Comprehensive Remedial Investigation Technical Memorandum Orange County North Basin Superfund Site Orange County, California

Response Action Contract 3 Full Service Contract: EP-S9-14-01 Task Order: 045-RIRI-A978

Prepared for

U.S. Environmental Protection Agency Region 9
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San Francisco, California 94105

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November 2024
Revision: 02
EA Project No. 1518945

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
µg/L	microgram(s) per liter
%	percent
3D	three-dimensional
BC2	BC2 Environmental
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHG	Certified Hydrogeologist
COC	contaminant of concern
DCE	dichloroethene
EA	EA Engineering, Science, and Technology, Inc.
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
Eurofins	Eurofins Calscience, LLC
FS	Feasibility Study
ft	foot (feet)
GPRS	Ground Penetrating Radar Systems, LLC
HSM	hydrogeologic site model
IDW	investigation-derived waste
MCL	maximum contaminant level
NL	notification level
No.	number
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
OCNB	Orange County North Basin
OCWD	Orange County Water District
PCE	tetrachloroethene
PDF	portable document format
PFAS	per- and polyfluoroalkyl substances
PG	Professional Geologist
Pro DSS	Professional Digital Sampling Solution
PVC	polyvinyl chloride

QAPP	Quality Assurance Project Plan
QSM	Quality Systems Manual
RI	remedial investigation
site	Orange County North Basin Superfund Site
SOP	Standard Operating Procedure
TCE	trichloroethene
UFP	Uniform Federal Policy
VOC	volatile organic compound

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EXECUTIVE SUMMARY

The purpose of this technical memorandum is to: (1) describe remedial investigation activities conducted between June 2021 and March 2024; (2) document groundwater data collected during remedial investigation activities; (3) present groundwater plume maps for the four major contaminants of concern at the site in two aquifer zones; (4) provide a statistical analysis of the groundwater data; and (5) recommend where additional monitoring wells may, if determined to be necessary, be located to further delineate the plume.

The Orange County North Basin site is located in the northern part of the Orange County Groundwater Basin and includes a groundwater plume of chlorinated solvents and other contaminants beneath parts of the cities of Placentia, Anaheim, Fullerton, and Buena Park.

Site groundwater is contaminated with volatile organic compounds. The contaminants of concern for the site are trichloroethene, tetrachloroethene, and 1,1-dichloroethene, each in exceedance of U.S. Environmental Protection Agency's (EPA's) Safe Drinking Water Act and California's Maximum Contaminant Levels, and 1,4-dioxane in exceedance of California's Notification Level. Other contaminants of interest include perchlorate and per- and polyfluoroalkyl substances.

In 2018, EA Engineering, Science, and Technology, Inc. (EA) developed three-dimensional plume maps for each of the four contaminants of concern. Using the 2018 plume models, EPA and EA identified five general areas for investigation: the northern extent of the plume in two areas, the centerline of the plume at depth, the leading edge of the plume, and the southern extent of the plume. In 2021, EA updated the 2018 plume volume models to represent the maximum contaminant concentration measurements taken between 2018 and 2021. The larger 2021 plume models led to the addition of more monitoring wells, still aligned with the original five areas of investigation identified from the 2018 plume model. In 2022, the plume models were again updated as part of the development of a hydrogeologic site model for the site. The update incorporated the contaminant concentrations in groundwater from: (1) 16 newly installed monitoring wells; (2) data collected in 2022 from existing Orange County Water District monitoring wells; and (3) data collected from Orange County North Basin remediation sites within the plume area. The hydrogeologic site model continues to be developed and used, through iterative steps, to identify additional monitoring well locations as EPA's understanding of the nature and extent of the comingled plume evolves.

A total of 25 monitoring wells across 8 locations were installed and sampled during these remedial investigation activities.

Based on the available maximum concentrations from 2019 to the first quarter of 2024, adequate data exist to define a continuous plume volume extending from shallow contamination under the potential source areas in the eastern plume area downgradient and migrating vertically downward into the deeper aquifer zone.

Recommendations for future activities are: (1) continued groundwater monitoring; (2) modeling of groundwater flow and contaminant fate and transport; (3) evaluation of the need for additional

monitoring wells based on the results of the continued groundwater monitoring; and (4) additional investigation in areas not part of these remedial investigation activities.

1. INTRODUCTION

EA Engineering, Science, and Technology, Inc. (EA) has been authorized by the U.S. Environmental Protection Agency (EPA), under Remedial Action Contract Number (No.) EP-S9-14-01, Task Order 045-RIRI-A978, to prepare a Comprehensive Remedial Investigation (RI) Technical Memorandum for the RI activities conducted to characterize the site-wide groundwater contaminant plume. The work under this Task Order is for the Orange County North Basin (OCNB) Superfund Site (site) in Orange County, California.

1.1 PURPOSE OF REPORT

The purpose of this technical memorandum is to: (1) describe RI activities conducted between June 2021 and March 2024; (2) document groundwater data collected during RI activities; (3) present groundwater plume maps for the four major contaminants of concern (COCs) at the site in two aquifer zones; (4) provide a statistical analysis of the groundwater data and; (5) recommend where additional monitoring wells may, if determined to be necessary, be located to further delineate the plume.

1.2 SITE DESCRIPTION

The OCNB site is located in the northern part of the Orange County Groundwater Basin (California Department of Water Resources 2004) and encompasses a mix of residential, commercial, and industrial areas (Figure 1). The site includes a groundwater plume of chlorinated solvents and other contaminants covering 10.4 square miles beneath parts of the cities of Placentia, Anaheim, Fullerton, and Buena Park (Figure 2). The Orange County Groundwater Basin supplies water to 22 cities, serving 2.4 million residents. EPA's objectives for Superfund sites includes ensuring safe and sustainable sources of drinking water for communities and increasing drought resiliency (EPA 2022), which are inherent in OCNB by restoring the regional drinking water aquifer.

Site groundwater is contaminated with volatile organic compounds (VOCs) and other chemicals from local industrial activities. Identified contaminants of concern include trichloroethene (TCE), tetrachloroethene (PCE), and 1,1-dichloroethene (1,1-DCE), each in exceedance of EPA's Safe Drinking Water Act Maximum Contaminant Levels (MCLs) and California's MCLs, and 1,4-dioxane in exceedance of California's Notification Level (NL). The action levels for the four COCs at the OCNB site are:

- PCE – 5.0 micrograms per liter (µg/L) (EPA MCL)
- TCE – 5.0 µg/L (EPA MCL)
- 1,1-DCE – 7.0 µg/L (EPA MCL) and 6.0 µg/L (California MCL)
- 1,4-Dioxane – 1.0 µg/L (California NL)

Other contaminants of interest include perchlorate and per- and polyfluoroalkyl substances (PFAS).

The known extent of the groundwater contamination lies entirely within the Orange County Groundwater Basin. The contaminated groundwater plume continues to migrate vertically and laterally, threatening drinking water supply wells, including at least 20 active downgradient production wells that serve Orange County. Due to site-related groundwater contamination, five (updated to six as of July 2024) production wells have been shut down and five of those production wells permanently destroyed. This technical memorandum includes groundwater data collected through March 2024; however, it is worth noting the July 2024 results from the PAGE-F production well showed TCE concentrations above EPA's MCL. As of August 2024, the production well PAGE-F is no longer being used as a drinking water supply well.

The water supply is closely monitored by the water purveyors, with regulatory oversight, and continues to provide drinking water that meets federal and state standards to consumers.

1.3 SITE BACKGROUND

Until the early 1950s, land use within the OCNB was primarily agriculture. Since then, there has been an increase in industrial activity, resulting in the operation of various industrial facilities. Industrial operations include aerospace manufacturing, electronics manufacturing, metals processing and plating, musical instrument manufacturing, rubber and plastics manufacturing, and dry cleaning (AECOM 2022). State and federal agencies have identified some of these industrial facilities as known or suspected release sites, contributing to the groundwater contamination at the site.

In 2016, EPA and Orange County Water District (OCWD) entered into an administrative agreement for OCWD to draft an Interim RI/Feasibility Study (FS). In summary, the objectives of EPA and OCWD under the agreement are to: (a) to protect human health and the environment by preventing exposure to contaminated groundwater in the North Basin Study Area; (b) to determine the nature and extent of contamination caused by the release of contaminants at or from the North Basin Study Area to support the development of an interim groundwater remedy; (c) to identify and evaluate remedial alternatives for an interim groundwater remedy to hydraulically contain contaminated groundwater originating from the majority of known or suspected sources in the North Basin Study Area; (d) to further characterize the full nature and extent of contamination in the North Basin Study Area downgradient of the interim groundwater remedy area; and (e) to recover response and oversight costs incurred by EPA (EPA 2016). The North Basin Study Area, as defined in the administrative agreement, is illustrated on Figure 3. Under EPA oversight, OCWD conducted the interim RI/FS. The interim RI work focused on the drinking water aquifer in the most contaminated portion of the site – the North Basin Study Area (Figure 3). Work included the installation of a limited number of groundwater monitoring wells to characterize the study area. The interim RI was not intended to characterize the full extent of site groundwater contamination (EPA 2024).

In 2017, EPA received a letter from the State of California in support of placing OCNB on the National Priorities List through the Comprehensive Environmental Response, Compensation, and Liability Act (CERLA). EPA proposed to add the site to the National Priorities List in 2018 and on 3 September 2020, EPA added the OCNB site to the National Priorities List.

Several known sources of contamination at the site are actively being addressed by two California EPA state agencies: the Department of Toxic Substances Control and the Santa Ana Regional Water Quality Control Board. Several other possible sources have also been preliminarily assessed by EPA.

EPA is the lead agency for the Comprehensive (site-wide) RI/FS. The Comprehensive RI/FS further characterizes the downgradient portion of the contamination plume. EA, subcontracted by EPA, is conducting the Comprehensive RI/FS, which includes the installation of additional monitoring wells in the downgradient portion of the plume. EPA will combine the interim RI/FS work performed by OCWD in the North Basin Study Area with the site-wide RI/FS findings to identify site-wide remedial actions necessary to protect human health and the environment.

1.4 REPORT ORGANIZATION

The following are provided as appendices:

- Appendix A—Well Installation Plan, Amendment 04
- Appendix B—Scanned Logbooks and Field Forms
- Appendix C—Community Flyers
- Appendix D—Photographs
- Appendix E—Waste Management Plan, Amendment 02
- Appendix F—Waste Determination Memorandums
- Appendix G—Waste Manifests
- Appendix H—Geophysical Logs
- Appendix I—Lithologic Descriptions and Well Construction Details
- Appendix J—Laboratory Analytical Reports, Validation Reports, and Chains-of-Custody
- Appendix K—Comprehensive Remedial Investigation Dataset (Excel)
- Appendix L—Data Usability Assessment Technical Memorandum

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2. GROUNDWATER MODELING AND WELL LOCATION SELECTION

Figure 4 shows the three sets of plume models created between 2018 and 2023 to evaluate plume movement and select monitoring well locations best fit to address the project's data quality objectives identified in the UFP-QAPP (EA 2024). Originally, 36 monitoring wells at 11 different locations were proposed for installation. As discussed later in this Comprehensive Technical Memorandum, not all of the proposed wells were installed during the Comprehensive RI. In total, 25 wells at 8 different locations were installed (Figure 5). EPA assigned specific objectives for each well proposed. The priority of the well's objective, balanced with available funding, resulted in the final selection for wells to be installed. EPA's process for the selection of monitoring wells to be installed is discussed in Section 2 and the evaluation of each well meeting its specific objective is found in Section 4. Table 1 provides the purpose, location coordinates, screen intervals, pump set depths, and screen objective for each monitoring well installed.

2.1 2018 PLUME MODELS

Beginning in 2018, EA developed three-dimensional (3D) plume maps for each of the four COCs: PCE, TCE, 1,1-DCE, and 1,4-dioxane. Each COC was interpolated using EVS's kriging algorithms with the resulting plumes bounded by the water table. Monitoring well screened intervals are fully represented in the interpolation and ultimately assist in bounding the plume vertically at depth. Plume volumes are calculated by integrating over interpolated COC concentrations at or above EPA's MCL or California's NL for the plume constituent.

Plume volume modeling considers the entirety of the saturated sub-surface (excluding localized perched water tables) as a single aquifer unit with interbedded high and low permeability zones. Therefore, groundwater samples, no matter the depth from which they were taken, were used in plume volume development for each COC. However, in 2018, the convention was to separate the aquifer into a Shallow Zone and a Principal Zone[1]. The Shallow Zone generally refers to the saturated region down to a depth of 200 to 250 feet (ft) below ground surface (bgs), with the Principal Zone below. The zonation is due to a layer of fine-grained sediments that hydraulically separates the two zones in the western portion of the plume area and is mostly absent under the eastern portion of the plume area. Due to this convention, the 2018 plume analyses were broken into Shallow Zone and Principal Zone by slicing the continuous 3D plume volumes along the fine-grained sediment interface. Later plume analyses were performed on unsliced plume volumes.

In August 2018, EA prepared a technical memorandum (EA 2018) that details these modeling methods used to delineate the VOC plume and identifies data gaps in the number and location of existing monitoring wells. In the 2018 technical memorandum, EA presented the combined plume boundary within the Shallow and Principal Zones and identified regions within the plume where confidence in the ability to interpolate the 3D extent of the plume is either above or below 50 percent (%) due to the number and location of existing monitoring wells and the measured concentration at each well (Figure 6).

[1] The OCWD identifies three zones (Shallow, Principal, and Deep). For the purposes of investigating the groundwater contamination, EA has identified three subzones (A, B, and C) in the Shallow and Principal zones.

The 2018 plume analysis was based primarily on OCWD monitoring well locations and contaminant concentrations in groundwater provided by OCWD. Plume volumes for each COC were interpolated from the maximum concentration measured at 121 monitoring well screens between 2016 and 2018. The plume volumes also represented contamination in nine production wells if the wellhead COC concentration was above detection during this time period. The result of the 2018 plume delineations showed that while contamination in the Shallow Zone was continuous and moving down gradient from potential surface source areas, contamination in the Principal Zone was separated into two regions: one continuous with Shallow Zone contamination under the potential source areas, and a smaller zone further downgradient and vertically separate from the Shallow Zone. Therefore, the 2018 plume volume analyses were used to achieve two objectives:

- Identify new monitoring well locations that would significantly improve the confidence in the plume delineation using kriging derived high and low confidence zones within each plume volume.

- Identify new monitoring well locations that would define whether or not the two Principal Zone plume volumes were part of the same plume.

Using the 2018 plume models, EPA and EA identified five general areas for investigation: the northern extent of the plume in two areas, the centerline of the plume at depth, the leading edge of the plume, and the southern extent of the plume (Figure 7). Based on project objectives for each location and available funding, EPA prioritized the installation of three monitoring wells each at two locations: E-FM-36 and E-FM-37 (Figure 8).

Location E-FM-36 (Figure 9) was designed as a three-well-cluster located in the region between the two Principal Zone plume volumes. Monitoring well E-FM-36A, with a target screen interval depth of 145 to 165 ft bgs, had an objective of providing characterization of the TCE and 1,4-dioxane plumes in the Shallow Zone. The objective of monitoring well E-FM-36B, with a target screen interval depth of 220 to 240 ft bgs, was to characterize the downward migration of the 1,4-dioxane plume into the Principal Zone. The objective of monitoring well E-FM-36C objective, with a target screen interval depth of 300 to 320 ft bgs, was to delineate the bottom of the 1,4-dioxane plume in the Principal Zone.

Location E-FM-37 (Figure 10) well cluster was chosen based on proximity to production well PAGE-F (Figure 8), a production well with two screen intervals, one in the Shallow Zone (ranging in depth from 186 to 195 ft bgs), and one in the upper part of the Principal Zone (ranging in depth from 343 to 364 ft bgs). Since 2006, wellhead samples from PAGE-F have consistently contained 1,4-dioxane with concentrations above California's NL. Originally, the E-FM-37 monitoring well cluster was to include three monitoring wells and be located up-gradient of PAGE-F; however, the closest available location, and thus the location chosen, was just downgradient of PAGE-F. The target screen interval depths of 185 to 205 ft bgs (E-FM-37A), 220-240 ft bgs (E-FM-37B), and 330-350 ft bgs (E-FM-37C) were chosen to cover the depth range of the two PAGE-F screens with the objective of defining the depths at which 1,4-dioxane was entering the production well.

2.2 2021 PLUME MODELS

In 2021, EA updated the 2018 plume volume models to represent the maximum contaminant concentration measurements taken between 2018 and 2021 from over 400 data points (Figure 11). This update also included a lateral expansion of the model domain as it incorporated additional OCWD monitoring wells and impacted production wells not included in the 2018 plume interpolations. This update resulted in an overall increase in size of the comingled[2] plume, most significantly an expansion towards the south and downgradient towards the southwest. The southward expansion was due to representing wellhead contamination in some of the Fullerton production wells and the increase in TCE concentration to above EPA's MCL in AMD-4-MP2[3]. The downgradient expansion was due to adding production well CRES-A to the model, which consistently has had 1,4-dioxane concentrations above California's NL in wellhead samples.

The larger 2021 plume models led to the addition of more monitoring wells, still aligned with the original five areas of investigation identified from the 2018 plume model (Figure 7). The increase in plume volume at depth and further downgradient emphasized the need to investigate whether or not the Shallow contamination to the east was connected to the deeper contamination to the southwest. With this objective, EPA, OCWD, and EA held planning sessions, identified six potential locations, prioritized three locations for completion (E-FM-38, E-FM-39, and E-AM-58 on Figure 11), and optimized location E-FM-37 by adding two Principal Zone monitoring wells to the cluster.

EPA tentatively identified three potential locations for well clusters within the areas of investigation identified from the 2018 plume: one within a northern extent area, one along the centerline, and one within the southern extent area. The areas of investigation are shown on Figure 7. Again, based on available funding and project objectives for each location, EPA did not pursue well clusters at these locations.

Location E-FM-38 (Figure 12) was prioritized to serve as a monitoring location just up-gradient of irrigation well TLLC-F2, which, like production wells PAGE-F and CRES-A, has wellhead samples with 1,4-dioxane concentrations above California's NL. Using the plume models as a guide, location E-FM-38 was identified as a three monitoring well cluster. The objective for monitoring well E-FM-38A (target screen interval depth of 140 to 160 ft bgs) was to characterize contamination in the Shallow Zone. The objective for monitoring well E-FM-38B (target screen interval depth of 240 to 260 ft bgs) was to characterize contamination entering the TLLC-F2 well screen (target screen interval depth of 190 to 350 ft bgs). Finally, the objective for monitoring well E-FM-38C (target screen interval depth of 340 to 360 ft bgs) was to characterize the bottom of the comingled plume, specifically the 1,4-dioxane plume.

Location E-FM-39 (Figure 13) serves as a monitoring location up-gradient of monitoring well FM-33A. In 2018, monitoring well FM-33A was installed with the objective of defining the northern limit of the co-mingled plume within the Shallow Zone. Monitoring well FM-33A was completed at a depth range of 135 to 155 ft bgs. Since installation, groundwater samples from

[2] "Comingled" refers to the single plume volume that is a combination of the plume volume of each COC.
[3] The MP# designation identifies a single port in a multi-port monitoring well.

this monitoring well contain PCE concentrations ranging from 32 to 55 µg/L, which has expanded the estimated extent of the plume, leaving the northern boundary undefined. Monitoring well E-FM-39A was initially conceptualized to be located north of FM-33A with the objective of defining the northern edge of the plume. The location of the monitoring well was moved to the northeast of FM-33A in order to intercept groundwater flow coming down from the Coyote Hills towards FM-33A, with the objective of either defining the northern edge of the plume or identifying the source of elevated PCE in FM-33A. A location in agreement with this objective was secured in the Fullerton Joint Union High School parking lot, and the well was installed at similar depth range as the FM-33A screen, between 129 and 139 ft bgs.

The 2021 plume models also supported the need for a monitoring location up-gradient of the contaminated production well CRES-A and the contaminated irrigation well A-DMGC. Similar to other production and irrigation wells, A-DMGC (screen depth between 430 and 482 ft bgs), has had consistent wellhead samples containing 1,4-dioxane concentrations above California's NL. Using the plume models as a guide, EPA identified a location for the five-well-cluster designated as E-AM-58 (Figure 14). Monitoring well E-AM-58A (target screen interval depth of 115 to 135 ft bgs) was to delineate the top of the comingled plume. Monitoring wells E-AM-58B (target screen interval depth of 210 to 230 ft bgs), E-AM-58C (target screen interval depth of 320 to 340 ft bgs), and E-AM-58D (target screen interval depth of 430 to 450 ft bgs) were to characterize the vertical migration of the plume. Monitoring well E-AM-58E (target screen interval depth of 540 to 560 ft bgs) was to delineate the bottom of the plume.

The expansion of the plume volume downward, based on the depth of contamination at production well CRES-A (depth between 485 and 525 ft bgs) added to the model, suggested that the plume at location E-FM-37 (Figure 8) may be deeper than initially expected. Therefore, two deeper wells, monitoring well E-FM-37D (target screen interval depth between 440 and 460 ft bgs) with an objective of characterizing the plume and monitoring well E-FM-37E (target screen interval depth between 530 and 550 ft bgs) with an objective of delineating the bottom of the plume, were added to this existing well cluster (Figure 10).

2.3 2022 PLUME MODELS

In 2022, the plume models were again updated as part of the development of a hydrogeologic site model (HSM) for the OCNB plume area. The update incorporated the contaminant concentrations in groundwater from: (1) 16 newly installed monitoring wells described above (monitoring well E-FM-39A had not been installed); (2) data collected in 2022 from existing OCWD monitoring wells; and (3) data collected from OCNB remediation sites within the plume area.

The 2022 plume models, based on maximum concentrations for COCs measured between 2019 and 2022, suggested that the comingled plume, specifically the 1,4-dioxane plume, has migrated deeper and further downgradient than the 2021 plume models suggested (Figure 15). The 2022 plume models represented 1,4-dioxane contamination at California's NL in well head samples from two large production wells, BP-LIND (City of Buena Park) and A-39 (City of Anaheim), and a sample from OCWD monitoring well AMD-8-MP5. These wells are located further downgradient than production well CRES-A, which marked the previous downgradient extent of the plume, and are deeper, having top of screen depth of 470 ft bgs (BP-LIND), 540 ft bgs (A-39), and 670 ft bgs (AMD-8-MP5). Because of their depth and the distance of these wells from other previously identified contaminated wells, the 2022 plume models showed contamination at production well A-39 and monitoring well AMD-8-MP5 as an isolated plume volume separated from the main comingled plume extending to production well CRES-A. Therefore, the next series of monitoring wells were located to investigate if the two plume volumes were connected.

The first monitoring location identified based on the 2022 plume models was the E-BPM-3 monitoring well cluster (Figure 16). This monitoring well cluster is located up-gradient of production well BP-LIND and contains three wells to target contamination entering the production well screens. Monitoring well E-BPM-3A was targeted for a screen interval between 300 and 320 ft bgs and monitoring well E-BPM-3B with a screen interval between 485 and 505 ft bgs, which match the depth of the upper two production well screens. Monitoring well E-BPM-3C was targeted with a screen interval between the production well's second and third screen with the objective of delineating the bottom of the plume (350 to 370 ft bgs).

Another monitoring location, E-AM-60 (Figure 17), was identified up-gradient of the City of Anaheim production well A-39 with the objective of characterizing the plume entering this production well. Initially designed as a four monitoring well cluster, budget constraints reduced it to a two monitoring well cluster with target screen intervals of 620 to 640 ft bgs (E-AM-60C) and 735 to 755 ft bgs (E-AM-60D). These depths match the depths of the second and third screens of production well A-39 and are consistent with the depth of contamination measured in upgradient monitoring well AMD-8-MP5.

The third monitoring location identified based on the 2022 plume models, E-AM-61 (Figure 18), was designed to characterize the downward migration of the plume between production well CRES-A and monitoring well AMD-8-MP5. Located between these two contaminated wells, the E-AM-61 cluster contains three deep monitoring wells. Monitoring wells E-AM-61B (target screen interval of 500 to 520 ft bgs) and E-AM-61C (target screen interval of 645 to 665 ft bgs) had the objectives of characterizing the plume, while monitoring well E-AM-61D (target screen interval of 735 to 755 ft bgs) had the objective of delineating the bottom of the plume.

The plume models were updated again in 2023 and 2024 to support continuing iterations of the HSM. EA updated the model in 2023 to include water chemistry results for newly installed monitoring wells E-BPM-3A, E-BPM-3B, E-BPM-3C, and E-FM-39A. This update also included water chemistry data from OCWD monitoring wells sampled in the first half of 2023. The 2024 update incorporated water chemistry data from monitoring wells E-AM-61B, E-AM-61C, E-AM-61D, E-AM-60C, and E-AM-60D. The 2024 update also included water chemistry data from samples collected by OCWD during the second half of 2023 and the first quarter of 2024. The HSM continues to be developed and used, through iterative steps, to identify additional monitoring well locations as EPA's understanding of the nature and extent of the comingled plume evolves.

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3. REMEDIAL INVESTIGATION ACTIVITIES

This section presents a summary of activities conducted between June 2021 and March 2024 to support the site-wide RI.

EPA and EA performed the investigation activities in general accordance with the following documents, including previous versions:

- Well Installation Plan, Amendment 04 (Appendix A)
- UFP-QAPP, Amendment 04 (EA 2024)
- Waste Management Plan, Amendment 02 (Appendix E)
- Health and Safety Plan, Amendment 01 (EA 2021)

Table 2 provides a schedule detailing the start and finish dates of specific tasks related to the execution of the RI activities, including location-specific tasks. Appendix D contains photographs of the general monitoring well installation and groundwater sampling processes.

3.1 CONSENT FOR ACCESS AND PERMITS

EA supported EPA's efforts to obtain consent from local authorities and comply with the permitting requirements of local governments within the requirements of CERCLA to complete the Comprehensive RI work. EA began with pursuing private properties for the installation of the monitoring wells. Due to an overall lack of success with property owners, EA shifted the monitoring well locations to city- or county-owned properties or rights-of-way.

The City of Fullerton Public Works Department granted access for locations E-FM-36, E-FM-37, and E-FM-38. Fullerton School District concurred with the consent granted for location E-FM-36. Orange County Public Works granted consent for access to locations E-AM-58 and E-AM-61. The City of Anaheim Public Works Department granted access to location E-AM-60. The City of Buena Park granted access for location E-BPM-3. Fullerton Joint Union High School District consented to access for location E-FM-39. For each location, coordination with the respective entity was required for compliance with the encroachment permit or consent for access.

EA initially reached out to the Orange County Health Care Agency to coordinate the submission of well installation permits. EA was informed that since OCNB is a CERCLA site, a permit is not required from the Orange County Health Care Agency. While not required under CERCLA, EA submitted well permits as a courtesy to the City of Fullerton for locations E-FM-36, E-FM-37, E-FM-38, and E-FM-39. EA obtained well permits through the City of Anaheim for locations E-AM-58, E-AM-60, and E-AM-61. The City of Buena Park did not request a permit for location E-BPM-3; however, they requested and received a well completion diagram upon completion of the wells.

EA submitted formal traffic control plans to the local governments for locations E-AM-60 and E-BPM-3. EA contacted local law enforcement, fire departments, school districts, trash collection companies, city traffic and transportation departments, and medical centers to inform them of any road closures prior to work at each location. EA also continued to update local contacts of any changes to the road closures and schedule.

3.2 MONITORING WELL NAMING CONVENTION

The naming convention of the monitoring wells installed during the Comprehensive RI was consistent with the naming convention established by OCWD during the interim RI/FS. The naming convention for a monitoring well is as follows:

- E-^M-##
    - E identifies the well as installed by EPA
    - ^ identifies the city where the monitoring well is located
        - A = Anaheim
        - BP = Buena Park
        - F = Fullerton
    - M identifies the well as a monitoring well
    - ## is assigned based on the city where the monitoring well is located, ensuring no number is used twice within a city
    - X identifies borings drilled or wells installed that were subsequently abandoned

3.3 COMMUNITY OUTREACH

At EPA's request, applicable agencies and neighboring communities were notified about proposed field work prior to mobilization. EPA flyers were distributed to inform the community of upcoming work.

Flyers were mailed to residents and businesses in the surrounding area at locations E-FM-36, E-FM-37, and E-FM-38. For location E-AM-58, flyers were handed out to the golf course that neighbored the flood control property. EPA and EA personnel hand-delivered flyers to residents and businesses in the surrounding areas at locations E-AM-60, E-AM-61, E-BPM-3, and E-FM-39. Flyers were provided in English, Spanish, and/or translated to additional languages as needed. The flyers for each location can be found in Appendix C.

For the duration of drilling at each location, EA and EPA personnel responded to noise, access, and property damage concerns from the surrounding community. Field personnel also notified residents in the immediate area if work extended past normal work hours or over weekends.

3.4 PRE-CONSTRUCTION

Three types of utility clearances were completed prior to any ground disturbance at each location. The drilling subcontractor, BC2 Environmental (BC2), pre-marked locations in white paint and contacted Underground Service Alert/DIG ALERT to mark utilities in the planned drilling locations. EA also subcontracted a private subsurface utility locator, Ground Penetrating Radar Systems, LLC (GPRS), to clear suspected underground utilities close to proposed well locations. Based on the DIG ALERT and GPRS locate results, BC2 identified the final well locations and used an air-knife to clear potential unmarked subsurface utilities up to 10 ft bgs, at 14-inches in diameter for the majority of the wells or 20-inches in diameter when permanent conductor casing was installed. BC2 then temporarily backfilled or securely covered the air knife holes until beginning the borehole drilling.

Noise controls were employed to reduce the impact to neighboring properties. Controls consisted of 12-ft-high vertical noise barrier walls. The noise barrier walls were free-standing and installed on a weighted base sufficient to maintain barrier wall stability during work. Noise controls were implemented at locations that were directly adjacent to residential or commercial properties, and on school properties. The golf course next to location E-AM-58 provided enough space between the drilling location and the main buildings of the golf course that noise controls were not needed.

BC2 provided means and materials for limiting access, establishing site control, and ensuring drilling locations were secure. A uniformed security guard was present when equipment and supplies were on location and the drilling crew was not present (i.e., overnight, weekends, and holidays).

BC2 implemented traffic control measures at locations E-FM-36, E-FM-37, E-FM-38, and E-FM-39. Traffic control plans required and approved by local governments were implemented by Meyers & Sons Hi-Way Safety, Inc. at locations E-AM-60 and E-BPM-3. Traffic control was not necessary on the two flood control properties, locations E-AM-58 and E-AM-61.

3.5 DRILLING

A total of 25 monitoring wells were installed across eight locations between June 2021 and January 2024 (Figure 5). Borehole completion generally followed the Well Installation Plan (Appendix A) which includes EA's Standard Operating Procedure (SOP) No. 019 Monitoring Well Installation. In summary, boreholes were drilled to a total depth identified by EPA. The EA Field Geologist recorded the lithology every 5 ft using cuttings (mud rotary) or every 2 ft using cores (sonic). The EA Field Geologist used the Unified Soil Classification System to log the borehole lithology and recorded the color using a Munsell color book. At the end of each workday when the drill rig was still on-site, the drill pipe was removed from the borehole and the borehole was covered with a bucket and secured. Between the time the well was constructed, and the surface completion was in place, the wells were secured by placing tamper-proof steel plating across the opening.

3.5.1 Mud Rotary

The direct circulation mud rotary drilling method was chosen for the installation of 24 of the monitoring wells because of its ability to advance large diameter boreholes to depths greater than other methods. This method of drilling is better for borehole stability and the management of subsurface pressures, which is crucial when drilling to the depths that were needed to delineate the vertical extent of the plume. While the mud rotary method generates more waste than other methods, the cost per foot is less expensive.

BC2 used the direct circulation mud rotary method at locations E-FM-36, E-FM-37, E-FM-38, E-AM-58, E-AM-60, E-AM-61, and E-BPM-3. For 21 of the monitoring wells, a 10-inch diameter borehole was drilled from the ground surface to the total depth specified by EPA and as directed by the EA Field Geologist. BC2 provided the EA Field Geologist with cuttings collected every 5 ft from the sample trough. After the EA Field Geologist recorded the description of the lithology, cuttings were placed into gallon-freezer storage bags and labeled for future reference. When the well was completed, the cuttings were staged at each drilling location in the proper waste container prior to transportation and off-site disposal. Borehole depths can be found on the lithologic log forms in Appendix B.

Due to borehole collapse concerns and previous experience (i.e., E-AM-61CX-abandoned), a permanent 16-inch diameter steel conductor casing was placed at monitoring wells E-AM-61C and E-AM-61B to depths of 52 ft bgs. Permanent steel conductor casings (16-inch diameter) were also placed to 57 ft bgs at monitoring wells E-AM-60D and E-AM-60C. BC2 drilled a 20-inch diameter borehole to the depth of the permanent conductor casing for these four monitoring wells to accommodate the casing.

While drilling the borehole for monitoring well E-AM 60C, the drill bit and rods became lodged in clay at approximately 480 ft bgs. BC2 worked the tooling out of the borehole, and upon approval from the EA Professional Geologist, were able to reuse the borehole and completed monitoring well E-AM-60C.

One monitoring well and one borehole were abandoned and re-drilled/constructed. The original monitoring well E-AM-58E (now referred to as E-AM-58EX) was plugged and abandoned because the polyvinyl chloride (PVC) well screen was damaged during development. Filter-pack material and PVC pieces were recovered while bailing E-AM-58EX. While drilling at the original place for monitoring well E-AM-61C (now referred to as E-AM-61CX), drilling mud began to seep through the surface surrounding the borehole; the borehole subsequently collapsed to 80 ft bgs after being drilled to 280 ft bgs. Both the monitoring well (E-AM-58EX) and the borehole (E-AM-61CX) were abandoned in general accordance with California Regulations (Part III, Section 19) (California Department of Water Resources 2024).

3.5.2 Sonic

The sonic drilling method generates less waste and causes minimal disruption to neighboring facilities when compared to mud rotary. Sonic, however, is best used for shallower boreholes. Due to the advancement and retrieval of the core barrel, it can take longer to drill a deeper borehole using sonic and is more expensive per foot than mud rotary methods. When evaluating the overall costs of sonic drilling at shallow depths, the costs are less than those of mud rotary when taking into account the costs related to waste management and off-site disposal as necessary for this project. Many downhole geophysical logging methods are not feasible with sonic drilling; however, sonic does provide continuous cores for field logging and analysis.

BC2 used the sonic method at location E-FM-39 because of the shallow target screen interval and other benefits noted. A 10-inch diameter borehole, telescoped to an 8-inch diameter borehole at depth, was drilled from the ground surface to the total depth determined by EPA. Core barrels were advanced into the subsurface and once the core barrel was retrieved, the driller transferred the material from inside the barrel to plastic core bags. The EA Field Geologist logged the 2 feet of core material contained in the bags. Core material was staged at the drilling location in the proper waste container prior to transportation and off-site disposal. The lithologic log and well completion diagram for monitoring well E-FM-39A can be found in Appendix B.

3.6 WELL CONSTRUCTION

Geophysical logging was completed in the deepest borehole, at each well cluster location, after the total depth was reached, with the exception of E-FM-39. Geophysical logging included fluid temperature, single point resistance and spontaneous potential, 16- and 64-inch normal resistivity, laterolog 3 (guard resistivity), natural gamma, sonic, caliper, and deviation. Appendix H contains the geophysical logs from each location.

Immediately after the completion of the geophysical logging, EA, EPA, and OCWD personnel met to review the geophysical logs, the EA Field Geologist's logs, and the objectives for each screen interval, and identified the target screen interval for each well at the well cluster location. If the EA Field Geologist identified slight differences in the lithology from the other borings to that of the deepest hole, EPA and EA personnel were immediately notified and the target screen interval was adjusted accordingly. In some instances, the original target depth was deeper than a depth necessary for the chosen screen intervals and those boreholes were partially backfilled with bentonite prior to constructing the monitoring well. Screen intervals for each monitoring well are provided in Table 1.

Monitoring wells were constructed in general accordance with the Well Installation Plan (Appendix A) and in accordance with the California Department of Water Resources Well Standards (Bulletins 74-81 and 74-90). Wells were constructed with 4-inch diameter, Schedule 80 PVC blank casing. A stainless-steel centralizer was installed approximately every 40 to 50 ft along the blank section of the casing and at the bottom and top of the screen interval. Monitoring well screens consisted of 0.020-inch slotted Schedule 80 PVC. A 5-ft Schedule 80 PVC casing sump was placed below the screen interval. Prior to placement of the casing, a 50/50 mixture of bentonite chips and a No. 12/20 silica sand gradation was used to seal boreholes that extend below the bottom of the screen. Following installation of the casing, a No. 8/16 silica sand gradation filter pack (California Grade #3) was placed approximately 5 ft above the well screen. A bentonite transition seal was placed above the filter pack, and the remaining annular space was backfilled using high-solids bentonite or cement grout seal. Well construction details for each monitoring well can be found in Appendix I. Scanned field forms can be found in Appendix B.

The monitoring wells at each location were completed as flush mount wells. Surface completions were finished in accordance with the Well Installation Plan (Appendix A). Monitoring wells at locations E-FM-37 (Figure 19), E-FM-38 (Figure 20), E-FM-39 (Figure 21), E-AM-60 (Figure 22), and E-BPM-3 (Figure 23) have concrete well pads flush with the ground surface. Locations E-FM-36 (Figure 24), E-AM-58 (Figure 25), and E-AM-61 (Figure 26) have slightly elevated concrete well pads. At location E-FM-36, Nicolas Junior High School personnel asked for raised well boxes to protect the wells from lawn mowers. Per an Orange County Public Works request for the wells located at their flood control properties (locations E-FM-58 and E-AM-61), surface completions were completed with a wooden frame around the concrete pad and flexible delineators were attached to opposite corners of the concrete pad.

3.7 WELL DEVELOPMENT

Wells were developed in general accordance with the Well Installation Plan (Appendix A) and Uniform Federal Policy (UFP) – Quality Assurance Project Plan (QAPP) (EA 2024). Before development occurred, BC2 measured the depth to water and total depth of the completed well. The wells were considered developed when the water was clear, appeared to be free of sediment, and water quality parameters (specific conductance, temperature, dissolved oxygen, oxidation-reduction potential, and pH) had stabilized (i.e., three consecutive readings are within 10% of each other). As noted in the Well Installation Plan (Appendix A), the turbidity goal for this project was less than 5 nephelometric turbidity units (NTUs). The UFP-QAPP (EA 2024) identified stabilization criteria for turbidity as less than 5 NTU or stabilized as described for the water quality parameters. During development, EA field personnel measured water quality parameters using a YSI Professional Digital Sampling Solution (Pro DSS) multiparameter instrument. The YSI Pro DSS multiparameter instrument was verified to be correctly reading each day before use. Development records can be found in Appendix B.

During development activities, EA noted monitoring well E-FM-39A was not as productive as others drilled for this project. After approximately 360 gallons of water were removed from the well, the turbidity at monitoring well E-FM-39A did not meet the project's goal nor the development criteria. EPA did not disagree with EA's recommendation that, although the turbidity did not meet the goal of 5 NTUs nor did it stabilize during development activities, the turbidity would meet the stabilization criteria during low-flow purging prior to sampling and thereby be deemed as developed.

3.8 GROUNDWATER SAMPLING

Before sampling occurred, dedicated submersible pumps were installed in 24 of the monitoring wells. For wells where the screen is deeper than 200 ft bgs, the pump intake is placed at approximately 200 ft below the top of the landing plate, consistent with other pump installations by OCWD. For wells where the screen is less than 200 ft bgs, the pump is placed approximately 5 ft above the top of screen. The center of the pump intake is approximately 8 inches below the top of the pump. Depths of dedicated pumps for each monitoring well can be found in Table 1. Due to the slow recharge rate, monitoring well E-FM-39A is sampled using a non-dedicated submersible variable rate pump (i.e., bladder or Monsoon® style).

Groundwater sampling was a tandem effort between OCWD and EA. For monitoring wells equipped with a dedicated pump, groundwater sampling was completed in general accordance with OCWD's submersible pump sampling SOP (EA 2024) and purged a minimum of 3.5 well volumes. For monitoring wells not equipped with a dedicated pump (i.e., E-FM-39A), the monitoring well was purged consistent with EA SOP 013 for variable rate (i.e., low-flow) pumps (EA 2024).

OCWD provided equipment needed for sample collection, except sample bottles. Sample bottles were managed by EA through Eurofins Calscience, LLC (Eurofins). OCWD treated, when required, and disposed of purge water generated during sampling. OCWD collected a groundwater sample during well development to characterize the VOCs present in the groundwater at each well to identify if the water required treatment prior to discharge, and if so, ensure the necessary treatment equipment (i.e., granular activated carbon units) was available to treat the purge water. Under the authority of OCWD's existing National Pollutant Discharge Elimination System (NPDES) permit, OCWD personnel discharged the purge water directly to the storm sewer system. Since the waste generated during sampling was not being transported off-site, it was not subject to EPA's Off-Site Rule approval. Groundwater field forms can be found in Appendix B and water quality parameters recorded in the field are summarized in Table 3.

EA sampled monitoring well E-FM-39A twice: November 2023 and January 2024. OCWD is not able to collect a sample from a non-dedicated variable rate pump. OCWD did support waste management for the purge water generated from monitoring well E-FM-39A and disposed of the waste in accordance with their NPDES permit.

3.9 WASTE MANAGEMENT AND DISPOSAL

3.9.1 Waste Management

Investigation-derived waste (IDW) generated during drilling, installation, development, and sampling of the newly installed monitoring wells was disposed of in accordance with the Waste Management Plan (EA 2023) and was subject to EPA's Off-Site Rule approval. BC2 was responsible for the containment, handling, and disposal of IDW generated during borehole drilling, well construction, and well development. As discussed in Section 3.8, purge water generated during sampling was managed in accordance with OCWD's NPDES permit. IDW in the form of spent drilling fluids (mud), soil cuttings, and development water was temporarily stored in watertight containers provided by BC2 until final disposal. Each type of waste was considered a separate waste stream from a single source (location). For example, the spent drilling fluids from each location was treated as a single waste stream and did not need to be managed separately for each monitoring well at that location. Quantities of waste generated during the project can be found in Table 4.

3.9.2 Waste Determination

EA sampled IDW in the form of drill cuttings, drilling fluid, and development water once the deepest boring at each location reached total depth. Samples were analyzed in general accordance with the UFP-QAPP (EA 2024) for waste characterization according to the Waste Management Plan (EA 2023). Per the Waste Management Plan, contaminant concentrations were expected to be similar across the borings at each location; therefore, waste samples collected from the deepest boring were representative of the anticipated highest contaminant levels in the waste from each drilling location because the deepest boring includes the intervals, and therefore contamination, to be encountered while drilling the other monitoring wells at each location.

Waste characterization samples were hand-delivered to Eurofins after collection. Eurofins provided rapid turnaround times for the waste characterization samples to support off-site transport and disposal of the IDW. The process for waste characterization and determination of the appropriate off-site disposal option for the leachate is detailed in the Waste Management Plan (EA 2023). EA prepared Waste Determination Memorandums (Appendix F) for EPA's consideration, proposing the appropriate waste disposal activities for IDW generated at each location. EPA concurred with EA's conclusion as presented in the Waste Determination Memorandums and approved the IDW for off-site disposal as non-hazardous at an EPA Off-Site Rule-approved facility. Manifests for each off-site shipment of waste are in Appendix G.

3.10 SURVEY

EA subcontracted a State of California licensed Professional Land Surveyor to survey each monitoring well location and the elevations of the top of the well monument (center of well vault with the lid securely attached), the water-level measuring point (north side of the top of the PVC well casing with the well cap removed), and the finished surface (elevation measured on nail set flush in lead filled drill hole set in concrete on north side of well monument) for each monitoring well. A permanent marking on the water level port was made for consistency in future depth-to-water level measurements. These survey data are found in Table 5.

Survey standards include surveying the well to vertical accuracy of 0.010 U.S. survey foot using the 1983 North American Datum California State Plane Zone 6 coordinates and a horizontal accuracy to within 0.10 foot tied to site datum (World Geodetic System 1984 Universal Transverse Mercator Zone 11 North).

3.11 LABORATORY ANALYSIS AND DATA VALIDATION, MANAGEMENT, AND USABILITY ASSESSMENT

3.11.1 Laboratory Analysis and Data Validation

Groundwater samples from EPA-installed monitoring wells were hand-delivered to Eurofins for laboratory analysis of VOCs (EPA Method 8260B), 1,4-dioxane (EPA Method 8260B SIM), perchlorate (EPA Method 331.0), and PFAS (EPA Method 537). Eurofins provided electronic data deliverables and Level 4 data packages to support third-party data validation.

Data validation of the groundwater data was completed in accordance with Worksheet #36 of the UFP-QAPP (EA 2024). In general, 10% of the VOC and 1,4-dioxane groundwater data underwent Stage 3 manual validation; the remaining 90% of the VOC and 1,4-dioxane groundwater data underwent Stage 2b manual validation; and the waste characterization and groundwater perchlorate and PFAS data underwent Stage 1 manual validation. As the validation stages build upon one another, all of the data underwent Stage 1 and Stage 2 validation. EA completed the Stage 1 validation. Stage 2 and Stage 3 data validation was completed by Environmental Data Services, LTD for the samples collected from locations E-AM-58, E-BPM-3, E-FM-36, E-FM-37, E-FM-38, and E-FM-39 (November 2023 sample); and by Laboratory Data Consultants, Inc. for the samples collected from locations E-AM-60, E-AM-61, and E-FM-39 (January 2024 sample).

Appendix J includes Eurofins' groundwater analytical results, the Stage 1 validation checklists, and the third-party data validation reports (Stage 2b and Stage 3). The laboratory results for the waste characterization samples are included in the Waste Determination Memorandums (Appendix F).

3.11.2 Data Management

Data management consists of EPA monitoring well analytical laboratory and non-laboratory data collected and recorded during the Comprehensive RI. Analytical laboratory data were provided by Eurofins in portable document format (PDF) reports and EQuIS™ electronic data deliverable (EDD) format. Non-laboratory data consist of field parameter data recorded during sampling activities (e.g., conductivity, dissolved oxygen, oxidation-reduction potential, pH, turbidity, temperature, and water levels).

Data management staff reviewed the data received from the laboratories and field teams using the following processes:

- Verify field coordinates as applicable to sample locations with the project team
- Review chain-of-custody documentation for samples shipped to laboratories
- Verify that sample IDs are accurate as reported by the laboratories and as compared to the chain-of-custody
- Review laboratory analytical data reports and EDDs to ensure the laboratory is following the scope of work and providing complete data in the required format
- Review data validation reports and validated EDDs prior to importing into database management system.

Once the analytical laboratory and non-laboratory data were reviewed, it was imported and stored in the database management system called EQuIS™ version 7.23.3. EQuIS™ is a Structured Query Language database management system and allows for automatic check and import of EDDs. The OCNB EQuIS™ database includes only fully validated analytical laboratory data and quality control reviewed non-laboratory data and is maintained and managed within EA offices. Servers located in EA facilities are physically secured in locked buildings and rooms with access limited to authorized personnel and backed up on a nightly basis. The Comprehensive RI data are available for queries, reports, and distribution upon request.

The Comprehensive RI validated groundwater analytical laboratory dataset is provided in a raw Excel file as Appendix K.

Samples collected for waste characterization are not in the Comprehensive RI dataset (Appendix K); however, laboratory reports are attached to the Waste Determination Memorandums found in Appendix F.

3.11.3 Data Usability Assessment

In accordance with Worksheet #37 of the UFP-QAPP (EA 2024), EA completed a data usability assessment for the groundwater analytical data. The Data Usability Assessment Technical Memorandum can be found in Appendix L. In summary, the data are of the right type, quality, and quantity considered usable to support the characterization of the nature and extent of contamination.

3.12 AMENDMENTS TO GOVERNING DOCUMENTS

The final version of the Well Installation Plan was approved by EPA in December 2020 and the final version of the UFP-QAPP was approved by EPA in February 2021. Both documents provide detailed plans, rationale, and SOPs for field and laboratory tasks completed during the Comprehensive RI. As situations were encountered, both routine and unique, EA prepared and EPA approved four individual amendments to each governing document. Amendment 4 of the Well Installation Plan is Appendix A of this Comprehensive Technical Memorandum. Tasks completed during the Comprehensive RI were in general compliance with these governing documents and their amendments.

4. DATA SUMMARY AND EVALUATION

4.1 MONITORING WELL OBJECTIVES

EPA identified specific objectives for each monitoring well installed during the Comprehensive RI. The well-specific objectives are identified in Table 1. This section presents the analytical results for each monitoring well installed during the Comprehensive RI and the conclusion if the monitoring well met its planned objective. Target screen depths may have been adjusted to coincide with the location of higher permeability zones as indicated in geophysical logs developed after drilling the deepest borehole in each cluster.

Figure 5 illustrates the location of each cluster installed during the Comprehensive RI. Figure 27 provides a cross-section of the locations and screen interval depths of the 24 wells installed along the main plume and leading edge.

EPA collected the initial groundwater sample from each monitoring well installed during the Comprehensive RI. With the exception of monitoring well E-FM-39A, OCWD has collected subsequent groundwater samples on a semi-annual basis, beginning after EPA's initial sample. Additional and continued groundwater monitoring is necessary to build confidence in the dataset and inform the hydrogeologic site model (HSM). Therefore, this section includes discussion of groundwater sample results from both the initial EPA groundwater samples and the semi-annual groundwater samples collected by OCWD through the first quarter of 2024 (Table 6). Note that some wells have only been sampled initially by EPA and the conclusions presented herein are based on a single sample. Figure 2 presents the approximate extent of groundwater contamination based on available data collected between 2019 and the first quarter of 2024.

EPA's initial samples from the E-FM-36 monitoring well cluster (Figure 28) showed that monitoring wells E-FM-36A, E-FM-36B, and E-FM-36C met their objectives. Analytical results from monitoring well E-FM-36A indicated concentrations of TCE above EPA's MCL and 1,4-dioxane above California's NL, characterizing the Shallow Zone plume. Groundwater from monitoring well E-FM-36B contained detectable concentrations of 1,4-dioxane less than California's NL and therefore established the lack of plume migration into the Principal Zone at this location. Groundwater from monitoring well E-FM-36C did not have detectable concentrations of any of the four COCs and therefore delineates the bottom of the plume. It should be noted that a 2024 groundwater sample from monitoring well E-FM-36B did have a 1,4-dioxane concentration at California's NL, suggesting that the plume may be present in the Principal Zone at this location and depth.

While the five wells in the E-FM-37 monitoring well cluster (Figure 29) did not fully meet their planned objective of characterizing the plume entering production well PAGE-F (Figure 30; Table 7), the cluster did provide valuable information regarding the plume. Groundwater samples from all five monitoring wells have consistently been either non-detect or contained trace concentrations of PCE, TCE, and 1,1-DCE (Figure 29). Only groundwater from monitoring well E-FM-37B contained detectable (0.9 µg/L maximum), yet below California's NL, concentrations of 1,4-dioxane. With the E-FM-37B concentration being almost at the California NL for 1,4-dioxane (1.0 µg/L) and the production well PAGE-F concentration being above the NL, the model estimates the plume to extend across the E-FM-37 monitoring well cluster location at a depth between monitoring wells E-FM-37A and E-FM-37B. Since the wells are actually located downgradient of PAGE-F, the E-FM-37 monitoring well cluster serves to delineate the lateral extent of the plume and suggests that contamination does not migrate past production well PAGE-F, which is most likely capturing the plume based on the volume of groundwater pumped at that location. The E-FM-37 monitoring well cluster may provide future indications of contamination drawn toward PAGE-F during periods of pumping that potentially migrates downgradient of the supply well when it is not pumping.

The three monitoring wells in the E-FM-38 monitoring well cluster (Figure 31) have met their planned objectives. Groundwater samples from monitoring wells E-FM-38A and E-FM-38B have 1,4-dioxane concentrations above California's NL and TCE concentrations above EPA's MCL, characterizing the plume in the Shallow Zone and identifying the migration of the plume into the Principal Zone. Groundwater samples from monitoring well E-FM-38C contained no detectable concentrations of any of the four COCs, therefore, indicating that the bottom of the plume is vertically positioned between the bottom of the E-FM-38B screen and the top of the E-FM-38C screen at this location.

Monitoring well E-FM-39A (Figure 32) met its planned objective. The two groundwater samples from this monitoring well had no detectable concentrations of any of the four COCs, thereby providing an interpolated northern plume boundary between monitoring wells FM-33A and E-FM-39A (Figure 30).

Four of the five monitoring wells in the E-FM-58 monitoring well cluster (Figure 33) met their planned objectives. Monitoring well E-AM-58A did not meet the planned objective of delineating the top of the plume as samples from this well have 1,4-dioxane concentrations above California's NL, placing the plume in both the Shallow Zone and Principal Zone at this location. Groundwater samples from monitoring wells E-AM-58B, E-AM-58C, and E-AM-58D all contain 1,4-dioxane concentrations above California's NL, effectively mapping the migration of Shallow Zone contamination into the Principal Zone. Groundwater samples from monitoring wells E-AM-58B and E-AM-58C also contain TCE concentrations above EPA's MCL, mapping the migration of the TCE plume into the Principal Zone. Groundwater samples from monitoring well E-AM-58E, while having detectable concentrations of 1,1-DCE and 1,4-dioxane, do not have concentrations of any COC above EPA's MCLs or California's NL, effectively delineating the bottom of the plume at this location.

Monitoring wells in the E-AM-60 well cluster (Figure 34) did not meet their planned objectives of identifying the depth at which 1,4-dioxane is entering production well A-39 (Figure 30; Table 8) and delineating the bottom of the plume at this location. The initial groundwater samples from monitoring wells E-AM-60C and E-AM-60D were non-detect for the four COCs and therefore, the monitoring wells did not characterize the plume entering production well A-39. However, the information provided by these monitoring wells does serve to emphasize the isolated, transient, and complex nature of the plume at its deep distal end. Wellhead samples from production well A-39 have contained elevated 1,4-dioxane concentrations that vary in magnitude with time. The E-AM-60 monitoring well cluster suggests that contamination at production well A-39 does not follow a linear pathway from the main plume body upgradient. This information is vital to understanding the flow dynamics in the main water production depth from the Principal Zone, where production wells are screened, and will help in the decision of where additional monitoring wells designed to delineate the plume at production well A-39 should be placed.

The three monitoring wells in the E-AM-61 monitoring well cluster (Figure 35) did not meet their planned objective of delineating a pathway between upper Principal Zone contamination at the E-AM-58 monitoring well cluster location and deeper Principal Zone contamination observed at multiport monitoring well AMD-8. However, they did meet the objective of delineating the extent and depth of the plume at this location. The initial groundwater sample from monitoring well E-AM-61B did not contain detectable concentrations of any of the four COCs indicating the absence of the plume at this depth and location. The initial groundwater sample from monitoring well E-AM-61C did have detectable concentrations of 1,1-DCE and 1,4-dioxane, however, the concentrations were not above EPA's MCL or California's NL. Elevated concentrations may indicate that E-AM-61C represents the migration pathway of the plume and that the plume becomes too dispersed at this distance from the source areas to have concentrations above EPA's MCL or California's NL. Continued sampling of E-AM-61C may show periodic concentration increases that provide information on the transient nature of the plume at this depth and location. The initial groundwater sample from monitoring well E-AM-61D did not contain detectable concentrations of any of the four COCs; therefore, the monitoring well did meet its objective of delineating the bottom of the plume at this location.

The three monitoring wells in the E-BPM-3 monitoring well cluster (Figure 36) met their planned objectives. The four COCs were not detected in the initial groundwater samples from monitoring wells E-BPM-3A and E-BPM-3C, effectively defining the top and bottom of the plume at this location. The initial groundwater sample from monitoring well E-BPM-3B contained 1,4-dioxane at a concentration above California's NL, effectively identifying the zone at which the COC was entering the City of Buena Park's production well BP-LIND (Figure 30).

4.2 STATISTICAL ANALYSIS OF PLUME CONFIDENCE

EA used C-Tech Earth Volumetric Studio software to develop four COC-specific groundwater contaminant plumes across the site. The C-Tech Earth Volumetric Studio kriging algorithms were used in tandem with a spherical variogram model to interpolate concentrations at unknown locations for four contaminants: PCE, TCE, 1,1-DCE, and 1,4-dioxane. Concentrations from 2019 through the first quarter of 2024 were used for this statistical analysis. If a monitoring location was sampled more than once over this 5-year period, then the most recent sample was used as the representative value. Each of the four contaminants were interpolated independently and were delineated at EPA's MCL or California's NL.

The associated confidence of each plume interpolation was then calculated internally within the C-Tech Earth Volumetric Studio software. In this analysis, a confidence of 50% or greater than the predicted concentration (factor of 2 of the actual concentration) was desired. For example, to say there is a 50% confidence in the PCE interpolation of 5 µg/L along the plume boundary is to say there is greater than 50% confidence that the true concentration ranges from 2 µg/L to 10 µg/L. The same confidence and factor apply to the interior of the plume. Figure 37 (PCE), Figure 38 (TCE), and Figure 39 (1,1-DCE) visually identify the regions of the plume interpolations in which there is a relatively high confidence (greater than 50%). Figure 40 (1,4-dioxane) visually identifies the regions of the plume interpolations in which there is a relatively high confidence (greater than 50%) and relatively low confidence (less than 50%).

4.2.1 PCE

Figure 37 shows that the entire PCE plume exceeding 5.0 µg/L was interpolated with greater than 50% confidence. In particular, EPA monitoring well E-FM-39A provides upgradient delineation, bounding and characterizing the north-northwestern extent of the PCE plume.

4.2.2 TCE

Figure 38 shows that the entire TCE plume exceeding 5.0 µg/L was interpolated with greater than 50% confidence. Similarly, as for PCE, EPA's monitoring well E-FM-39A assists in increasing the confidence in the northern extent of the TCE plume. Moreover, E-FM-37 monitoring well cluster provides strong lateral control along the western flank of the TCE plume, characterizing plume geometry as well as offering valuable data on future fate and transport of the TCE plume.

4.2.3 1,1-DCE

Figure 39 shows that the entire 1,1-DCE plume exceeding 7.0 µg/L was interpolated with greater than 50% confidence. EPA monitoring well E-FM-39A again provides upgradient delineation, bounding and characterizing the northern extent of the 1,1-DCE plume.

4.2.4 1,4-Dioxane

Figure 40 identifies the regions of the 1,4-dioxane plume exceeding 1 µg/L in which there is greater than 50% confidence in the interpolation (light green) and regions in which there is less than 50% confidence in the interpolation (dark green). It is emphasized that the plume interpolations shown on Figure 40 are two-dimensional projections of 3D plumes (i.e., flattened). To be conservative, at a given spatial location, preference was given to the lowest calculated confidence, meaning not all of the 1,4-dioxane plume at all depths is characterized with less than 50% confidence. In fact, the majority of the plume body under the dark green (less than 50% confidence) shading is interpolated with greater than 50% confidence. Only the shallow portion of the plume, where monitoring wells with screens along the water table are lacking, is interpolated with less than 50% confidence.

E-AM-58 monitoring well cluster assists in characterizing the 1,4-dioxane plume, especially in its downgradient regions. E-BPM-3 and E-AM-61 monitoring well clusters also serve as significant delineation wells, defining the downgradient extent of the plume currently, and will continue to serve as vital monitoring locations tracking contaminant transport and plume cores.

4.3 PERCHLORATE AND PFAS INFORMATIONAL RESULTS

Groundwater in the northern part of the Orange County Groundwater Basin is also contaminated with perchlorate at concentrations above California's MCL. Limited information is available for the presence of PFAS in the groundwater. Perchlorate and PFAS were analytes of interest and EPA analyzed the groundwater for these contaminants to better understand the frequency of detection and relative concentrations of these compounds when combined with other data from within the site (i.e., OCWD, sources).

Figures 41 through 48 present the perchlorate and PFAS concentrations in groundwater from each well installed during the Comprehensive RI.

- Figure 41—Location E-FM-36
- Figure 42—Location E-FM-37
- Figure 43—Location E-FM-38
- Figure 44—Location E-FM-39
- Figure 45—Location E-AM-58
- Figure 46—Location E-AM-60
- Figure 47—Location E-AM-61
- Figure 48—Location E-BPM-3

Figure 49 identifies the Comprehensive RI locations where perchlorate exceeds California's MCL. Figure 50 identifies the Comprehensive RI locations where at least one PFAS compound exceeds their respective EPA MCL.

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5. CONCLUSIONS AND RECOMMENDATIONS

The production and monitoring wells identified throughout this section and the approximate extent of contamination based on available data collected between 2019 and the first quarter of 2024 can be found on Figure 30. Isocontour maps for each COC are found on Figure 30a for PCE, Figure 30b for TCE, Figure 30c for 1,1-DCE, and Figure 30d for 1,4-dioxane. Isocontours are defined as an of order of magnitude increase from each COCs respective screening level.

5.1 CONCLUSIONS

The plume volume models for each COC were updated to include the results from sampling the monitoring wells in the E-AM-60, E-AM-61, and E-BPM-3 well clusters and to include the 2024 concentrations from the earlier well clusters, E-FM-36, E-FM-37, E-FM-38, E-FM-39, and E-AM-58. The plume volumes based on the available maximum concentrations from 2019 to the first quarter of 2024 are shown on Figure 51 (1,1-DCE), Figure 52 (1,4-dioxane), Figure 53 (PCE), and Figure 54 (TCE). The 2019 to the first quarter of 2024 comingled plume volume, which defines the current nature and extent of the OCNB plume, is shown on Figure 55. As can be seen on Figures 51 through 55, adequate data exist to define a continuous plume volume extending from shallow contamination under the potential source areas in the eastern plume area downgradient and migrating vertically downward into the deeper Principal Zone to the location of E-BPM-3. The Shallow Zone generally refers to the saturated region down to a depth of 200 to 250 ft bgs, with the Principal Zone below.

The PCE component of the plume is located primarily in the Shallow Zone under the potential source areas (Figure 53). Similarly, the 1,1-DCE component of the plume is located in the same aquifer zone and has a slightly longer extent in the downgradient direction (Figure 51). The TCE component of the plume is present with PCE and 1,1-DCE in the shallow eastern portion of the plume and has migrated further downgradient (southwestward) and vertically downward into the Principal Zone. The 1,4-dioxane portion of the plume has migrated the furthest downgradient and deepest from the potential source areas impacting several low yield Principal Zone production and irrigation wells (A-DMGC, CRES-A, PAGE-F, and TLLC-F2) as well as at least three deeper high yield municipal production wells (City of Anaheim A-47, City of Fullerton F-5, and City of Buena Park BP-LIND). Wellhead samples from City of Anaheim production wells A-39, A-54, and A-56 have elevated 1,4-dioxane concentrations; however, available data are insufficient to connect these wells to the main plume volume.

The general conceptualization of plume migration based on plume volume, lithologic, and water level modeling is that the groundwater contamination impacts the Shallow Zone to the east under the potential source areas. In this region, the aquitard (layer of fine-grained, low permeability sediments) that separates the Shallow Zone and Principal Zone is discontinuous or absent. This allows for plume migration into the deeper Principal Zone, where production wells are located south and southwest of the potential source areas The presence of a continuous and thickening aquitard west and southwest of the potential source areas limits the downward migration from the Shallow Zone. However, contamination which has moved downward into the Principal Zone where the aquitard is absent continues to migrate towards the deeper extraction wells.

The continuous comingled plume volume has been mapped into the Principal Zone impacting several relatively shallow low yield extraction wells and several Fullerton production wells (depth to top of screen around 350 ft bgs) located close to the potential source areas. The continuous plume also impacts two deeper Principal Zone production wells closest to the potential source area, City of Anaheim A-47 (top of screen 482 ft bgs) and City of Buena Park BP-LIND (top of screen 470 ft bgs). In general, these depths mark the top of the main production zone for most of the City of Buena Park and City of Anaheim production wells surrounding the potential source area. It will be difficult to fully map the migration of the plume below this depth due to the number of and the extraction patterns for these production wells. While these wells are all relatively high yield, they pump at different rates and are active at different times and for different durations. This creates a complex groundwater flow field at depth, resulting in a lateral dispersal of contamination moving with ever changing flow directions in response to transient pumping stresses imposed on the aquifer. Contamination at this depth may reach a production well via a circuitous path instead of following a constant gradient. This circuitous pathway requires multiple deep monitoring wells around each production well to articulate the path of impact. In addition, contamination may be transient, reaching production wells in pulses of higher concentrations separated by periods of relatively low or below detection concentrations depending on the dynamics of the flow field.

5.2 RECOMMENDATIONS

The most immediate recommendation is for continued monitoring (includes both OCWD and EPA installed monitoring wells) within and surrounding the current approximate extent of contamination. Samples should be collected on at least an annual basis and analyzed for all four COCs: PCE, TCE, 1,1-DCE, and 1,4-dioxane. 1,4-dioxane has not been consistently analyzed at several well locations even though it is has shown to be the most mobile of the COCs. Consider bi-annual network sampling centered on historic high and low water use periods as these hydraulic changes may induce plume migration.

Transient groundwater flow and fate and transport modeling should be performed. The development of the HSM provides for an up-to-date comprehensive collection of all available hydrogeologic data for the OCNB. The existing HSM provides the necessary foundation for the development of a robust numerical 3D groundwater flow model that can be used to simulate the effect variable pumping on the aquifer flow field. With the cost and uncertainty of placing deep monitoring wells to find migration pathways, a groundwater flow model offers an option that would help predict locations that would yield the most information. Combining the flow simulation with contaminant fate and transport modeling would help in understanding if groundwater with contaminant concentrations above EPA's MCL or California's NL should be expected in the deeper portion of the aquifer and where these higher concentrations may be located.

Additional monitoring wells should be installed, contingent on the results of continued monitoring and flow and transport modeling. If monitoring shows that concentrations are increasing at distal monitoring wells such as locations E-AM-60 or E-AM-61, then the placement of additional monitoring wells may be warranted to delineate the extent of the comingled plume. Similarly, if flow and transport modeling identify high probability, high concentration pathways, placement of additional monitoring wells in these pathways may be warranted. In addition, several high-risk OCNB production wells currently have ‘sentinel monitoring wells’ (i.e., AMD-8 for production well A-51, CB-1 for production well A-47, AMD-7 for production well A-56). Additional sentinel wells close to and upgradient of other high-risk production wells such as BP-BOIS and A-53 may be warranted before the completion of flow and transport modeling in order to articulate the depth and concentration of the impact. An increased gauging schedule and the placement of transducers where possible for sentinel monitoring wells may be warranted to provide a better understanding of production well flow dynamics and define under what conditions contamination is likely impacting potable water production.

Finally, additional investigation is warranted in the area of the main plume and the lobe extending to the south, located between Interstate 5 and Highway 57 (Figure 30). This lobe was not a focus of the Comprehensive RI because the 2018 plume model’s dataset did not include these datapoints.

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6. REFERENCES

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Tables

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Table 1. Summary of Monitoring Well Locations

Well ID No.	Purpose	Monitoring Well Coordinates[b]		Screen Interval (ft bgs)			Pump Depths[c]	Screen Objective	Figure(s)
		Latitude	Longitude	Flow Zone	Top	Bottom			
E-FM-36A	Characterize lateral and vertical migration; define vertical extent	33.861653	-117.943094	Shallow	175	185	170	Characterize plume; TCE and 1,4-dioxane	9, 24
E-FM-36B		33.861669	-117.943072	Principal	244	254	200	Characterize plume; 1,4-dioxane	
E-FM-36C		33.861689	-117.943047	Principal	310	320	200	Delineate bottom of the plume; 1,4-dioxane	
E-FM-37A	Define lateral and vertical extent	33.857203	-117.962678	Shallow	145	160	140	Characterize plume; 1,4-dioxane	10, 19
E-FM-37B		33.857203	-117.962597	Principal	240	260	200	Characterize plume; 1,4-dioxane	
E-FM-37C		33.857203	-117.962564	Principal	342	357	200	Characterize plume; 1,4-dioxane	
E-FM-37D		33.857203	-117.962531	Principal	415	435	200	Characterize plume; 1,4-dioxane	
E-FM-37E		33.857203	-117.962497	Principal	516	526	200	Delineate bottom of the plume; 1,4-dioxane	
E-FM-38A	Characterize lateral and vertical migration; define vertical extent	33.860267	-117.951719	Shallow	170	190	165	Characterize plume; 1,4-dioxane	12, 20
E-FM-38B		33.860267	-117.951831	Principal	244	254	200	Characterize plume; 1,4-dioxane	
E-FM-38C		33.860267	-117.951914	Principal	338	358	200	Delineate bottom of the plume; 1,4-dioxane	
E-FM-39A	Define lateral extent	33.877514	-117.921653	Shallow	129	139	NA	Delineate edge of the plume; TCE and PCE	13, 21

Table 1. Summary of Monitoring Well Locations

Well ID No.	Purpose	Monitoring Well Coordinates[b]		Screen Interval (ft bgs)			Pump Depths[c]	Screen Objective	Figure(s)
		Latitude	Longitude	Flow Zone	Top	Bottom			
E-AM-58A	Characterize vertical migration; define vertical extent	33.839586	-117.960739	Shallow	160	175	155	Delineate top of the plume; 1,4-dioxane	14, 25
E-AM-58B		33.839583	-117.960781	Principal	205	225	200	Characterize plume; 1,4-dioxane	
E-AM-58C		33.839583	-117.960828	Principal	330	350	200	Characterize plume; 1,4-dioxane	
E-AM-58D		33.839581	-117.960869	Principal	405	425	200	Characterize plume; 1,4-dioxane	
E-AM-58E		33.839589	-117.960708	Principal	540	560	200	Delineate bottom of the plume; 1,4-dioxane	
E-AM-60A[a]	Characterize vertical migration; define vertical extent	TBD	TBD	TBD	TBD	TBD	NA	TBD	17, 22
E-AM-60B[a]		TBD	TBD	TBD	TBD	TBD	NA	TBD	
E-AM-60C		33.825186	-117.999531	Principal	618	638	200	Characterize plume entering A-39; 1,4-dioxane	
E-AM-60D		33.825175	-117.999561	Principal	680	700	200	Characterize plume entering A-39; if contamination not detected, then delineate bottom of the plume; 1,4-dioxane	
E-AM-61A[a]	Characterize vertical migration; identify vertical migration pathway	TBD	TBD	TBD	TBD	TBD	NA	TBD	18, 26
E-AM-61B		33.832917	-117.978142	Principal	380	400	200	Characterize plume; 1,4-dioxane	
E-AM-61C		33.832953	-117.978142	Principal	505	525	200	Characterize plume; 1,4-dioxane	
E-AM-61D		33.833006	-117.978139	Principal	654	674	200	Delineate bottom of the plume; 1,4-dioxane	

Table 1. Summary of Monitoring Well Locations

Well ID No.	Purpose	Monitoring Well Coordinates[b]		Screen Interval (ft bgs)			Pump Depths[c]	Screen Objective	Figure(s)
		Latitude	Longitude	Flow Zone	Top	Bottom			
E-BPM-3A	Characterize plume entering BP-LIND	33.842447	-117.984994	Principal	406	426	200	Characterize plume entering BP-LIND; 1,4-dioxane	16, 23
E-BPM-3B		33.842472	-117.984994	Principal	482	502	200	Characterize plume entering BP-LIND; 1,4-dioxane	
E-BPM-3C		33.842500	-117.984994	Principal	646	666	200	Delineate bottom of the plume; 1,4-dioxane	

Notes:

[a] Proposed monitoring wells not installed.

[b] Latitude and longitude coordinates are in North American Datum of 1983 (NAD 83, decimal degrees); measured from the center of the well vault lid.

[c] Depth to pump is measured from the top of the landing plate to the top of the bushing on the pump. For wells where the screen is deeper than 200 ft bgs, the pump intake is placed at approximately 200 feet below the top of the landing plate, consistent with other pump installations by the OCWD. For wells where the screen is less than 200 ft bgs, the pump is placed approximately 5 feet above the top of screen. The center of the pump intake is approximately 8 inches below the top of the pump.

ft bgs = feet below ground surface

ID = identification

No. = number

PCE = tetrachloroethene

TBD = to be determined

TCE = trichloroethene

Table 2. Schedule

Task Name	Subtask Name	Start	Finish
Well Installation Governing Documents		Monday, August 10, 2020	Monday, July 1, 2024
	Health and Safety Plan (final and amendments as needed)	Monday, August 10, 2020	Monday, July 1, 2024
	Well Installation Plan (final and amendments as needed)	Tuesday, October 20, 2020	Monday, July 1, 2024
	UFP-QAPP (includes Data Filing Plan) (final and amendments as needed)	Friday, December 11, 2020	Monday, July 1, 2024
	Waste Management Plan (final and amendments as needed)	Tuesday, June 29, 2021	Monday, July 1, 2024
Drilling Solicitation, Contract Award, and Modifications (as needed)		Monday, November 30, 2020	Monday, July 1, 2024
Permitting and Coordination with Local Governments		Thursday, April 1, 2021	Monday, April 1, 2024
E-FM-36 (3 wells - A, B, C)		Thursday, October 29, 2020	Wednesday, November 17, 2021
	Consent for Access	EPA secured	
	Reconnaissance Trip and Preliminary Utility Locates	Thursday, October 29, 2020	Thursday, October 29, 2020
	Community Outreach - Mail Flyers	EPA distributed	
	Utility Locates (EA private utility subcontractor)	Friday, June 18, 2021	Friday, June 18, 2021
	Drilling and Development	Monday, June 28, 2021	Thursday, July 29, 2021
	Survey, Surface Completions, and Pump Install	Monday, October 25, 2021	Friday, October 29, 2021
	Groundwater Sampling	Wednesday, November 17, 2021	Wednesday, November 17, 2021
E-FM-37 (5 wells - A, B, C, D, E)		Thursday, July 1, 2021	Monday, November 15, 2021
	Reconnaissance Trip and Preliminary Utility Locates	Thursday, July 1, 2021	Thursday, July 1, 2021
	Community Outreach - Mail Flyers	EPA distributed	
	Consent for Access	Friday, July 9, 2021	
	Utility Locates (EA private utility subcontractor)	Friday, July 9, 2021	Friday, July 9, 2021
	Drilling and Development	Thursday, July 22, 2021	Friday, September 24, 2021
	Survey, Surface Completions, and Pump Install	Monday, October 25, 2021	Friday, October 29, 2021
	Groundwater Sampling	Monday, November 15, 2021	Monday, November 15, 2021

Table 2. Schedule

Task Name	Subtask Name	Start	Finish
E-FM-38 (3 wells - A, B, C)		Tuesday, September 7, 2021	Tuesday, November 16, 2021
	Consent for Access	Tuesday, September 7, 2021	
	Utility Locates (EA private utility subcontractor)	Wednesday, September 1, 2021	Wednesday, September 1, 2021
	Community Outreach - Mail Flyers	Thursday, August 26, 2021	Thursday, August 26, 2021
	Drilling and Development	Tuesday, September 14, 2021	Friday, October 22, 2021
	Survey, Surface Completions, and Pump Install	Monday, October 25, 2021	Friday, October 29, 2021
	Sampling	Tuesday, November 16, 2021	Tuesday, November 16, 2021
E-AM-58 (5 wells - A, B, C, D, Abandoned E)		Wednesday, November 3, 2021	Wednesday, June 15, 2022
	Consent for Access	Wednesday, November 3, 2021	
	Utility Locates (EA private utility subcontractor)	Tuesday, November 9, 2021	Tuesday, November 9, 2021
	Community Outreach - Hard Copies at Golf Course	Wednesday, November 10, 2021	Wednesday, November 10, 2021
	Drilling and Development	Monday, November 29, 2021	Friday, January 28, 2022
	Surface Completions and Pump Install	Friday, January 21, 2022	Friday, January 28, 2022
	Survey	Wednesday, April 20, 2022	Sunday, April 24, 2022
	Groundwater Sampling	Tuesday, June 14, 2022	Wednesday, June 15, 2022
E-AM-58 (1 well - Replacement E)		Tuesday, November 9, 2021	Wednesday, June 15, 2022
	Utility Locates (EA private utility subcontractor)	Tuesday, November 9, 2021	Tuesday, November 9, 2021
	Drilling	Tuesday, February 22, 2022	Friday, March 4, 2022
	Development, Surface Completion, and Pump Install	Tuesday, March 22, 2022	Wednesday, March 23, 2022
	Survey	Wednesday, April 20, 2022	Sunday, April 24, 2022
	Sampling	Wednesday, June 15, 2022	Wednesday, June 15, 2022

Table 2. Schedule

Task Name	Subtask Name	Start	Finish
E-BPM-3 (3 Wells - A, B, and C)		Thursday, May 25, 2023	Thursday, November 2, 2023
	Consent for Access	Thursday, May 25, 2023	
	Utility Locates (EA private utility subcontractor)	Monday, June 7, 2021	Monday, June 7, 2021
	Community Outreach - Hand Deliver Flyers	Friday, June 9, 2023	Friday, June 9, 2023
	Drilling and Development	Wednesday, June 14, 2023	Tuesday, August 1, 2023
	Surface Completions and Pump Install	Wednesday, July 26, 2023	Friday, September 8, 2023
	Groundwater Sampling	Wednesday, September 13, 2023	Wednesday, September 13, 2023
	Survey	Thursday, November 2, 2023	Thursday, November 2, 2023
E-FM-39 (1 Well - A)		Thursday, June 15, 2023	Thursday, November 2, 2023
	Consent for Access	Thursday, June 15, 2023	
	Utility Locates (EA private utility subcontractor)	Thursday, July 20, 2023	Thursday, July 20, 2023
	Drilling	Monday, July 24, 2023	Thursday, July 27, 2023
	Community Outreach - Hand Deliver Flyers	Wednesday, July 19, 2023	Saturday, July 22, 2023
	Development	Friday, July 28, 2023	Monday, September 18, 2023
	Surface Completion	Wednesday, September 6, 2023	Wednesday, September 6, 2023
	Groundwater Sampling	Tuesday, November 7, 2023	Tuesday, November 7, 2023
	Groundwater Sampling	Tuesday, January 16, 2024	Tuesday, January 16, 2024
	Survey	Thursday, November 2, 2023	Thursday, November 2, 2023

Table 2. Schedule

Task Name	Subtask Name	Start	Finish
E-AM-61 (3 Wells - B, C, and, D)		Tuesday, May 23, 2023	Tuesday, March 12, 2024
	Consent for Access	Tuesday, May 23, 2023	
	Community Outreach - Hand Deliver Flyers	Wednesday, July 19, 2023	Saturday, July 22, 2023
	Utility Locates (EA private utility subcontractor)	Tuesday, July 25, 2023	Tuesday, July 25, 2023
	Drilling and Development	Monday, August 7, 2023	Wednesday, October 11, 2023
	Surface Completions	Tuesday, October 17, 2023	Tuesday, October 17, 2023
	Survey	Tuesday, November 7, 2023	Tuesday, November 7, 2023
	Pump Install and Groundwater Sampling	Monday, March 11, 2024	Tuesday, March 12, 2024
E-AM-60 (2 Wells - C and D)		Tuesday, September 19, 2023	Thursday, March 14, 2024
	Consent for Access	Tuesday, September 19, 2023	
	Community Outreach - Hand Deliver Flyers	Friday, September 22, 2023	Saturday, September 23, 2023
	Utility Locates (EA private utility subcontractor)	Saturday, October 7, 2023	Saturday, October 7, 2023
	Drilling and Development	Tuesday, October 17, 2023	Tuesday, January 16, 2024
	Surface Completions	Wednesday, January 17, 2024	Wednesday, January 17, 2024
	Survey	Monday, January 29, 2024	Monday, January 29, 2024
	Pump Install and Groundwater Sampling	Tuesday, March 12, 2024	Thursday, March 14, 2024

Notes:

EA = EA Engineering, Science, and Technology, Inc.

EPA = U.S. Environmental Protection Agency

UFP-QAPP = Uniform Federal Policy for Quality Assurance Project Plan

Table 3. Groundwater Water Quality Parameters

Location	Well ID	Corresponding Sample Identification Number	Date Measured	Water Temperature (°C)	Specific Conductivity (µS/cm)	DO (mg/L)	pH	ORP (mV)
E-FM-36	E-FM-36A	E-FM-36A-20211117	11/17/2021	19.9	1200	4.60	7.35	151.9
	E-FM-36B	E-FM-36B-20211117		19.6	1485	5.11	7.31	151.1
	E-FM-36C	E-FM-36C-20211117		19.9	876	2.44	7.39	137.6
E-FM-37	E-FM-37A	E-FM-37A-20211115	11/15/2021	20.3	1185	5.48	7.21	118.3
	E-FM-37B	E-FM-37B-20211115		19.8	1369	5.29	7.08	105.3
	E-FM-37C	E-FM-37C-20211115		19.9	1047	4.20	7.22	101.8
	E-FM-37D	E-FM-37D-20211115		19.5	1356	3.75	7.23	96.3
	E-FM-37E	E-FM-37E-20211115		19.5	781	1.56	7.37	66.7
E-FM-38	E-FM-38A	E-FM-38A-20211116	11/16/2021	19.9	1262	4.38	7.24	NR
	E-FM-38B	E-FM-38B-20211116		19.5	1194	4.91	7.24	129.6
	E-FM-38C	E-FM-38C-20211116		19.5	986	3.96	7.25	116.9
E-FM-39	E-FM-39A	E-FM-39A-20231107	11/7/2023	23.4	2223	0.21	6.94	103.7
E-AM-58	E-AM-58A	E-AM-58A-20220614	6/14/2022	20.7	1112	0.29	7.27	13.9
	E-AM-58B	E-AM-58B-20220614		20.9	1186	2.37	7.33	103.2
	E-AM-58C	E-AM-58C-20220614		21.9	1176	2.78	7.27	75.8
	E-AM-58D	E-AM-58D-20220615	6/15/2022	20.9	1150	3.17	7.27	66.8
	E-AM-58E	E-AM-58E-20220615		21.9	816	4.13	7.43	113.1
E-AM-60	E-AM-60C	E-AM-60C-20240314	3/14/2024	19.2	883	4.51	7.29	200
	E-AM-60D	E-AM-60D-20240314		18.7	408	0.24	7.53	110
E-AM-61	E-AM-61B	E-AM-61B-20240312	3/12/2024	19.7	773	3.37	7.47	62
	E-AM-61C	E-AM-61C-20240312		19.2	892	4.91	7.48	71
	E-AM-61D	E-AM-61D-20240312		18.5	538	2.19	7.61	51
E-BPM-3	E-BPM-3A	E-BPM-3A-20230913	9/13/2023	20.7	688	0.95	7.45	189.1
	E-BPM-3B	E-BPM-3B-20230913		20.0	1088	4.11	7.31	198.5
	E-BPM-3C	E-BPM-3C-20230913		19.9	401.7	0.23	7.61	166.3

Notes:

°C = degrees Celsius
µS/cm = microSiemen(s) per centimeter
DO = dissolved oxygen
mg/L = milligram(s) per liter
mV = millivolt(s)
NR = not recorded (error on field form)
NTU = nephelometric turbidity unit
ORP = oxidation-reduction potential

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Table 4. Waste Disposal Quantities

Location	Date	Manifest Number	Receiving Facility Name [1,2]	Cuttings (cy)	Mud (gal)	Development Water (gal)
E-FM-36	7/20/2021	0720218043	Crosby & Overton	--	4,000	--
E-FM-36	7/26/2021	41015-073-002	Crosby & Overton	--	4,800	--
E-FM-36	8/10/2021	41015-073-005 [3]	Crosby & Overton	--	--	4,500
E-FM-36	8/13/2021	41015-073-003	Simi Valley	16	--	--
E-FM-36	8/13/2021	41015-073-004	Simi Valley	16	--	--
			E-FM-36 Subtotal	32	8,800	4,500
E-FM-37	8/24/2021	41015-080-002	Simi Valley	12	--	--
E-FM-37	8/24/2021	41015-080-003	Simi Valley	14	--	--
E-FM-37	8/30/2021	41015-080-005	Simi Valley	15	--	--
E-FM-37	8/30/2021	41015-080-006 [4]	Simi Valley	9.5	--	--
E-FM-37	8/31/2021	41015-080-004	Crosby & Overton	--	4,500	--
E-FM-37	9/8/2021	41015-080-007	Crosby & Overton	--	4,000	--
E-FM-37	9/8/2021	41015-080-008	Crosby & Overton	--	2,700	--
E-FM-37	9/15/2021	41015-080-009	Crosby & Overton	--	3,600	--
E-FM-37	9/20/2021	41015-080-010	Crosby & Overton	--	2,600	--
E-FM-37	9/20/2021	41015-080-011	Simi Valley	14	--	--
E-FM-37	9/21/2021	41015-080-015	Crosby & Overton	--	2,689	--
E-FM-37	9/24/2021	41015-080-016	Crosby & Overton	--	3,990	--
E-FM-37	9/27/2021	41015-080-017 [3]	Crosby & Overton	--	--	1,800
E-FM-37	9/29/2021	41015-080-018	Simi Valley	10	--	--
			E-FM-37 Subtotal	75	24,079	1,800
E-FM-38	10/5/2021	41015-090-001	Crosby & Overton	--	4,500	--
E-FM-38	10/7/2021	41015-090-002	Simi Valley	16	--	--
E-FM-38	10/19/2021	41015-090-003	Crosby & Overton	--	4,800	--
E-FM-38	10/20/2021	41015-090-004	Simi Valley	6	--	--
E-FM-38	10/20/2021	41015-090-005	Simi Valley	16	--	--
E-FM-38	10/28/2021	41015-090-006 [3]	Crosby & Overton	--	--	4,200
E-FM-38	10/28/2021	1020210016 [3]	Crosby & Overton	--	--	2,600
			E-FM-38 Subtotal	38	9,300	6,800
E-FM-39	9/8/2023	0920230002 [5]	Simi Valley	6	--	--
E-FM-39	9/11/2023	430150410001	Crosby & Overton	--	--	440
			E-FM-39 Subtotal	6		440

Table 4. Waste Disposal Quantities

Location	Date	Manifest Number	Receiving Facility Name [1,2]	Cuttings (cy)	Mud (gal)	Development Water (gal)
E-AM-58	12/29/2021	41015-109-001	Crosby & Overton	--	4,800	--
E-AM-58	1/5/2022	41015-109-002	Crosby & Overton	--	4,100	--
E-AM-58	1/12/2022	41015-109-003	Crosby & Overton	--	4,400	--
E-AM-58	1/17/2022	41015-109-004	Crosby & Overton	--	4,400	--
E-AM-58	1/25/2022	41015-109-005	Crosby & Overton	--	1,750	--
E-AM-58	2/16/2022	4105-109-006 [3]	Crosby & Overton	--	--	4,700
E-AM-58	2/17/2022	4105-109-008	Simi Valley	15	--	--
E-AM-58	2/17/2022	4105-109-009 [3]	Crosby & Overton	--	--	4,700
E-AM-58	2/17/2022	4105-109-010	Simi Valley	15	--	--
E-AM-58	2/17/2022	4105-109-011	Simi Valley	15	--	--
E-AM-58	2/17/2022	4105-109-012	Simi Valley	15	--	--
E-AM-58	2/18/2022	4105-109-013 [3]	Crosby & Overton	--	--	4,700
			E-AM-58 Subtotal	60	19,450	14,100
E-AM-60	11/17/2023	0580614	Simi Valley	16	--	--
E-AM-60	11/17/2023	0580615	Simi Valley	16	--	--
E-AM-60	12/8/2023	0540912	Crosby & Overton	--	400	--
E-AM-60	12/15/2023	0540912	Crosby & Overton	--	1,600	--
E-AM-60	12/15/2023	0540912	Crosby & Overton	--	2,000	--
E-AM-60	12/18/2023	None	Crosby & Overton	--	2,000	--
E-AM-60	12/18/2023	43015-049-1	Crosby & Overton	--	1,800	--
E-AM-60	12/19/2023	0581131	Simi Valley	16	--	--
E-AM-60	12/19/2023	0540922	Crosby & Overton	--	1,800	--
E-AM-60	12/19/2023	0540923	Crosby & Overton	--	1,800	--
E-AM-60	12/20/2023	43015-049-3	Crosby & Overton	--	1,800	--
E-AM-60	12/20/2023	43015-049-2	Crosby & Overton	--	1,800	--
E-AM-60	12/20/2023	0581137	Simi Valley	5	--	--
E-AM-60	12/21/2023	43015049122101	Crosby & Overton	--	2,700	--
E-AM-60	1/11/2024	0581182	Crosby & Overton	--	--	2,000
E-AM-60	1/23/2024	44015-02	Crosby & Overton	--	--	5,000
E-AM-60	1/23/2024	44015-02 SBVAC	Crosby & Overton	--	--	1,500
E-AM-60	1/25/2024	44015-02 SB VAC	Crosby & Overton	--	--	5,000
E-AM-60	2/15/2024	0583081	Crosby & Overton	--	--	2,550
E-AM-60	2/15/2024	0583182	Crosby & Overton	--	--	1,450
E-AM-60	2/17/2024	0000839	Simi Valley	10	--	--
E-AM-60	2/17/2024	0000842	Simi Valley	8	--	--
E-AM-60	2/29/2024	0583380	Simi Valley	16	--	--
E-AM-60	2/29/2024	0583381	Simi Valley	16	--	--
			E-AM-60 Subtotal	103	17,700	17,500

Table 4. Waste Disposal Quantities

Location	Date	Manifest Number	Receiving Facility Name [1,2]	Cuttings (cy)	Mud (gal)	Development Water (gal)
E-AM-61	9/6/2023	0579666	Crosby & Overton	--	2,000	--
E-AM-61	9/6/2023	0579667	Crosby & Overton	--	2,400	--
E-AM-61	9/11/2023	43015-043-002	Simi Valley	16	--	--
E-AM-61	9/11/2023	43015-43-001	Simi Valley	20	--	--
E-AM-61	9/19/2023	0578993	Crosby & Overton	--	1,300	--
E-AM-61	12/19/2023	43015-043-002	Crosby & Overton	--	2,600	--
E-AM-61	9/25/2023	0579746	Simi Valley	12	--	--
E-AM-61	9/25/2023	0579747	Simi Valley	12	--	--
E-AM-61	9/25/2023	0579744	Crosby & Overton	--	2,800	--
E-AM-61	9/25/2023	0579745	Crosby & Overton	--	2,600	--
E-AM-61	10/6/2023	0579850	Crosby & Overton	--	2,500	--
E-AM-61	10/24/2023	1020237861	Crosby & Overton	--	2,700	--
E-AM-61	10/24/2023	1020237862	Crosby & Overton	--	2,000	--
E-AM-61	10/26/2023	0580310	Simi Valley	16	--	--
E-AM-61	10/26/2023	0580311	Simi Valley	16	--	--
E-AM-61	10/27/2023	0540867	Crosby & Overton	--	2,850	--
E-AM-61	10/27/2023	0540868	Crosby & Overton	--	2,980	--
E-AM-61	10/30/2023	0580351	Crosby & Overton	--	2,673	--
E-AM-61	10/31/2023	43015-43 NH	Crosby & Overton	--	2,940	--
E-AM-61	11/3/2023	0580354	Crosby & Overton	--	2,752	--
E-AM-61	11/3/2023	0580355	Crosby & Overton	--	2,841	--
E-AM-61	11/3/2023	0580390	Crosby & Overton	--	2,600	--
E-AM-61	11/7/2023	0540869	Crosby & Overton	--	2,500	--
E-AM-61	12/19/2023	43015-043-003	Crosby & Overton	--	800	--
E-AM-61	12/19/2023	43015-043-001	Simi Valley	13	--	--
			E-AM-61 Subtotal	105	43,836	
E-BPM-3	7/6/2023	430150360001	Crosby & Overton	--	2,600	--
E-BPM-3	7/6/2023	430150360002	Crosby & Overton	--	2,700	--
E-BPM-3	7/12/2023	0578335	Simi Valley	16	--	--
E-BPM-3	7/12/2023	0578337	Simi Valley	16	--	--
E-BPM-3	7/12/2023	0578339	Simi Valley	16	--	--
E-BPM-3	7/26/2023	45045-038	Crosby & Overton	--	5,000	--
E-BPM-3	8/14/2023	43015-036	Crosby & Overton	--	4,600	--
E-BPM-3	8/16/2023	0540738 [3]	Crosby & Overton	--	--	4,800
E-BPM-3	8/16/2023	0540729	Simi Valley	16	--	--
E-BPM-3	8/16/2023	0579126	Simi Valley	18	--	--
E-BPM-3	8/18/2023	0579292	Crosby & Overton	--	4,500	--
			E-BPM-3 Subtotal	82	19,400	4,800

Table 4. Waste Disposal Quantities

Location	Date	Manifest Number	Receiving Facility Name [1,2]	Cuttings (cy)	Mud (gal)	Development Water (gal)
Grand Total				**500.5**	**142,565**	**49,940**

Notes:

[1] Crosby & Overton = Crosby & Overton, Inc. 1630 W. 17th StreetLong Beach, CA 90813

[2] Simi Valley = Simi Valley Landfill, 2801 N. Madera Rd. Simi Valley, CA 93065

[3] Development water was collected; however, mud is indicated as the type of waste collected from the location on the waste manifest.

[4] Waste container was transported to disposal facility to dry. This table reflects the final cubic yards of dry cuttings disposed.

[5] The waste manifest indicates 10 cy was removed, however, only 6 cy was charged for disposal, which is reflected on the invoice.

-- = not applicable

cy = cubic yard(s)

gal = gallon(s)

Table 5. Monitoring Wells Survey Details

Location	Well Identification	Northing [1]	Easting [1]	Z-1 [2]	Z-2 [3]	Z-3 [4]	Z-4 [5]	Z-5 [6]	Z-6 [7]
E-FM-36	E-FM-36A	2261330.61	6047685.27	131.97277	131.06077	132.00177	129.550437	128.638437	129.5794367
	E-FM-36B	2261337.36	6047692.45	131.99277	131.10377	132.01277	129.570437	128.680000	129.5904367
	E-FM-36C	2261343.96	6047699.85	131.97077	131.10000	131.99177	129.548437	128.677667	129.5694367
E-FM-37	E-FM-37A	2259808.30	6041729.03	107.16899	106.23999	107.17199	104.746657	103.817657	104.7496567
	E-FM-37B	2259808.36	6041738.92	107.20099	106.28099	107.21299	104.778657	103.858657	104.7906567
	E-FM-37C	2259808.23	6041748.98	107.20699	106.26199	107.20299	104.784657	103.839657	104.7806567
	E-FM-37D	2259807.81	6041758.79	107.21899	106.30799	107.20299	104.796657	103.885657	104.7806567
	E-FM-37E	2259808.06	6041768.82	107.22599	106.29499	107.21899	104.803657	103.872657	104.7966567
E-FM-38	E-FM-38A	2260869.30	6045058.82	121.69524	120.74124	121.68924	119.272907	118.318907	119.2669067
	E-FM-38B	2260869.63	6045025.29	121.76324	120.83624	121.74924	119.340907	118.413907	119.3269067
	E-FM-38C	2260869.97	6045000.20	121.77324	120.83024	121.78624	119.350907	118.407907	119.3639067
E-FM-39	E-FM-39A	2266997.04	6054286.28	184.89050	184.15850	184.86250	182.500000	181.760000	182.4700000
E-AM-58	E-AM-58A	2253389.64	6042197.22	113.13450	112.18150	113.13550	110.670167	109.717167	110.6711667
	E-AM-58B	2253388.94	6042185.05	113.12250	112.23850	113.12450	110.658167	109.774167	110.6601667
	E-AM-58C	2253388.28	6042170.39	112.86450	111.96950	112.86850	110.400167	109.505167	110.4041667
	E-AM-58D	2253387.92	6042157.77	112.80250	111.88250	112.79450	110.338167	109.418167	110.3301667
	E-AM-58E	2253390.17	6042207.29	113.07750	112.37150	113.07850	110.613167	109.907167	110.6141667
E-AM-60	E-AM-60C	2248344.83	6030331.72	68.48450	67.54550	68.51550	66.090000	65.150000	66.1200000
	E-AM-60D	2248341.15	6030322.53	68.38450	67.40650	68.39250	65.990000	65.010000	66.0000000
E-AM-61	E-AM-61B	2251050.06	6036873.43	92.25800	91.49000	92.26400	89.860000	89.090000	89.8700000
	E-AM-61C	2251062.50	6036873.79	92.33600	91.29500	92.35300	89.940000	88.900000	89.9600000
	E-AM-61D	2251082.29	6036874.87	92.55000	91.82900	92.55300	90.150000	89.430000	90.1600000
E-BPM-3	E-BPM-3A	2254551.57	6034850.37	89.89450	88.92350	89.87950	87.500000	86.530000	87.4800000
	E-BPM-3B	2254561.30	6034850.57	89.86950	88.86550	89.86650	87.470000	86.470000	87.4700000
	E-BPM-3C	2254571.52	6034850.38	89.87050	88.90550	89.85250	87.480000	86.510000	87.4600000

Notes:

[1] Northing and easting coordinates are in North American Datum of 1983 (NAD 83) California State Plane Zone 6 (feet); measured from the center of the well vault lid.

[2] Z-1 elevations are in North American Vertical Datum of 1988 (NAVD88) of the top of well monument (defined by surveyor as center of well vault with the lid securely attached).

[3] Z-2 elevations are in North American Vertical Datum of 1988 (NAVD88) of the measuring point (defined by surveyor as north side of the top of the PVC well casing with the well cap removed).

[4] Z-3 elevations are in North American Vertical Datum of 1988 (NAVD88) of the finished surface (defined by surveyor as elevation measured on nail set flush in lead filled drill hole set in concrete on north side of well monument).

[5] Z-4 elevations are in National Geodetic Vertical Datum of 1929 (NGVD29) of the top of well monument (defined by surveyor as center of well vault with the lid securely attached).

[6] Z-5 elevations are in National Geodetic Vertical Datum of 1929 (NGVD29) of the measuring point (defined by surveyor as north side of the top of the PVC well casing with the well cap removed).

[7] Z-6 elevations are in National Geodetic Vertical Datum of 1929 (NGVD29) of the finished surface (defined by surveyor as elevation measured on nail set flush in lead filled drill hole set in concrete on north side of well monument).

ft bgs = feet below ground surface

NA = not applicable

Table 6. EPA Monitoring Wells Analytical Results

			Analyte	1,1-DCE		1,4-DIOX		PCE		TCE		Perchlorate		PFOA		PFOS		PFNA		PFHxS	
			Unit	µg/L		µg/L		µg/L		µg/L		µg/L		ng/L		ng/L		ng/L		ng/L	
			Screening Level	7.0		1.0		5.0		5.0		6.0		4.0		4.0		10		10	
Entity	Well No.	Sample Name	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
OCWD	E-AM-58A	AM-58A/1_20220614	6/14/2022	1.8		**3.0**		< 0.050		3.1		< 2.0		--		--		--		--	
EPA/EA	E-AM-58A	E-AM-58A-20220614	6/14/2022	1.5		**3.3**		< 1.0		2.9		0.51		**11**		**9.4**		< 2.0		**14**	
OCWD	E-AM-58A	AM-58A/1_20220720	7/20/2022	1.6		**4.3**		< 0.050		3.0		< 2.0		--		--		--		--	
OCWD	E-AM-58A	AM-58A/1_20230125	1/25/2023	1.7		**2.4**		< 0.50		3.2		< 2.0		--		--		--		--	
OCWD	E-AM-58A	AM-58A/1_20230719	7/19/2023	1.9		**2.0**		< 0.50		3.4		< 2.0		--		--		--		--	
OCWD	E-AM-58A	AM-58A/1_20240102	1/2/2024	1.6		**1.8**		< 0.50		3.3		<1.0		--		--		--		--	
OCWD	E-AM-58B	AM-58B/1_20220614	6/14/2022	2.9		**1.6**		1.5		**6.2**		4.0		--		--		--		--	
EPA/EA	E-AM-58B	E-AM-58B-20220614	6/14/2022	2.3		**1.6**		1.3		**5.6**		3.9		**4.3**		**7.4**		< 1.9		**11**	
OCWD	E-AM-58B	AM-58B/1_20220720	7/20/2022	2.2		**2.1**		1.2		**5.2**		3.7		--		--		--		--	
OCWD	E-AM-58B	AM-58B/1_20230125	1/25/2023	2.6		**1.2**		1.7		**6.3**		3.5		--		--		--		--	
OCWD	E-AM-58B	AM-58B/1_20230719	7/19/2023	3.1		**1.6**		1.8		**5.9**		3.1		--		--		--		--	
OCWD	E-AM-58B	AM-58B/1_20240102	1/2/2024	2.4		**1.5**		1.8		**5.5**		4.0		--		--		--		--	
OCWD	E-AM-58C	AM-58C/1_20220614	6/14/2022	2.3		**1.5**		TR		4.7		3.0		--		--		--		--	
EPA/EA	E-AM-58C	E-AM-58C-20220614	6/14/2022	1.6		**1.4**		< 1.0		3.6		3.0		**9.0**		**9.9**		0.31	J	**15**	
OCWD	E-AM-58C	AM-58C/1_20220719	7/19/2022	2.3		**1.8**		TR		4.8		2.8		--		--		--		--	
OCWD	E-AM-58C	AM-58C/1_20230126	1/26/2023	1.7		**1.1**		TR		**5.1**		2.4		--		--		--		--	
OCWD	E-AM-58C	AM-58C/1_20230724	7/24/2023	2.0		0.90		TR		4.6		2.6		--		--		--		--	
OCWD	E-AM-58C	AM-58C/1_20240102	1/2/2024	1.8		0.90		TR		4.8		2.9		--		--		--		--	
OCWD	E-AM-58D	AM-58D/1_20220615	6/15/2022	2.5		**1.6**		< 0.050		3.7		3.3		--		--		--		--	
EPA/EA	E-AM-58D	E-AM-58D-20220615	6/15/2022	2.1		**1.7**		0.25	J	4.0		3.1		**8.4**		**9.5**		0.34	J	**14**	
OCWD	E-AM-58D	AM-58D/1_20220719	7/19/2022	2.4		**2.0**		< 0.050		3.7		2.9		--		--		--		--	
OCWD	E-AM-58D	AM-58D/1_20230126	1/26/2023	2.0		**1.4**		< 0.50		3.6		2.6		--		--		--		--	
OCWD	E-AM-58D	AM-58D/1_20230724	7/24/2023	2.3		**1.1**		< 0.50		3.8		2.7		--		--		--		--	
OCWD	E-AM-58D	AM-58D/1_20240103	1/3/2024	2.1		**1.2**		TR		4.2		2.8		--		--		--		--	
OCWD	E-AM-58E	AM-58E/1_20220615	6/15/2022	1.0		0.70		< 0.050		< 0.050		5.0		--		--		--		--	
EPA/EA	E-AM-58E	E-AM-58E-20220615	6/15/2022	0.83		< 1.0		< 0.500		< 0.500		4.6		< 1.8		< 1.8		< 1.8		2.0	
OCWD	E-AM-58E	AM-58E/1_20220719	7/19/2022	1.0		0.80		< 0.050		< 0.050		4.3		--		--		--		--	
OCWD	E-AM-58E	AM-58E/1_20230126	1/26/2023	1.0		0.70		< 0.50		< 0.50		4.8		--		--		--		--	
OCWD	E-AM-58E	AM-58E/1_20230724	7/24/2023	0.90		0.50		< 0.50		< 0.50		5.0		--		--		--		--	
OCWD	E-AM-58E	AM-58E/1_20240103	1/3/2024	1.1		0.60		< 0.50		< 0.50		5.6		--		--		--		--	
EPA/EA	E-AM-60C	E-AM-60C-20240314	3/14/2024	< 0.50		< 1.0		< 0.50		< 0.50		4.5		**4.1**		**8.4**		< 1.9		6.5	
EPA/EA	E-AM-60D	E-AM-60D-20240314	3/14/2024	< 0.50		< 1.0		< 0.50		< 0.50		< 0.10		< 2.0		< 2.0		< 2.0		< 2.0	
EPA/EA	E-AM-61B	E-AM-61B-20240312	3/12/2024	< 0.50		< 1.0		< 0.50		< 0.50		3.5		< 1.9		< 1.9		< 1.9		< 1.9	
EPA/EA	E-AM-61C	E-AM-61C-20240312	3/12/2024	1.4		0.82	J	< 0.50		0.23	J	2.3		**9.9**		**18**		0.75	J	9.8	
EPA/EA	E-AM-61D	E-AM-61D-20240312	3/12/2024	< 0.50		< 1.0		< 0.50		< 0.50		1.5		< 1.9		< 1.9		< 1.9		< 1.9	
EPA/EA	E-BPM-3A	E-BPM-3A-20230913	9/13/2023	< 0.50		< 1.0		< 0.50		< 0.50		1.2		< 1.9		< 1.9		< 1.9		< 1.9	
OCWD	E-BPM-3B	BPM-3B/1_20230913	9/13/2023	4.5		**1.8**		< 0.50		TR		--		--		--		--		--	
EPA/EA	E-BPM-3B	E-BPM-3B-20230913	9/13/2023	3.2		**1.6**		< 0.50		0.35	J	4.8		1.9		2.3	J	< 1.9		5.9	
EPA/EA	E-BPM-3C	E-BPM-3C-20230913	9/13/2023	< 0.50		< 1.0		< 0.50		< 0.50		< 0.10		< 1.9		< 1.9		< 1.9		< 1.9	
OCWD	E-FM-36A	FM-36A/1_20211117	11/17/2021	2.3		**3.9**		0.25		**46.2**		5.8		--		--		--		--	
EPA/EA	E-FM-36A	E-FM-36A-20211117	11/17/2021	2.5		**3.3**		0.65		**46**		5.2		**4.2**		**5.4**		< 1.7		7.8	

Table 6. EPA Monitoring Wells Analytical Results

			Analyte	1,1-DCE		1,4-DIOX		PCE		TCE		Perchlorate		PFOA		PFOS		PFNA		PFHxS	
			Unit	µg/L		µg/L		µg/L		µg/L		µg/L		ng/L		ng/L		ng/L		ng/L	
			Screening Level	7.0		1.0		5.0		5.0		6.0		4.0		4.0		10		10	
Entity	Well No.	Sample Name	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
OCWD	E-FM-36A	FM-36A/1_20220711	7/11/2022	2.3		**4.4**		0.60		**45.1**		5.5		--		--		--		--	
OCWD	E-FM-36A	FM-36A/1_20230112	1/12/2023	2.2		**3.7**		0.80		**46.5**		4.7		--		--		--		--	
OCWD	E-FM-36A	FM-36A/1_20230712	7/12/2023	2.4		**3.2**		1.2		**42.6**		4.7		--		--		--		--	
OCWD	E-FM-36A	FM-36A/1_20240108	1/8/2024	2.7		< 0.50		1.8		**49.5**		5.1		--		--		--		--	
OCWD	E-FM-36B	FM-36B/1_20211117	11/17/2021	0.50		0.80		< 0.050		1.8		**12.4**		--		--		--		--	
EPA/EA	E-FM-36B	E-FM-36B-20211117	11/17/2021	0.68		0.82	J	< 0.500		2.3		**12**		1.2	J	1.7	J	< 1.8		3.7	
OCWD	E-FM-36B	FM-36B/1_20220711	7/11/2022	0.60		0.90		< 0.050		2.6		**11.9**		--		--		--		--	
OCWD	E-FM-36B	FM-36B/1_20230112	1/12/2023	0.60		0.80		< 0.50		3.0		**9.7**		--		--		--		--	
OCWD	E-FM-36B	FM-36B/1_20230712	7/12/2023	0.70		0.80		< 0.50		3.3		**11.4**		--		--		--		--	
OCWD	E-FM-36B	FM-36B/1_20240108	1/8/2024	0.80		**1.0**		< 0.50		4.2		**11.8**		--		--		--		--	
OCWD	E-FM-36C	FM-36C/1_20211117	11/17/2021	< 0.050		< 0.050		< 0.050		< 0.050		**7.6**		--		--		--		--	
EPA/EA	E-FM-36C	E-FM-36C-20211117	11/17/2021	< 0.500		< 1.0		< 0.500		< 0.500		**7.0**		< 1.9		< 1.9		< 1.9		< 1.9	
OCWD	E-FM-36C	FM-36C/1_20220711	7/11/2022	< 0.050		< 0.050		< 0.050		< 0.050		**7.6**		--		--		--		--	
OCWD	E-FM-36C	FM-36C/1_20230112	1/12/2023	< 0.50		< 0.50		< 0.50		< 0.50		**8.0**		--		--		--		--	
OCWD	E-FM-36C	FM-36C/1_20230712	7/12/2023	< 0.50		< 0.50		< 0.50		< 0.50		**7.9**		--		--		--		--	
OCWD	E-FM-36C	FM-36C/1_20240108	1/8/2024	< 0.50		< 0.50		< 0.50		< 0.50		**8.8**		--		--		--		--	
OCWD	E-FM-37A	FM-37A/1_20211115	11/15/2021	< 0.050		< 0.050		< 0.050		< 0.050		5.4		--		--		--		--	
EPA/EA	E-FM-37A	E-FM-37A-20211115	11/15/2021	< 0.500		< 1.0		< 0.500		< 0.500		5.1		< 1.9		< 1.9		< 1.9		< 1.9	
OCWD	E-FM-37A	FM-37A/1_20220721	7/21/2022	< 0.050		< 0.050		< 0.050		< 0.050		5.0		--		--		--		--	
OCWD	E-FM-37A	FM-37A/1_20230125	1/25/2023	< 0.50		< 0.50		< 0.50		< 0.50		5.4		--		--		--		--	
OCWD	E-FM-37A	FM-37A/1_20230719	7/19/2023	< 0.50		< 0.50		< 0.50		< 0.50		5.2		--		--		--		--	
OCWD	E-FM-37A	FM-37A/1_20240110	1/10/2024	< 0.50		< 0.50		< 0.50		< 0.50		5.9		--		--		--		--	
OCWD	E-FM-37B	FM-37B/1_20211115	11/15/2021	< 0.050		0.50		< 0.050		< 0.050		**7.5**		--		--		--		--	
EPA/EA	E-FM-37B	E-FM-37B-20211115	11/15/2021	< 0.500		< 1.0		< 0.500		< 0.500		**7.1**		< 1.7		< 1.7		< 1.7		< 1.7	
OCWD	E-FM-37B	FM-37B/1_20220721	7/21/2022	0.25		0.90		< 0.050		< 0.050		**6.3**		--		--		--		--	
OCWD	E-FM-37B	FM-37B/1_20230125	1/25/2023	TR		0.60		< 0.50		< 0.50		**6.6**		--		--		--		--	
OCWD	E-FM-37B	FM-37B/1_20230719	7/19/2023	0.60		0.70		< 0.50		TR		**6.6**		--		--		--		--	
OCWD	E-FM-37B	FM-37B/1_20240110	1/10/2024	TR		0.80		< 0.50		0.50		**7.6**		--		--		--		--	
OCWD	E-FM-37C	FM-37C/1_20211115	11/15/2021	< 0.050		< 0.050		< 0.050		< 0.050		3.4		--		--		--		--	
EPA/EA	E-FM-37C	E-FM-37C-20211115	11/15/2021	< 0.500		< 1.0		< 0.500		< 0.500		3.4		3.7		**5.8**		< 1.7		7.0	
OCWD	E-FM-37C	FM-37C/1_20220721	7/21/2022	< 0.050		< 0.050		< 0.050		< 0.050		3.0		--		--		--		--	
OCWD	E-FM-37C	FM-37C/1_20230123	1/23/2023	< 0.50		< 0.50		< 0.50		< 0.50		2.6		--		--		--		--	
OCWD	E-FM-37C	FM-37C/1_20230717	7/17/2023	< 0.50		< 0.50		< 0.50		< 0.50		3.4		--		--		--		--	
OCWD	E-FM-37C	FM-37C/1_20240110	1/10/2024	< 0.50		< 0.50		< 0.50		< 0.50		3.4		--		--		--		--	
OCWD	E-FM-37D	FM-37D/1_20211115	11/15/2021	< 0.050		< 0.050		< 0.050		< 0.050		**6.0**		--		--		--		--	

Table 6. EPA Monitoring Wells Analytical Results

			Analyte	1,1-DCE		1,4-DIOX		PCE		TCE		Perchlorate		PFOA		PFOS		PFNA		PFHxS	
			Unit	µg/L		µg/L		µg/L		µg/L		µg/L		ng/L		ng/L		ng/L		ng/L	
			Screening Level	7.0		1.0		5.0		5.0		6.0		4.0		4.0		10		10	
Entity	Well No.	Sample Name	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
EPA/EA	E-FM-37D	E-FM-37D-20211115	11/15/2021	< 0.500		< 1.0		< 0.500		< 0.500		5.6		< 1.8		1.8		< 1.8		3.5	
OCWD	E-FM-37D	FM-37D/1_20220720	7/20/2022	< 0.050		< 0.050		< 0.050		< 0.050		5.4		--		--		--		--	
OCWD	E-FM-37D	FM-37D/1_20230123	1/23/2023	< 0.50		< 0.50		< 0.50		< 0.50		5.2		--		--		--		--	
OCWD	E-FM-37D	FM-37D/1_20230717	7/17/2023	< 0.50		< 0.50		< 0.50		< 0.50		**6.2**		--		--		--		--	
OCWD	E-FM-37D	FM-37D/1_20240111	1/11/2024	< 0.50		< 0.50		< 0.50		< 0.50		4.7		--		--		--		--	
OCWD	E-FM-37E	FM-37E/1_20211115	11/15/2021	< 0.050		< 0.050		< 0.050		< 0.050		2.3		--		--		--		--	
EPA/EA	E-FM-37E	E-FM-37E-20211115	11/15/2021	< 0.500		< 1.0		< 0.500		< 0.500		2.0		< 1.8		0.87	J	< 1.8		1.5	J
OCWD	E-FM-37E	FM-37E/1_20220720	7/20/2022	< 0.050		< 0.050		< 0.050		< 0.050		2.5		--		--		--		--	
OCWD	E-FM-37E	FM-37E/1_20230123	1/23/2023	< 0.50		< 0.50		< 0.50		< 0.50		< 2.0		--		--		--		--	
OCWD	E-FM-37E	FM-37E/1_20230717	7/17/2023	< 0.50		< 0.50		< 0.50		< 0.50		3.4		--		--		--		--	
OCWD	E-FM-37E	FM-37E/1_20240111	1/11/2024	< 0.50		< 0.50		< 0.50		< 0.50		3.4		--		--		--		--	
OCWD	E-FM-38A	FM-38A/1_20211116	11/16/2021	1.4		**1.9**		< 0.050		**8.4**		**6.6**		--		--		--		--	
EPA/EA	E-FM-38A	E-FM-38A-20211116	11/16/2021	1.6		**2.3**		< 1.0		**9.2**		**6.4**		< 1.8		< 1.8		< 1.8		3.3	
OCWD	E-FM-38A	FM-38A/1_20220713	7/13/2022	1.2		**2.3**		< 0.050		**8.3**		**6.0**		--		--		--		--	
OCWD	E-FM-38A	FM-38A/1_20230117	1/17/2023	1.3		**1.8**		< 0.50		**9.5**		5.4		--		--		--		--	
OCWD	E-FM-38A	FM-38A/1_20230713	7/13/2023	1.3		**1.6**		< 0.50		**7.4**		**6.6**		--		--		--		--	
OCWD	E-FM-38A	FM-38A/1_20240115	1/15/2024	1.5		**2.0**		< 0.50		**8.9**		**6.7**		--		--		--		--	
OCWD	E-FM-38B	FM-38B/1_20211116	11/16/2021	0.50		**1.2**		< 0.050		4.7		**8.5**		--		--		--		--	
EPA/EA	E-FM-38B	E-FM-38B-20211116	11/16/2021	0.68	J	**1.2**		< 1.0		**5.0**		**7.8**		< 1.7		< 1.7		< 1.7		2.1	
OCWD	E-FM-38B	FM-38B/1_20220713	7/13/2022	0.70		**1.4**		< 0.050		**6.7**		**8.1**		--		--		--		--	
OCWD	E-FM-38B	FM-38B/1_20230117	1/17/2023	0.60		**1.0**		< 0.50		**6.1**		**6.5**		--		--		--		--	
OCWD	E-FM-38B	FM-38B/1_20230713	7/13/2023	0.90		**1.0**		< 0.50		**9.4**		**7.0**		--		--		--		--	
OCWD	E-FM-38B	FM-38B/1_20240115	1/15/2024	0.90		**1.1**		< 0.50		**8.7**		**7.5**		--		--		--		--	
OCWD	E-FM-38C	FM-38C/1_20211116	11/16/2021	< 0.050		< 0.050		< 0.050		< 0.050		3.7		--		--		--		--	
EPA/EA	E-FM-38C	E-FM-38C-20211116	11/16/2021	< 1.0		< 1.0		< 1.0		< 1.0		3.1		**5.3**		**9.5**		< 1.7		8.9	
OCWD	E-FM-38C	FM-38C/1_20220713	7/13/2022	< 0.050		< 0.050		< 0.050		< 0.050		3.3		--		--		--		--	
OCWD	E-FM-38C	FM-38C/1_20230117	1/17/2023	< 0.50		< 0.50		< 0.50		< 0.50		2.6		--		--		--		--	
OCWD	E-FM-38C	FM-38C/1_20230713	7/13/2023	< 0.50		< 0.50		< 0.50		< 0.50		3.0		--		--		--		--	
OCWD	E-FM-38C	FM-38C/1_20240115	1/15/2024	< 0.50		< 0.50		< 0.50		< 0.50		3.3		--		--		--		--	
EPA/EA	E-FM-39A	E-FM-39A-20231107	11/7/2023	< 0.50		< 1.0		< 0.50		< 0.50		**13**		< 1.7		< 1.7		< 1.7		0.50	J
EPA/EA	E-FM-39A	E-FM-39A-20240116	1/16/2024	< 0.50		< 1.0		< 0.50	UJ	< 0.50		**12**		< 1.9		< 1.9		< 1.9		< 1.9	

Notes:

-- = not analyzed
< = the result is non-detected
µg/L = microgram(s) per liter
1,1-DCE = 1,1-dichloroethene
1,4-DIOX = 1,4-dioxane
J qualifier = the result is an estimated quantity
ng/L = nanogram(s) per liter
PCE = tetrachloroethene
PFHxS = perfluorohexanesulfonic acid
PFNA = perfluorobutanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
Q = data qualifier
TCE = trichloroethene
TR = trace

Results in light blue and bold exceed the established screening level for the compound.

Table 7. PAGE-F Analytical Results

Well No.	Sample Name	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
		Unit	µg/L		µg/L		µg/L		µg/L	
		Screening Level	7.0		1.0		5.0		5.0	
		Sample Date	Result	Q	Result	Q	Result	Q	Result	Q
PAGE-F	PAGE-F/1_20140116	1/16/2014	3.5		**1.4**		< 0.050		0.25	
PAGE-F	PAGE-F/1_20140401	4/1/2014	5.3		**1.6**		< 0.050		0.60	
PAGE-F	PAGE-F/1_20140702	7/2/2014	5.6		**1.7**		< 0.050		0.70	
PAGE-F	PAGE-F/1_20141002	10/2/2014	4.5		**1.9**		< 0.050		0.70	
PAGE-F	PAGE-F/1_20150113	1/13/2015	4.9		**1.6**		< 0.050		0.70	
PAGE-F	PAGE-F/1_20150402	4/2/2015	5.2		**1.7**		< 0.050		0.70	
PAGE-F	PAGE-F/1_20150701	7/1/2015	4.1		**1.3**		< 0.050		0.60	
PAGE-F	PAGE-F/1_20151001	10/1/2015	5.8		**1.5**		< 0.050		0.90	
PAGE-F	PAGE-F/1_20160105	1/5/2016	5.1		**1.3**		< 0.050		0.70	
PAGE-F	PAGE-F/1_20160314	3/14/2016	5.2		--		< 0.050		0.70	
PAGE-F	PAGE-F/1_20160404	4/4/2016	4.7		**1.8**		< 0.050		0.70	
PAGE-F	PAGE-F/1_20160517	5/17/2016	3.5		--		< 0.050		0.60	
PAGE-F	PAGE-F/1_20160804	8/4/2016	< 0.050		**1.5**		< 0.050		0.70	
PAGE-F	PAGE-F/1_20160912	9/12/2016	4.8		--		< 0.050		0.70	
PAGE-F	PAGE-F/1_20161003	10/3/2016	4.4		**1.6**		< 0.050		0.70	
PAGE-F	PAGE-F/1_20161027	10/27/2016	4.9		--		< 0.050		0.80	
PAGE-F	PAGE-F/1_20161116	11/16/2016	4.6		--		< 0.050		0.80	
PAGE-F	PAGE-F/1_20161205	12/5/2016	4.7		--		< 0.050		0.80	
PAGE-F	PAGE-F/1_20170104	1/4/2017	5.2		**1.9**		< 0.050		0.90	
PAGE-F	PAGE-F/1_20170202	2/2/2017	5.6		--		< 0.050		1.0	
PAGE-F	PAGE-F/1_20170307	3/7/2017	4.3		--		< 0.050		0.70	
PAGE-F	PAGE-F/1_20170313	3/13/2017	4.8		--		< 0.050		0.80	
PAGE-F	PAGE-F/1_20170328	3/28/2017	5.3		--		< 0.050		0.90	
PAGE-F	PAGE-F/1_20170406	4/6/2017	4.4		**1.8**		< 0.050		0.80	
PAGE-F	PAGE-F/1_20170504	5/4/2017	5.8		--		< 0.050		0.90	

Table 7. PAGE-F Analytical Results

		Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
		Unit	µg/L		µg/L		µg/L		µg/L	
		Screening Level	7.0		1.0		5.0		5.0	
Well No.	Sample Name	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q
PAGE-F	PAGE-F/1_20170605	6/5/2017	5.3		--		< 0.050		0.90	
PAGE-F	PAGE-F/1_20170706	7/6/2017	5.0		**1.6**		< 0.050		0.80	
PAGE-F	PAGE-F/1_20170808	8/8/2017	6.0		--		< 0.050		1.0	
PAGE-F	PAGE-F/1_20170823	8/23/2017	5.4		--		< 0.050		1.0	
PAGE-F	PAGE-F/1_20170907	9/7/2017	4.6		--		< 0.050		0.90	
PAGE-F	PAGE-F/1_20171003	10/3/2017	4.7		**1.4**		< 0.050		1.0	
PAGE-F	PAGE-F/1_20180103	1/3/2018	5.2		**1.4**		< 0.050		1.1	
PAGE-F	PAGE-F/1_20180130	1/30/2018	5.1		--		< 0.050		1.0	
PAGE-F	PAGE-F/1_20180411	4/11/2018	3.9		**1.2**		< 0.050		0.90	
PAGE-F	PAGE-F/1_20180507	5/7/2018	3.6		--		< 0.050		0.90	
PAGE-F	PAGE-F/1_20180703	7/3/2018	4.1		**1.5**		< 0.050		1.0	
PAGE-F	PAGE-F/1_20181001	10/1/2018	3.5		**1.5**		< 0.050		0.90	
PAGE-F	PAGE-F/1_20190108	1/8/2019	2.9		**1.4**		< 0.050		1.0	
PAGE-F	PAGE-F/1_20190401	4/1/2019	3.0		**1.5**		< 0.050		1.0	
PAGE-F	PAGE-F/1_20190701	7/1/2019	3.1		**1.8**		< 0.050		1.1	
PAGE-F	PAGE-F/1_20191002	10/2/2019	3.2		**1.7**		< 0.050		1.2	
PAGE-F	PAGE-F/1_20200109	1/9/2020	3.1		**1.6**		< 0.050		1.4	
PAGE-F	PAGE-F/1_20200407	4/7/2020	3.4		**1.5**		< 0.050		1.4	
PAGE-F	PAGE-F/1_20200701	7/1/2020	3.5		**1.9**		< 0.050		1.4	
PAGE-F	PAGE-F/1_20201001	10/1/2020	3.9		**2.0**		< 0.050		1.8	
PAGE-F	PAGE-F/1_20210125	1/25/2021	3.6		**1.6**		< 0.050		1.7	
PAGE-F	PAGE-F/1_20210405	4/5/2021	3.7		**1.9**		< 0.050		1.9	
PAGE-F	PAGE-F/1_20210701	7/1/2021	4.3		**1.7**		< 0.050		2.4	
PAGE-F	PAGE-F/1_20211021	10/21/2021	3.1		**1.6**		< 0.50		2.2	
PAGE-F	PAGE-F/1_20220103	1/3/2022	4.0		**2.3**		< 0.50		2.9	

Table 7. PAGE-F Analytical Results

Well No.	Sample Name	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
		Unit	µg/L		µg/L		µg/L		µg/L	
		Screening Level	7.0		1.0		5.0		5.0	
		Sample Date	Result	Q	Result	Q	Result	Q	Result	Q
PAGE-F	PAGE-F/1_20220404	4/4/2022	3.0		**2.0**		< 0.50		2.3	
PAGE-F	PAGE-F/1_20220705	7/5/2022	3.9		**2.2**		< 0.50		3.2	
PAGE-F	PAGE-F/1_20220719	7/19/2022	3.3		--		< 0.50		2.7	
PAGE-F	PAGE-F/1_20221006	10/6/2022	2.6		--		< 0.50		2.6	
PAGE-F	PAGE-F/1_20221020	10/20/2022	--		**1.8**		--		--	
PAGE-F	PAGE-F/1_20230112	1/12/2023	3.5		**1.6**		< 0.50		3.3	
PAGE-F	PAGE-F/1_20230403	4/3/2023	3.0		**1.2**		< 0.50		3.0	
PAGE-F	PAGE-F/1_20230711	7/11/2023	3.3		--		< 0.50		3.7	
PAGE-F	PAGE-F/1_20230807	8/7/2023	3.3		**1.7**		< 0.50		3.7	
PAGE-F	PAGE-F/1_20231030	10/30/2023	3.1		**1.9**		< 0.50		4.0	

Notes:

< = the result is non-detected

-- = not analyzed

µg/L = microgram(s) per liter

1,1-DCE = 1,1-dichloroethene

1,4-DIOX = 1,4-dioxane

PCE = tetrachloroethene

TCE = trichloroethene

Q = data qualifier

Results in light blue and bold exceed the established screening level for the compound.

Table 8. A-39 Analytical Results

Well No.	Sample Name	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
		Unit	µg/L		µg/L		µg/L		µg/L	
		Screening Level	7.0		1.0		5.0		5.0	
		Sample Date	Result	Q	Result	Q	Result	Q	Result	Q
A-39	A-39/1_20140204	2/4/2014	0.25		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20140401	4/1/2014	0.25		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20140701	7/1/2014	0.25		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20141007	10/7/2014	0.25		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20150106	1/6/2015	0.25		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20150407	4/7/2015	0.25		--		< 0.050		< 0.050	
A-39	A-39/1_20150707	7/7/2015	0.25		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20150804	8/4/2015	0.25		--		< 0.050		< 0.050	
A-39	A-39/1_20151006	10/6/2015	0.25		--		< 0.050		< 0.050	
A-39	A-39/1_20160105	1/5/2016	0.25		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20160616	6/16/2016	0.25		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20160705	7/5/2016	0.25		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20161004	10/4/2016	0.25		--		< 0.050		< 0.050	
A-39	A-39/1_20170103	1/3/2017	0.60		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20170321	3/21/2017	0.60		--		< 0.050		< 0.050	
A-39	A-39/1_20170404	4/4/2017	0.25		--		< 0.050		< 0.050	
A-39	A-39/1_20170711	7/11/2017	0.60		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20171107	11/7/2017	0.60		--		< 0.050		< 0.050	
A-39	A-39/1_20180206	2/6/2018	0.50		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20180501	5/1/2018	0.70		--		< 0.050		< 0.050	
A-39	A-39/1_20180703	7/3/2018	0.60		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20181002	10/2/2018	0.60		--		< 0.050		< 0.050	
A-39	A-39/1_20190108	1/8/2019	0.70		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20190409	4/9/2019	0.60		< 0.10		< 0.050		< 0.050	

Table 8. A-39 Analytical Results

Well No.	Sample Name	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
		Unit	µg/L		µg/L		µg/L		µg/L	
		Screening Level	7.0		1.0		5.0		5.0	
		Sample Date	Result	Q	Result	Q	Result	Q	Result	Q
A-39	A-39/1_20190710	7/10/2019	0.80		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20191008	10/8/2019	0.70		--		< 0.050		< 0.050	
A-39	A-39/1_20200107	1/7/2020	0.70		**1.1**		< 0.050		< 0.050	
A-39	A-39/1_20200128	1/28/2020	--		1.0		--		--	
A-39	A-39/1_20200407	4/7/2020	0.70		< 0.10		< 0.050		< 0.050	
A-39	A-39/1_20200804	8/4/2020	0.80		0.90		< 0.050		< 0.050	
A-39	A-39/1_20201020	10/20/2020	0.70		0.90		< 0.050		< 0.050	
A-39	A-39/1_20210406	4/6/2021	0.80		0.70		< 0.050		< 0.050	
A-39	A-39/1_20220112	1/12/2022	0.70		0.80		< 0.050		< 0.050	

Notes:

< = the result is non-detected

-- = not analyzed

µg/L = microgram(s) per liter

1,1-DCE = 1,1-dichloroethene

1,4-DIOX = 1,4-dioxane

PCE = tetrachloroethene

TCE = trichloroethene

Q = data qualifier

Results in light blue and bold exceed the established screening level for the compound.

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Figures

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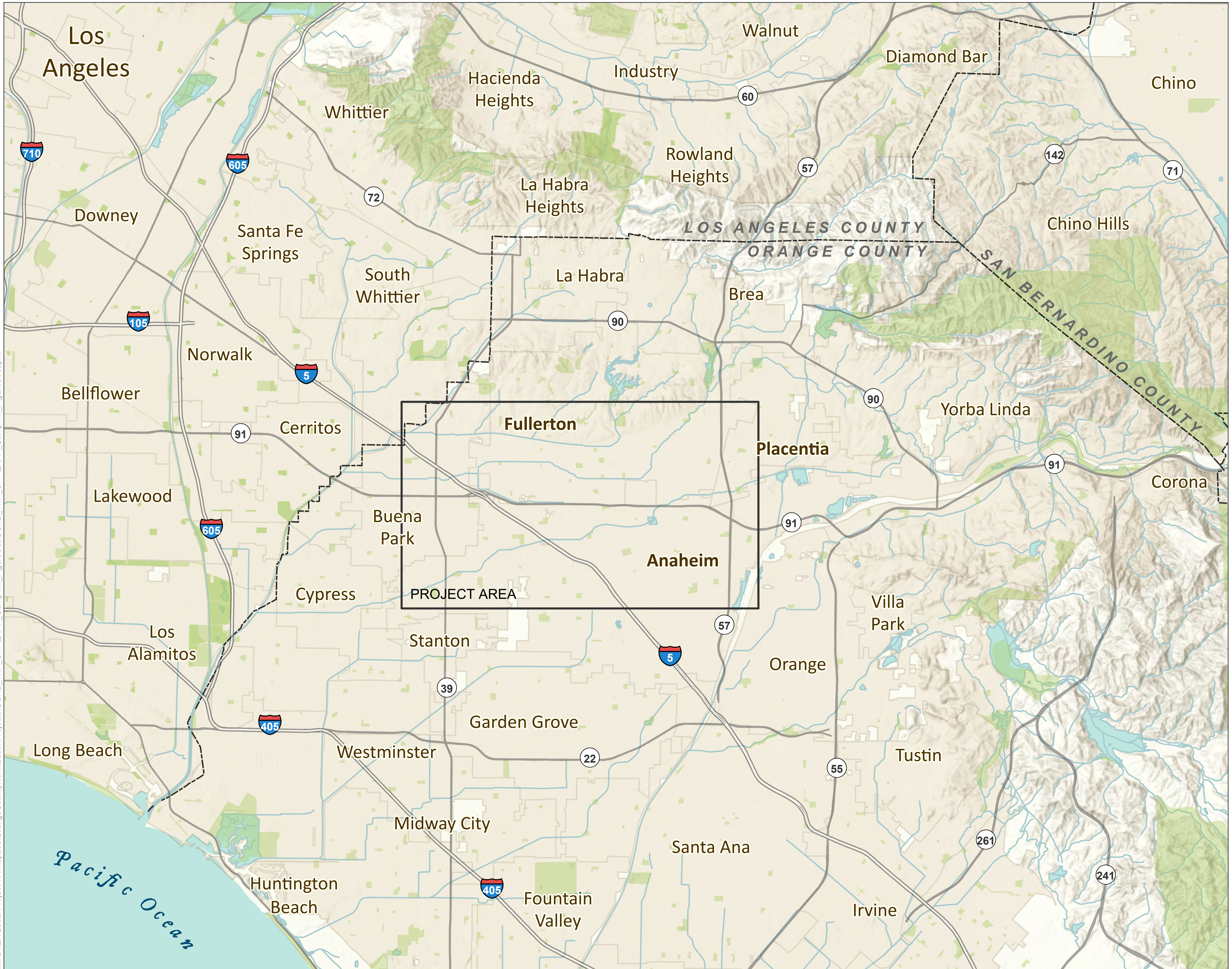


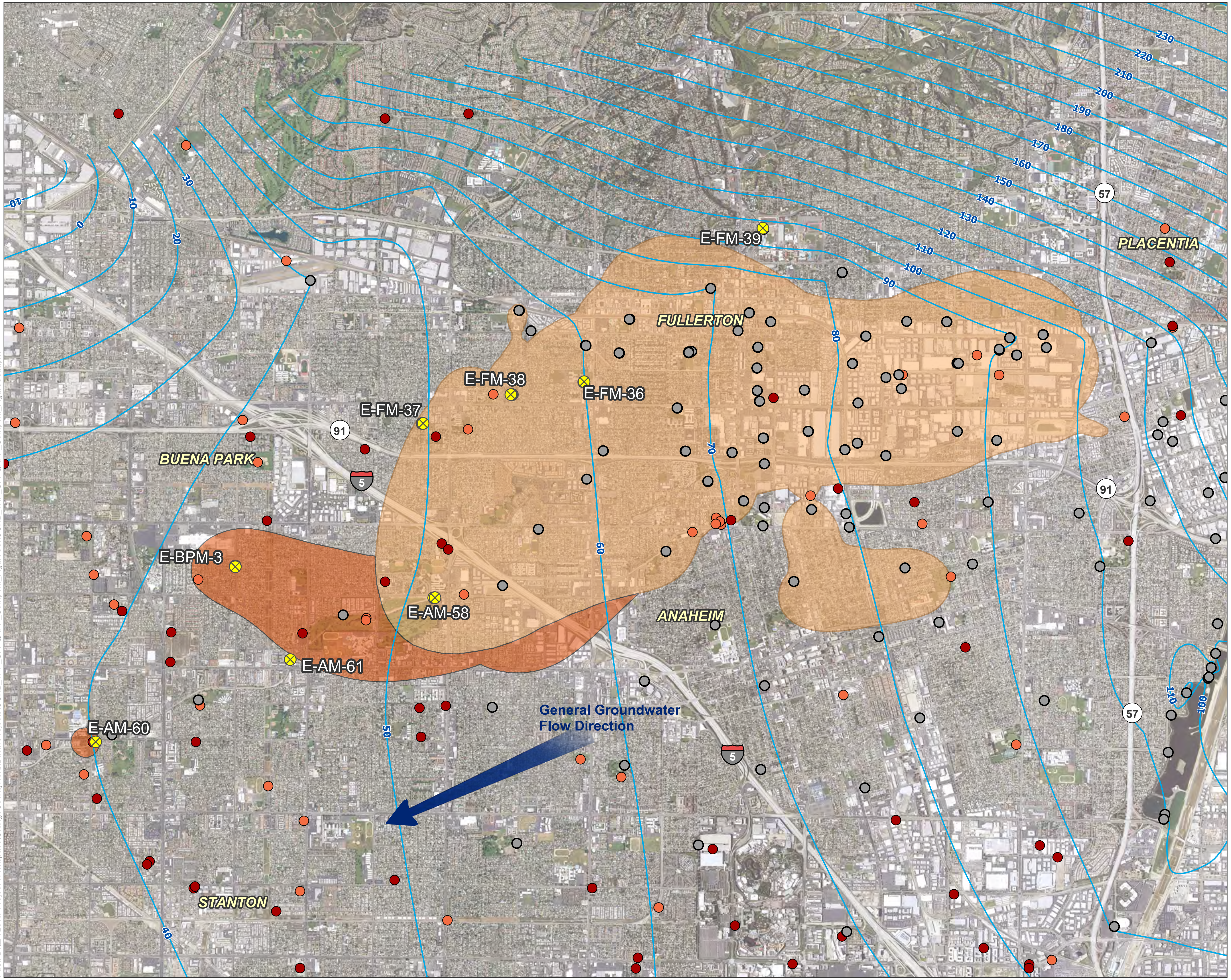
0 1 2 4
Miles

Date: 7/12/2024

Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 1
Site Location



Approximate Extent of Groundwater Contamination (2019-2024)*

- Shallow Zone
- Principal Zone**
- EPA Monitoring Well
- Production Well (Active)
- Production Well (Inactive)
- Monitoring Well
- Potentiometric Contour - Shallow Zone (10' intervals)

* The plume is constructed from the maximum concentration of tetrachloroethene, trichloroethene, 1,1-dichloroethene, and 1,4-dioxane recorded at each monitoring location between 2019 and first quarter of 2024.

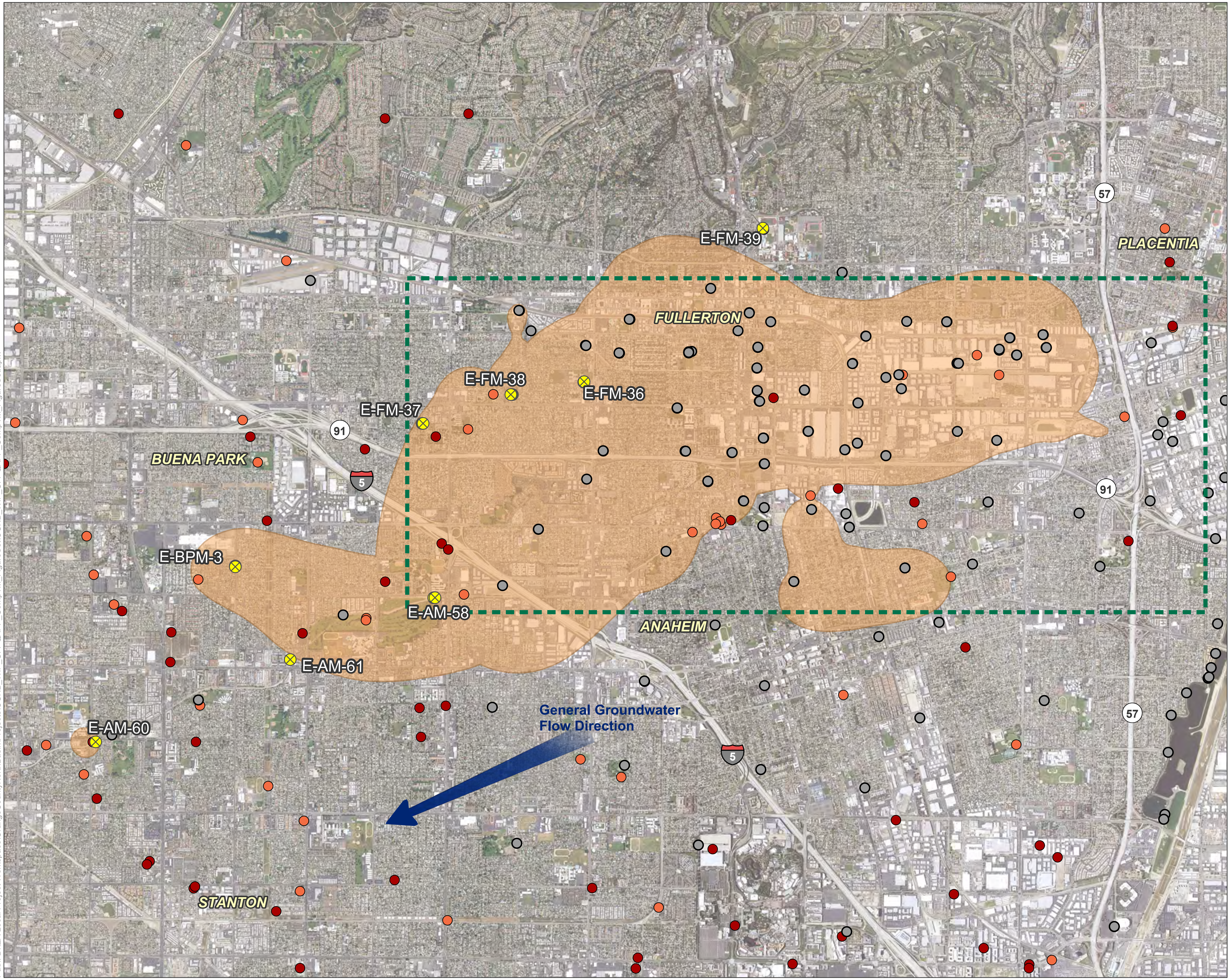
** While the plume is present in the deeper aquifer to the west as indicated, there is a lack of deep monitoring well data to characterize this area.

0 0.5 1 2
Miles

Map Date: 10/25/2024 *Data Sources: ESRI, USDA*

Orange County North Basin Superfund Site
Orange County, California

Figure 2
Approximate Extent of Contamination (2024)



- Orange County Water District's Study Area Boundary
- Approximate Extent of Groundwater Contamination (2019-2024)*
- EPA Monitoring Well
- Monitoring Well
- Production Well (Active)
- Production Well (Inactive)

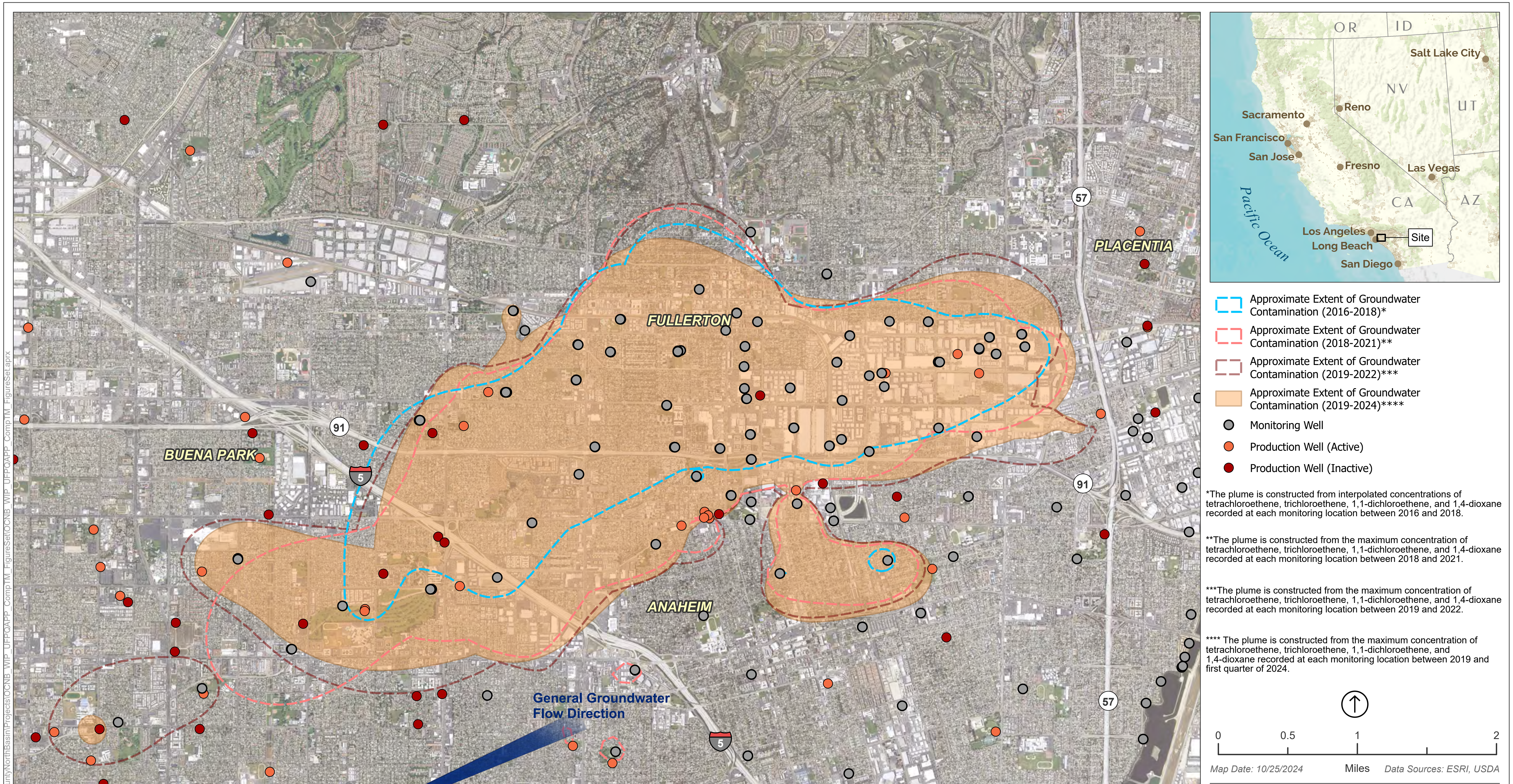
* The plume is constructed from the maximum concentration of tetrachloroethene, trichloroethene, 1,1-dichloroethene, and 1,4-dioxane recorded at each monitoring location between 2019 and first quarter of 2024.

0 0.5 1 2
Miles

Map Date: 10/25/2024 *Data Sources: ESRI, USDA*

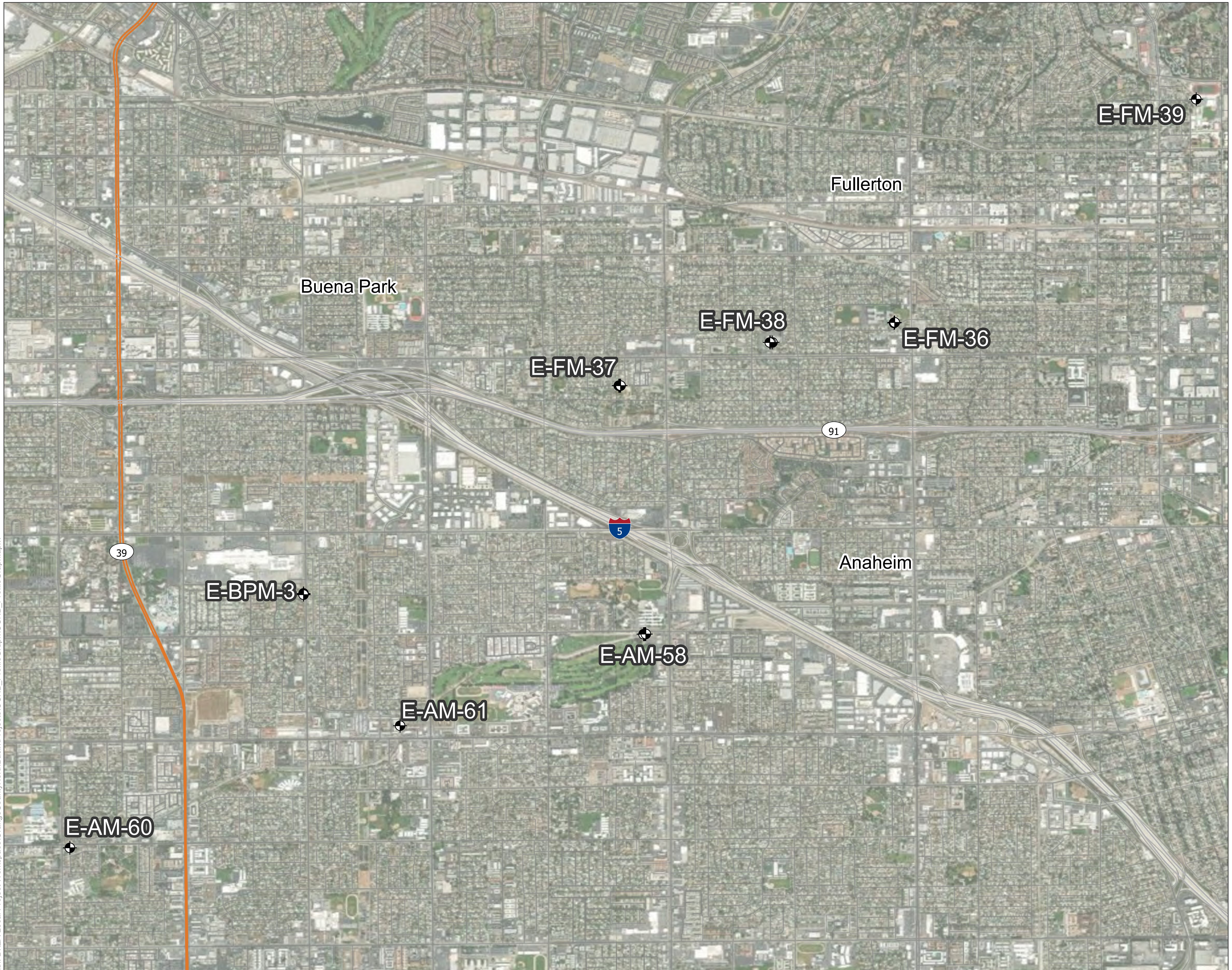
Orange County North Basin Superfund Site
Orange County, California

Figure 3
Study Area Boundary and Approximate Extent of Contamination (2024)



Orange County North Basin Superfund Site
Orange County, California

Figure 4
Approximate Extent of Contamination: Comparison of 2018, 2021, 2022, and 2024



EPA Monitoring Well Cluster

0 0.25 0.5 1

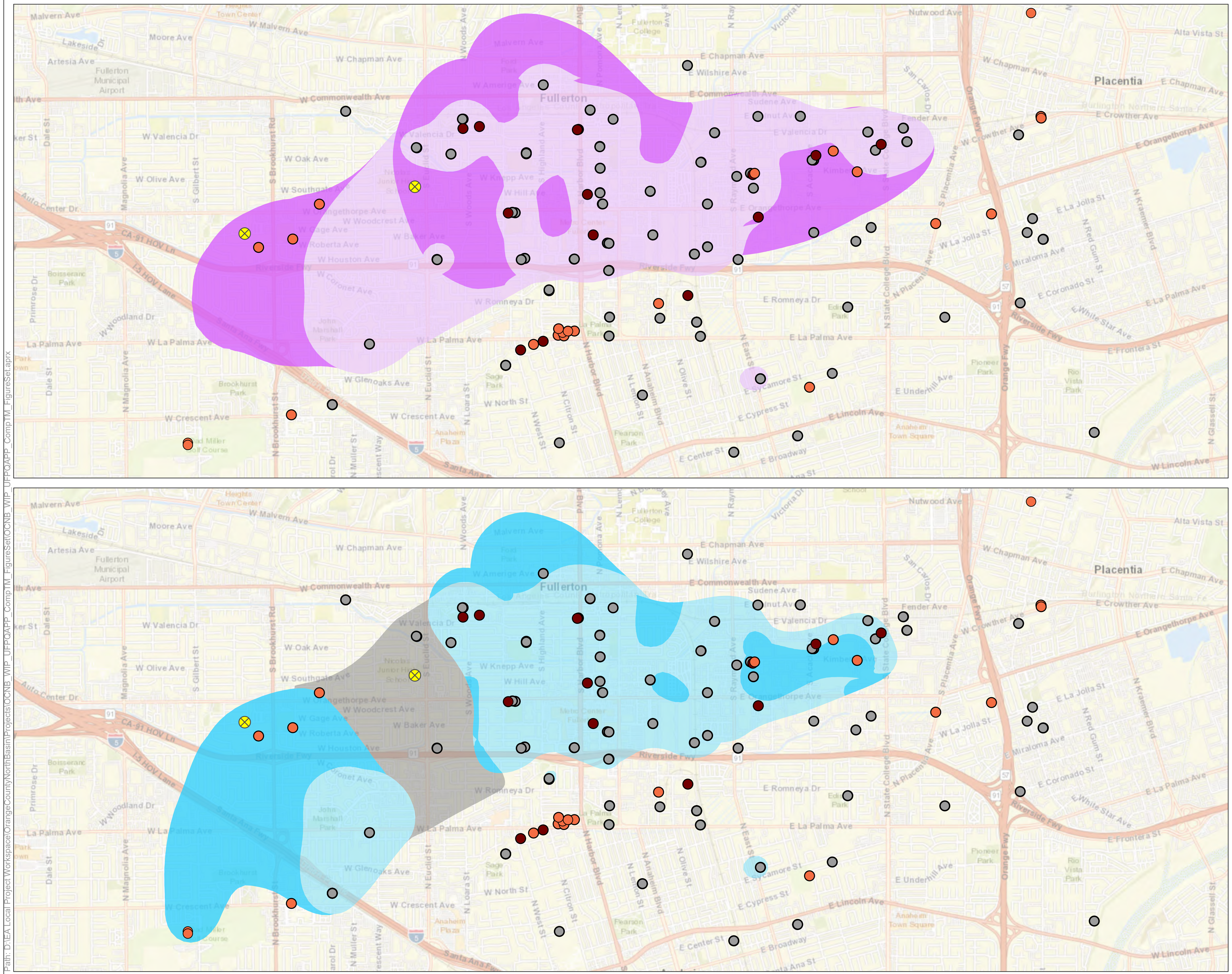
Miles

Map Date: 7/12/2024 *Data Sources: ESRI*

Orange County North Basin Superfund Site
Orange County, California

Figure 5
EPA Monitoring Well Cluster Locations

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_ProfileGraph\OCNB_ProfileGraph.aprx



- EPA Monitoring Well
- Monitoring Well
- Production Well (Active)
- Production Well (Inactive)
- Shallow Zone Plume Boundary (>50% Confidence)
- Shallow Zone Plume Boundary (<50% Confidence)
- Principal Zone Plume Boundary (>50% Confidence)
- Principal Zone Plume Boundary (<50% Confidence)
- Requires Further Characterization Due to Lack of Monitoring Wells

*The plume is constructed from interpolated concentrations of tetrachloroethene, trichloroethene, 1,1-dichloroethene, and 1,4-dioxane recorded at each monitoring location between 2016 and 2018.

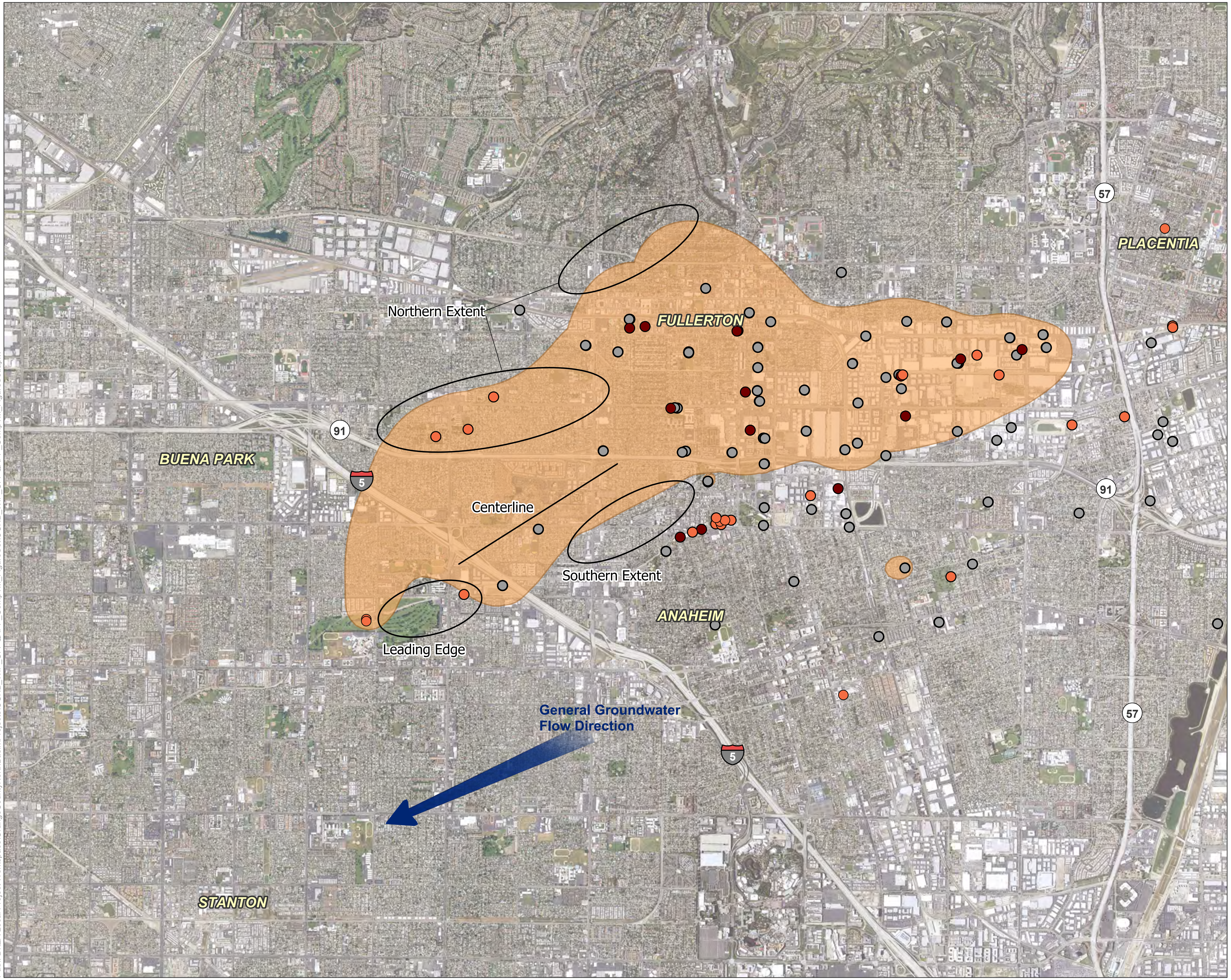
0 2,000 4,000 8,000
US Feet

Map Date: 7/12/2024 *Data Sources: ESRI*

Orange County North Basin Superfund Site
Orange County, California

Figure 6
Approximate Extent of Contamination (2018)

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_WIP_UFPOAPP_CompTM_FigureSetOCNB_WIP_UFPOAPP_CompTM_FigureSet.aprx



Approximate Extent of Groundwater Contamination (2016 - 2018)*

Monitoring Well

Production Well (Active)

Production Well (Inactive)

*The plume is constructed from interpolated concentrations of tetrachloroethene, trichloroethene, 1,1-dichloroethene, and 1,4-dioxane recorded at each monitoring location between 2016 and 2018.

0 0.5 1 2

Miles

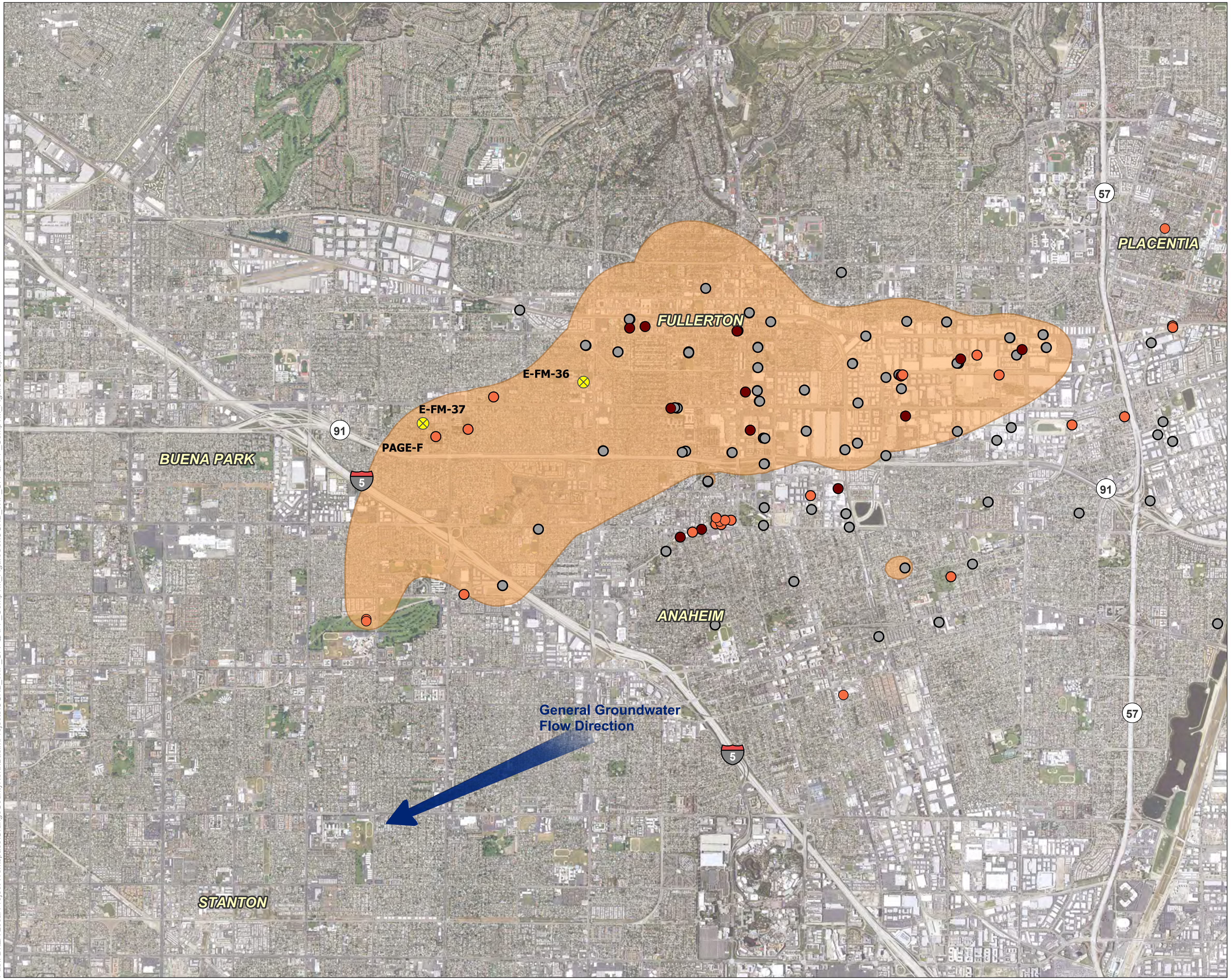
Map Date: 7/12/2024

Data Sources: ESRI, USDA

Orange County North Basin Superfund Site
Orange County, California

Figure 7
Investigation Areas and Approximate Extent of Contamination (2018)

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_WIP_UFPQAPP_CompTM_FigureSet\OCNB_WIP_UFPQAPP_CompTM_FigureSet.aprx



- Approximate Extent of Groundwater Contamination (2016 - 2018)*
- EPA Monitoring Well
- Monitoring Well
- Production Well (Active)
- Production Well (Inactive)

*The plume is constructed from interpolated concentrations of tetrachloroethene, trichloroethene, 1,1-dichloroethene, and 1,4-dioxane recorded at each monitoring location between 2016 and 2018.

0 0.5 1 2

Miles

Map Date: 7/12/2024 *Data Sources: ESRI, USDA*

Orange County North Basin Superfund Site
Orange County, California

Figure 8
EPA Monitoring Wells and Approximate Extent of Contamination (2018)

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_WIP_UFPOAPP_CompTM_FigureSet\OCNB_WIP_UFPOAPP_CompTM_FigureSet.aprx

Monitoring Well

0 25 50 100
Feet

Map Date: 10/12/2022 *Data Sources: ESRI*

Orange County North Basin Superfund Site
Orange County, California

Figure 9
E-FM-36A, E-FM-36B, and E-FM-36C Locations

Path: C:\EA\projects\CAEPA\OrangeCountyNorthBasin\MXD\WP\E-FM-36_Aerial.mxd

Monitoring Well

0 25 50 100

Feet

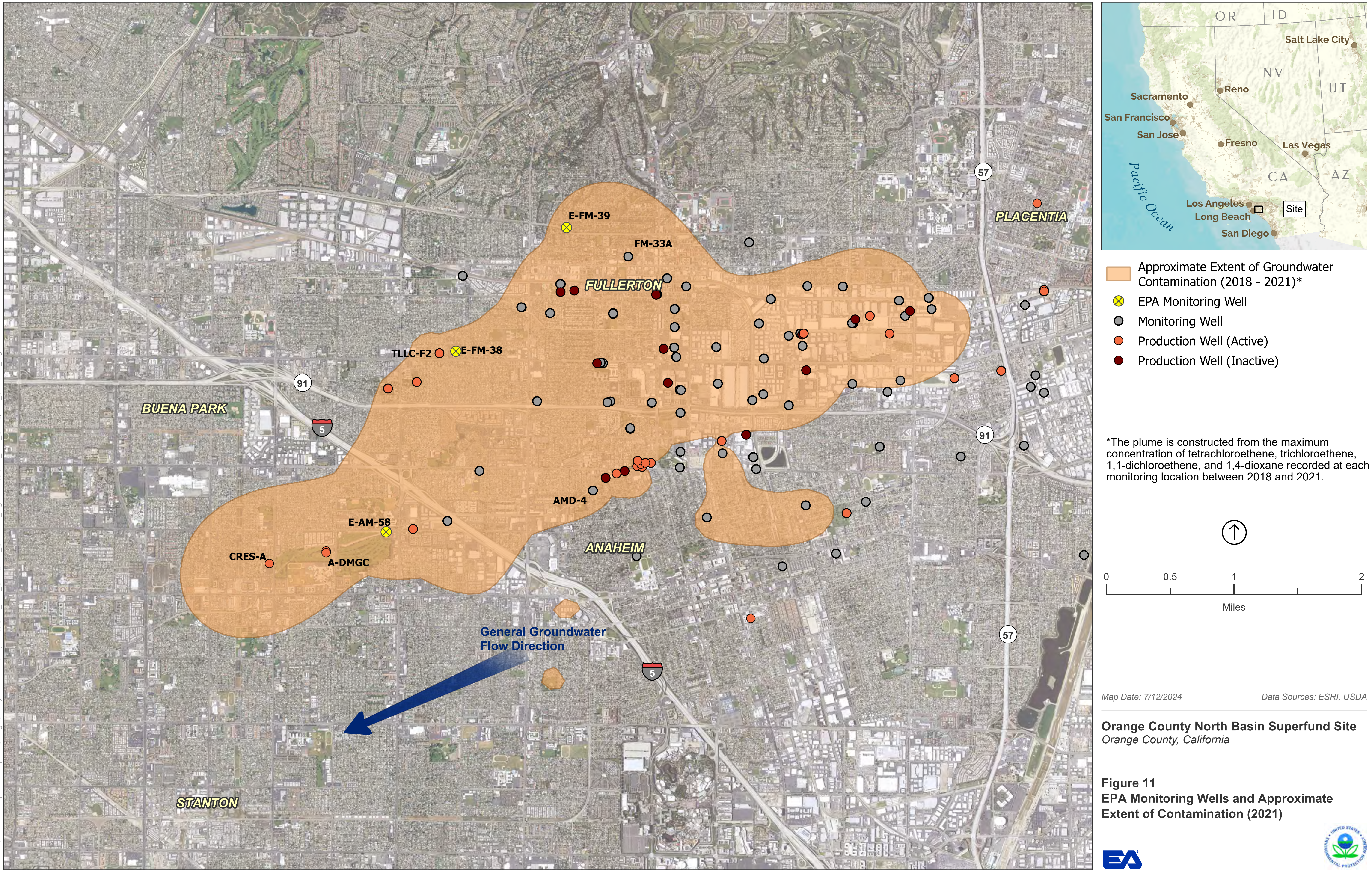
Map Date: 10/12/2022

Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 10
E-FM-37A, E-FM-37B, E-FM-37C, E-FM-37D, and E-FM-37E Locations

Path: C:\EA\projects\CA\EPA\OrangeCountyNorthBasin\MXD\WP\E-FM-37_Aerial.mxd



Map Date: 7/12/2024 *Data Sources: ESRI, USDA*

Orange County North Basin Superfund Site
Orange County, California

Figure 11
EPA Monitoring Wells and Approximate Extent of Contamination (2021)

Map Date: 10/13/2022

Data Sources: ESRI

Orange County North Basin Superfund Site

Orange County, California

Figure 12

E-FM-38A, E-FM-38B, and E-FM-38C Locations

Monitoring Well

0 50 100 200

US Feet

Date: 7/12/2024

Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 13
E-FM-39A Location

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_WIP_UFPOAPP_CompTM_FigureSet\OCNB_WIP_UFPOAPP_CompTM_FigureSet.aprx

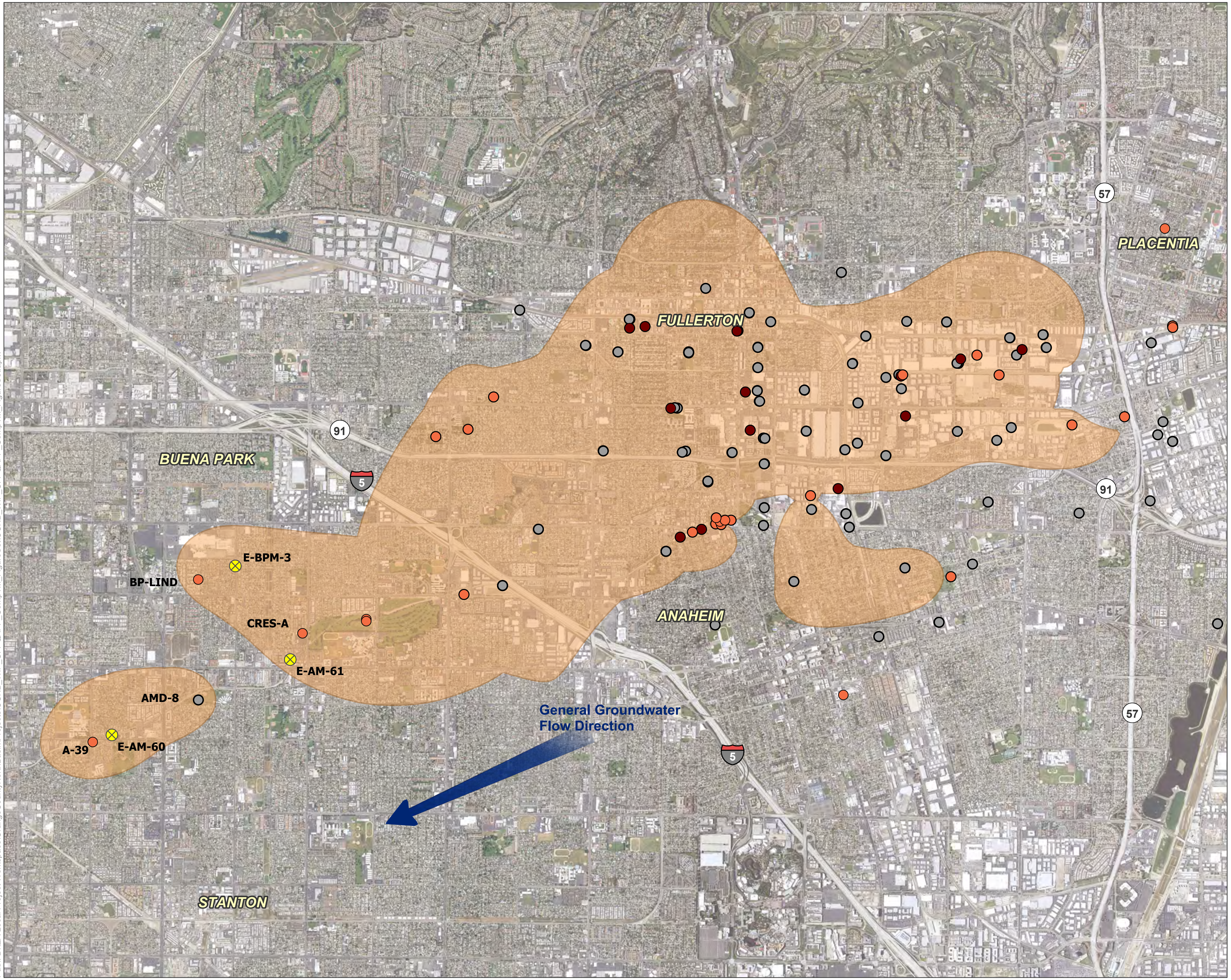
Monitoring Well

0 25 50 100
Feet

Map Date: 10/13/2022 *Data Sources: ESRI*

Orange County North Basin Superfund Site
Orange County, California

Figure 14
E-AM-58A, E-AM-58B, E-AM-58C, E-AM-58D, and E-AM-58E Locations



Approximate Extent of Groundwater Contamination (2019-2022)*

EPA Monitoring Well

Monitoring Well

Production Well (Active)

Production Well (Inactive)

*The plume is constructed from the maximum concentration of tetrachloroethene, trichloroethene, 1,1-dichloroethene, and 1,4-dioxane recorded at each monitoring location between 2019 and 2022.

0 0.5 1 2

Miles

Map Date: 9/18/2024 *Data Sources: ESRI, USDA*

Orange County North Basin Superfund Site
Orange County, California

Figure 15
EPA Monitoring Wells and Approximate Extent of Contamination (2022)

Monitoring Well

0 50 100 200
US Feet

Date: 7/12/2024

Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 16
E-BPM-3A, E-BPM-3B, and E-BPM-3C Locations

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_WIP_UFPOAPP_CompTM_FigureSet\OCNB_WIP_UFPOAPP_CompTM_FigureSet.aprx

Monitoring Well

0 50 100 200

US Feet

Date: 7/12/2024

Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 17
E-AM-60C and E-AM-60D Locations

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_WIP_UFPQAPP_CompTM_FigureSet\OCNB_WIP_UFPQAPP_CompTM_FigureSet.aprx

Date: 7/12/2024

Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 18
E-AM-61B, E-AM-61C, and E-AM-61D Locations

Note:
This image is oriented west.

Map Date: 10/13/2022

Orange County North Basin Superfund Site
Orange County, California

Figure 19
E-FM-37A, E-FM-37B, E-FM-37C, E-FM-37D, and E-FM-37E Locations Street View

Path: C:\EA\projects\CA\EPA\OrangeCountyNorthBasin\MXD\WIP\E-FM-37_StreetView.mxd

Note:
This image is oriented west.

Map Date: 10/13/2022

Orange County North Basin Superfund Site
Orange County, California

Figure 20
E-FM-38A, E-FM-38B, and E-FM-38C Locations
Street View

Path: C:\EA\projects\CA\EPA\OrangeCountyNorthBasin\MXD\WP\E-FM-38_StreetView.mxd

Note:
This image is oriented south.

Date: 7/12/2024

Orange County North Basin Superfund Site
Orange County, California

Figure 21
E-FM-39A Location
Street View

Note:
This image is oriented west.

Date: 7/12/2024

Orange County North Basin Superfund Site
Orange County, California

Figure 22
E-AM-60C and E-AM-60D Locations
Street View

Note:
This image is oriented north.

Date: 7/12/2024

Orange County North Basin Superfund Site
Orange County, California

Figure 23
E-BPM-3A, E-BPM-3B, and E-BPM-3C Locations Street View

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_WIP_UFPQAPP_CompTM_FigureSet\OCNB_WIP_UFPQAPP_CompTM_FigureSet.aprx

Note:
This image is oriented east.

Map Date: 10/13/2022

Orange County North Basin Superfund Site
Orange County, California

Figure 24
E-FM-36A, E-FM-36B, and E-FM-36C Locations
Street View

Path: C:\EA\projects\CA\EPA\OrangeCountyNorthBasin\MXD\WP\E-FM-36_StreetView.mxd

Note:
This image is oriented west.

Map Date: 10/13/2022

Orange County North Basin Superfund Site
Orange County, California

Figure 25
E-AM-58A, E-AM-58B, E-AM-58C, E-AM-58D, and E-AM-58E Locations Street View

Path: C:\EA\projects\CA\EPA\OrangeCountyNorthBasin\MXD\WIP\E-AM-58_StreetView.mxd

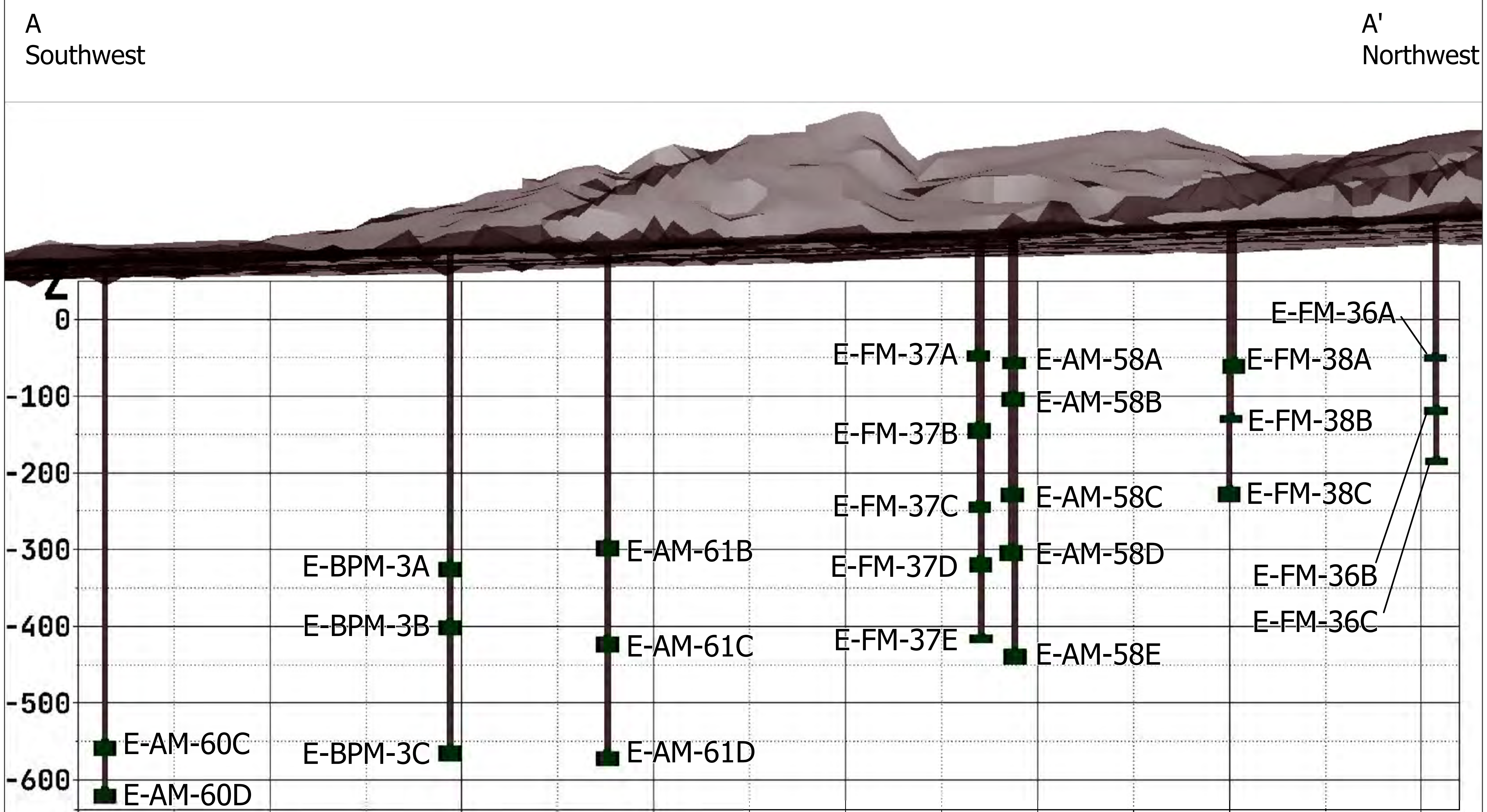
Note:
This image is oriented south.

Date: 7/12/2024

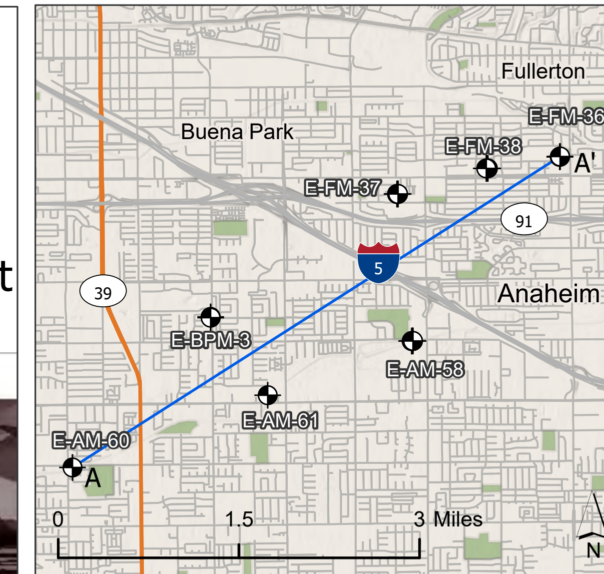
Orange County North Basin Superfund Site
Orange County, California

Figure 26
E-AM-61B, E-AM-61C, and E-AM-61D
Locations Street View

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_WIP_UFPQAPP_CompTM_FigureSet\OCNB_WIP_UFPQAPP_CompTM_FigureSet.aprx



*Horizontal axis is not to scale



EPA Monitoring Well

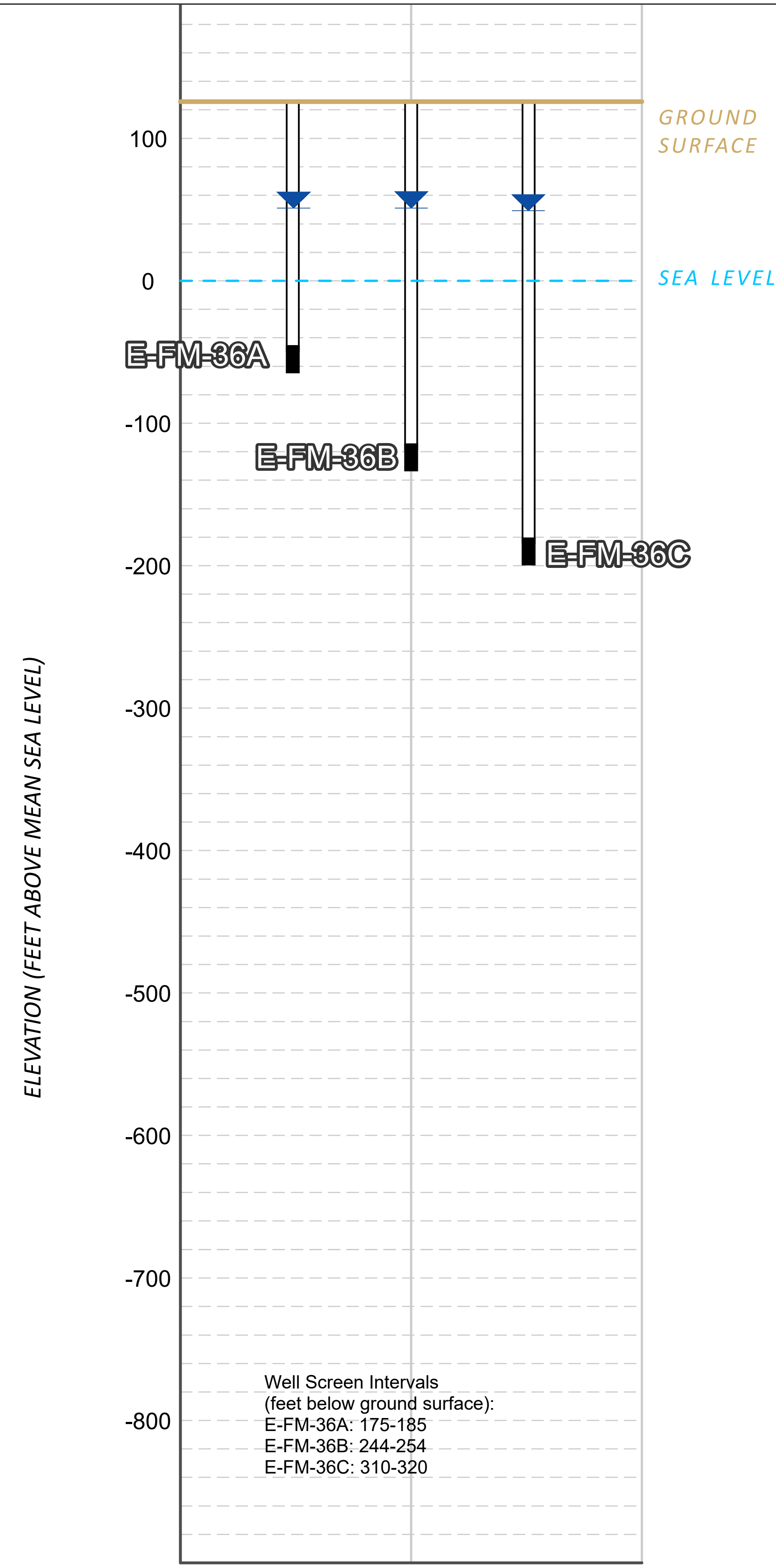
Note:
Depth measurement is elevation in NGVD29 feet
The image has a 10 to 1 vertical exaggeration
"0" = Mean Sea Level

Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 27
3D Perspective View of EPA Monitoring Wells: Location and Depth

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_ProfileGraph\OCNB_ProfileGraph.aprx | 7/22/2024 | jblock



= Approximate top of water table.
= Well Screen.

	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-36A	11/17/2021	2.3		3.9		0.25		46.2	
E-FM-36A	11/17/2021	2.5		3.3		0.65		46	
E-FM-36A	7/11/2022	2.3		4.4		0.60		45.1	
E-FM-36A	1/12/2023	2.2		3.7		0.80		46.5	
E-FM-36A	7/12/2023	2.4		3.2		1.2		42.6	
E-FM-36A	1/8/2024	2.7		< 0.50		1.8		49.5	

	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-36B	11/17/2021	0.50		0.80		< 0.050		1.8	
E-FM-36B	11/17/2021	0.68		0.82	J	< 0.500		2.3	
E-FM-36B	7/11/2022	0.60		0.90		< 0.050		2.6	
E-FM-36B	1/12/2023	0.60		0.80		< 0.50		3.0	
E-FM-36B	7/12/2023	0.70		0.80		< 0.50		3.3	
E-FM-36B	1/8/2024	0.80		1.0		< 0.50		4.2	

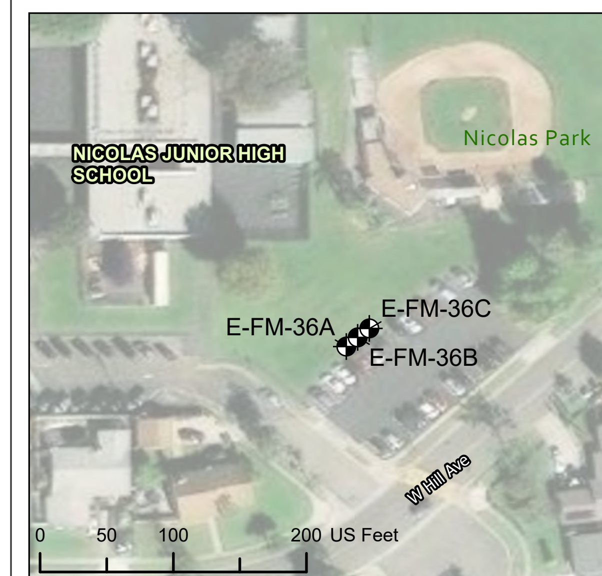
	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-36C	11/17/2021	< 0.050		< 0.050		< 0.050		< 0.050	
E-FM-36C	11/17/2021	< 0.500		< 1.0		< 0.500		< 0.500	
E-FM-36C	7/11/2022	< 0.050		< 0.050		< 0.050		< 0.050	
E-FM-36C	1/12/2023	< 0.50		< 0.50		< 0.50		< 0.50	
E-FM-36C	7/12/2023	< 0.50		< 0.50		< 0.50		< 0.50	
E-FM-36C	1/8/2024	< 0.50		< 0.50		< 0.50		< 0.50	

Results are presented in micrograms per liter (µg/L).

The MCL for 1,1-DCE is 7 µg/L.
The NL for 1,4-dioxane is 1 µg/L.
The MCL for TCE is 5 µg/L.
The MCL for PCE is 5 µg/L.

J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

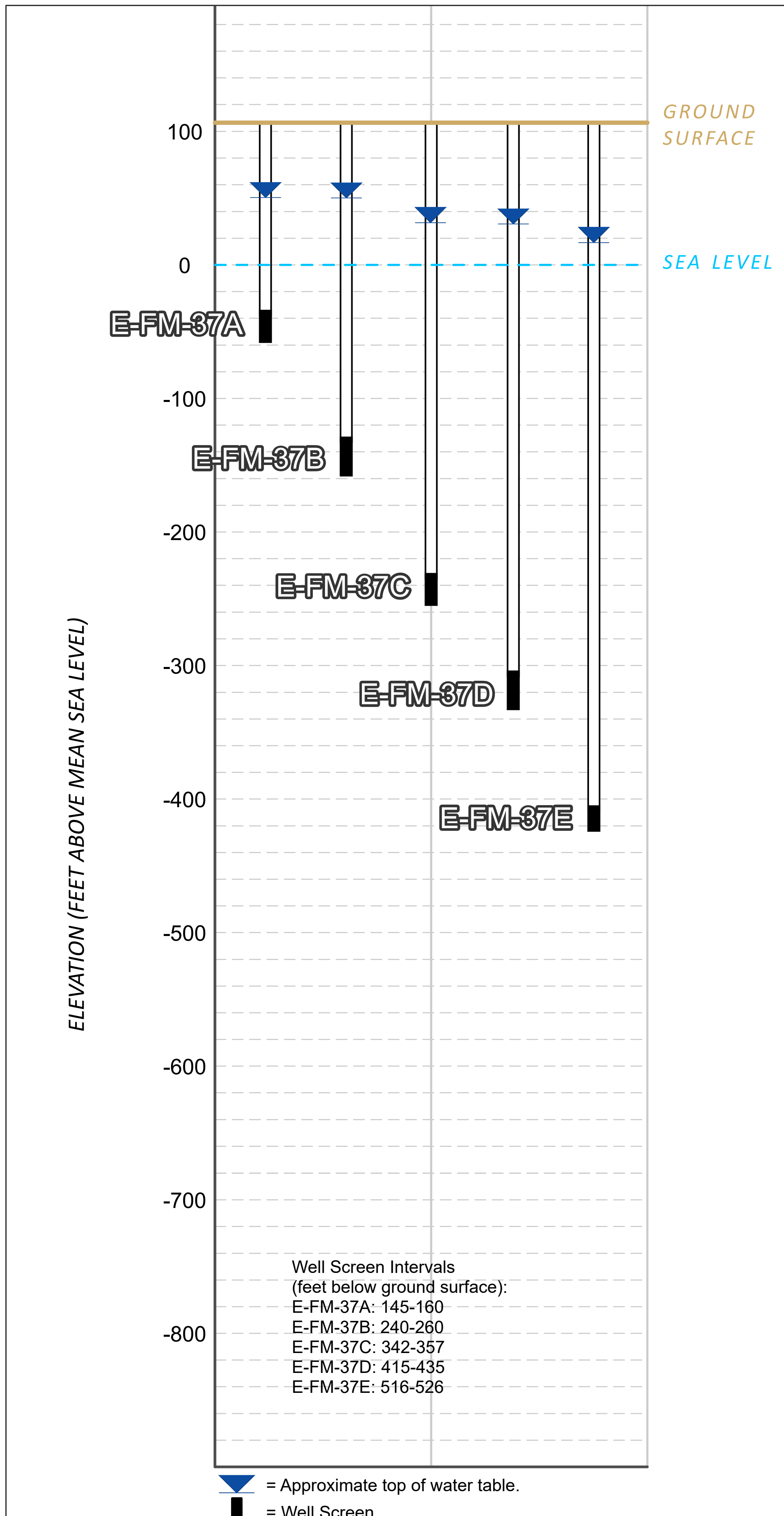
< = The result is non-detect
1,1-DCE = 1,1-dichloroethene
1,4-DIOX = 1,4-dioxane
MCL = EPA Maximum Contaminant Level
NL = California Notification Level
PCE = tetrachloroethene
Q = Data qualifier (unvalidated lab qualifiers)
TCE = trichloroethene
TR = Trace



Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 28
E-FM-36 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and 1,1-DCE, 1,4-Dioxane, PCE, and TCE Results



	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-37A	11/15/2021	< 0.050		< 0.050		< 0.050		< 0.050	
E-FM-37A	11/15/2021	< 0.500		< 1.0		< 0.500		< 0.500	
E-FM-37A	7/21/2022	< 0.050		< 0.050		< 0.050		< 0.050	
E-FM-37A	1/25/2023	< 0.50		< 0.50		< 0.50		< 0.50	
E-FM-37A	7/19/2023	< 0.50		< 0.50		< 0.50		< 0.50	
E-FM-37A	1/10/2024	< 0.50		< 0.50		< 0.50		< 0.50	

	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-37B	11/15/2021	< 0.050		0.50		< 0.050		< 0.050	
E-FM-37B	11/15/2021	< 0.500		< 1.0		< 0.500		< 0.500	
E-FM-37B	7/21/2022	0.25		0.90		< 0.050		< 0.050	
E-FM-37B	1/25/2023	TR		0.60		< 0.50		< 0.50	
E-FM-37B	7/19/2023	0.60		0.70		< 0.50		TR	
E-FM-37B	1/10/2024	TR		0.80		< 0.50		0.50	

	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-37C	11/15/2021	< 0.050		< 0.050		< 0.050		< 0.050	
E-FM-37C	11/15/2021	< 0.500		< 1.0		< 0.500		< 0.500	
E-FM-37C	7/21/2022	< 0.050		< 0.050		< 0.050		< 0.050	
E-FM-37C	1/23/2023	< 0.50		< 0.50		< 0.50		< 0.50	
E-FM-37C	7/17/2023	< 0.50		< 0.50		< 0.50		< 0.50	
E-FM-37C	1/10/2024	< 0.50		< 0.50		< 0.50		< 0.50	

	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-37D	11/15/2021	< 0.050		< 0.050		< 0.050		< 0.050	
E-FM-37D	11/15/2021	< 0.500		< 1.0		< 0.500		< 0.500	
E-FM-37D	7/20/2022	< 0.050		< 0.050		< 0.050		< 0.050	
E-FM-37D	1/23/2023	< 0.50		< 0.50		< 0.50		< 0.50	
E-FM-37D	7/17/2023	< 0.50		< 0.50		< 0.50		< 0.50	
E-FM-37D	1/11/2024	< 0.50		< 0.50		< 0.50		< 0.50	

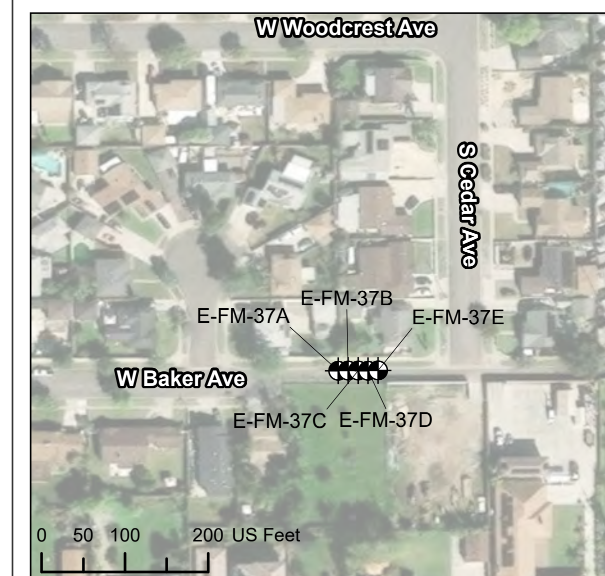
	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-37E	11/15/2021	< 0.050		< 0.050		< 0.050		< 0.050	
E-FM-37E	11/15/2021	< 0.500		< 1.0		< 0.500		< 0.500	
E-FM-37E	7/20/2022	< 0.050		< 0.050		< 0.050		< 0.050	
E-FM-37E	1/23/2023	< 0.50		< 0.50		< 0.50		< 0.50	
E-FM-37E	7/17/2023	< 0.50		< 0.50		< 0.50		< 0.50	
E-FM-37E	1/11/2024	< 0.50		< 0.50		< 0.50		< 0.50	

Results are presented in micrograms per liter (µg/L).

The MCL for 1,1-DCE is 7 µg/L.
The NL for 1,4-dioxane is 1 µg/L.
The MCL for TCE is 5 µg/L.
The MCL for PCE is 5 µg/L.

J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

< = The result is non-detect
1,1-DCE = 1,1-dichloroethene
1,4-DIOX = 1,4-dioxane
MCL = EPA Maximum Contaminant Level
NL = California Notification Level
PCE = tetrachloroethene
Q = Data qualifier (unvalidated lab qualifiers)
TCE = trichloroethene
TR = Trace

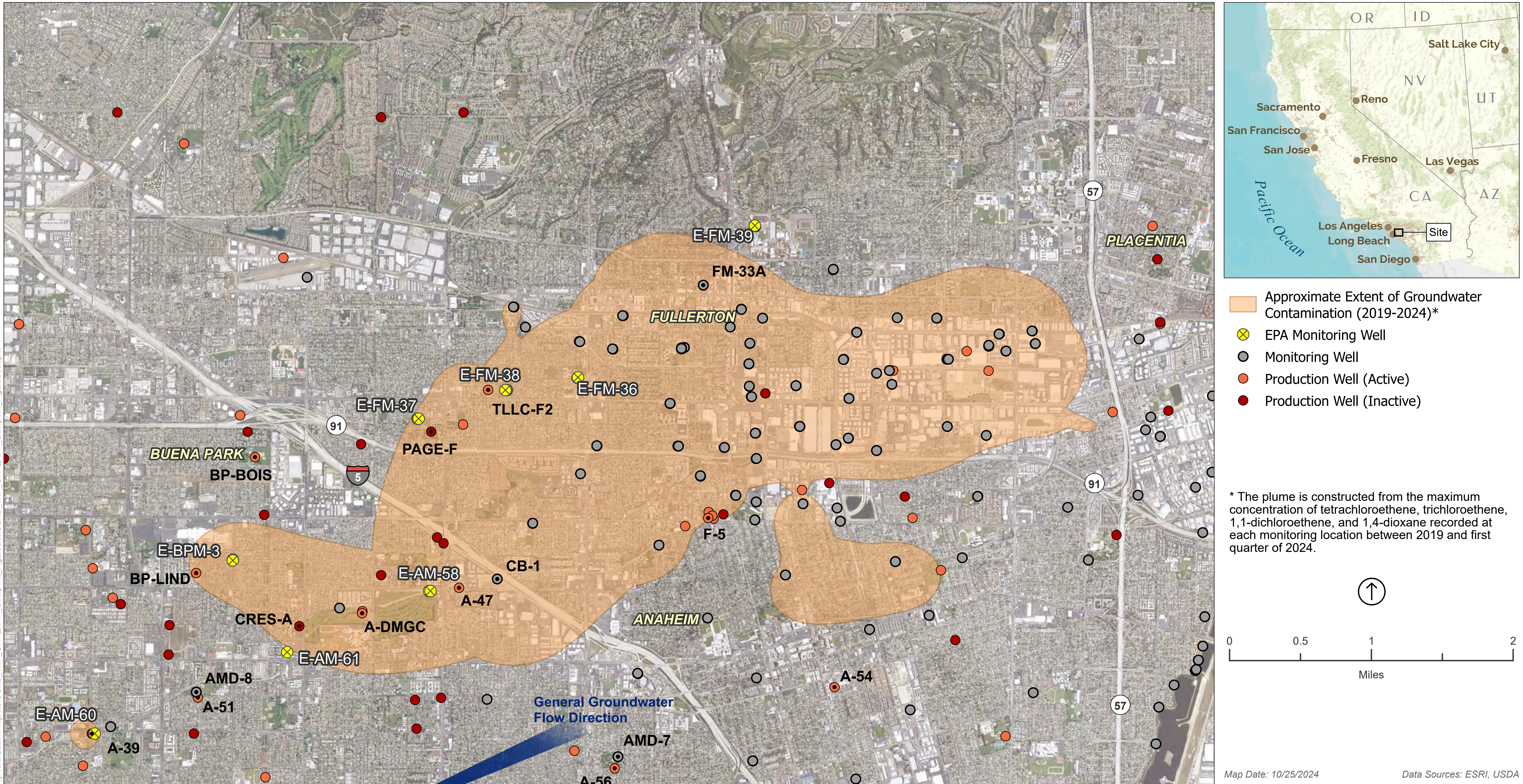


Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

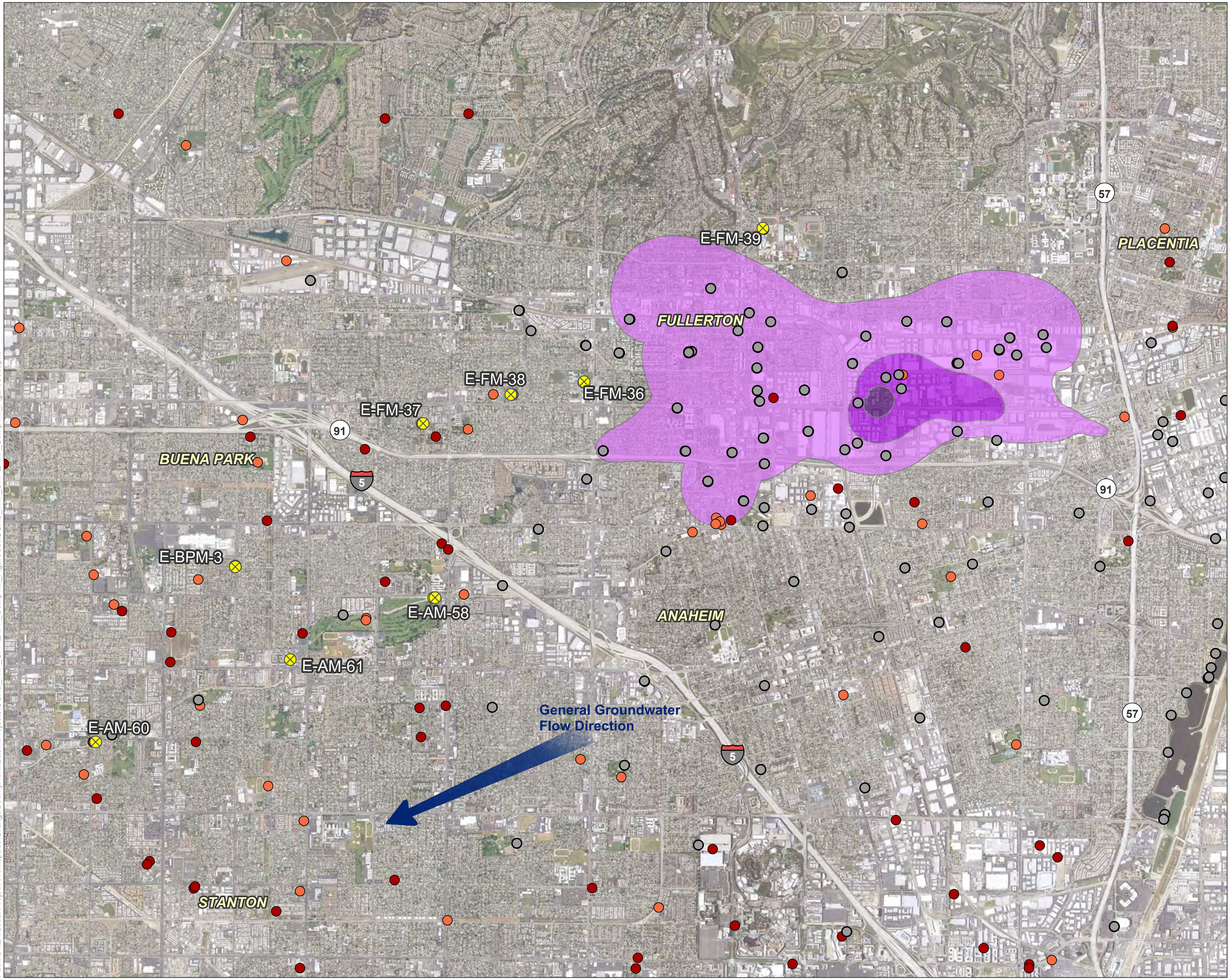
Figure 29
E-FM-37 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and 1,1-DCE, 1,4-Dioxane, PCE, and TCE Results

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_ProfileGraph\OCNB_ProfileGraph.aprx | 10/21/2024 | jblock



Orange County North Basin Superfund Site
Orange County, California

Figure 30
Approximate Extent of Contamination (2024), Objectives, Conclusions, and Recommendations



Tetrachloroethene

- 5 - 50 µg/L
- 50 - 500 µg/L
- >500 ug/L
- EPA Monitoring Well
- Monitoring Well
- Production Well (Active)
- Production Well (Inactive)

*The plume is constructed from interpolated concentrations of tetrachloroethene recorded at each monitoring location between 2019 and first quarter of 2024.

Results are presented in micrograms per liter (µg/L).

The EPA Maximum Contaminant Level for tetrachloroethene is 5 ug/L.

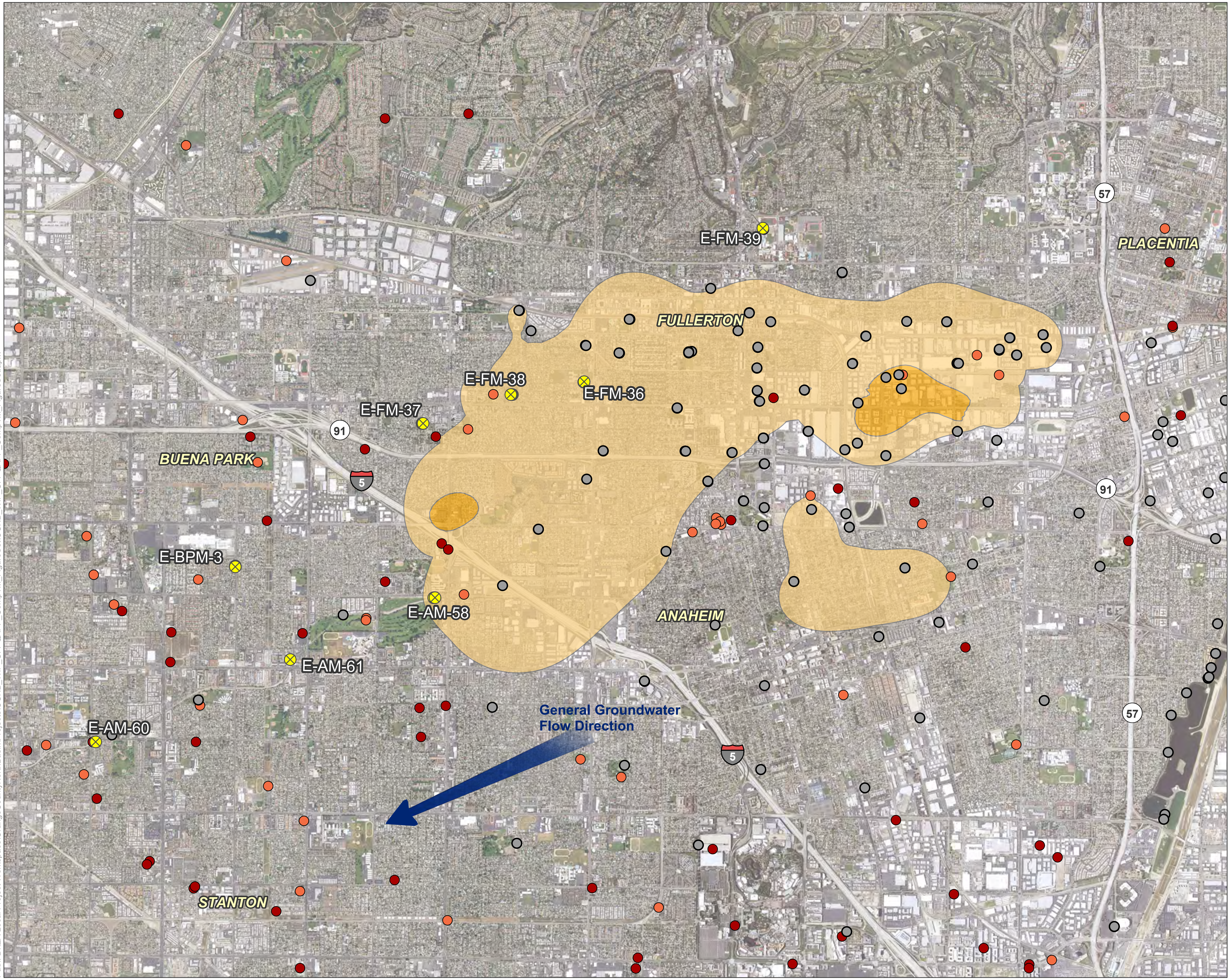
0 0.5 1 2

Miles

Map Date: 9/19/2024 *Data Sources: ESRI, USDA*

Orange County North Basin Superfund Site
Orange County, California

Figure 30a
Isocontours (2024): Tetrachloroethene



Trichloroethene
- 5 - 50 μg/L
- >50 μg/L
- EPA Monitoring Well
- Monitoring Well
- Production Well (Active)
- Production Well (Inactive)

*The plume is constructed from interpolated concentration of trichloroethene recorded at each monitoring location between 2019 and first quarter of 2024.

Results are presented in micrograms per liter (μg/L).

The EPA Maximum Contaminant Level for trichloroethene is 5 ug/L.

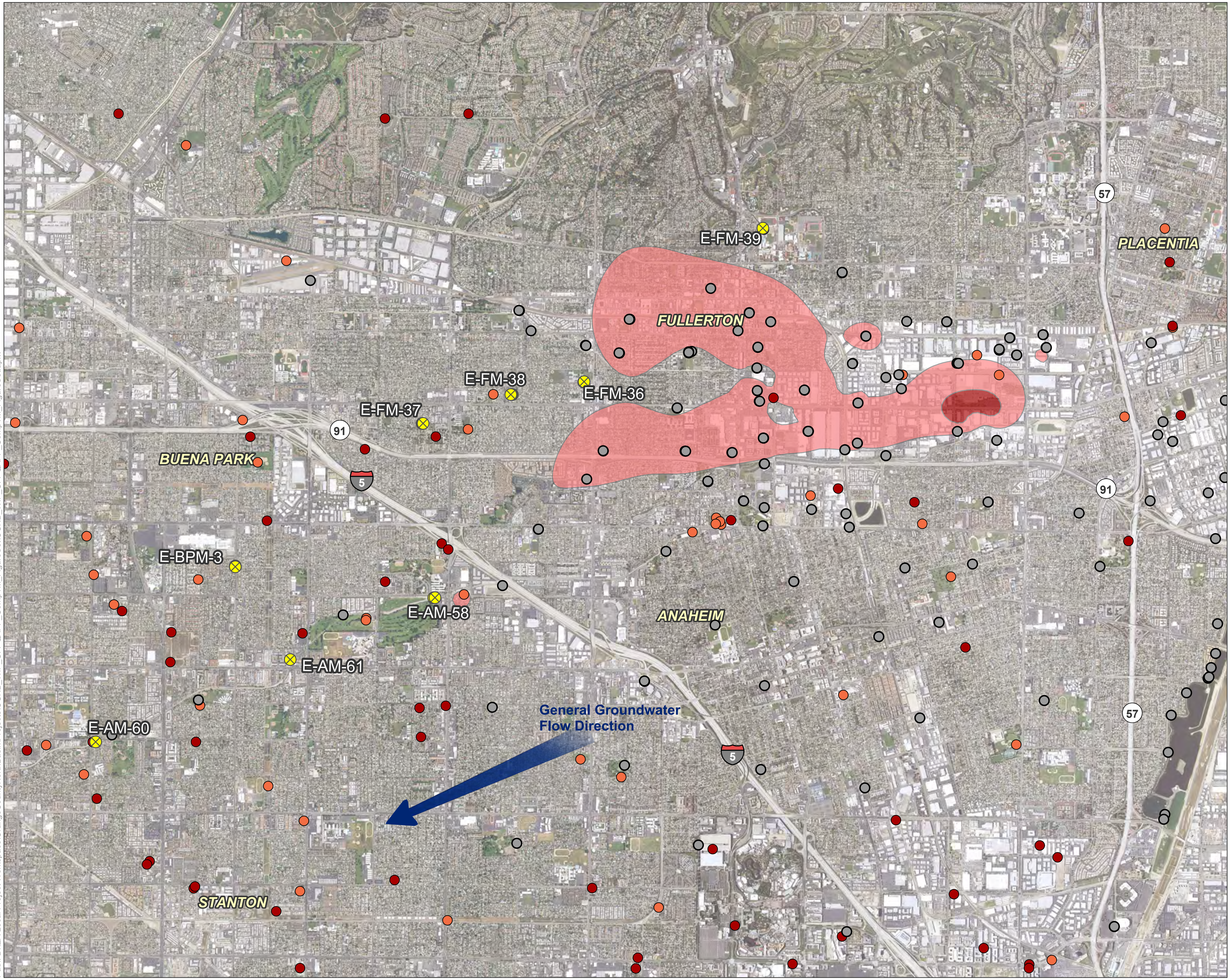
0 0.5 1 2
Miles

Map Date: 9/19/2024 *Data Sources: ESRI, USDA*

Orange County North Basin Superfund Site
Orange County, California

Figure 30b
Isocontours (2024): Trichloroethene

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_WIP_UFPQAPP_CompTM_FigureSet\OCNB_WIP_UFPQAPP_CompTM_FigureSet.aprx



1,1-Dichloroethene
- 7 - 70 µg/L
- >70 µg/L
- EPA Monitoring Well
- Monitoring Well
- Production Well (Active)
- Production Well (Inactive)

*The plume is constructed from interpolated concentration of 1,1-dichloroethene recorded at each monitoring location between 2019 and first quarter of 2024.

Results are presented in micrograms per liter (µg/L).

The EPA Maximum Contaminant Level for 1,1-dichloroethene is 7 ug/L.

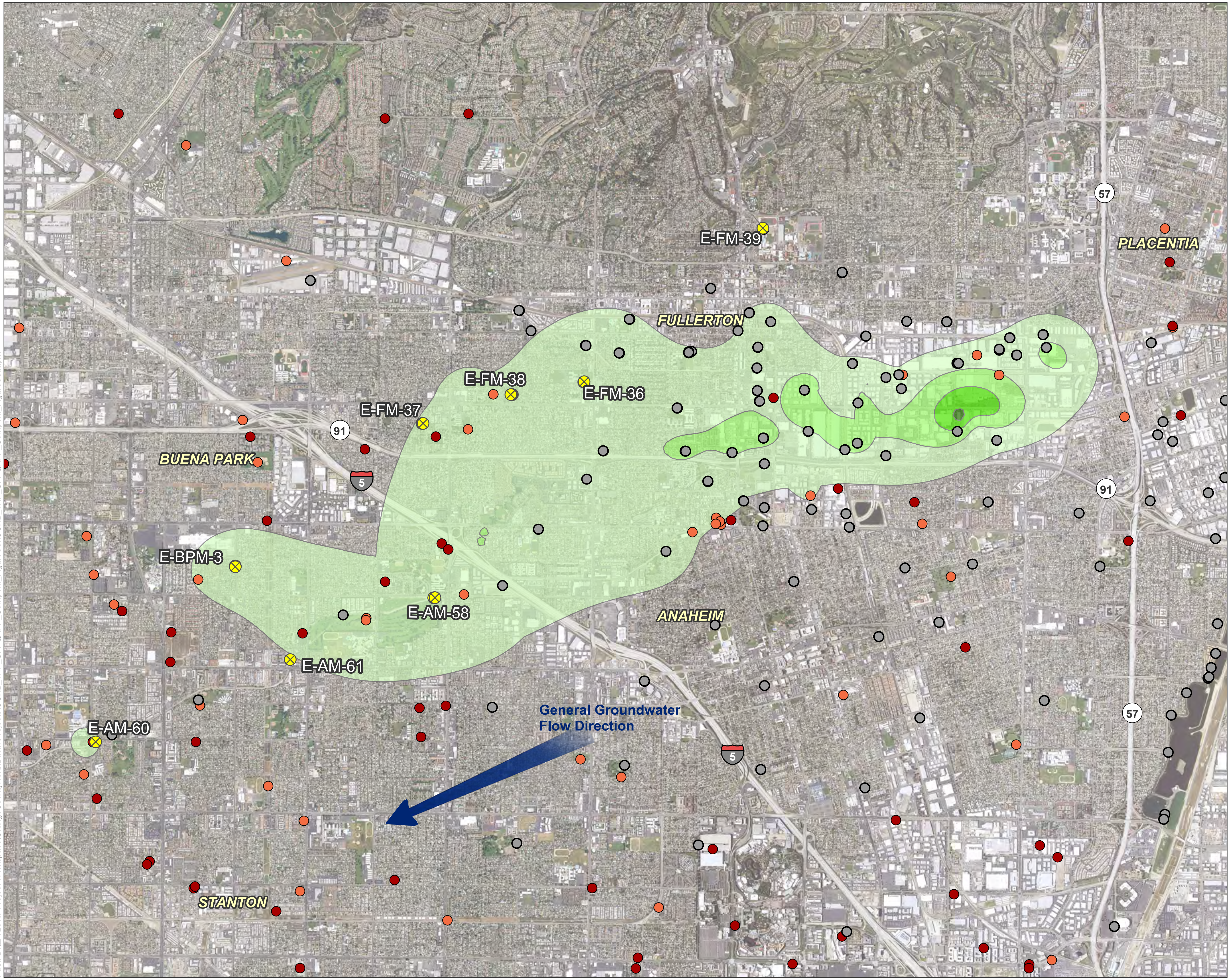
0 0.5 1 2
Miles

Map Date: 9/19/2024 *Data Sources: ESRI, USDA*

Orange County North Basin Superfund Site
Orange County, California

Figure 30c
Isocontours (2024): 1,1-Dichloroethene

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_WIP_UFPQAPP_CompTM_FigureSet\OCNB_WIP_UFPQAPP_CompTM_FigureSet.aprx



1,4-Dioxane

- 1-10 µg/L
- 10-100 µg/L
- 100-1000 µg/L
- >1000 µg/L
- EPA Monitoring Well
- Monitoring Well
- Production Well (Active)
- Production Well (Inactive)

*The plume is constructed from interpolated concentration of 1,4-dioxane recorded at each monitoring location between 2019 and first quarter of 2024.

Results are presented in micrograms per liter (µg/L).

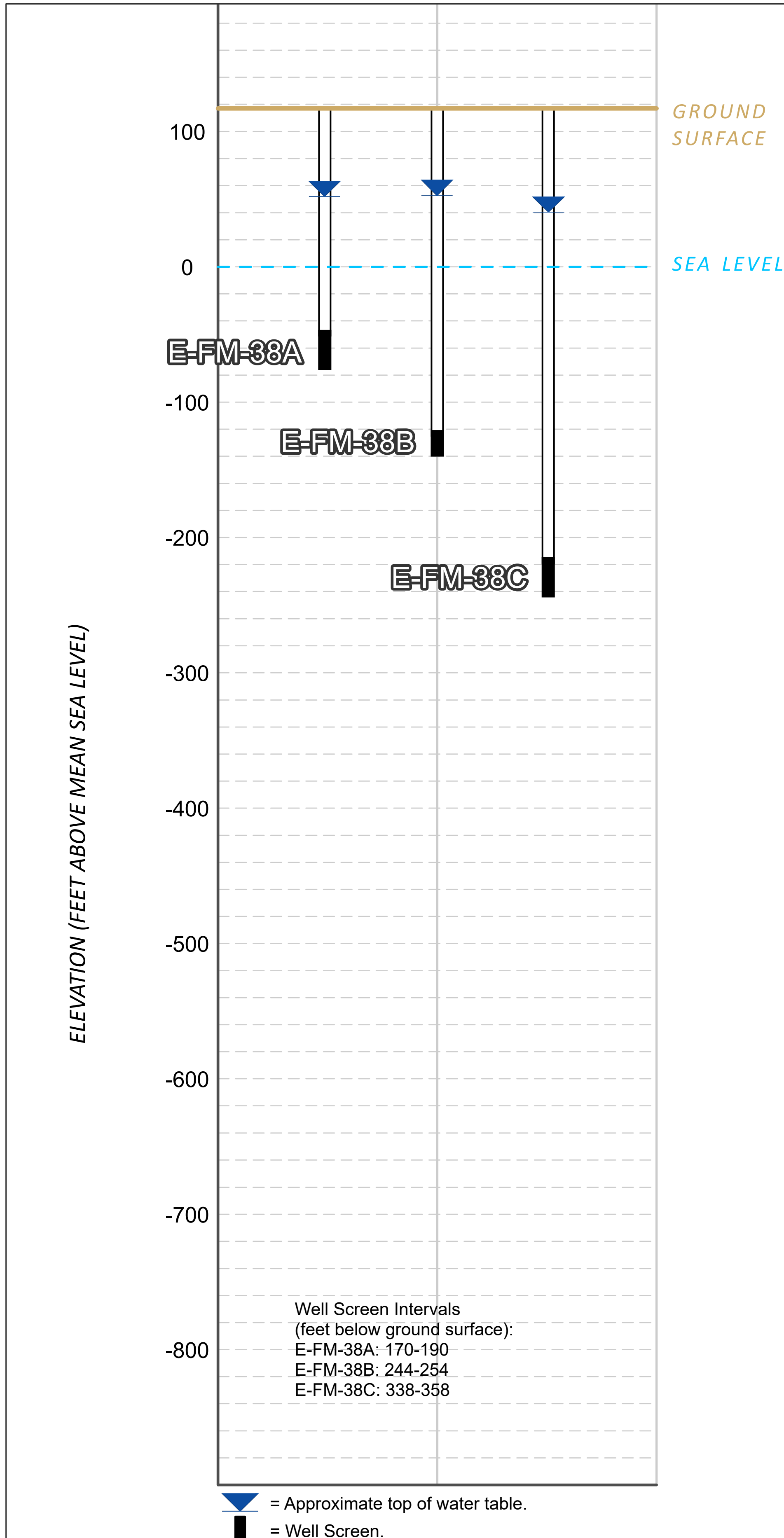
The California Notification Level for 1,4-dioxane is 1 ug/L.

0 0.5 1 2
Miles

Map Date: 9/19/2024 *Data Sources: ESRI, USDA*

Orange County North Basin Superfund Site
Orange County, California

Figure 30d
Isocontours (2024): 1,4-Dioxane



	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-38A	11/16/2021	1.4		1.9		< 0.050		8.4	
E-FM-38A	11/16/2021	1.6		2.3		< 1.0		9.2	
E-FM-38A	7/13/2022	1.2		2.3		< 0.050		8.3	
E-FM-38A	1/17/2023	1.3		1.8		< 0.50		9.5	
E-FM-38A	7/13/2023	1.3		1.6		< 0.50		7.4	
E-FM-38A	1/15/2024	1.5		2.0		< 0.50		8.9	

	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-38B	11/16/2021	0.50		1.2		< 0.050		4.7	
E-FM-38B	11/16/2021	0.68	J	1.2		< 1.0		5.0	
E-FM-38B	7/13/2022	0.70		1.4		< 0.050		6.7	
E-FM-38B	1/17/2023	0.60		1.0		< 0.50		6.1	
E-FM-38B	7/13/2023	0.90		1.0		< 0.50		9.4	
E-FM-38B	1/15/2024	0.90		1.1		< 0.50		8.7	

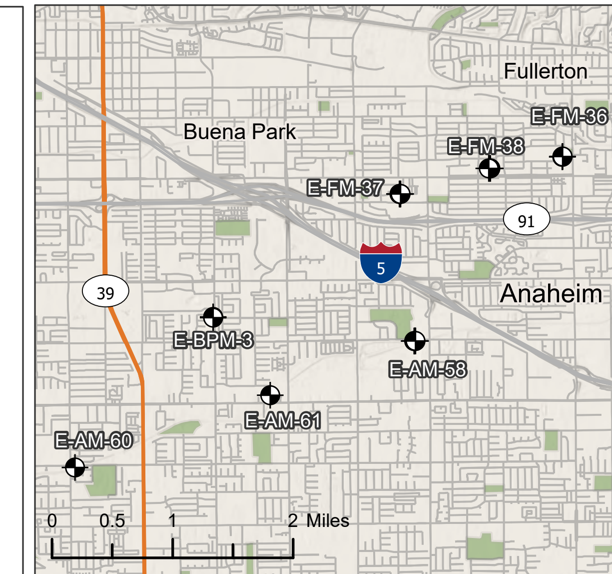
	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-38C	11/16/2021	< 0.050		< 0.050		< 0.050		< 0.050	
E-FM-38C	11/16/2021	< 1.0		< 1.0		< 1.0		< 1.0	
E-FM-38C	7/13/2022	< 0.050		< 0.050		< 0.050		< 0.050	
E-FM-38C	1/17/2023	< 0.50		< 0.50		< 0.50		< 0.50	
E-FM-38C	7/13/2023	< 0.50		< 0.50		< 0.50		< 0.50	
E-FM-38C	1/15/2024	< 0.50		< 0.50		< 0.50		< 0.50	

Results are presented in micrograms per liter (µg/L).

The MCL for 1,1-DCE is 7 µg/L.
The NL for 1,4-dioxane is 1 µg/L.
The MCL for TCE is 5 µg/L.
The MCL for PCE is 5 µg/L.

J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

< = The result is non-detect
1,1-DCE = 1,1-dichloroethene
1,4-DIOX = 1,4-dioxane
MCL = EPA Maximum Contaminant Level
NL = California Notification Level
PCE = tetrachloroethene
Q = Data qualifier (unvalidated lab qualifiers)
TCE = trichloroethene
TR = Trace

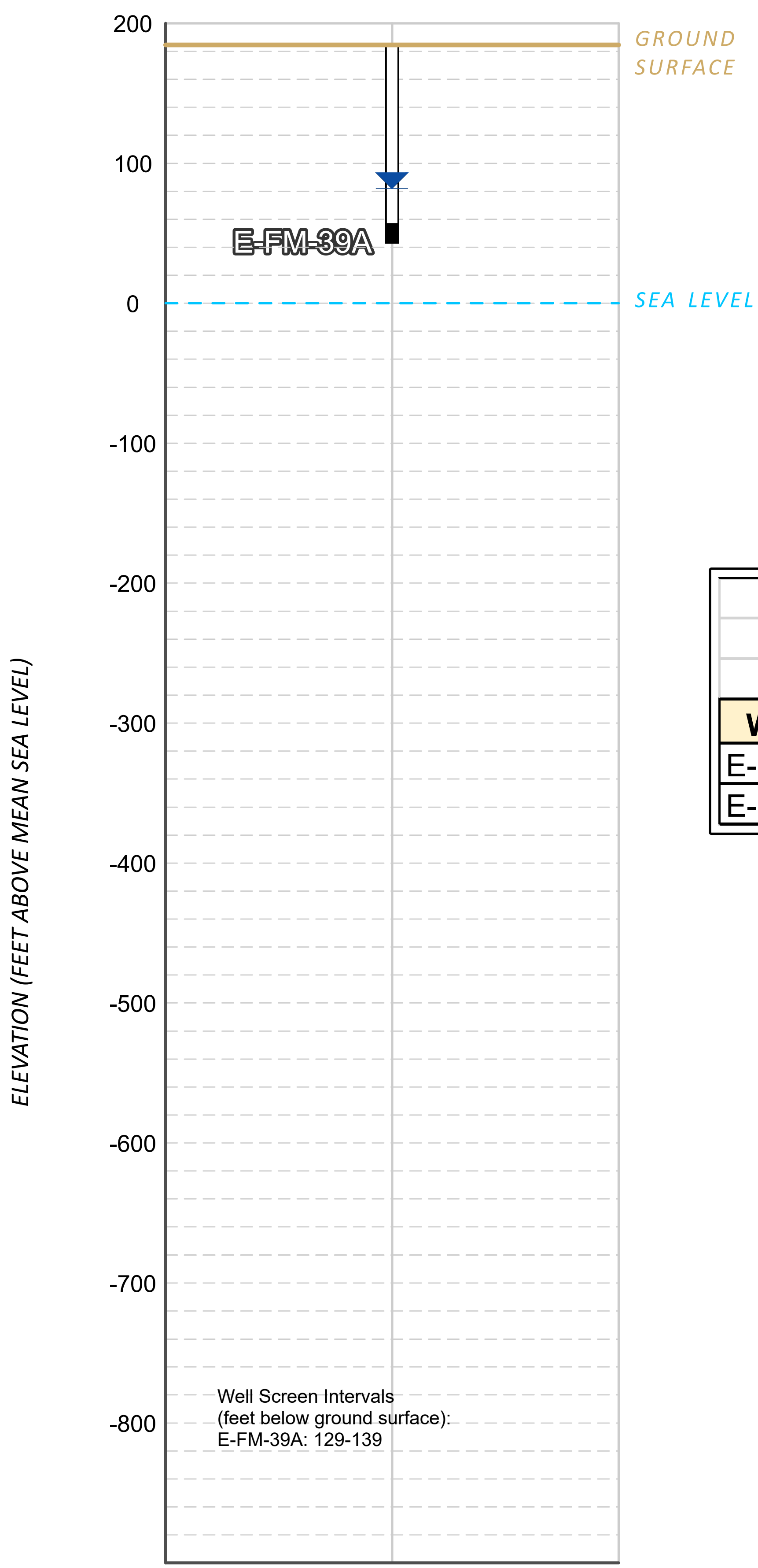


Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 31
E-FM-38 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and 1,1-DCE, 1,4-Dioxane, PCE, and TCE Results

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_ProfileGraph\OCNB_ProfileGraph.aprx | 10/21/2024 | jblock



= Approximate top of water table.
= Well Screen.

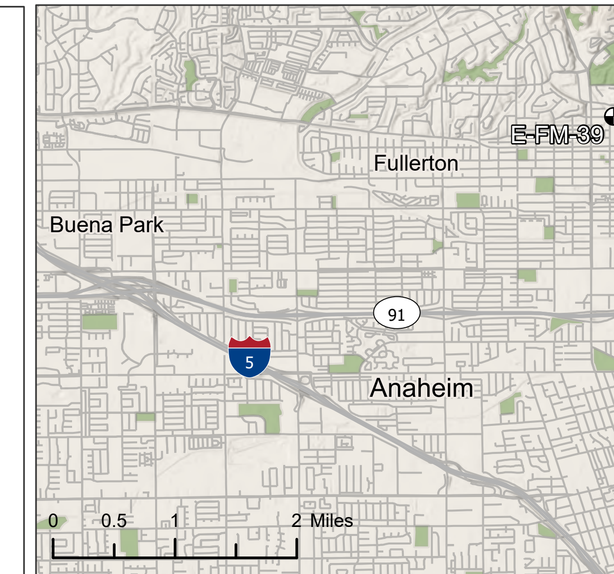
	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-39A	11/7/2023	< 0.50		< 1.0		< 0.50		< 0.50	
E-FM-39A	1/16/2024	< 0.50		< 1.0		< 0.50	UJ	< 0.50	

Results are presented in micrograms per liter (µg/L).

The MCL for 1,1-DCE is 7 µg/L.
The NL for 1,4-dioxane is 1 µg/L.
The MCL for TCE is 5 µg/L.
The MCL for PCE is 5 µg/L.

J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

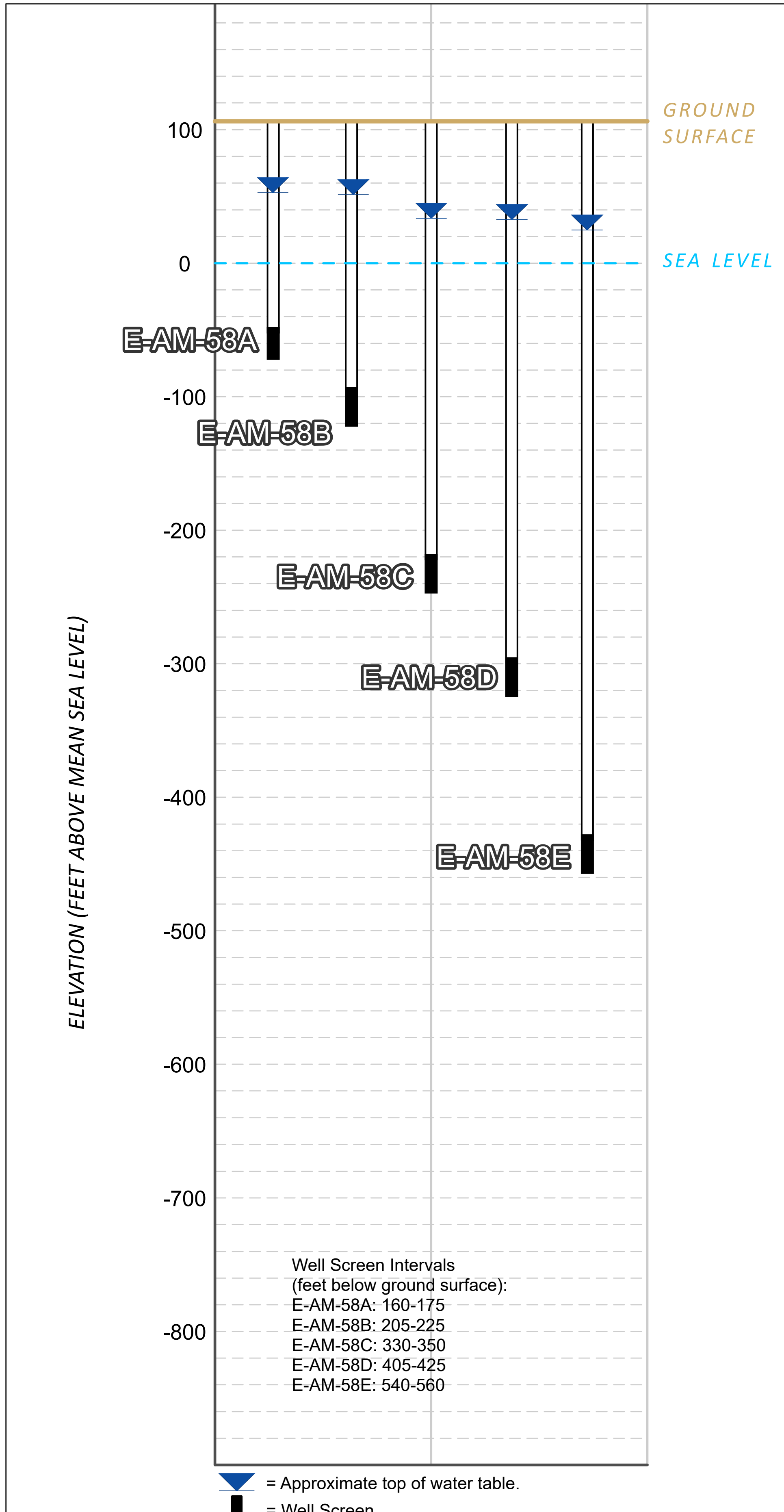
< = The result is non-detect
1,1-DCE = 1,1-dichloroethene
1,4-DIOX = 1,4-dioxane
MCL = EPA Maximum Contaminant Level
NL = California Notification Level
PCE = tetrachloroethene
Q = Data qualifier (unvalidated lab qualifiers)
TCE = trichloroethene
TR = Trace



Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 32
E-FM-39 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and 1,1-DCE, 1,4-Dioxane, PCE, and TCE Results



	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-AM-58A	6/14/2022	1.8		3.0		< 0.050		3.1	
E-AM-58A	6/14/2022	1.5		3.3		< 1.0		2.9	
E-AM-58A	7/20/2022	1.6		4.3		< 0.050		3.0	
E-AM-58A	1/25/2023	1.7		2.4		< 0.50		3.2	
E-AM-58A	7/19/2023	1.9		2.0		< 0.50		3.4	
E-AM-58A	1/2/2024	1.6		1.8		< 0.50		3.3	

	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-AM-58B	6/14/2022	2.9		1.6		1.5		6.2	
E-AM-58B	6/14/2022	2.3		1.6		1.3		5.6	
E-AM-58B	7/20/2022	2.2		2.1		1.2		5.2	
E-AM-58B	1/25/2023	2.6		1.2		1.7		6.3	
E-AM-58B	7/19/2023	3.1		1.6		1.8		5.9	
E-AM-58B	1/2/2024	2.4		1.5		1.8		5.5	

	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-AM-58C	6/14/2022	2.3		1.5		TR		4.7	
E-AM-58C	6/14/2022	1.6		1.4		< 1.0		3.6	
E-AM-58C	7/19/2022	2.3		1.8		TR		4.8	
E-AM-58C	1/26/2023	1.7		1.1		TR		5.1	
E-AM-58C	7/24/2023	2.0		0.90		TR		4.6	
E-AM-58C	1/2/2024	1.8		0.90		TR		4.8	

	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-AM-58D	6/15/2022	2.5		1.6		< 0.050		3.7	
E-AM-58D	6/15/2022	2.1		1.7		0.25	J	4.0	
E-AM-58D	7/19/2022	2.4		2.0		< 0.050		3.7	
E-AM-58D	1/26/2023	2.0		1.4		< 0.50		3.6	
E-AM-58D	7/24/2023	2.3		1.1		< 0.50		3.8	
E-AM-58D	1/3/2024	2.1		1.2		TR		4.2	

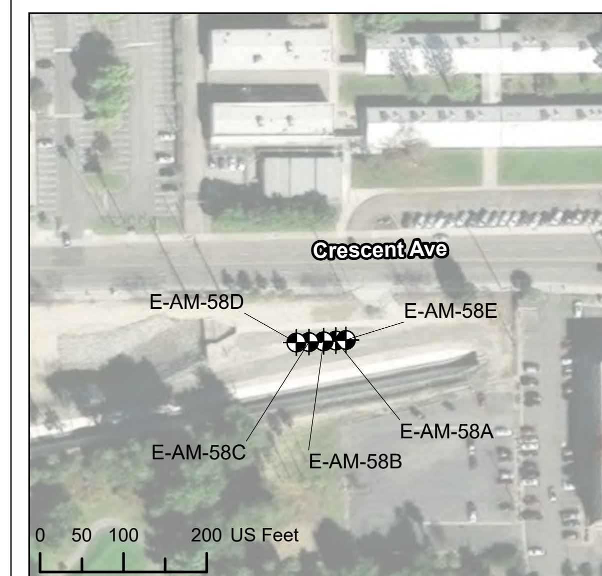
	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-AM-58E	6/15/2022	1.0		0.70		< 0.050		< 0.050	
E-AM-58E	6/15/2022	0.83		< 1.0		< 0.500		< 0.500	
E-AM-58E	7/19/2022	1.0		0.80		< 0.050		< 0.050	
E-AM-58E	1/26/2023	1.0		0.70		< 0.50		< 0.50	
E-AM-58E	7/24/2023	0.90		0.50		< 0.50		< 0.50	
E-AM-58E	1/3/2024	1.1		0.60		< 0.50		< 0.50	

Results are presented in micrograms per liter (µg/L).

The MCL for 1,1-DCE is 7 µg/L.
The NL for 1,4-dioxane is 1 µg/L.
The MCL for TCE is 5 µg/L.
The MCL for PCE is 5 µg/L.

J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

< = The result is non-detect
1,1-DCE = 1,1-dichloroethene
1,4-DIOX = 1,4-dioxane
MCL = EPA Maximum Contaminant Level
NL = California Notification Level
PCE = tetrachloroethene
Q = Data qualifier (unvalidated lab qualifiers)
TCE = trichloroethene
TR = Trace

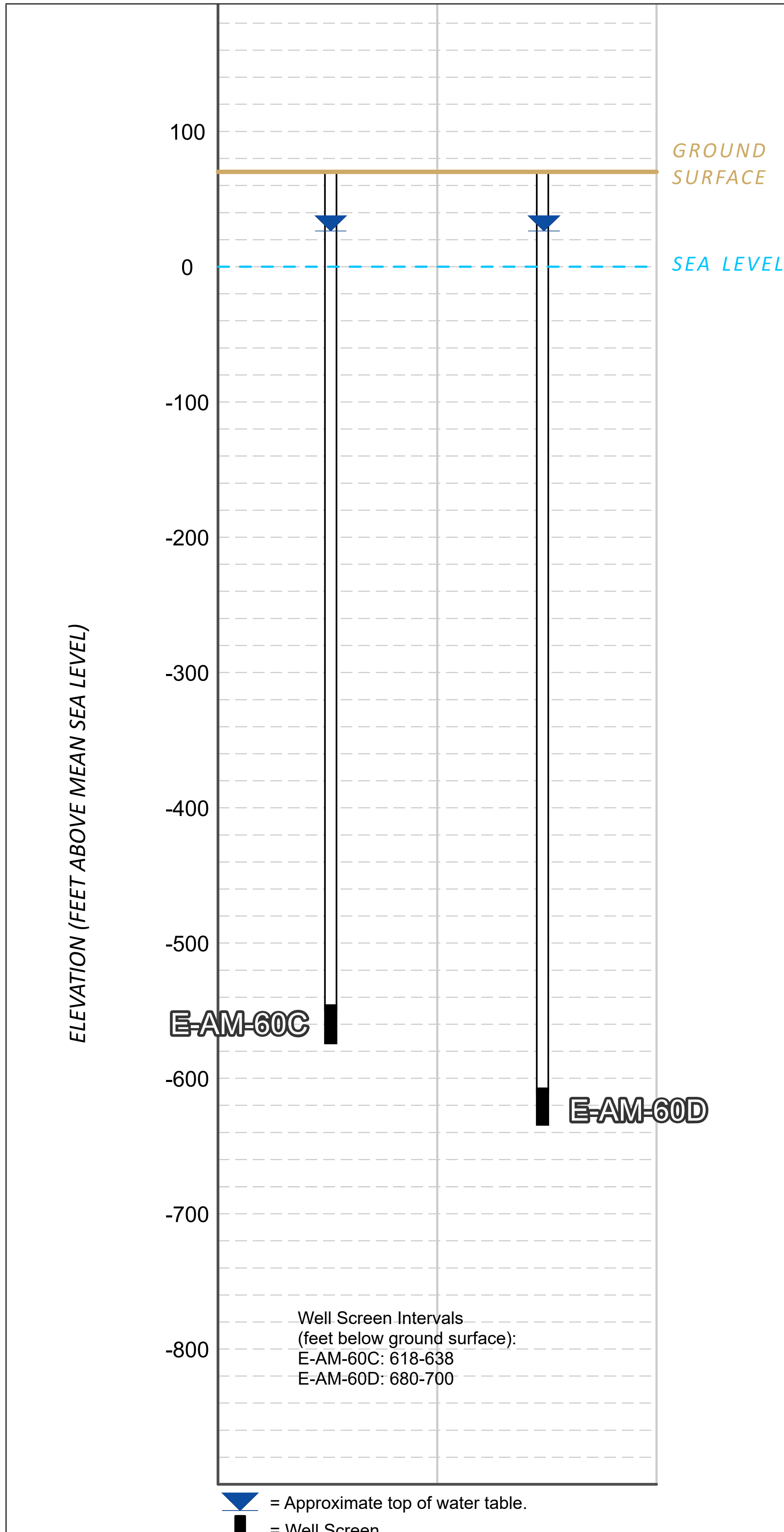


Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 33
E-AM-58 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and 1,1-DCE, 1,4-Dioxane, PCE, and TCE Results

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_ProfileGraph\OCNB_ProfileGraph.aprx | 10/21/2024 | jblock



	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-AM-60C	3/14/2024	< 0.50		< 1.0		< 0.50		< 0.50	

	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-AM-60D	3/14/2024	< 0.50		< 1.0		< 0.50		< 0.50	

Results are presented in micrograms per liter (µg/L).

The MCL for 1,1-DCE is 7 µg/L.
The NL for 1,4-dioxane is 1 µg/L.
The MCL for TCE is 5 µg/L.
The MCL for PCE is 5 µg/L.

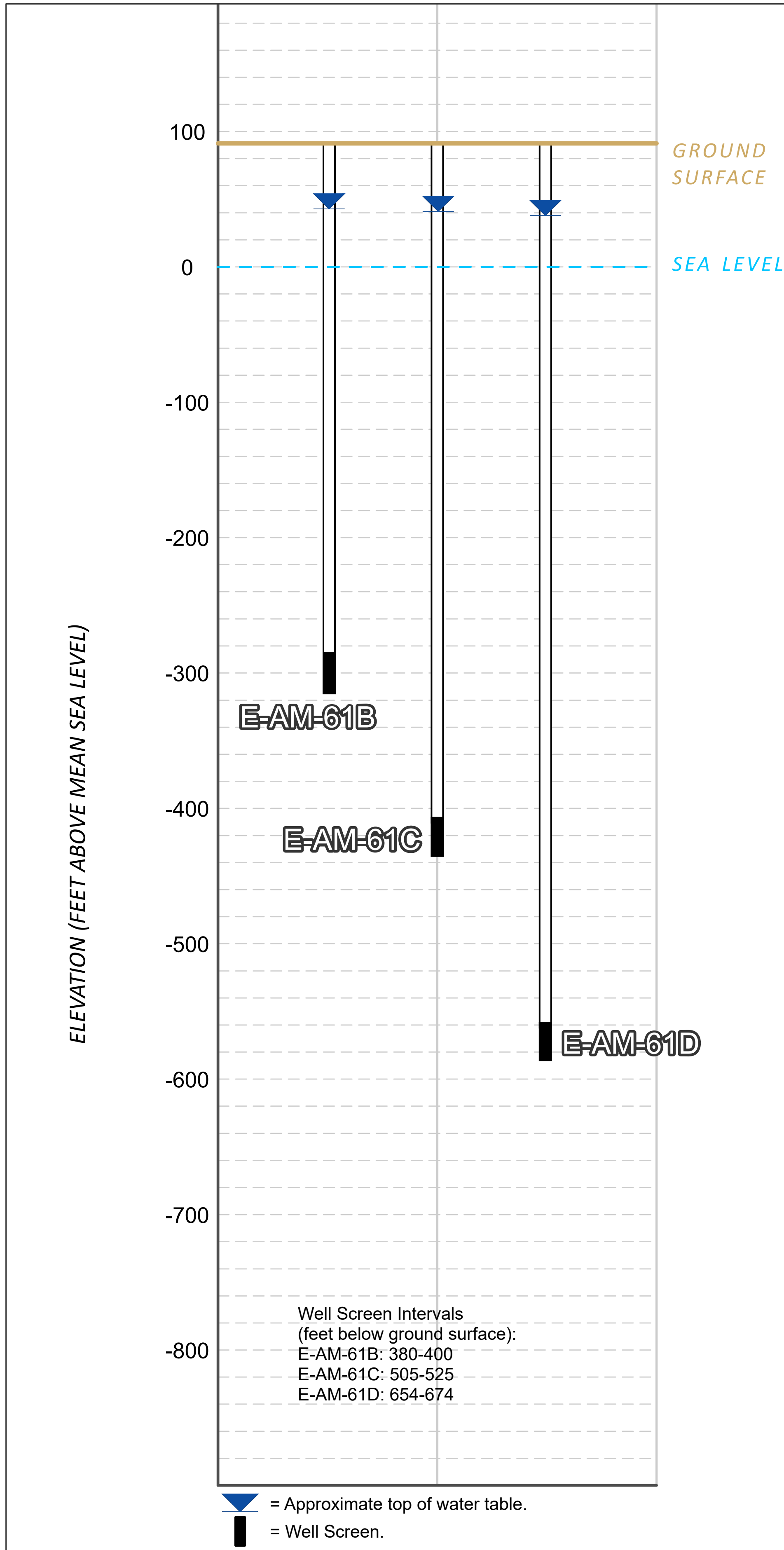
J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

< = The result is non-detect
1,1-DCE = 1,1-dichloroethene
1,4-DIOX = 1,4-dioxane
MCL = EPA Maximum Contaminant Level
NL = California Notification Level
PCE = tetrachloroethene
Q = Data qualifier (unvalidated lab qualifiers)
TCE = trichloroethene
TR = Trace

Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 34
E-AM-60 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and 1,1-DCE, 1,4-Dioxane, PCE, and TCE Results



	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-AM-61B	3/12/2024	< 0.50		< 1.0		< 0.50		< 0.50	

	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-AM-61C	3/12/2024	1.4		0.82	J	< 0.50		0.23	J

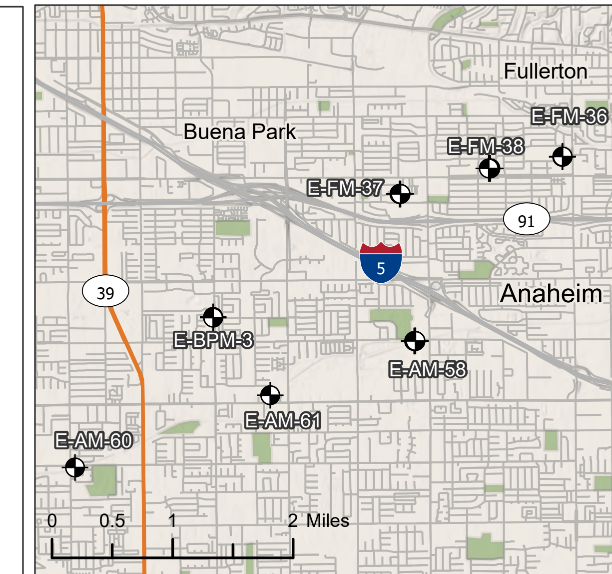
	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-AM-61D	3/12/2024	< 0.50		< 1.0		< 0.50		< 0.50	

Results are presented in micrograms per liter (µg/L).

The MCL for 1,1-DCE is 7 µg/L.
The NL for 1,4-dioxane is 1 µg/L.
The MCL for TCE is 5 µg/L.
The MCL for PCE is 5 µg/L.

J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

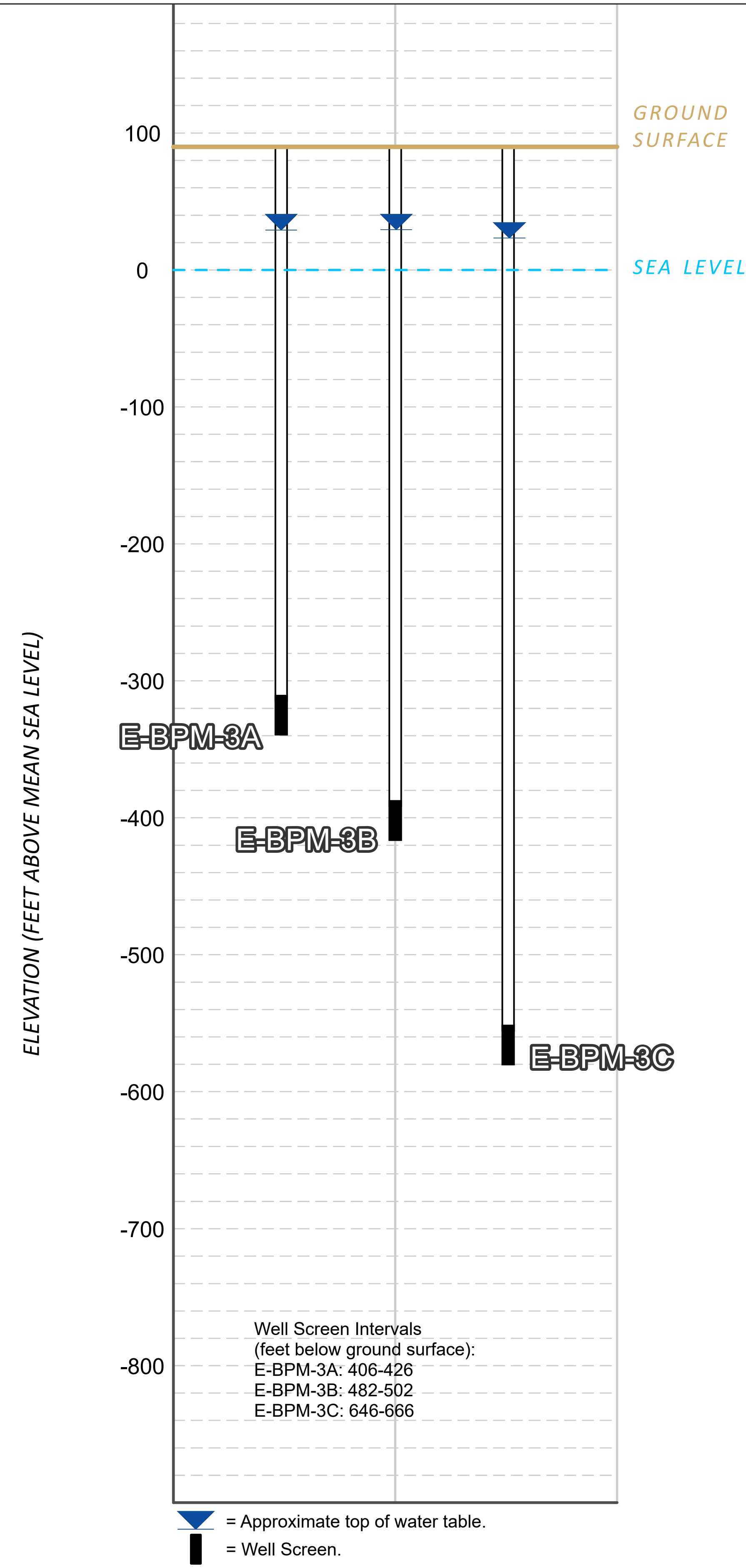
< = The result is non-detect
1,1-DCE = 1,1-dichloroethene
1,4-DIOX = 1,4-dioxane
MCL = EPA Maximum Contaminant Level
NL = California Notification Level
PCE = tetrachloroethene
Q = Data qualifier (unvalidated lab qualifiers)
TCE = trichloroethene
TR = Trace



Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 35
E-AM-61 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and 1,1-DCE, 1,4-Dioxane, PCE, and TCE Results



	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-BPM-3A	9/13/2023	< 0.50		< 1.0		< 0.50		< 0.50	

	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-BPM-3B	9/13/2023	4.5		1.8		< 0.50		TR	
E-BPM-3B	9/13/2023	3.2		1.6		< 0.50		0.35	J

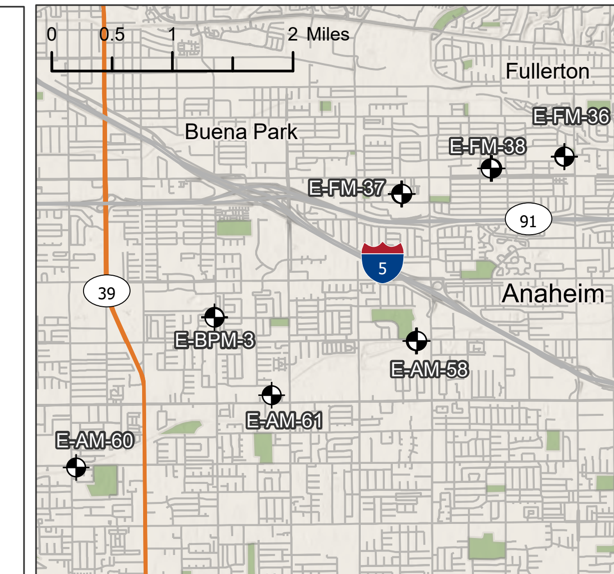
	Analyte	1,1-DCE		1,4-DIOX		PCE		TCE	
	Unit	µg/L		µg/L		µg/L		µg/L	
	Screening Level	7.0		1.0		5.0		5.0	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-BPM-3C	9/13/2023	< 0.50		< 1.0		< 0.50		< 0.50	

Results are presented in micrograms per liter (µg/L).

The MCL for 1,1-DCE is 7 µg/L.
The NL for 1,4-dioxane is 1 µg/L.
The MCL for TCE is 5 µg/L.
The MCL for PCE is 5 µg/L.

J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

< = The result is non-detect
1,1-DCE = 1,1-dichloroethene
1,4-DIOX = 1,4-dioxane
MCL = EPA Maximum Contaminant Level
NL = California Notification Level
PCE = tetrachloroethene
Q = Data qualifier (unvalidated lab qualifiers)
TCE = trichloroethene
TR = Trace

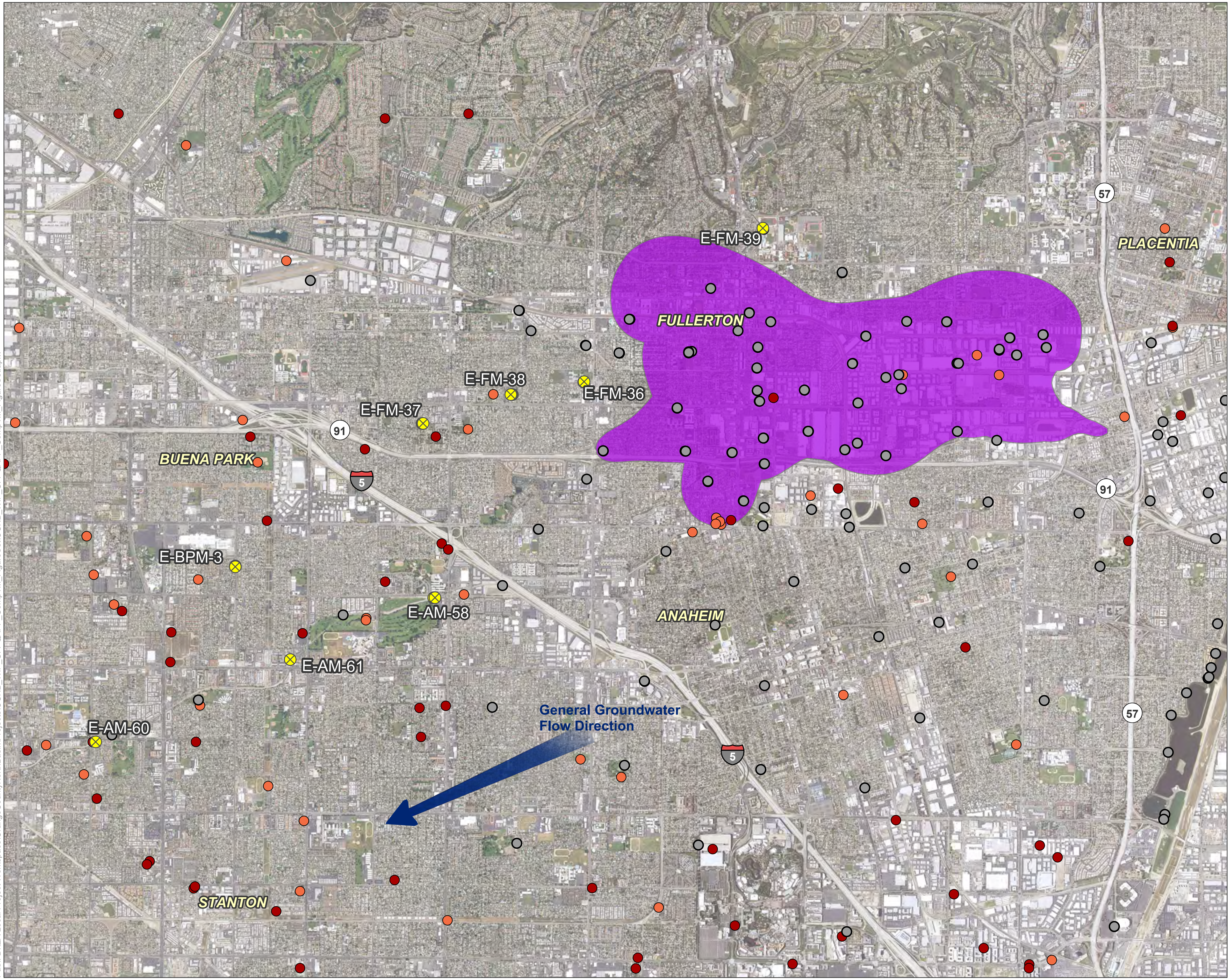


Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 36
E-BPM-3 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and 1,1-DCE, 1,4-Dioxane, PCE, and TCE Results

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_ProfileGraph\OCNB_ProfileGraph.aprx | 10/21/2024 | jblock



- Tetrachloroethene Plume Boundary (>50% Confidence)
- EPA Monitoring Well
- Monitoring Well
- Production Well (Active)
- Production Well (Inactive)

*The plume is constructed from interpolated concentrations of tetrachloroethene recorded at each monitoring location between 2019 and first quarter of 2024.

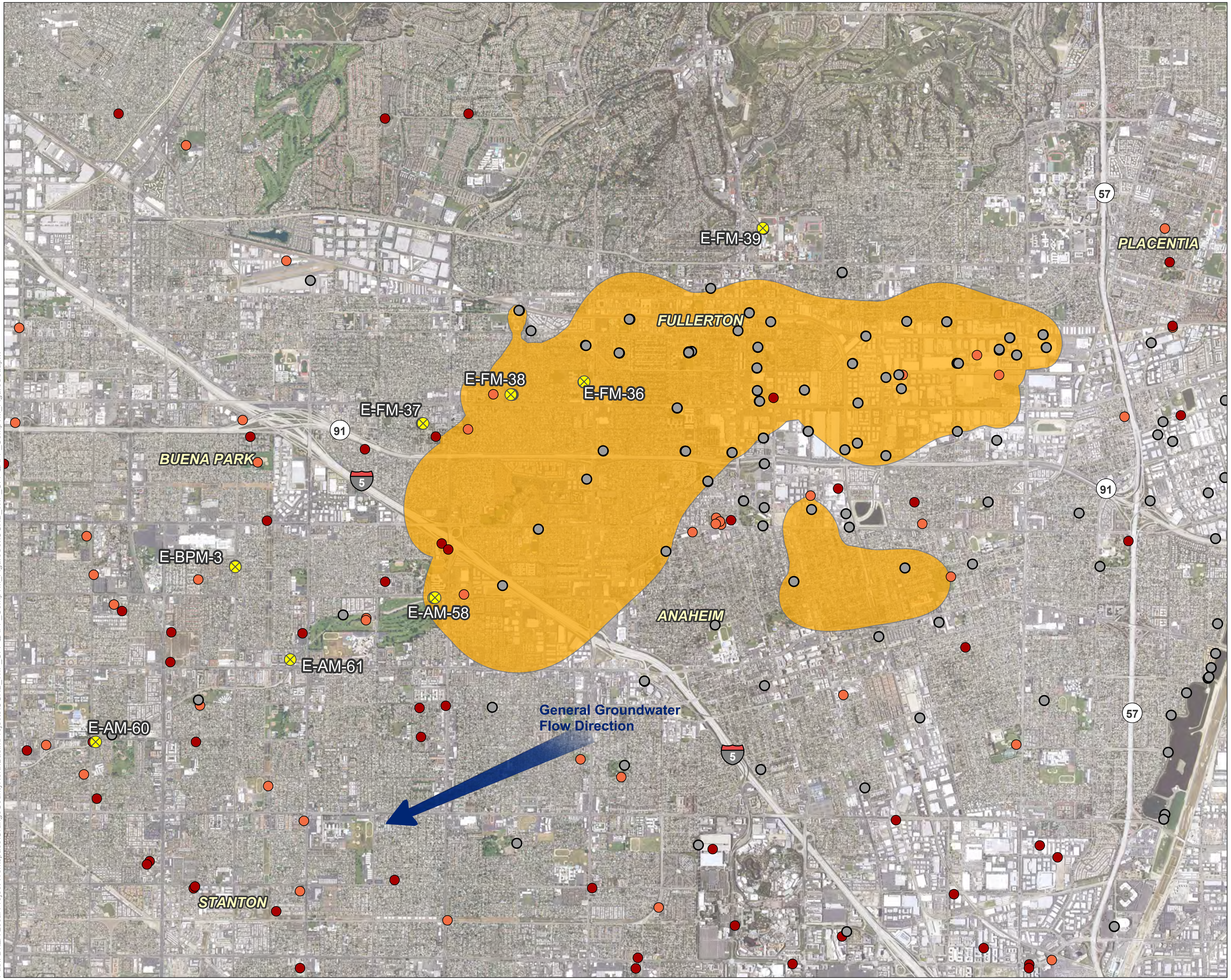
0 0.5 1 2

Miles

Map Date: 9/17/2024 *Data Sources: ESRI, USDA*

Orange County North Basin Superfund Site
Orange County, California

Figure 37
Approximate Extent of Contamination (2024): Tetrachloroethene



Trichloroethene Plume Boundary (>50% Confidence)

EPA Monitoring Well

Monitoring Well

Production Well (Active)

Production Well (Inactive)

*The plume is constructed from interpolated concentration of trichloroethene recorded at each monitoring location between 2019 and first quarter of 2024.

0 0.5 1 2

Miles

Map Date: 9/17/2024

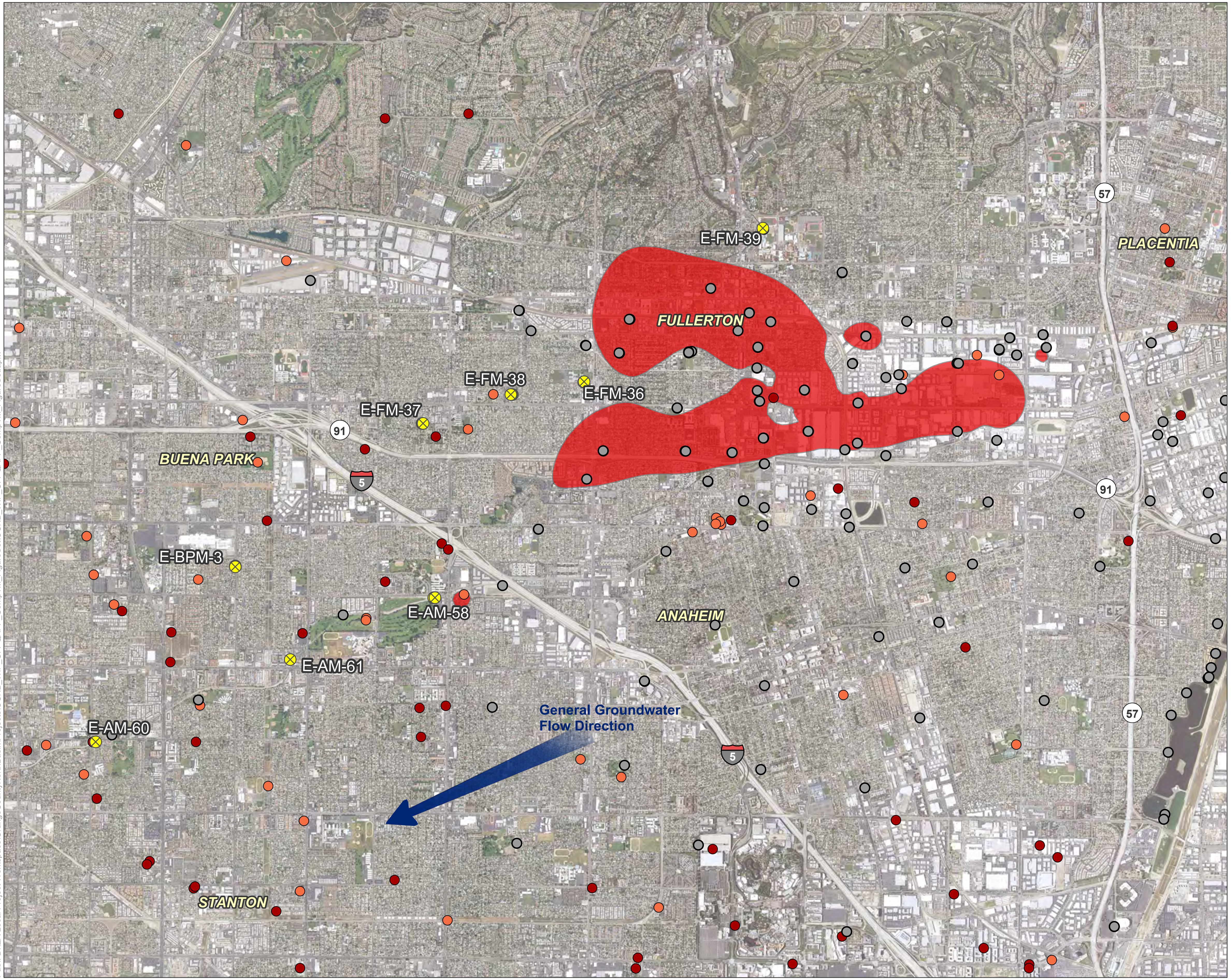
Data Sources: ESRI, USDA

Orange County North Basin Superfund Site

Orange County, California

Figure 38

Approximate Extent of Contamination (2024): Trichloroethene



1,1-Dichloroethene Plume Boundary (>50% Confidence)
EPA Monitoring Well
Monitoring Well
Production Well (Active)
Production Well (Inactive)

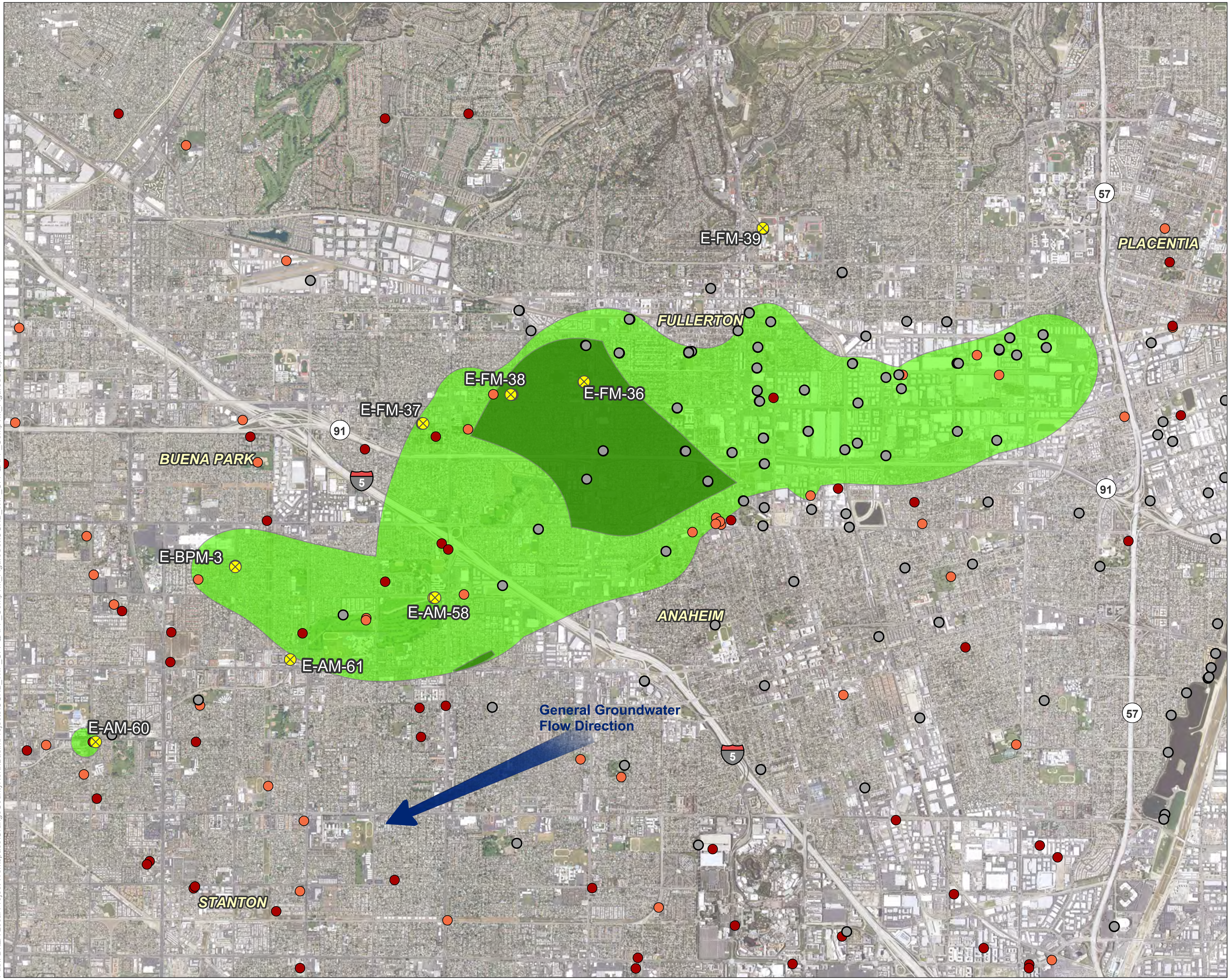
*The plume is constructed from interpolated concentration of 1,1-dichloroethene recorded at each monitoring location between 2019 and first quarter of 2024.

0 0.5 1 2
Miles

Map Date: 9/17/2024 *Data Sources: ESRI, USDA*

Orange County North Basin Superfund Site
Orange County, California

Figure 39
Approximate Extent of Contamination (2024): 1,1-Dichloroethene



- 1,4-Dioxane Plume Boundary (>50% Confidence)
- 1,4-Dioxane Plume Boundary (<50% Confidence)
- EPA Monitoring Well
- Monitoring Well
- Production Well (Active)
- Production Well (Inactive)

*The plume is constructed from interpolated concentration of 1,4-dioxane recorded at each monitoring location between 2019 and first quarter of 2024.

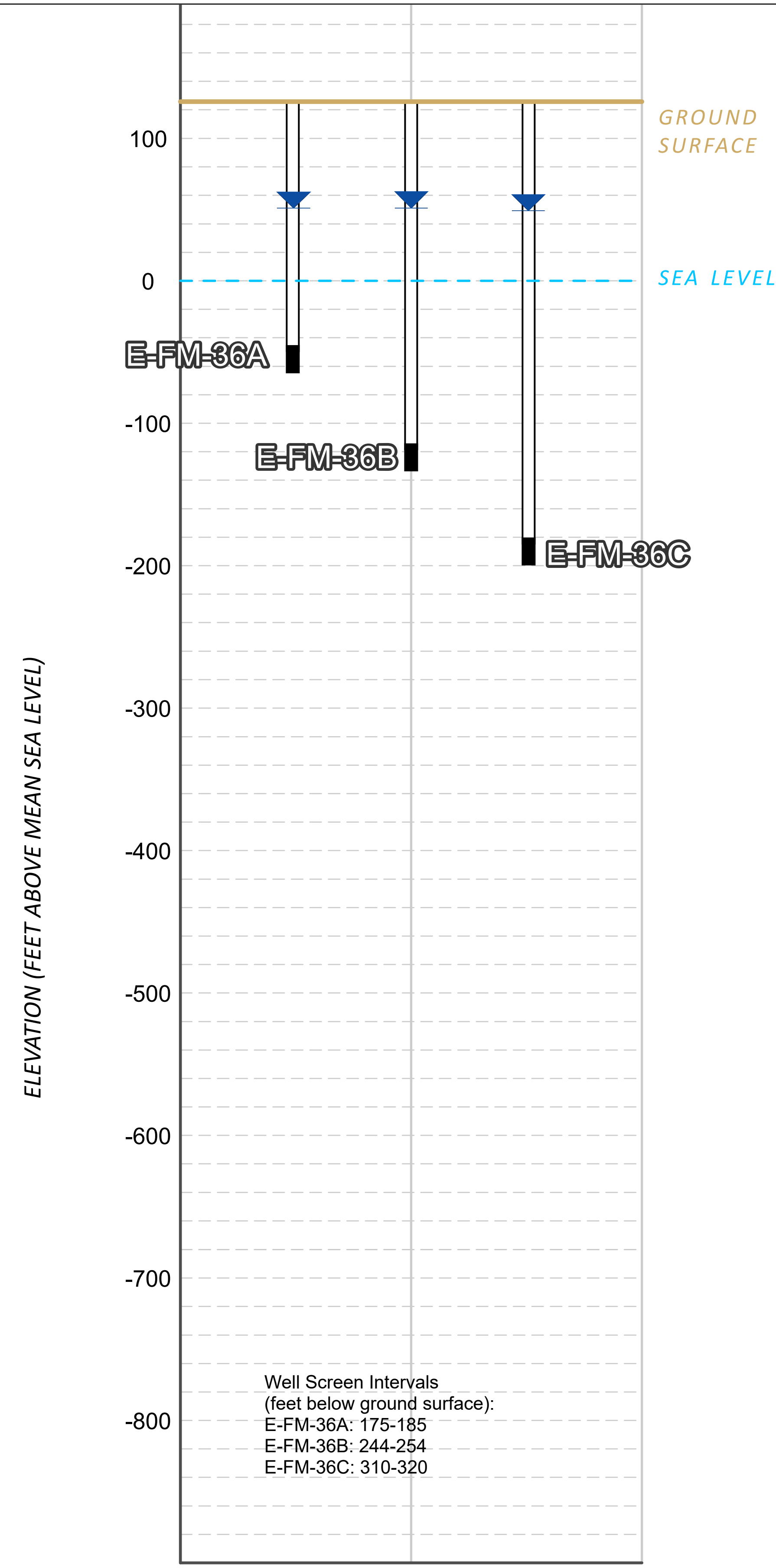
0 0.5 1 2

Miles

Map Date: 9/17/2024 *Data Sources: ESRI, USDA*

Orange County North Basin Superfund Site
Orange County, California

Figure 40
Approximate Extent of Contamination (2024): 1,4-Dioxane



= Approximate top of water table.

= Well Screen.

	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-36A	11/17/2021	5.8		--		--		--		--	
E-FM-36A	11/17/2021	5.2		4.2		5.4		< 1.7		7.8	
E-FM-36A	7/11/2022	5.5		--		--		--		--	
E-FM-36A	1/12/2023	4.7		--		--		--		--	
E-FM-36A	7/12/2023	4.7		--		--		--		--	
E-FM-36A	1/8/2024	5.1		--		--		--		--	

	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-36B	11/17/2021	12.4		--		--		--		--	
E-FM-36B	11/17/2021	12		1.2	J	1.7	J	< 1.8		3.7	
E-FM-36B	7/11/2022	11.9		--		--		--		--	
E-FM-36B	1/12/2023	9.7		--		--		--		--	
E-FM-36B	7/12/2023	11.4		--		--		--		--	
E-FM-36B	1/8/2024	11.8		--		--		--		--	

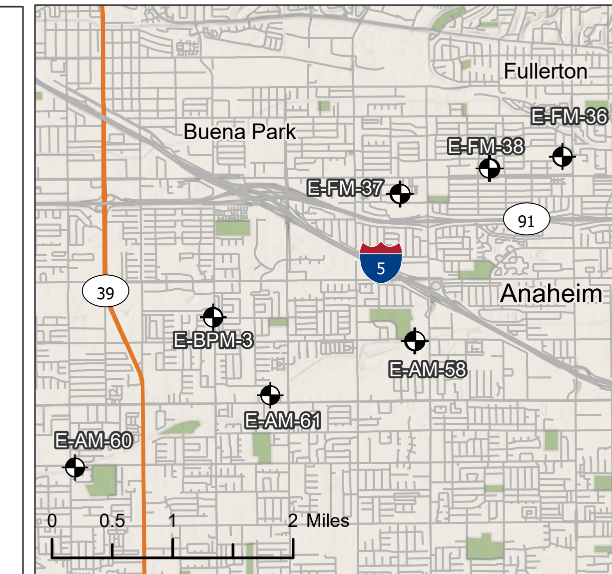
	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-36C	11/17/2021	7.6		--		--		--		--	
E-FM-36C	11/17/2021	7.0		< 1.9		< 1.9		< 1.9		< 1.9	
E-FM-36C	7/11/2022	7.6		--		--		--		--	
E-FM-36C	1/12/2023	8.0		--		--		--		--	
E-FM-36C	7/12/2023	7.9		--		--		--		--	
E-FM-36C	1/8/2024	8.8		--		--		--		--	

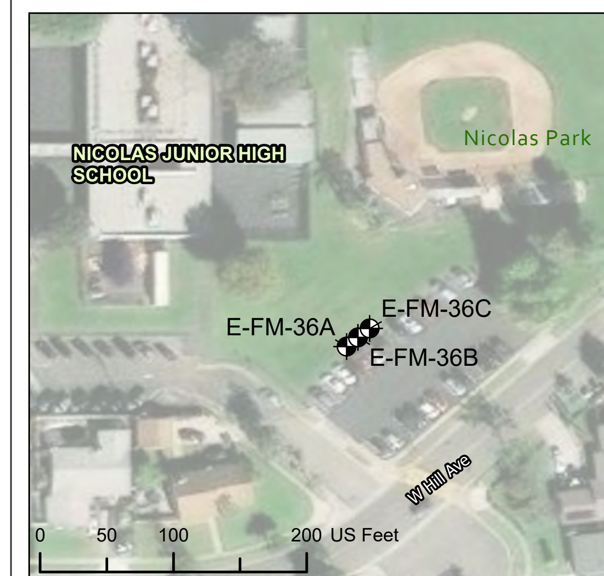
J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

Perchlorate results are presented in micrograms per liter (µg/L).
Per- and Polyfluoroalkyl results are presented in nanograms per liter (ng/L).

The California MCL for perchlorate is 6 µg/L.
The EPA MCL for PFOA is 4.0 ng/L.
The EPA MCL for PFOS is 4.0 ng/L.
The EPA MCL for PFNA is 10 ng/L.
The EPA MCL for PFHxS is 10 ng/L.

-- = The analyte was not requested.
< = The result is non-detect.
MCL = Maximum Contaminant Level
PFNA = Perfluorononanoic acid
PFHxS = Perfluorohexanesulfonic acid
PFOA = Perfluorooctanoic acid
PFOS = Perfluorooctanesulfonic acid
Q = Data qualifier (unvalidated lab qualifiers)



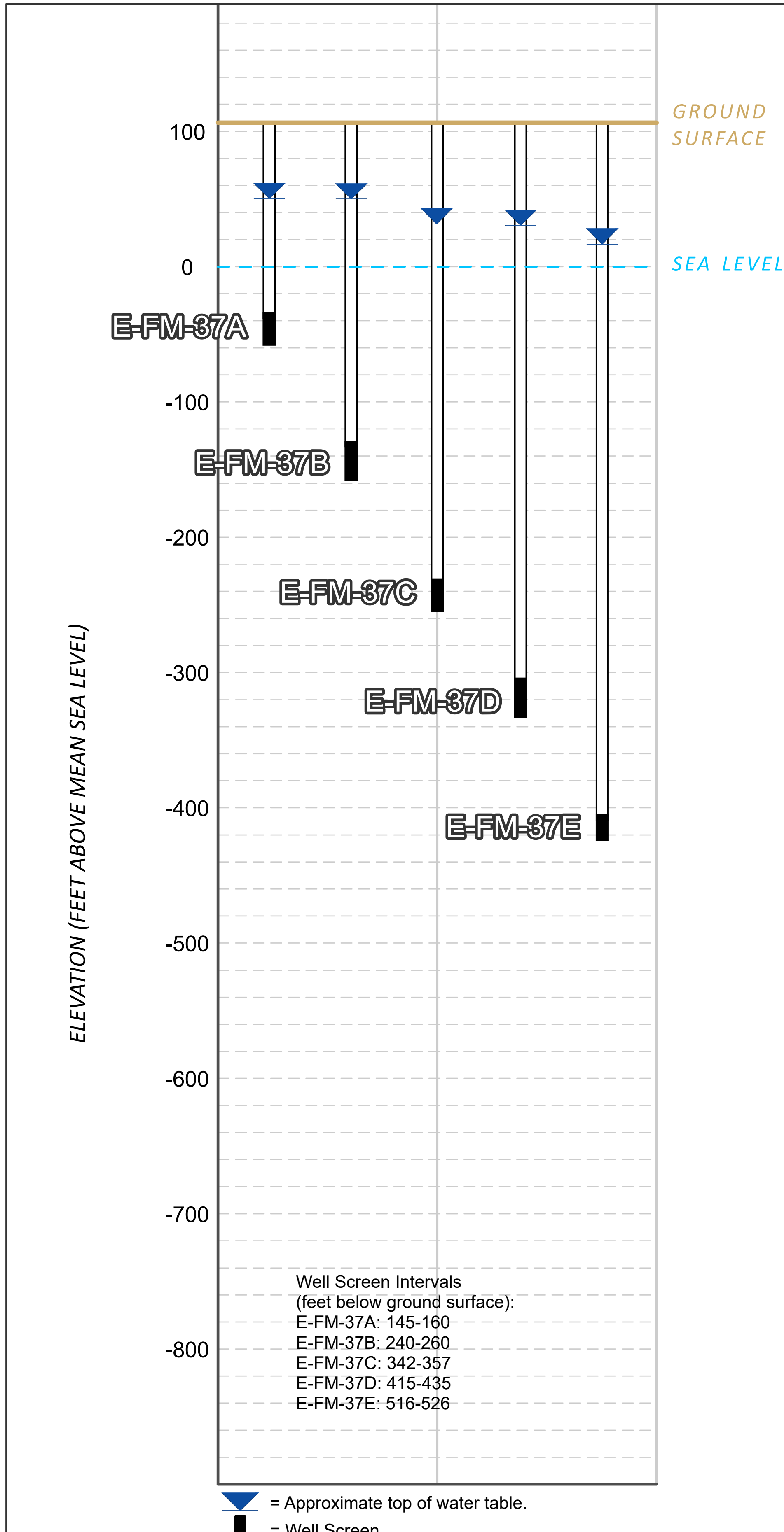


Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 41
E-FM-36 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and Perchlorate, PFOA, PFOS, PFNA, and PFHxS Results

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_ProfileGraph\OCNB_ProfileGraph.aprx | 10/21/2024 | jblock



	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
E-FM-37A	11/15/2021	5.4		--		--		--		--	
E-FM-37A	11/15/2021	5.1		< 1.9		< 1.9		< 1.9		< 1.9	
E-FM-37A	7/21/2022	5.0		--		--		--		--	
E-FM-37A	1/25/2023	5.4		--		--		--		--	
E-FM-37A	7/19/2023	5.2		--		--		--		--	
E-FM-37A	1/10/2024	5.9		--		--		--		--	

	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
E-FM-37B	11/15/2021	7.5		--		--		--		--	
E-FM-37B	11/15/2021	7.1		< 1.7		< 1.7		< 1.7		< 1.7	
E-FM-37B	7/21/2022	6.3		--		--		--		--	
E-FM-37B	1/25/2023	6.6		--		--		--		--	
E-FM-37B	7/19/2023	6.6		--		--		--		--	
E-FM-37B	1/10/2024	7.6		--		--		--		--	

	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
E-FM-37C	11/15/2021	3.4		--		--		--		--	
E-FM-37C	11/15/2021	3.4		3.7		5.8		< 1.7		7.0	
E-FM-37C	7/21/2022	3.0		--		--		--		--	
E-FM-37C	1/23/2023	2.6		--		--		--		--	
E-FM-37C	7/17/2023	3.4		--		--		--		--	
E-FM-37C	1/10/2024	3.4		--		--		--		--	

	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
E-FM-37D	11/15/2021	6.0		--		--		--		--	
E-FM-37D	11/15/2021	5.6		< 1.8		1.8		< 1.8		3.5	
E-FM-37D	7/20/2022	5.4		--		--		--		--	
E-FM-37D	1/23/2023	5.2		--		--		--		--	
E-FM-37D	7/17/2023	6.2		--		--		--		--	
E-FM-37D	1/11/2024	4.7		--		--		--		--	

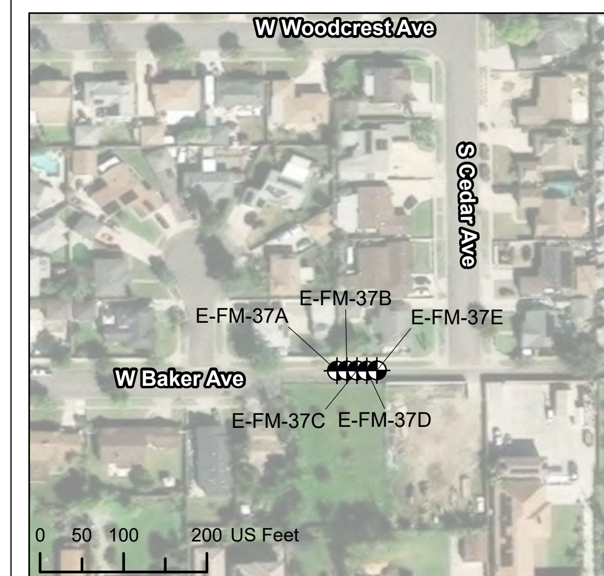
	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
E-FM-37E	11/15/2021	2.3		--		--		--		--	
E-FM-37E	11/15/2021	2.0		< 1.8		0.87	J	< 1.8		1.5	J
E-FM-37E	7/20/2022	2.5		--		--		--		--	
E-FM-37E	1/23/2023	< 2.0		--		--		--		--	
E-FM-37E	7/17/2023	3.4		--		--		--		--	
E-FM-37E	1/11/2024	3.4		--		--		--		--	

J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

Perchlorate results are presented in micrograms per liter (µg/L).
Per- and Polyfluoroalkyl results are presented in nanograms per liter (ng/L).

The California MCL for perchlorate is 6 µg/L.
The EPA MCL for PFOA is 4.0 ng/L.
The EPA MCL for PFOS is 4.0 ng/L.
The EPA MCL for PFNA is 10 ng/L.
The EPA MCL for PFHxS is 10 ng/L.

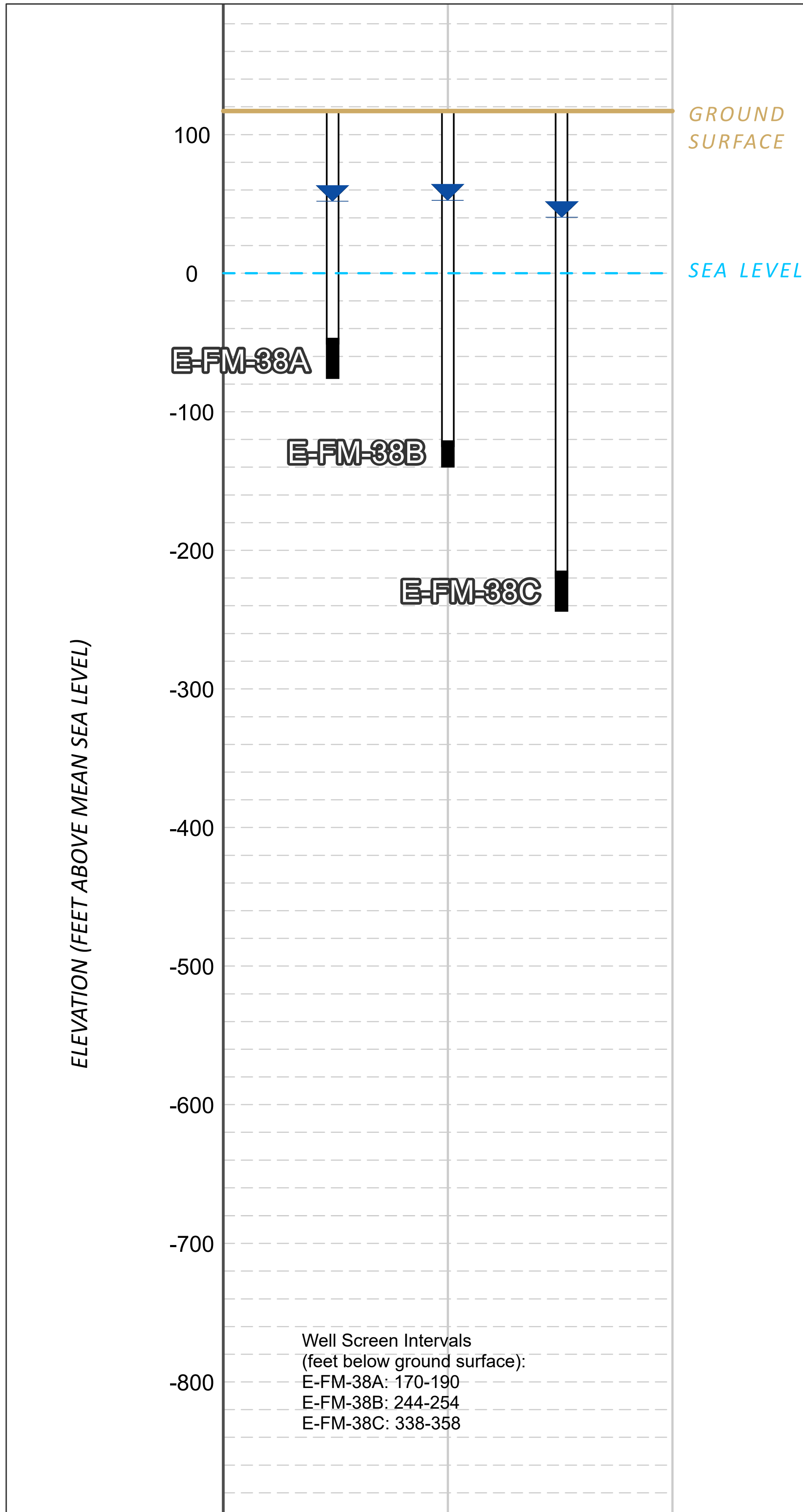
-- = The analyte was not requested.
< = The result is non-detect.
MCL = Maximum Contaminant Level
PFNA = Perfluorononanoic acid
PFHxS = Perfluorohexanesulfonic acid
PFOA = Perfluorooctanoic acid
PFOS = Perfluorooctanesulfonic acid
Q = Data qualifier (unvalidated lab qualifiers)



Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 42
E-FM-37 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and Perchlorate, PFOA, PFOS, PFNA, and PFHxS Results



= Approximate top of water table.
= Well Screen.

	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-38A	11/16/2021	6.6		--		--		--		--	
E-FM-38A	11/16/2021	6.4		< 1.8		< 1.8		< 1.8		3.3	
E-FM-38A	7/13/2022	6.0		--		--		--		--	
E-FM-38A	1/17/2023	5.4		--		--		--		--	
E-FM-38A	7/13/2023	6.6		--		--		--		--	
E-FM-38A	1/15/2024	6.7		--		--		--		--	

	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-38B	11/16/2021	8.5		--		--		--		--	
E-FM-38B	11/16/2021	7.8		< 1.7		< 1.7		< 1.7		2.1	
E-FM-38B	7/13/2022	8.1		--		--		--		--	
E-FM-38B	1/17/2023	6.5		--		--		--		--	
E-FM-38B	7/13/2023	7.0		--		--		--		--	
E-FM-38B	1/15/2024	7.5		--		--		--		--	

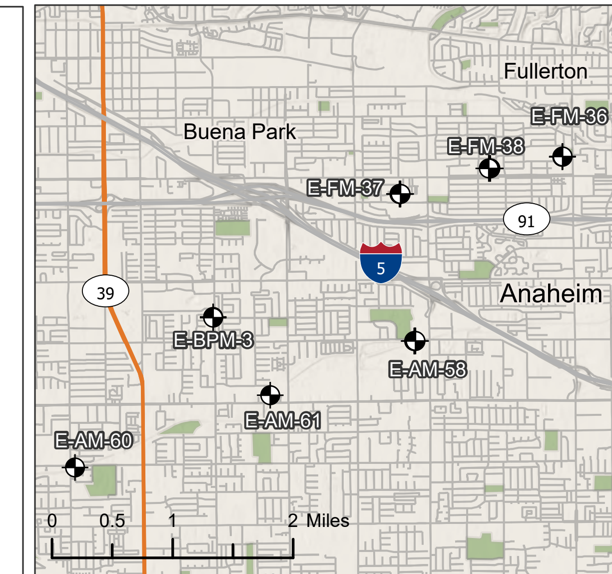
	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-38C	11/16/2021	3.7		--		--		--		--	
E-FM-38C	11/16/2021	3.1		5.3		9.5		< 1.7		8.9	
E-FM-38C	7/13/2022	3.3		--		--		--		--	
E-FM-38C	1/17/2023	2.6		--		--		--		--	
E-FM-38C	7/13/2023	3.0		--		--		--		--	
E-FM-38C	1/15/2024	3.3		--		--		--		--	

J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

Perchlorate results are presented in micrograms per liter (µg/L).
Per- and Polyfluoroalkyl results are presented in nanograms per liter (ng/L).

The California MCL for perchlorate is 6 µg/L.
The EPA MCL for PFOA is 4.0 ng/L.
The EPA MCL for PFOS is 4.0 ng/L.
The EPA MCL for PFNA is 10 ng/L.
The EPA MCL for PFHxS is 10 ng/L.

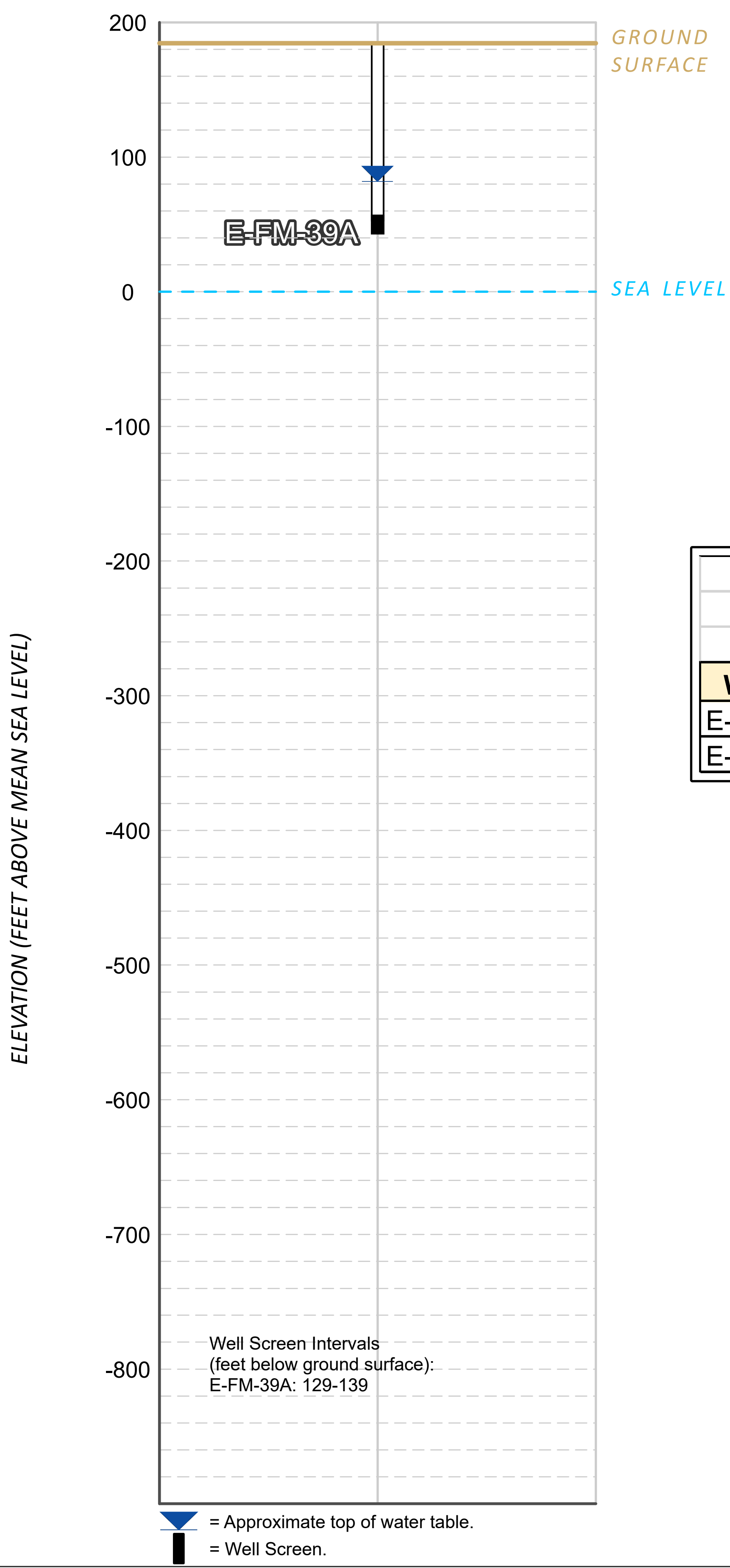
-- = The analyte was not requested.
< = The result is non-detect.
MCL = Maximum Contaminant Level
PFNA = Perfluorononanoic acid
PFHxS = Perfluorohexanesulfonic acid
PFOA = Perfluorooctanoic acid
PFOS = Perfluorooctanesulfonic acid
Q = Data qualifier (unvalidated lab qualifiers)



Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 43
E-FM-38 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and Perchlorate, PFOA, PFOS, PFNA, and PFHxS Results



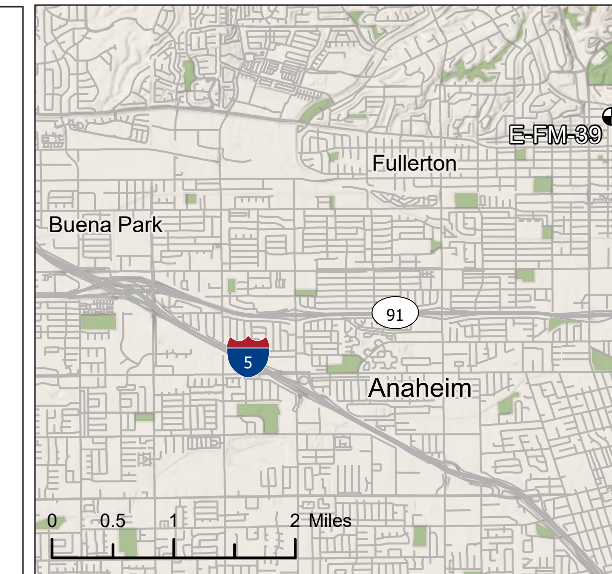
	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-FM-39A	11/7/2023	13		< 1.7		< 1.7		< 1.7		0.50	J
E-FM-39A	1/16/2024	12		< 1.9		< 1.9		< 1.9		< 1.9	

J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

Perchlorate results are presented in micrograms per liter (µg/L).
Per- and Polyfluoroalkyl results are presented in nanograms per liter (ng/L).

The California MCL for perchlorate is 6 µg/L.
The EPA MCL for PFOA is 4.0 ng/L.
The EPA MCL for PFOS is 4.0 ng/L.
The EPA MCL for PFNA is 10 ng/L.
The EPA MCL for PFHxS is 10 ng/L.

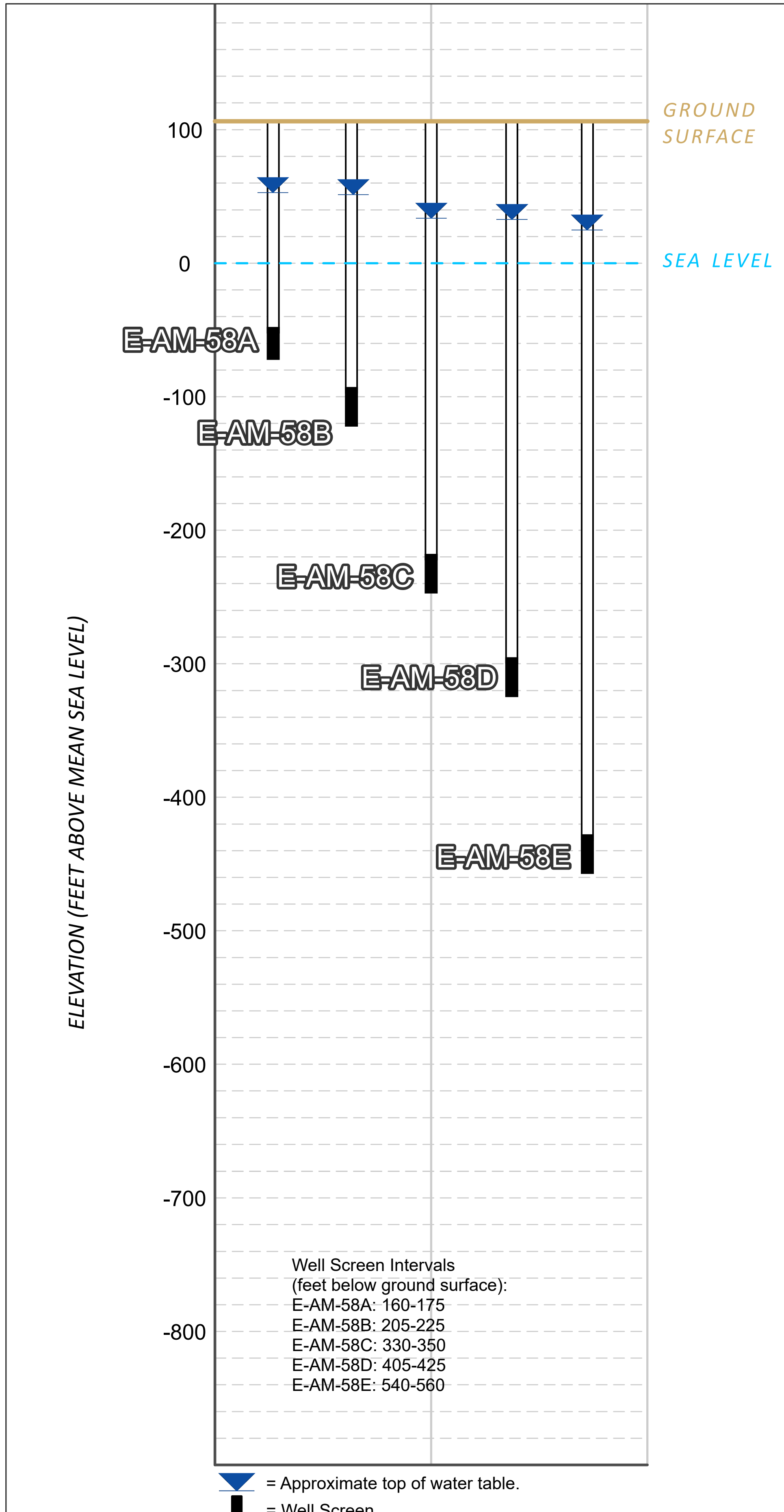
-- = The analyte was not requested.
< = The result is non-detect.
MCL = Maximum Contaminant Level
PFNA = Perfluorononanoic acid
PFHxS = Perfluorohexanesulfonic acid
PFOA = Perfluorooctanoic acid
PFOS = Perfluorooctanesulfonic acid
Q = Data qualifier (unvalidated lab qualifiers)



Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 44
E-FM-39 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and Perchlorate, PFOA, PFOS, PFNA, and PFHxS Results



	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
E-AM-58A	6/14/2022	< 2.0		--		--		--		--	
E-AM-58A	6/14/2022	0.51		11		9.4		< 2.0		14	
E-AM-58A	7/20/2022	< 2.0		--		--		--		--	
E-AM-58A	1/25/2023	< 2.0		--		--		--		--	
E-AM-58A	7/19/2023	< 2.0		--		--		--		--	
E-AM-58A	1/2/2024	<1.0		--		--		--		--	

	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
E-AM-58B	6/14/2022	4.0		--		--		--		--	
E-AM-58B	6/14/2022	3.9		4.3		7.4		< 1.9		11	
E-AM-58B	7/20/2022	3.7		--		--		--		--	
E-AM-58B	1/25/2023	3.5		--		--		--		--	
E-AM-58B	7/19/2023	3.1		--		--		--		--	
E-AM-58B	1/2/2024	4.0		--		--		--		--	

	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
E-AM-58C	6/14/2022	3.0		--		--		--		--	
E-AM-58C	6/14/2022	3.0		9.0		9.9		0.31	J	15	
E-AM-58C	7/19/2022	2.8		--		--		--		--	
E-AM-58C	1/26/2023	2.4		--		--		--		--	
E-AM-58C	7/24/2023	2.6		--		--		--		--	
E-AM-58C	1/2/2024	2.9		--		--		--		--	

	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
E-AM-58D	6/15/2022	3.3		--		--		--		--	
E-AM-58D	6/15/2022	3.1		8.4		9.5		0.34	J	14	
E-AM-58D	7/19/2022	2.9		--		--		--		--	
E-AM-58D	1/26/2023	2.6		--		--		--		--	
E-AM-58D	7/24/2023	2.7		--		--		--		--	
E-AM-58D	1/3/2024	2.8		--		--		--		--	

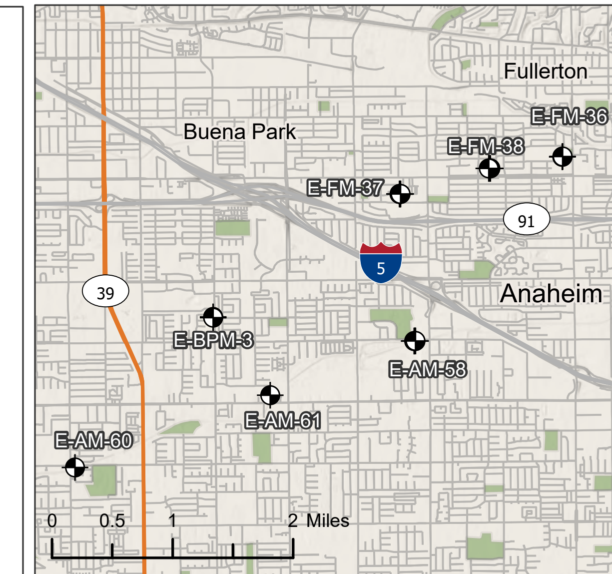
	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
E-AM-58E	6/15/2022	5.0		--		--		--		--	
E-AM-58E	6/15/2022	4.6		< 1.8		< 1.8		< 1.8		2.0	
E-AM-58E	7/19/2022	4.3		--		--		--		--	
E-AM-58E	1/26/2023	4.8		--		--		--		--	
E-AM-58E	7/24/2023	5.0		--		--		--		--	
E-AM-58E	1/3/2024	5.6		--		--		--		--	

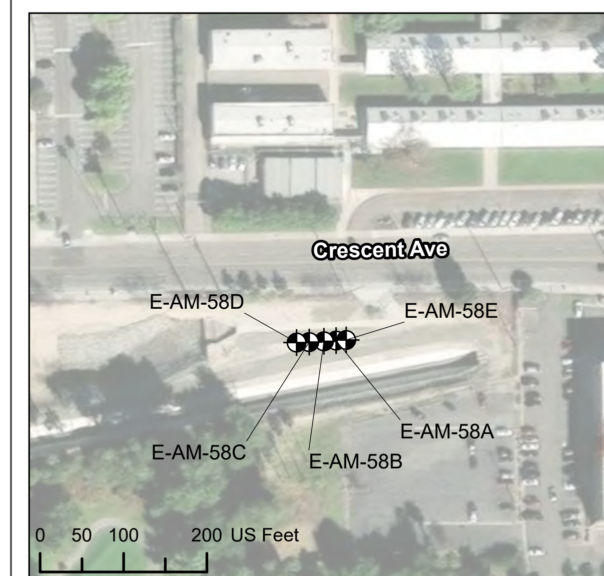
J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

Perchlorate results are presented in micrograms per liter (µg/L).
Per- and Polyfluoroalkyl results are presented in nanograms per liter (ng/L).

The California MCL for perchlorate is 6 µg/L.
The EPA MCL for PFOA is 4.0 ng/L.
The EPA MCL for PFOS is 4.0 ng/L.
The EPA MCL for PFNA is 10 ng/L.
The EPA MCL for PFHxS is 10 ng/L.

-- = The analyte was not requested.
< = The result is non-detect.
MCL = Maximum Contaminant Level
PFNA = Perfluorononanoic acid
PFHxS = Perfluorohexanesulfonic acid
PFOA = Perfluorooctanoic acid
PFOS = Perfluorooctanesulfonic acid
Q = Data qualifier (unvalidated lab qualifiers)



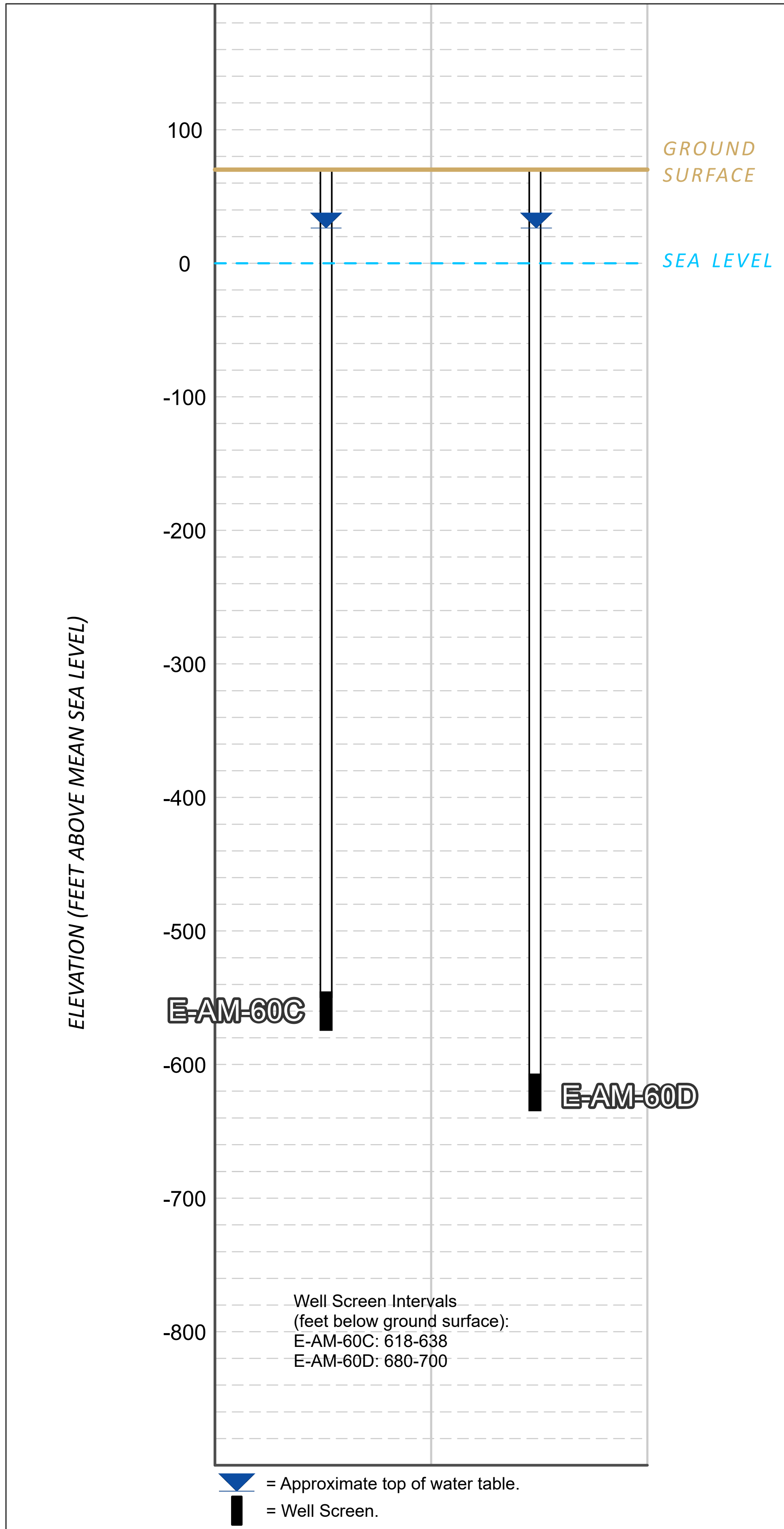


Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 45
E-AM-58 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and Perchlorate, PFOA, PFOS, PFNA, and PFHxS Results

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_ProfileGraph\OCNB_ProfileGraph.aprx | 10/21/2024 | jblock



	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
E-AM-60C	3/14/2024	4.5		4.1		8.4		< 1.9		6.5	

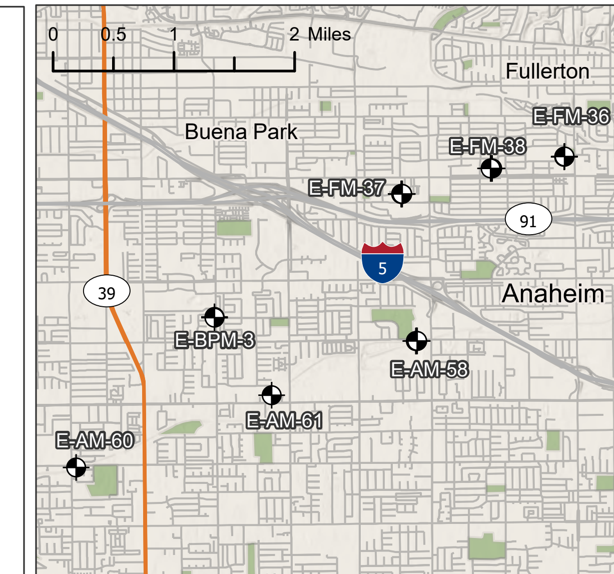
	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	Sample Date	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
E-AM-60D	3/14/2024	< 0.10		< 2.0		< 2.0		< 2.0		< 2.0	

J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

Perchlorate results are presented in micrograms per liter (µg/L).
Per- and Polyfluoroalkyl results are presented in nanograms per liter (ng/L).

The California MCL for perchlorate is 6 µg/L.
The EPA MCL for PFOA is 4.0 ng/L.
The EPA MCL for PFOS is 4.0 ng/L.
The EPA MCL for PFNA is 10 ng/L.
The EPA MCL for PFHxS is 10 ng/L.

-- = The analyte was not requested.
< = The result is non-detect.
MCL = Maximum Contaminant Level
PFNA = Perfluorononanoic acid
PFHxS = Perfluorohexanesulfonic acid
PFOA = Perfluorooctanoic acid
PFOS = Perfluorooctanesulfonic acid
Q = Data qualifier (unvalidated lab qualifiers)

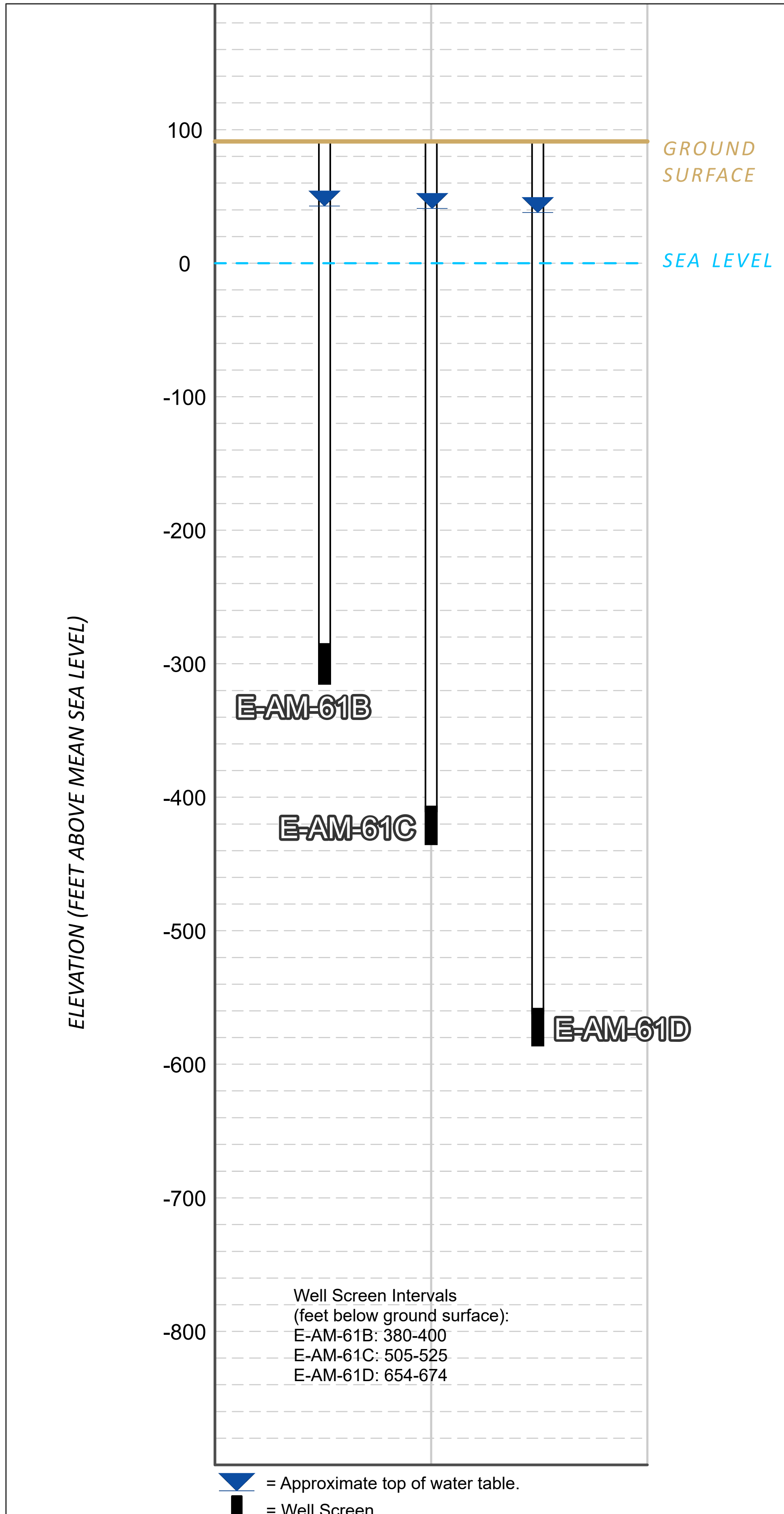


Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 46
E-AM-60 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and Perchlorate, PFOA, PFOS, PFNA, and PFHxS Results

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_ProfileGraph\OCNB_ProfileGraph.aprx | 10/21/2024 | jblock



	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-AM-61B	3/12/2024	3.5		< 1.9		< 1.9		< 1.9		< 1.9	

	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-AM-61C	3/12/2024	2.3		9.9		18		0.75	J	9.8	

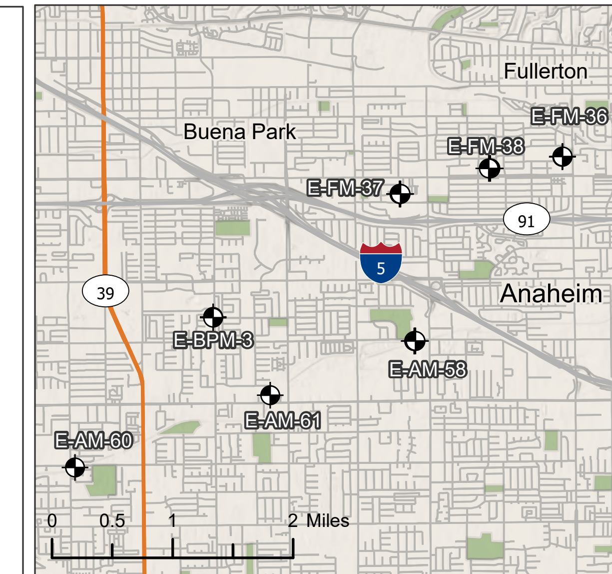
	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-AM-61D	3/12/2024	1.5		< 1.9		< 1.9		< 1.9		< 1.9	

J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

Perchlorate results are presented in micrograms per liter (µg/L).
Per- and Polyfluoroalkyl results are presented in nanograms per liter (ng/L).

The California MCL for perchlorate is 6 µg/L.
The EPA MCL for PFOA is 4.0 ng/L.
The EPA MCL for PFOS is 4.0 ng/L.
The EPA MCL for PFNA is 10 ng/L.
The EPA MCL for PFHxS is 10 ng/L.

-- = The analyte was not requested.
< = The result is non-detect.
MCL = Maximum Contaminant Level
PFNA = Perfluorononanoic acid
PFHxS = Perfluorohexanesulfonic acid
PFOA = Perfluorooctanoic acid
PFOS = Perfluorooctanesulfonic acid
Q = Data qualifier (unvalidated lab qualifiers)

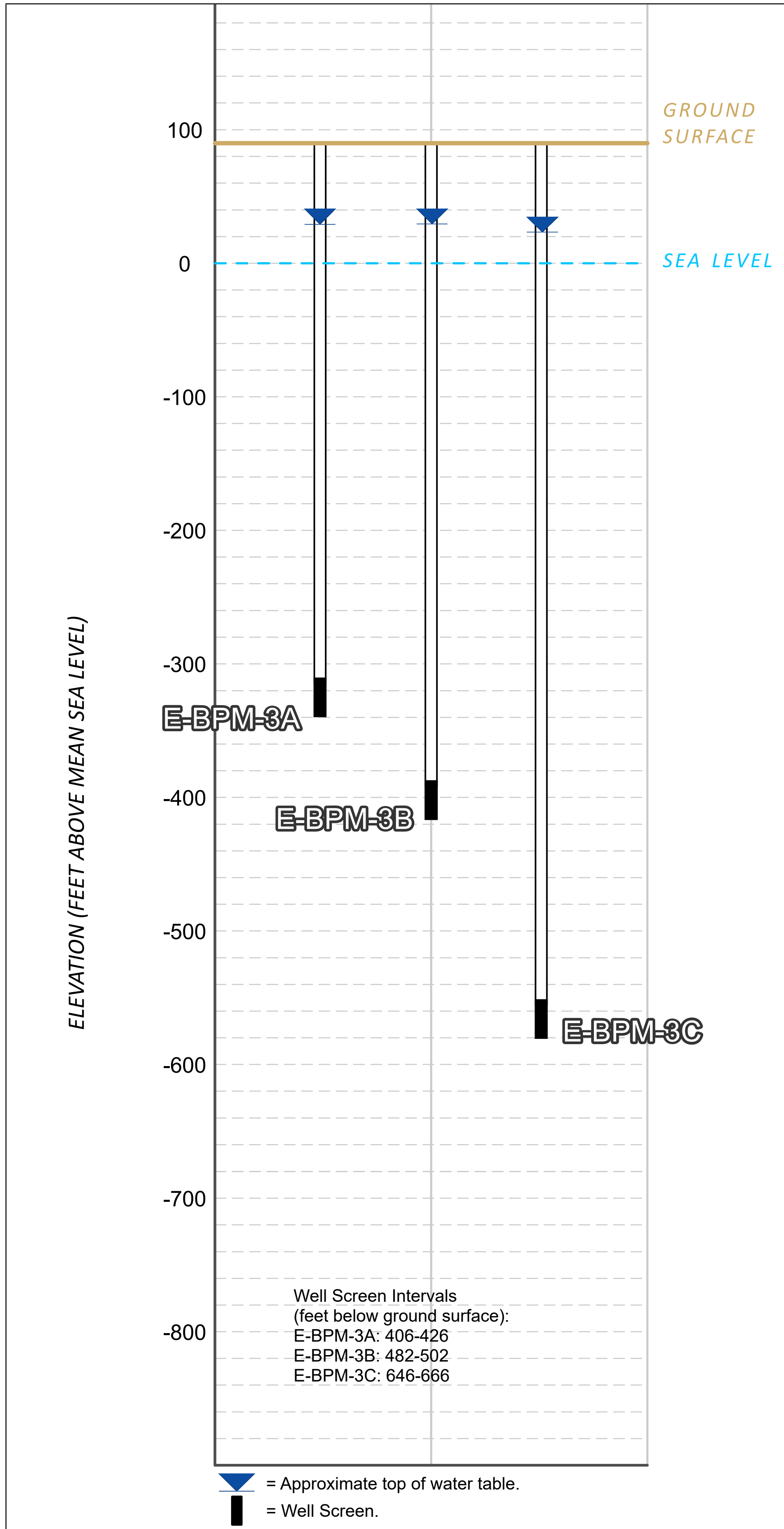


Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 47
E-AM-61 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and Perchlorate, PFOA, PFOS, PFNA, and PFHxS Results

Path: D:\EA Local Project Workspace\OrangeCountyNorthBasin\Projects\OCNB_ProfileGraph\OCNB_ProfileGraph.aprx | 10/21/2024 | jblock



	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-BPM-3A	9/13/2023	1.2		< 1.9		< 1.9		< 1.9		< 1.9	

	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-BPM-3B	9/13/2023	--		--		--		--		--	
E-BPM-3B	9/13/2023	4.8		1.9		2.3	J	< 1.9		5.9	

	Analyte	Perchlorate		PFOA		PFOS		PFNA		PFHxS	
	Unit	µg/L		ng/L		ng/L		ng/L		ng/L	
	Screening Level	6.0		4.0		4.0		10		10	
Well No.	**Sample Date**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
E-BPM-3C	9/13/2023	< 0.10		< 1.9		< 1.9		< 1.9		< 1.9	

J qualifier = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

Perchlorate results are presented in micrograms per liter (µg/L).
Per- and Polyfluoroalkyl results are presented in nanograms per liter (ng/L).

The California MCL for perchlorate is 6 µg/L.
The EPA MCL for PFOA is 4.0 ng/L.
The EPA MCL for PFOS is 4.0 ng/L.
The EPA MCL for PFNA is 10 ng/L.
The EPA MCL for PFHxS is 10 ng/L.

-- = The analyte was not requested.
< = The result is non-detect.
MCL = Maximum Contaminant Level
PFNA = Perfluorononanoic acid
PFHxS = Perfluorohexanesulfonic acid
PFOA = Perfluorooctanoic acid
PFOS = Perfluorooctanesulfonic acid
Q = Data qualifier (unvalidated lab qualifiers)

Data Sources: ESRI

Orange County North Basin Superfund Site
Orange County, California

Figure 48
E-BPM-3 EPA Monitoring Well Cluster Elevation Profile, Well Depths, and Perchlorate, PFOA, PFOS, PFNA, and PFHxS Results

Locations where perchlorate did not exceed the MCL in any sample

Locations where perchlorate exceeded the MCL

Note :
MCL = Maximum Contaminant Level

Perchlorate MCL = 6.0 µg/L

µg/L = micrograms per liter

0 0.5 1 2
Miles

Map Date: 7/12/2024 *Data Sources: ESRI, USDA*

Orange County North Basin Superfund Site
Orange County, California

Figure 49
EPA Monitoring Well Locations: Perchlorate

Locations where the select PFAS compounds did not exceed the MCL

Locations where at least one select PFAS compound did exceed the MCL

Note :
MCL = Maximum Contaminant Level

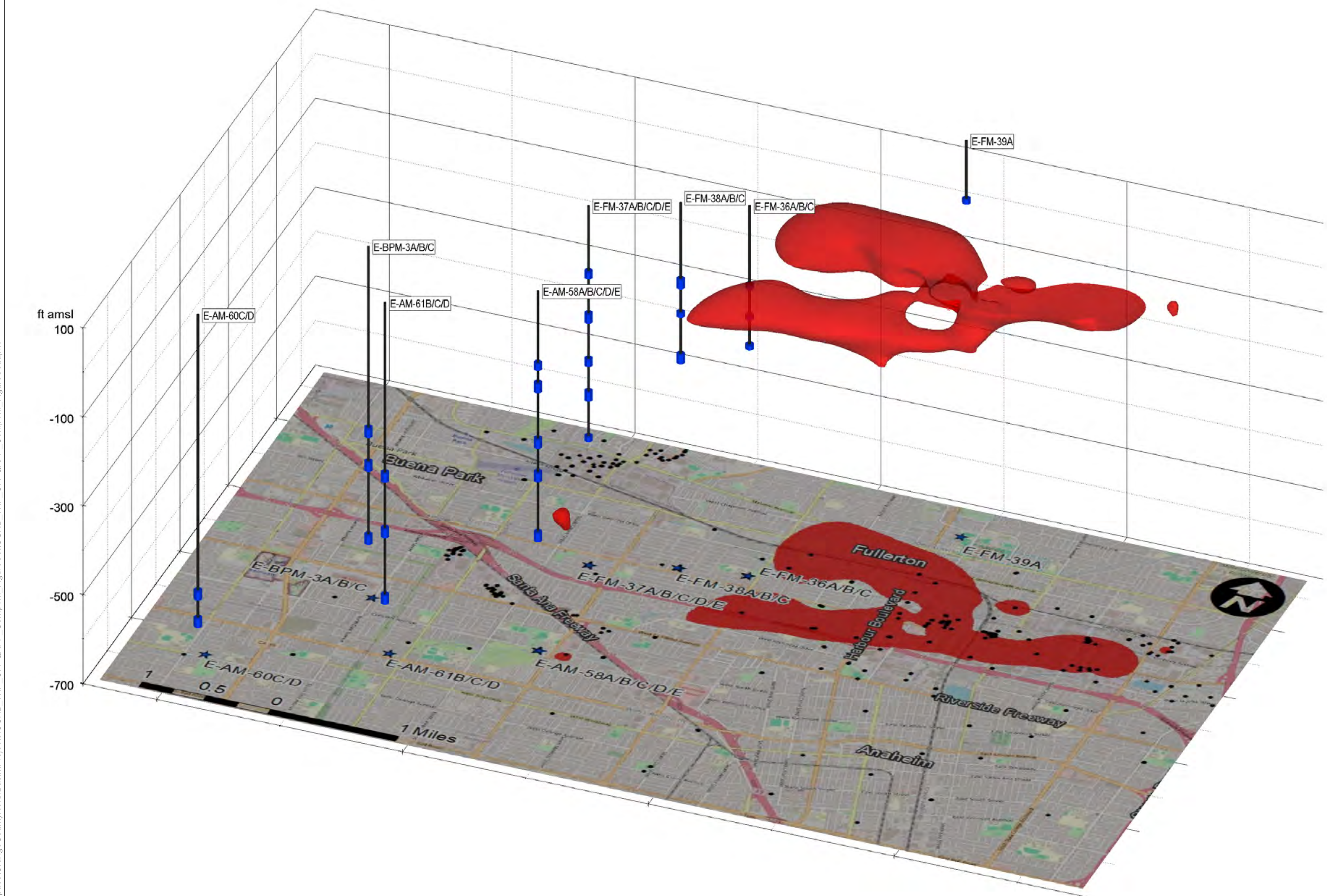
Select PFAS -
PFNA = Perfluorononanoic acid
PFHxS = Perfluorohexanesulfonic acid
PFOA = Perfluorooctanoic acid
PFOS = Perfluorooctanesulfonic acid

0 0.5 1 2
Miles

Map Date: 7/12/2024 *Data Sources: ESRI, USDA*

Orange County North Basin Superfund Site
Orange County, California

Figure 50
EPA Monitoring Well Locations: PFAS



Monitoring Well and Screen Intervals

1,1-Dichloroethene

EPA's Comprehensive Remedial Investigation Well Locations

Plume represents the area where one or more contaminants are above the MCL, CA MCL, and/or CA NL in either the Shallow and/or Principal Zones. It is constructed from the maximum contaminant concentration recorded at each monitoring location between 2019 and 1st quarter 2024.

Contaminant represented in the map:
1,1-DCE: EPA MCL = 7.0 µg/L, CA MCL = 6.0 µg/L

1,1-DCE = 1,1-Dichloroethene
CA MCL = California Maximum Contaminant Level
CA NL = California Notification Level
EPA MCL = Federal Maximum Contaminant Level
ft amsl = feet above mean sea level
µg/L = micrograms per liter

Date: 7/12/2024 *Data Sources: ESRI*

Orange County North Basin Superfund Site
Orange County, California

Figure 51
Interpretive Model Representation of Impacted Groundwater, 1,1-DCE Plume

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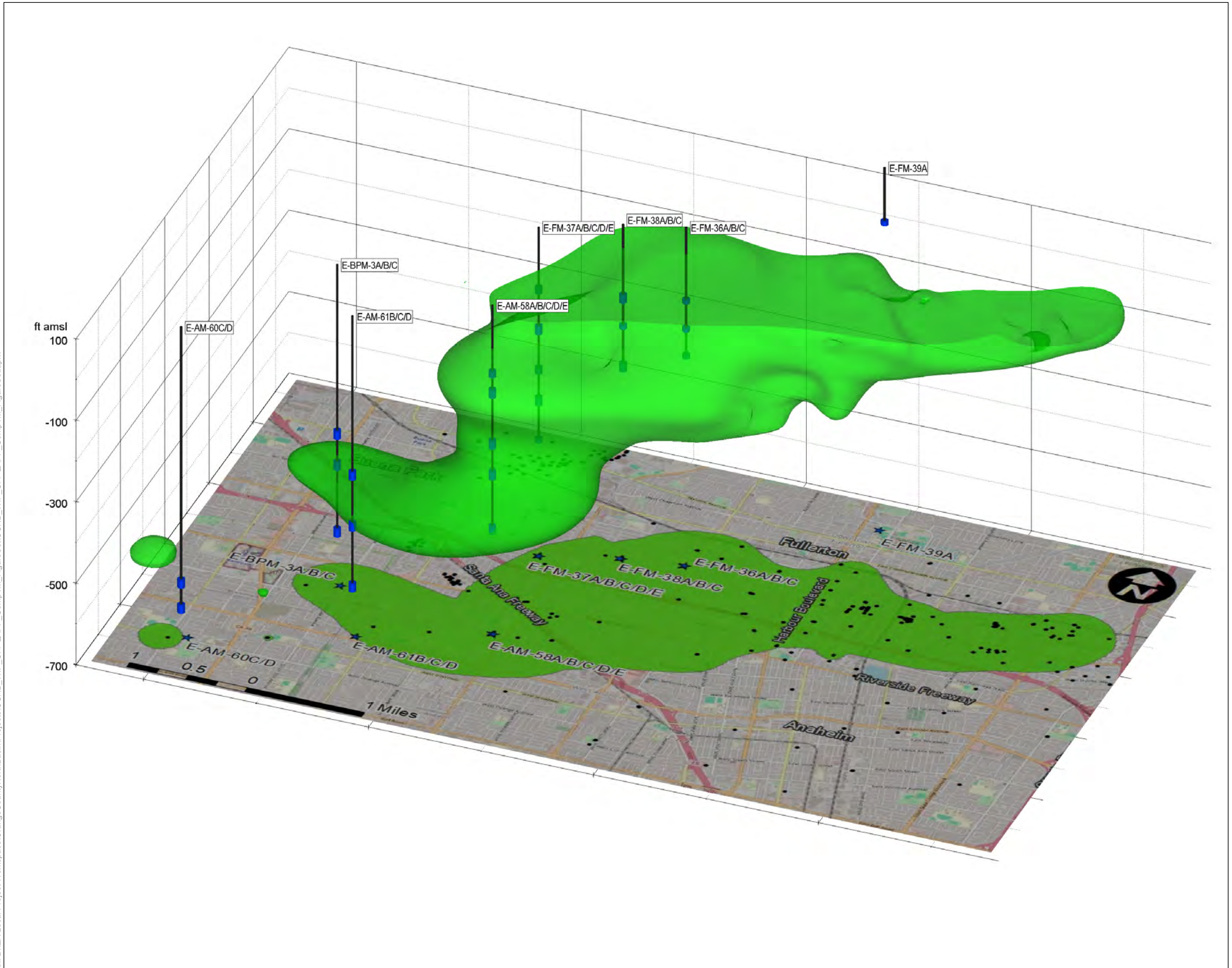

Monitoring Well and Screen Intervals

1,4-Dioxane

EPA's Comprehensive Remedial Investigation Well Locations

Plume represents the area where one or more contaminants are above the MCL, CA MCL, and/or CA NL in either the Shallow and/or Principal Zones. It is constructed from the maximum contaminant concentration recorded at each monitoring location between 2019 and 1st quarter 2024.

Contaminant represented in the map:
1,4-Dioxane: CA NL = 1.0 μg/L

CA MCL = California Maximum Contaminant Level
CA NL = California Notification Level
EPA MCL = Federal Maximum Contaminant Level
ft amsl = feet above mean sea level
μg/L = micrograms per liter

Date: 7/12/2024 *Data Sources: ESRI*

Orange County North Basin Superfund Site
Orange County, California

Figure 52
Interpretive Model Representation of Impacted Groundwater, 1,4-Dioxane Plume

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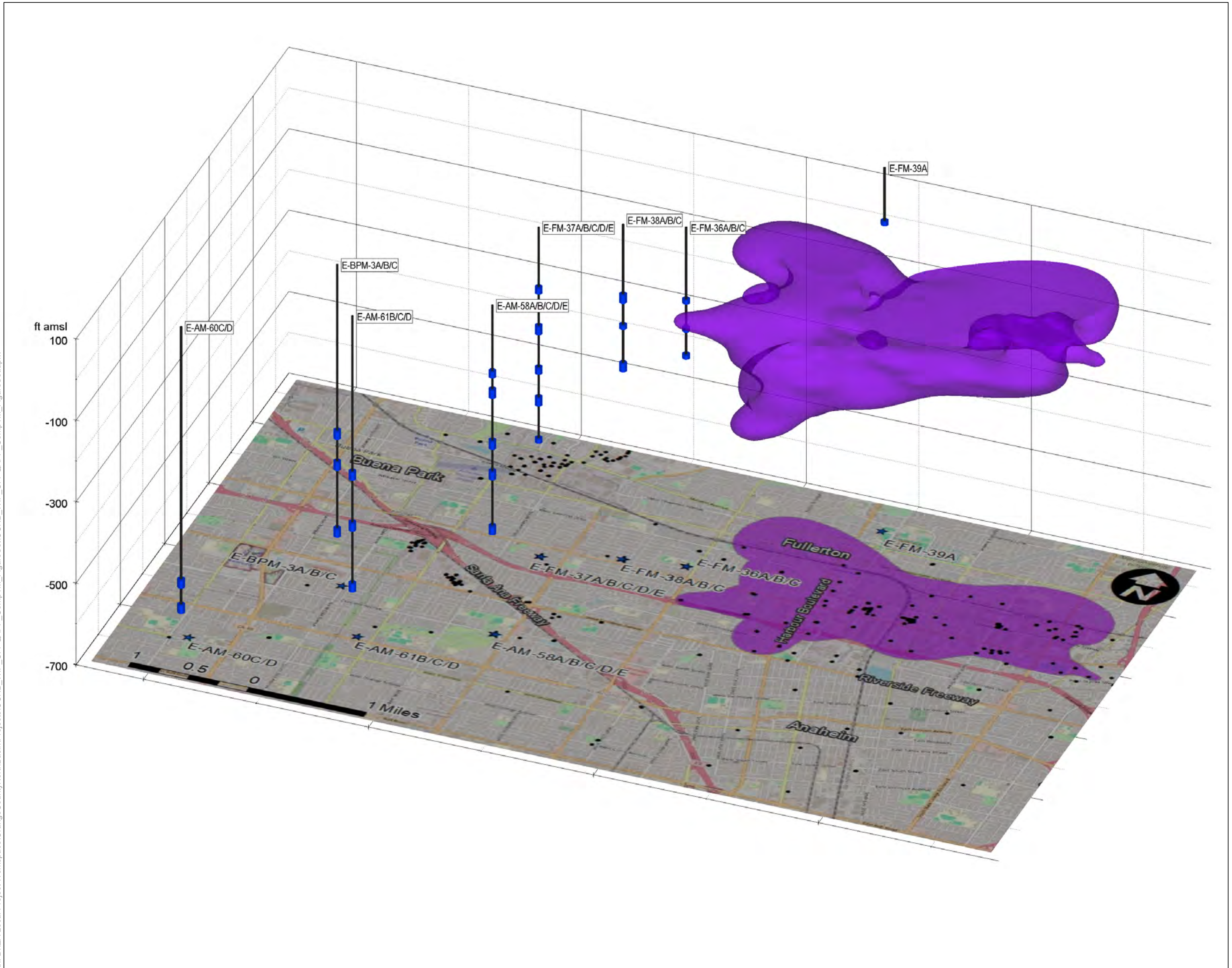

Monitoring Well and Screen Intervals

Tetrachloroethene

EPA's Comprehensive Remedial Investigation Well Locations

Plume represents the area where one or more contaminants are above the MCL, CA MCL, and/or CA NL in either the Shallow and/or Principal Zones. It is constructed from the maximum contaminant concentration recorded at each monitoring location between 2019 and 1st quarter 2024.

Contaminant represented in the map:
PCE: EPA and CA MCL = 5.0 µg/L

CA MCL = California Maximum Contaminant Level
CA NL = California Notification Level
EPA MCL = Federal Maximum Contaminant Level
ft amsl = feet above mean sea level
PCE = Tetrachlorothene
µg/L = micrograms per liter

Date: 7/12/2024 *Data Sources: ESRI*

Orange County North Basin Superfund Site
Orange County, California

Figure 53
Interpretive Model Representation of Impacted Groundwater, PCE Plume

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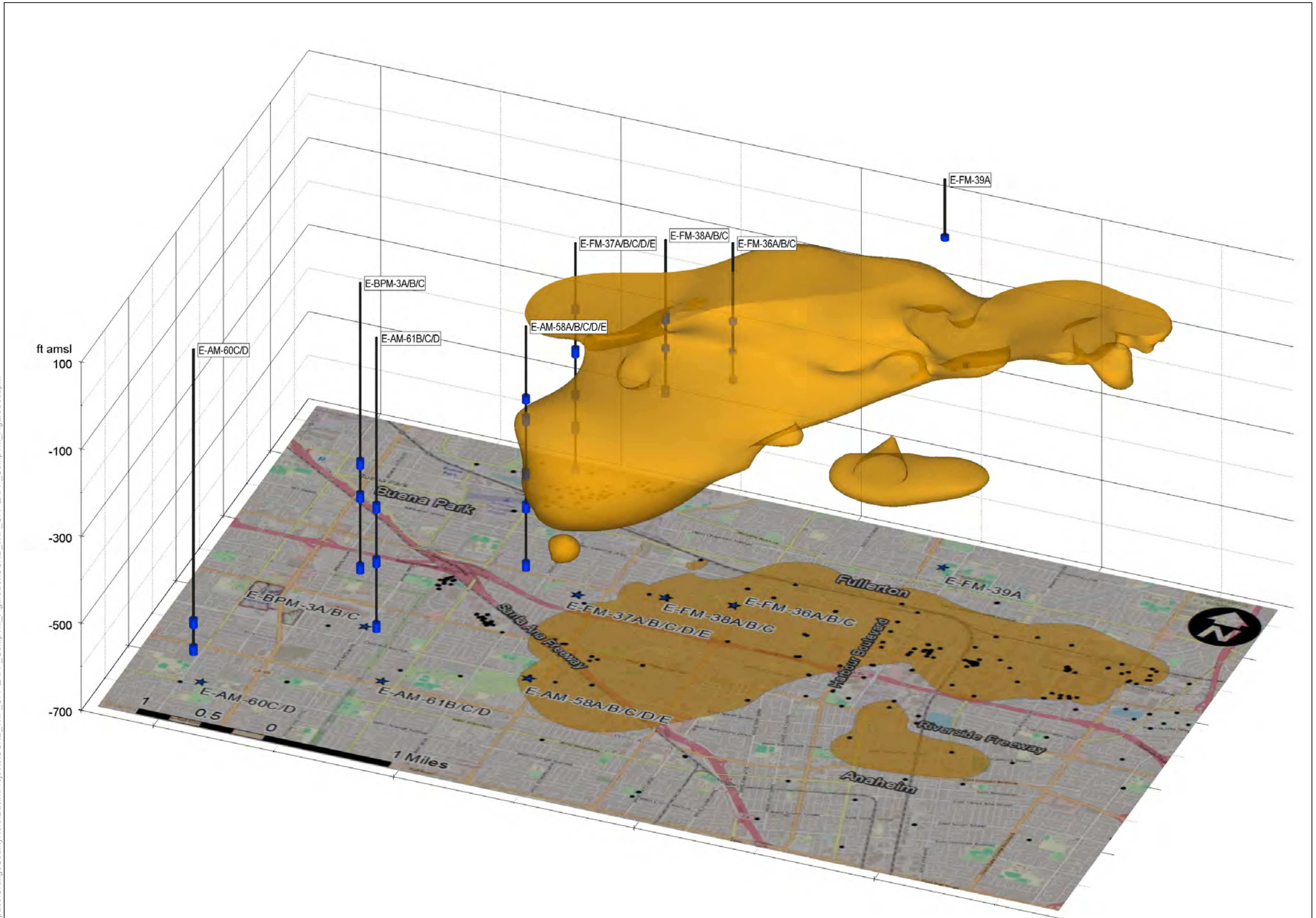

Monitoring Well and Screen Intervals

Trichloroethene

EPA's Comprehensive Remedial Investigation Well Locations

Plume represents the area where one or more contaminants are above the MCL, CA MCL, and/or CA NL in either the Shallow and/or Principal Zones. It is constructed from the maximum contaminant concentration recorded at each monitoring location between 2019 and 1st quarter 2024.

Contaminant represented in the map:
TCE: EPA and CA MCL = 5.0 µg/L

CA MCL = California Maximum Contaminant Level
CA NL = California Notification Level
EPA MCL = Federal Maximum Contaminant Level
ft amsl = feet above mean sea level
TCE = Trichlorothene
µg/L = micrograms per liter

Date: 7/12/2024 *Data Sources: ESRI*

Orange County North Basin Superfund Site
Orange County, California

Figure 54
Interpretive Model Representation of Impacted Groundwater, TCE Plume

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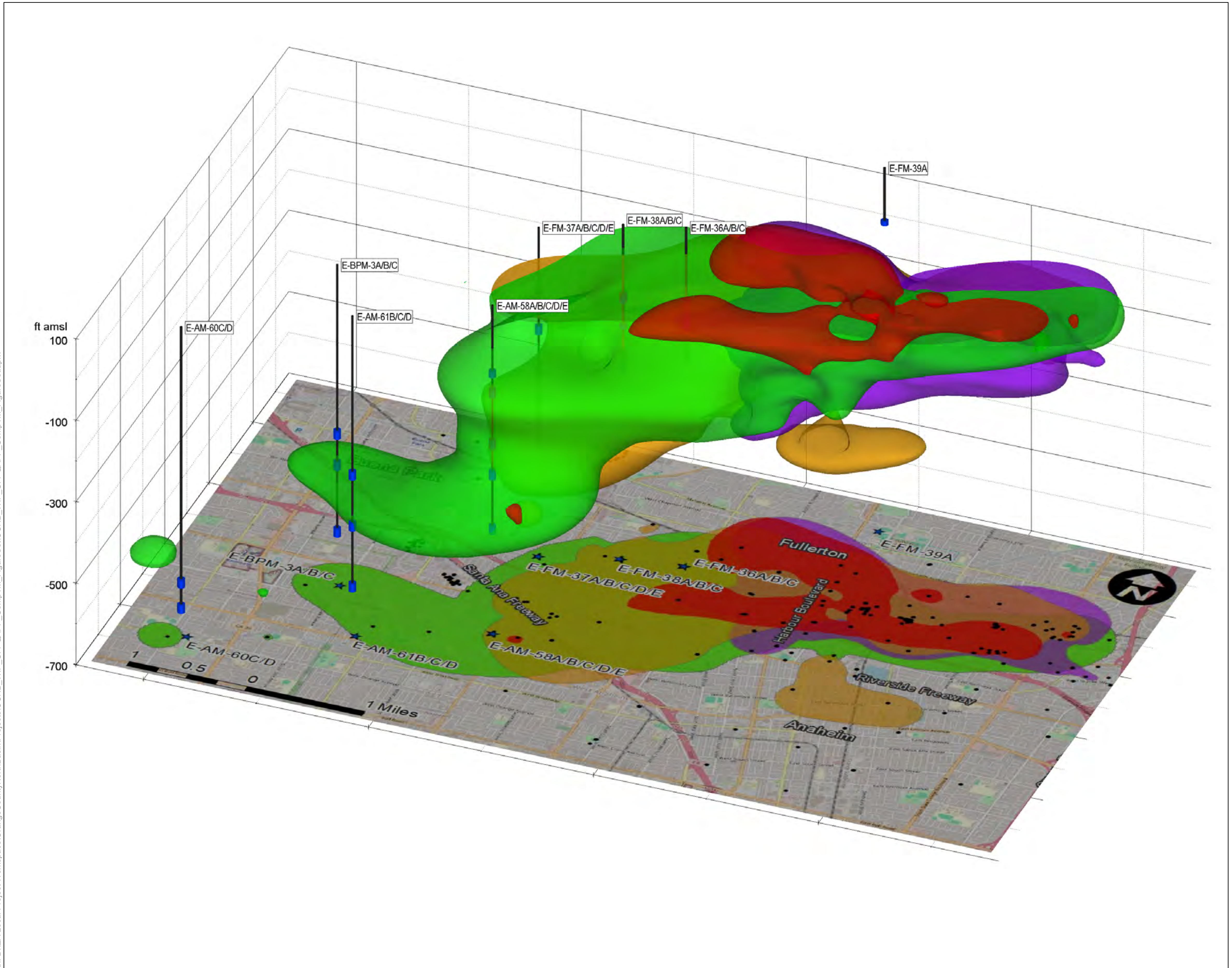

Monitoring Well and Screen Intervals

Tetrachloroethene

Trichloroethene

1,1-Dichloroethene

1,4-Dioxane

EPA's Comprehensive Remedial Investigation Well Locations

Plume represents the area where one or more contaminants are above the MCL, CA MCL, and/or CA NL in either the Shallow and/or Principal Zones. It is constructed from the maximum contaminant concentration recorded at each monitoring location between 2019 and 1st quarter 2024.

Contaminants represented in the map:
1,1-DCE: EPA MCL = 7.0 µg/L, CA MCL = 6.0 µg/L
1,4-Dioxane: CA NL = 1.0 µg/L
PCE: EPA and CA MCL = 5.0 µg/L
TCE: EPA and CA MCL = 5.0 µg/L

1,1-DCE = 1,1-Dichloroethene
CA MCL = California Maximum Contaminant Level
CA NL = California Notification Level
EPA MCL = Federal Maximum Contaminant Level
ft amsl = feet above mean sea level
PCE = Tetrachlorothene
TCE = Trichlorothene
µg/L = micrograms per liter

Date: 7/12/2024 *Data Sources: ESRI*

Orange County North Basin Superfund Site
Orange County, California

Figure 55
Interpretive Model Representation of Impacted Groundwater, Comingled Plume

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Appendix A

Well Installation Plan, Amendment 04

(submitted separately)

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Appendix B

Scanned Logbooks and Field Forms

(submitted separately)

Appendix C

Community Flyers

(submitted separately)

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Appendix D

Photographs

(submitted separately)

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Appendix E

Waste Management Plan, Amendment 02

(submitted separately)

Appendix F

Waste Determination Memorandums

(submitted separately)

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Appendix G

Waste Manifests

(submitted separately)

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Appendix H

Geophysical Logs

(submitted separately)

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Appendix I

Lithologic Descriptions and Well Construction Details

(submitted separately)

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Appendix J

Laboratory Analytical Reports, Validation Reports, and Chains-of-Custody

(submitted separately)

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Appendix K

Comprehensive Remedial Investigation Dataset (Excel)

(submitted separately)

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Appendix L

Data Usability Assessment Technical Memorandum

(submitted separately)