the internet to the Geotracker database system by **1 May and 1 November**, until such time as the Executive Officer determines that the reports are no longer necessary.

Each report shall include the following minimum information:

(a) a description and discussion of the groundwater sampling event and results, including trends in the concentrations of pollutants and groundwater elevations in the wells, how and when samples were collected, and whether the pollutant plume(s) is delineated;

(b) field logs that contain, at a minimum, water quality parameters measured before, during, and after purging, method of purging, depth of water, volume of water purged, etc.;

(c) groundwater contour maps for all groundwater zones, if applicable;

(d) pollutant concentration maps for all groundwater zones, if applicable;

(e) a table showing well construction details such as well number, groundwater zone being monitored, coordinates (longitude and latitude), ground surface elevation, reference elevation, elevation of screen, elevation of bentonite, elevation of filter pack, and elevation of well bottom;

(f) a table and rose diagram showing historical lateral and vertical (if applicable) flow directions and gradients;

(g) cumulative data tables containing the water quality analytical results and depth to groundwater;

(h) a copy of the laboratory analytical data report;

(i) the status of ongoing remediation, including estimate of amendments injected, an estimate of the cumulative mass of pollutant removed from the subsurface, system operating time, the effectiveness of the remediation system, and any field notes pertaining to the operation and maintenance of the system; and

(j) if applicable, the reasons for and duration of all interruptions in the operation of any remediation system, and actions planned or taken to correct and prevent interruptions.

Starting in 2021, an Annual Report shall be submitted to the Central Valley Water Board by **1 November** of each year. This report shall contain an evaluation of the effectiveness and progress of the investigation and remediation. The Annual Report may be substituted for the second semi-annual monitoring report as long as it contains all of the information required for that report plus that required for the Annual Report. The Annual Report shall contain the following minimum information:

(a) both tabular and graphical summaries of all data obtained during the year;

(b) groundwater contour maps and pollutant concentration maps containing all data obtained during the previous year;

(c) a discussion of the long-term trends in the concentrations of the pollutants in the groundwater monitoring wells;

(d) an analysis of whether the pollutant plume is being effectively treated;

(e) a description of all remedial activities conducted during the year, an analysis of their effectiveness in removing the pollutants, and plans to improve remediation system effectiveness;

(f) an identification of any data gaps and potential deficiencies/redundancies in the monitoring system or reporting program; and

(g) if desired, a proposal and rationale for any revisions to the groundwater sampling plan

A letter transmitting the monitoring reports shall accompany each report. Such a letter shall include a discussion of requirement violations found during the reporting period, and actions taken or planned for correcting noted violations, such as operation or facility modifications. If the Discharger has previously submitted a report describing corrective actions and/or a time schedule for implementing the corrective actions, reference to the previous correspondence will be satisfactory. The transmittal letter shall contain the penalty of perjury statement by the Discharger, or the Discharger's authorized agent, as described in the Standard Provisions General Reporting Requirements Section B.3.

The Discharger shall implement the above monitoring program on the first day of the month following adoption of this Order.

Ordered By: John J. Baum Digitally signed by John J. Baum Date: 2020.07.23 10:44:19 -07'00'
Water Boards
(for) PATRICK PULUPA, Executive Officer

7/23/2020
(Date)

Figure 1 – Site Location
PG&E Davis Service Center

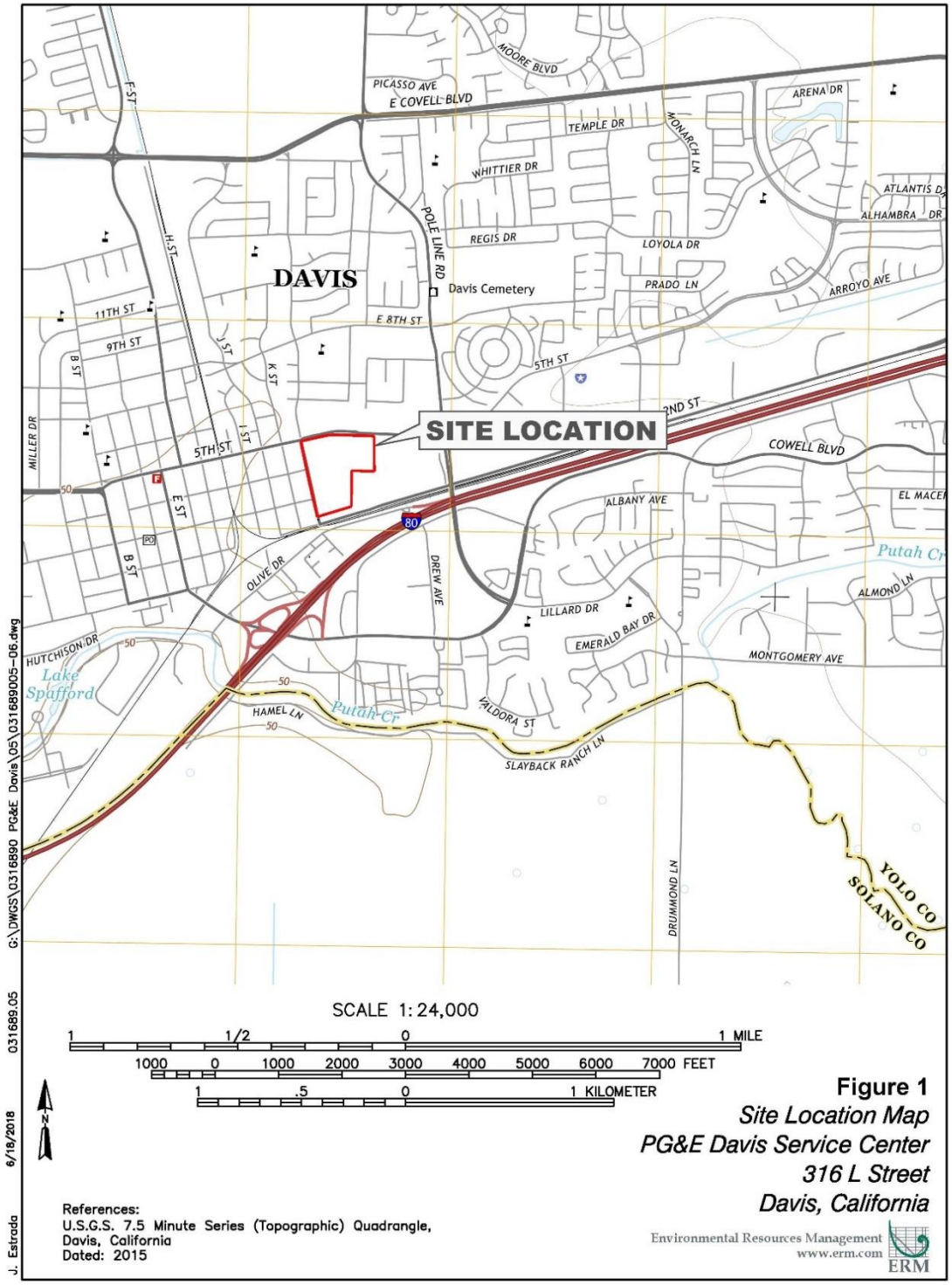

Figure 2
ISCR Injection Points and Performance Monitoring Locations
PG&E Davis Service Center