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LLNL
Ground Water Project

2016 Annual Report

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Environmental Restoration Department

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Summary

In 2016, environmental restoration activities for the Lawrence Livermore National Laboratory (LLNL) Livermore Site Ground Water Project (GWP) included:

- Removal of approximately 44 kilograms (kg) of volatile organic compounds (VOCs) from the Livermore Site subsurface, including 30 kg VOCs from ground water and 14 kg of VOCs from soil vapor (Table Summ-1).
- Operation and/or maintenance of 28 ground water treatment facilities and 8 soil vapor treatment facilities.
- Operation and/or maintenance of a network of 94 ground water extraction wells, 2 ground water injection wells, 13 dual extraction[1] wells, and 34 soil vapor extraction wells.
- On-going hydraulic control and treatment of VOCs in ground water along the western and southern margins of the site, where concentrations declined or remained stable during the year.
- Drilling and installation of three soil vapor monitor wells and two ground water monitor wells in the TFD, TFE and TFH areas, and redevelopment of extraction wells at TF406 Northwest and TFD South (Figures 1 and 2).
- Implementing four direct-push Cone Penetrometer Testing and sampling surveys: two in the TF518 Perched Zone area, one in the former Building 419 / Building 511 area, and one in the eastern TFE Hotspot / Trailer 5425 area (Figures 1 and 2).
- Completing treatment facility upgrades and remedial wellfield expansions using the Remediation Evaluation (REVAL) process at TFD and TFG North, and initiating the process at TFC Southeast and VTF518 Perched Zone (Figure 2).
- Continuing Enhanced Source Area Remediation (ESAR) treatability tests at TFD Helipad (*in situ* bioremediation), TFE Eastern Landing Mat (thermally enhanced remediation), and at TFC Hotspot (emplaced zero valent iron (ZVI) for promoting *in situ* VOC destruction).
- Submittal of the following documents to the regulatory agencies: 2015 Annual Report (McKereghan et al., 2016), four quarterly reports (Yow and Wong, 2016[a-d]), well construction work plans for five monitor wells, and drilling and sampling plans for four direct-push drilling surveys.

Livermore Site restoration activities in 2016, similar to those during the last several years, focused on enhancing and optimizing ongoing operations at treatment facilities. Evaluation of technologies that may accelerate cleanup of the Livermore Site source areas (Figure 2) and address areas of co-mingled VOC and low-level tritium plumes, also continued.

Ground water concentration and hydraulic data indicate consistent declines, subtle in some areas, in both the magnitude and areal extent of VOC plumes in 2016. VOCs in the offsite TFA area continued to decline rapidly in response to pumping along the Arroyo Seco Pipeline, which

[1] Extraction of ground water using a downhole pump with concurrent application of vacuum to the well. Ground water and soil vapor are removed in separate pipe manifolds and treated.

was extended in 2012 (Figure 1). Hydraulic containment along the western and southern boundaries of the site was fully maintained in 2016, and steady, incremental progress was made toward interior plume and source area cleanup.

Limited recharge due to the ongoing California drought and continued ground water pumping from the Livermore Site subsurface resulted in declining ground water levels and yields at many extraction wells, and induced ground water depressions across the site.

Two new TFD area monitor wells were installed where elevated saturated soil VOC concentrations were identified in 2014. Initial ground water VOC concentrations at these wells were lower than anticipated. Elsewhere, elevated VOC concentrations remain, indicating areas where additional remedial efforts will likely be needed, such as Hydrostratigraphic Unit 4 (HSU-4) in the TFD Helipad source area, east of Lake Haussmann (Figure 2). These and additional findings are discussed in Section 4.3.

An ESAR *in situ* bioremediation treatability test continued throughout the year at the TFD Helipad (Appendix G), as did the ESAR conductive heating treatability test at TFE Eastern Landing Mat (Appendix H). The required anaerobic subsurface conditions were achieved in the TFD Helipad area during the year and bioaugmentation was performed in the fall of 2016. At TFE Eastern Landing Mat, soil vapor extraction mass removal rates remained higher than previously observed without air injection and heating of air and ground water. At TFC Hotspot, ground water monitoring continued to evaluate the effectiveness of emplaced ZVI for *in situ* VOC destruction (Appendix I). Recent post-implementation performance monitoring data indicate reducing conditions at wells within the emplacement area. This suggests that the fluid used during the emplacement process and/or ground water affected by the emplaced ZVI has started to arrive at these performance monitor wells. All three tests are expected to continue into 2017.

Since remediation began in 1989, approximately 5.7 billion gallons of ground water and 768 million cubic feet (Mcf) of soil vapor have been treated, removing an estimated 3,267 kilograms (kg) (approximately 3.6 tons) of VOCs from the subsurface (Table Summ-2).

Table Summ-1. Summary of 2016 Livermore Site VOC remediation.

Treatment area[a]	Volume of ground water treated (Mgal)[b]	Estimated VOC mass removed from ground water (kg)[c]	Volume of soil vapor treated (Mcf)[b]	Estimated VOC mass removed from soil vapor (kg)[c]	Estimated total VOC mass removed (kg)[c, d]
TFA	97	2.6	na	na	2.7
TFB	29	1.8	na	na	1.8
TFC	30	3.1	na	na	3.1
TFD	61	14.6	13	1.8	16.4
TFE	28	7.2	11	1.5	8.7
TFG	3	0.2	na	na	0.2
TFH	7	0.8	34	10.7	11.5
Totals[d]	255	30.4	58	14.0	44.4

Notes:

Mgal = Millions of gallons.

kg = Kilograms.

Mcf = Millions of cubic feet.

na = Not applicable.

[a] **Treatment facilities in each treatment area (refer to Table 1 for abbreviations):**

TFA area: TFA, TFA-E

TFB area: TFB

TFC area: TFC, TFC-E, TFC-SE

TFD area: TFD, TFD-E, TFD-HPD, TFD-S, TFD-SE, TFD-SS, TFD-W, VTFD-ETCS, VTFD-HPD

TFE area: TFE-E, TFE-HS, TFE-NW, TFE-SE, TFE-SW, TFE-W, VTFE-ELM, VTFE-HS

TFG area: TFG-1, TFG-N

TFH area: TF406, TF406-NW, VTF406-HS, VTF511, TF518-N, TF518-PZ, VTF518-PZ, TF5475-1, TF5475-2, TF5475-3, VTF5475

TFF started operation in February 1993 for fuel hydrocarbon remediation. In August 1995, the regulatory agencies agreed that the vadose zone remediation was complete, and in October 1996 No Further Action status was granted for fuel hydrocarbons in ground water.

[b] **Volumes and VOC mass are from the sum of individual extraction wells shown in Table 4.**

[c] **VOC mass values are best estimates accounting for measurement uncertainties in both volume and chemical analyses.**

[d] **Rounded numbers.**

Table Summ-2. Summary of cumulative Livermore Site VOC remediation.

Treatment area	Volume of ground water treated (Mgal)[a]	Estimated VOC mass removed from ground water (kg)[b]	Volume of soil vapor treated (Mcf)[a]	Estimated VOC mass removed from soil vapor (kg)[b]	Estimated VOC mass removed (kg)[b, c]
TFA	2,384	225	<0.01	<0.01	225
TFB	585	90	na	na	90
TFC	652	122	na	na	122
TFD	1,328	933	166	105	1,038
TFE	492	253	235	162	415
TFG	103	13	na	na	13
TFH	202	45	367	1,319	1,364
Totals[c]	5,746	1,681	768	1,586	3,267

Notes:

Mgal = Millions of gallons.

kg = Kilograms.

Mcf = Millions of cubic feet.

na = Not applicable.

[a] **Refer to Table Summ-1 footnote "a" for facilities in each treatment area.**

[b] **The VOC mass values are best estimates accounting for measurement uncertainties in both volume and chemical analyses.**

[c] **Rounded numbers.**

1. Introduction

This report summarizes the Lawrence Livermore National Laboratory (LLNL) Livermore Site Ground Water Project (GWP) field and regulatory compliance activities, and remedial action program for calendar year 2016. The Field Activities section provides information on the GWP ground water monitoring and Enhanced Source Area Remediation (ESAR) activities (Section 3). The Remedial Action Program section includes details of treatment facility operations, treatment facility upgrades, ground water discharges, remediation performance, and decision support analysis (Section 4). The treatment areas, treatment facilities, newly installed and properly abandoned wells, and locations of principal projects conducted at the Livermore Site during 2016 are shown on Figures 1 and 2. Table 1 presents treatment facility abbreviations used in this report, Table 2 presents the types and number of wells at the site, and Table 3 presents treatment facility discharge sampling locations. Tables 4 and 5 summarize extraction well performance and treatment facility operations for 2016, respectively. In addition to Table 1, acronyms and abbreviations used in this report are defined in Section 6.

2. Regulatory Compliance

In 2016, the U.S. Department of Energy (DOE) and LLNL submitted all regulatory documents on schedule, and all Federal Facility Agreement (FFA) milestones were achieved on schedule. These included:

- *GWP 2015 Annual Report* (McKereghan et al., 2016); and
- *GWP Quarterly Self-Monitoring Reports* (Yow and Wong, 2016[a-d]).

In 2016, Livermore Site environmental community relations activities included:

- Maintaining the Environmental Community Relations website, consisting of project documents and reports, public notices, and other environment-related information https://www-envirinfo.llnl.gov/;
- Supporting the Environmental Information Repositories and the Administrative Record;
- Disseminating environment-related news releases and internal/external newsletter articles, and responding to journalists' inquiries regarding the Livermore Site environmental cleanup;
- Sent 391 letters to near neighbors living to the west of LLNL providing an update on the progress of the offsite ground water plume cleanup; and
- Conducting tours of site environmental activities upon request.

General community questions and requests for information were addressed via electronic mail, posted mail or telephone with the assistance of LLNL's Public Affairs Office. In addition, DOE/LLNL met with members of Tri-Valley CAREs and their scientific advisor on June 30, 2016, as part of the activities funded by a U.S. Environmental Protection Agency (EPA) Technical Assistance Grant.

Six treatment facilities remained offline in 2016. VTFD Helipad remained off-line while the *in situ* bioremediation ESAR treatability test continued at the TFD Helipad Source area

(Section 3.2 and Appendix G). TFA East remained off-line because the sole extraction well for this facility has dewatered due to over-drafting of the aquifer and limited recharge owing to the California drought. The four remaining facilities, TF5475-1, TF5475-3, VTF5475 and TF518 North, remain offline due to potential mixed waste issues (LLNL, 2009). Restart of these four facilities has been deferred pending the results of ESAR treatability tests described in this report. In the meantime, DOE/LLNL continue to monitor ground water in these areas for VOCs and tritium (see Section 4.4), while maintaining hydraulic control at downgradient ground water extraction wells and treatment facilities.

3. Field Activities

This section summarizes 2016 ground water monitoring, ESAR activities, and drilling activities.

3.1. Ground Water Monitoring

All ground water monitoring activities were conducted in compliance with applicable LLNL Standard Operating Procedures (Goodrich and Lorega, 2016).

3.1.1. Ground Water Level Measurements

All ground water levels were measured in monitor wells on a quarterly basis. Continuous ground water levels were recorded in pumping wells using real-time data acquisition, and additional ground water levels were measured during sampling events to augment these data. A total of 3,228 ground water levels were manually measured in 639 wells in 2016. Of these measurements, 2,056 were collected during quarterly water level measurements, 797 were collected just prior to well sampling, 335 were recorded from the real-time data acquisition readings, and 40 were collected during well testing.

Quarterly water level measurements are collected to create ground water elevation maps that represent contemporaneous operating conditions for each extraction wellfield. These data are primarily used to generate quarterly ground water elevation contour maps showing estimated hydraulic capture areas for active extraction wells in Hydrostratigraphic Units (HSUs) 1B through 5 (Figures 7, 9, 11, 13, 15, 17).

In addition to the routine quarterly measurements, ground water levels are measured to support DOE/LLNL Remediation Evaluation (REVAL) activities (Appendix E). These included manual depth-to-water measurements in addition to temporary installation of pressure transducers with data loggers in selected wells.

3.1.2. Ground Water Sampling

To determine the sampling frequency, chemical analyses and methods for collecting ground water samples, GWP personnel evaluated data quality objectives, analytical results, historical trends, the Cost Effective Sampling (CES) algorithm (Appendix C), and hydraulic data. The samples are analyzed for VOCs, fuel hydrocarbons, metals, and/or radionuclides, depending upon the sampling location.

In 2016, 823 well sampling events were conducted (Appendix D). Samplers were unable to complete 193 scheduled sampling events due to various circumstances, including dry or

insufficient water to collect samples from the well (176 events), inoperable pump or electrical safety issues (16 events), and well inaccessibility (1 event).

The methods and numbers of samples collected included:

- Specific-Depth Grab Sampling (SDGS): 396 events;
- Three-volume purge using a dedicated electric submersible pump: 83 events;
- Low-volume purge primarily using a dedicated electric submersible pump: 35 events; and
- Other methods (bailer, portable electronic submersible pump, etc.): 115 events.

Ongoing and significant cost reduction was achieved again in 2016 through the use of SDGS and low-volume purge methods. SDGS is the preferred method for collecting ground water samples, especially at wells where purge water potentially contains both VOCs and tritium. The benefits of these methods include:

- No need to replace dedicated pumps and related sampling equipment;
- Increased technician efficiency and reduced sampling time;
- Increased personnel safety through the use of low voltage equipment; and
- Virtually eliminating collection, treatment and disposal of purge water from all wells sampled using these methods, particularly where ground water contains both VOCs and tritium.

In addition to the ground water sampling noted above, *in situ* measurements were collected for several field parameters to support the ESAR tests (Section 3.2) during 2016, including dissolved oxygen, pH, specific conductance and temperature. A total of 357 measurements were collected for multiple parameters in seven wells at TFC Hotspot and nine wells at TFD Helipad.

DOE/LNL also performed vadose zone monitoring during 2016. A total of 121 soil vapor samples were collected from 75 wells; however, four soil vapor sampling events could not be completed for a variety of reasons (ground water covering screened interval, inaccessible due to construction, submersible pump in the way, etc.).

3.2. Enhanced Source Area Remediation Activities

As a working conceptual model, the LLNL Livermore Site GWP delineated ground water plumes into distal and source area components. Distal plumes reside in comparatively permeable portions of the subsurface where ambient ground water flow has resulted in downgradient migration and dilution. In contrast, source areas are characterized by relatively elevated concentrations of contaminants that are entrapped in low permeability materials or are otherwise hydraulically isolated. Back-diffusion from lower permeability zones, leaching of residual contaminants from the overlying vadose zone, and relatively slow advective transport in ground water all potentially contribute to a chronic “slow release” phenomenon of VOC mass transfer from source areas into more permeable, or hydraulically accessible, portions of the subsurface.

Historically, DOE/LLNL emphasized control and gradual cleanup of distal portions of VOC plumes at the Livermore Site as the priority of site remediation, along with containment of VOC mass flux emanating from source areas through conventional treatment technologies such as pump-and-treat, soil vapor extraction, and dual extraction (i.e., LLNL’s “Engineered Plume Collapse” strategy) (Berg et al., 1997).

In this context, the timeframe to achieve regulatory closure is closely tied to the persistence of the source areas that transfer mass to the VOC plumes. Therefore, source area remediation constitutes the primary rate-limiting step in the overall ground water cleanup effort, and thus targeted source area remediation warrants serious focus as a means for potentially reducing overall cleanup costs.

In 2007, DOE/LLNL developed the Source Area Cleanup Technology Evaluation (SACTE) approach to identify the most appropriate remediation strategies for the various VOC source areas across the site. DOE initiated this effort to identify and evaluate multiple technologies during treatability studies under the ESAR effort. The SACTE approach is based on:

(1) Systematic characterization and cataloguing of representative macroscopic features of each source area (e.g., dimensions of the source area footprint, representative hydraulic conductivity, mean ambient hydraulic gradient) as permitted by the available data;

(2) Development of a compartmental screening model based on those data that capture the salient VOC mass and concentration-controlling parameters characteristic of the source areas; and

(3) Utilizing the compartmental model to simulate the potential response of source area VOC distribution to various remediation approaches that correspond to changes in key model parameters (e.g., mechanical fracturing to increase average hydraulic conductivity).

The SACTE approach allows comparison of the response of VOC concentrations and overall mass to a remediation technology that destroys mass *in situ* (e.g., chemical oxidation or bioremediation) in the more hydraulically accessible materials. This approach involves methods that enhance access to VOCs in low permeability materials, either by mechanical means (e.g., mechanical fracturing to improve hydraulic conductivity) or by means that directly enhance the mobility of the solute itself (e.g., thermal remediation, electro-osmosis).

Twenty-one separate source areas have been identified at the Livermore Site based on distributions of VOCs in soil, soil vapor, and ground water samples, analysis of hydrogeologic data in the context of the Livermore Site HSU framework, and information pertaining to historical chlorinated solvent use and disposal practices. The application of the SACTE compartmental model for modeling source area behavior at the Livermore Site entails defining the physical and chemical characteristics of each source area, and the potential impact of different remediation technologies on the subsurface properties that control flow and transport processes in that source area.

As part of the modeling study, overall effects of alternative treatment technologies are compared numerically. The parameters include: increase in mass removal rates, reduction in cleanup time, effect on low-permeability units, areal coverage and capture, capital investment, and life-cycle costs. Four ESAR technologies were selected for treatability testing based on results of the SACTE effort (Figure 2):

- Dynamic Well-Field Operation (DWFO) at the TFE Eastern Landing Mat and Trailer 5475 Source Areas;
- *In situ* Bioremediation at the TFD Helipad Source Area;
- Thermally Enhanced Remediation at the TFE Eastern Landing Mat Source Area; and
- Mechanical Fracturing at the TFE Hotspot and TFC Hotspot Source Areas.

In 2007, LLNL concluded a preliminary test of the DWFO concept, primarily at the TFE Eastern Landing Mat Source Area. Ongoing TFE Eastern Landing Mat soil vapor extraction (SVE) had effectively reduced VOC concentrations in shallow soil vapor extraction wells. Therefore, LLNL incorporated the DWFO approach with plans for Thermally Enhanced Remediation in the deeper zone at this source area.

Thus, the concept of combining complimentary remediation technologies was incorporated into the SACTE approach. Accordingly, the TFC Hotspot mechanical fracturing treatability test was modified to include an *in situ* chemical reduction approach using zero-valent iron (ZVI) (GeoSierra Environmental, 2014).

In 2010, LLNL constructed and activated a ground water circulation system for *in situ* bioremediation at the TFD Helipad Source Area. Also in 2010, LLNL conducted pneumatic fracturing at the TFE Hotspot Source Area, and began performance monitoring for this treatability test in 2011. In 2011, LLNL constructed and activated the TFE Eastern Landing Mat thermally enhanced remediation system.

In 2014, LLNL completed the TFC Hotspot ZVI emplacement project and began post-emplacement performance monitoring for the treatability test. LLNL also completed analysis of the TFE Hotspot ESAR treatability test in 2014. A comprehensive analysis and review of the project is presented in Appendix I of the 2014 LLNL Ground Water Project Annual Report (McKereghan et al., 2015). In 2016, LLNL continued the ESAR treatability tests at TFD Helipad, TFE Eastern Landing Mat, and TFC Hotspot. The results of the treatability tests may identify alternative remedial approaches for other Livermore Site source areas. The active ESAR treatability tests are discussed in detail in Appendices G, H, and I.

3.3. Drilling Activities

In 2016, DOE/LLNL advanced approximately 121 direct-push boreholes and installed five new wells at the Livermore Site (Figure 2). A detailed map showing the location of all properly abandoned, new and existing wells, and treatment facilities is included as Attachment A.

The direct-push boreholes were advanced during four direct-push Cone Penetrometer Testing (CPT) and sampling surveys (Figures 2, 3, and 4). Analysis of analytical results obtained from the first three surveys was presented in Remedial Project Manager (RPM) meetings held on August 3 and September 29, 2016. An interpretation of the analytical results from the fourth survey will be presented at an RPM meeting in 2017. The analytical results of all four direct-push drilling surveys are presented in Attachment B of this report.

The first direct-push survey, consisting of six drilling locations, was performed in the VTF518 Perched Zone source area (Figure 3). The objective of the survey was to delineate the distribution of VOCs north of the existing treatment facility and remedial wellfield. Three boreholes were advanced at each drilling location: one for lithology (based on CPT readings), one for soil vapor sampling, and one for soil sampling. The results of the survey were used to help site soil vapor monitor wells W-3201 and W-3202.

A second direct-push CPT and sampling survey was conducted in the Trailer 5425 area and the eastern portion of the TFE Hotspot source area, and consisted of fifteen drilling locations (Figure 4). Three boreholes per drilling location were advanced for lithology, soil vapor sampling, and soil sampling. The objective of the survey was to further define the distribution of VOCs and tritium in the Trailer 5425 area and to help determine what clean up measures should

be taken there. Based on the results of the survey, soil vapor monitor well W-3203 was instead drilled and installed to the west, in the eastern TFE Hotspot area.

A third direct-push CPT and sampling survey was conducted to the west of the VTF518 Perched Zone source area (Figure 3). The survey consisted of ten drilling locations, advancing three boreholes at each location. Analytical sampling was similar to that performed during the previous 2016 survey. The objective was to determine the extent of VOCs west of the source area, and to determine whether levels warrant expansion of the VTF518 Perched Zone remediation effort.

The fourth 2016 direct-push CPT and sampling survey occurred north of former Building 419, and in the area between former Building 419 and Building 511 (Figure 3). The survey consisted of eight drilling locations, with three boreholes advanced at each location. Soil, soil vapor and ground water samples were collected for VOC analysis. Soil and ground water samples were also collected for tritium analysis. The objective of this survey was to help delineate the distribution of VOCs and tritium in the area between the two building locations and to evaluate the extent of VOC and tritium contamination north of former Building 419.

New HSU-2 soil vapor monitor wells W-3201 and W-3202 were installed in the Building 518 yard based largely on the results of the 2010 and 2016 VTF518 Perched Zone source area direct-push drilling surveys. Soil vapor monitor wells W-3201 and W-3202 were drilled and completed using the sonic drilling method. Short-term soil vapor extraction tests were conducted at both monitor wells following completion. During monitor well W-3201 test, 1 parts per million by volume (ppmv) Total VOCs were observed, while Total VOC concentrations of up to 84 ppmv were identified at monitor well W-3202. Additional testing is planned to help determine if connecting the wells to the VTF518 Perched Zone is warranted.

New HSU-2 soil vapor monitor well W-3203 was drilled and installed in the eastern TFE Hotspot source area using the sonic drilling method. The well was sited and completed there based on the results of the 2016 Trailer 5425 and eastern TFE Hotspot area direct-push drilling survey. A short-term soil vapor test was performed at soil vapor monitor well W-3203 and Total VOC concentrations up to 26 ppmv were recorded during the test. Additional testing is planned for 2017 to further evaluate whether to convert monitor well W-3203 to a soil vapor extraction well.

A new TFD area HSU-4 ground water monitor well was installed south of Lake Haussmann adjacent to borehole B-3018, where elevated trichloroethylene (TCE) concentrations were observed in saturated soil samples in 2014 (up to 0.26 mg/kg). The well was drilled and completed using the mud-rotary drilling method. TCE concentrations in ground water from ground water monitor well W-3204 were 330 parts per billion (ppb) in December 2016. The well will be used to monitor ground water cleanup in the Building 551 and East Traffic Circle North source areas.

TFD area HSU-3A ground water monitor well W-3205 was drilled and installed using the mud rotary drilling method near borehole B-3010, where elevated saturated soil TCE concentrations were observed in 2014 (0.35 mg/kg). TCE concentrations in ground water from ground water monitor well W-3205 were 1,000 ppb in December 2016. The well will be used to monitor ground water cleanup in the southern part of the TFD Hotspot source area.

4. Summary of Remedial Action Program

This section summarizes the 2016 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) remedial action program activities at the Livermore Site. In 2016, DOE/LLNL operated and/or maintained 28 ground water treatment facilities (Figure 1 and Table 1). During the year, ground water extraction and dual extraction wells produced approximately 255 million gallons (Mgal) of ground water, and the treatment facilities removed an estimated 30 kg of VOCs (Table Summ-1 and Table 4). Since remediation began in 1989, approximately 5.7 billion gallons of ground water have been treated, resulting in the removal of an estimated 1,681 kg of VOCs (Table Summ-2).

In 2016, DOE/LLNL also operated and/or maintained eight soil vapor treatment facilities in the TFD, TFE and TFH areas (Figure 1 and Table 1), and one mobile SVE system. The soil vapor extraction and dual extraction wells produced approximately 58 million cubic feet (Mcf) of soil vapor, and the vapor treatment facilities removed approximately 14 kg of VOCs (Table Summ-1 and Table 4). Since startup in 1995, approximately 768 Mcf of soil vapor has been extracted and treated, removing an estimated 1,586 kg of VOCs (Table Summ-2).

In total, an estimated 3,267 kg (approximately 3.6 tons) of VOCs have been removed from the subsurface beneath the Livermore Site and surrounding area since 1989 (Table Summ-2). However as remediation continues, less VOC mass is being removed from the unsaturated zone (i.e., soil vapor) and ground water. Approximately 32 kg of VOCs were removed from ground water in 2015 compared to approximately 30 kg in 2016. Approximately 19 kg of VOCs were removed from soil vapor in 2015 compared to approximately 14 kg in 2016 (McKereghan et al., 2016). The declining VOC mass removal rates are considered to be the result of decreasing VOC concentrations in the subsurface and an overall decrease in the amount of mass remaining in both ground water and the unsaturated zone beneath the Livermore Site due to active remediation since 1989 (Figures 5 and 6).

Effectiveness of ground water remediation at the Livermore Site is evaluated using multiple data sets. Depth to ground water measurements recorded during the third quarter 2016 were used to construct HSU-specific ground water elevation contour maps and estimate hydraulic capture areas due to ground water pumping (Figures 7, 9, 11, 13, 15 and 17). HSU-specific isoconcentration contour maps showing total VOC concentrations above the maximum contaminant levels (MCLs) during the third quarter 2016 are shown on Figures 8, 10, 12, 14, 16 and 18. The estimated hydraulic capture areas for each HSU are superimposed on the isoconcentration contour maps to highlight where hydraulic containment of contaminant plumes was achieved during this period. Contaminant concentration trends (Section 4.3) are also used to evaluate hydraulic capture and treatment facility performance.

4.1. Summary of Treatment Facility Operations

In 2016, all ground water and soil vapor treatment facilities were operated in compliance with applicable permits. In addition, DOE/LLNL completed its REVAL process (Appendix E) at TFD and TFG North, and initiated the process at TFC Southeast and VTF518 Perched Zone (Figure 2). A soil vapor extraction test was also conducted in the VTF518 Perched Zone area (Figure 1).

Vapor flow matrix tests were conducted to evaluate sustainable yields and vapor concentrations at soil vapor monitor wells W-3201, W-3202, and W-3203 (Figure 2). Four

treatment facilities, TF5475-1, TF5475-3, VTF5475 and TF518 North, remain offline due to potential mixed waste issues (LLNL, 2009). VTFD Helipad was not operated during the year due to an ongoing ESAR treatability test in the area (Section 3.2). TFA East was not operated during 2016, as the sole extraction well for this facility is currently dewatered due to over-drafting of the aquifer and limited recharge due to the California drought. Table 5 summarizes the treatment facility operations and facility highlights for 2016.

4.2. Ground Water Discharges

In 2016, LLNL treated and discharged approximately 255 Mgal of ground water. Approximately 128 Mgal were discharged to Arroyo Las Positas, 63 Mgal to the West Perimeter Drainage Channel, and 55 Mgal to Arroyo Seco (Figure 1). To reduce potable water usage at the site, LLNL utilized more than 9 Mgal of TFB-treated ground water at the Building 133 Cooling Tower and 113 gallons of ground water treated at TFD were used for onsite irrigation. Lastly, approximately 13,100 gallons of ground water were recirculated through the *in situ* bioremediation facility (ISB01) at the TFD Helipad as part of the *in situ* bioremediation treatability test.

4.3. Remediation Performance Evaluation

In 2016, VOC concentrations declined or remained unchanged in most Livermore Site ground water plumes. The decreases in VOC concentrations discussed below are primarily attributable to active remediation at Livermore Site treatment facilities (Section 4.1). They are consistent with longer-term trends that show steady onsite and offsite mass removal and cleanup as described in the 2012 Fourth Five-Year Review for the LLNL Livermore Site (McKereghan et al., 2012) and the 2015 Annual Report (McKereghan et al., 2016).

As discussed in Appendix F, saturated soil analytical data are used to augment the data collected from ground water wells to provide better resolution in isoconcentration contour maps where ground water data are not available. Additional saturated soil data were obtained during 2016 drilling activities (Section 3.3) to ensure that historical time-static, saturated soil data used to construct the Livermore Site VOC isoconcentration maps were still representative of subsurface conditions.

The VOC concentration data derived from saturated soil analytical data for purposes of refining the VOC plume maps are referred to as “ground water equivalent” concentrations, to distinguish them from actual ground water analyses. The ground water equivalent concentration is determined by comparing saturated soil analytical results from core retained from the screened interval of a given well with the first three ground water analytical results from the same completed well, for numerous well locations across the site. This analysis yielded a nominal 1 to 10 saturated soil to ground water relationship that helped provide better resolution and constraint for the contours. For example, a saturated soil concentration of 0.005 milligrams per kilogram (mg/kg) represents a 0.05 milligram per liter (mg/L) ground water equivalent concentration (0.05 mg/L is equal to 50 micrograms per liter (μg/L), or 50 ppb. Similarly, 0.050 mg/kg saturated soil concentration represents a 500-ppb ground water equivalent concentration, and so forth. A more detailed explanation of the algorithm-based methodology used for generating the isoconcentration maps, known as Optimized Environmental Restoration Analysis (OPERA), and the rules governing how these analytical results are used, is described in Appendix F.

Ground water elevation contour maps for each HSU for third quarter 2016 are presented on Figures 7, 9, 11, 13, 15 and 17. HSU-specific isoconcentration contour maps of total VOC concentrations above MCLs for third quarter 2016 are presented on Figures 8, 10, 12, 14, 16 and 18. Estimated hydraulic capture areas due to ground water pumping are also shown on these figures. These capture areas are depicted very conservatively, and the capture areas of individual extraction wells are very likely larger than shown. Treatment facility locations are shown on Figure 1. Notable VOC concentration trends and results observed during the past reporting year (third quarter 2015 through the third quarter 2016) are discussed below. Where available and relevant, VOC concentration data more recent than third quarter 2016 are also discussed below.

The ground water data discussed in Section 4.3 are presented in Attachment C. However, it is important to note that the concentrations plotted on the isoconcentration maps represent a three-point moving average and not a single analytical result at each well.

4.3.1. Hydrostratigraphic Unit 1B

In 2016, offsite TFA area VOC concentrations remain below cleanup standards in all wells except ground water monitor well W-1425. Tetrachloroethylene (PCE) has remained at or below the 5 ppb cleanup standard in monitor well W-1425 since January 2015, and is currently at 5 ppb (November 2016). This decrease in concentration is likely due to the increased flow rate (from 11 to about 30 gpm) at TFA Arroyo Seco Pipeline ground water extraction well W-408, which was implemented in January 2015 specifically to accelerate clean up at monitor well W-1425.

The onsite PCE plume contracted eastward, with concentrations at ground water monitor well W-604 falling from 7 ppb (March 2015) to 3 ppb (February 2016). Concentrations at idle TFA East ground water extraction well W-254 remained elevated in 2016 (78 ppb, October 2016) (Figure 8). The higher concentrations observed during the last two years may be in response to the cessation of pumping there due to falling water levels caused by overdrafting and exacerbated by diminishing recharge owing to the California drought. As shown in Figure 8, the well is within the capture area of ground water extraction well W-415, and therefore VOCs in the vicinity of the well are hydraulically contained and unlikely to migrate farther to the west.

In the TFA source area, PCE at ground water monitor well W-1217 fell slightly from 190 ppb (July 2015) to 150 ppb (August 2016), yet remained unchanged at ground water monitor well W-116 (210 ppb, April 2015 and August 2016). PCE concentrations did show a pronounced increase at ground water extraction well W-1214, from 6 ppb (July 2015) to 42 ppb (August 2016). This apparent rise may be the result of ground water and saturated sediments within the low-permeability aquifer coming back into chemical equilibrium following the 6-month 2014 performance evaluation test of the well (McKereghan et al., 2015).

At TFA source area monitor well W-116, concentrations of cis-1,2-DCE have been rising since 2013 (10 ppb, July 2013, to 74 ppb, August 2016). The reason for the rise is not readily apparent, and concentrations there will be closely monitored during 2017.

At TFB, concentrations were essentially unchanged during the year despite the ongoing ground water extraction there, although a slight increase in 1,1-DCE was noted at ground water monitor well W-269 (from 3 ppb, April 2015, to 6 ppb, December 2016). Concentrations there are being hydraulically captured for treatment by downgradient HSU-1B ground water extraction wells W-610 and W-620.

At the TFC Hotspot source area, TCE concentrations fell at several wells during the review period:

- From 170 ppb (July 2015) to 72 ppb (November 2016) at ground water monitor well W-1212;
- From 150 ppb (July 2015) to 110 ppb (October 2016) at ground water monitor well W-2611; and
- From 190 ppb (July 2015) to 140 ppb (October 2016) at ground water monitor well W-2612.

The reason for the decline in concentrations at TFC Hotspot is not necessarily related to ZVI emplaced at the source area in the fall of 2014, but is likely the result of ongoing ground water extraction from nearby ground water extraction well W-2201. An update of the ZVI emplacement ESAR treatability test is presented in Appendix I.

TFC ground water extraction wells W-1015, W-1102 and W-1103 were shut-in in April 2014 to perform a VOC concentration rebound test at these wells. VOC concentrations in this area of TFC have been consistently below cleanup standards since 2011. No significant increase or evidence of rebound has been observed since these extraction wells were turned off, and all wells in the area remained below cleanup standards during the review period. DOE/LLNL will continue to monitor the area closely during 2017 for any signs of a concentration rebound.

Further to the south, TCE concentrations at piezometer SIP-191-002 remain elevated at 52 ppb (September 2016). The area is within the hydraulic capture area of TFC ground water extraction well W-1104.

VOC concentrations elsewhere at TFC, TFC East, TFC Southeast, and in the TFG area remain essentially unchanged, with no evidence of westward migration of the contaminant plumes observed. As shown on Figures 7 and 8, the HSU-1B contaminant plumes along the western LLNL margin were under full hydraulic containment in the TFA, TFB, and TFC areas during third quarter 2016. At TFC Southeast, a small portion of the plume west of ground water extraction well W-1213 is likely within the stagnation zone of the well. Regardless, the area should be fully contained once new HSU-1B ground water extraction well W-3107 is activated in early 2017. To the east, HSU-1B contaminant plumes are also hydraulically contained at TFC East, TFG-1, and TFG North.

4.3.2. Hydrostratigraphic Unit 2

In the offsite TFA area, PCE concentrations remain below the cleanup standard at all monitor wells except for ground water monitor well W-1424, where concentrations fluctuated between 5 and 6 ppb during the year, and ground water monitor well W-1701, where concentrations were 5.3 ppb in August 2016. The wellfield optimization scheme implemented in late 2012, including the shut-in of ground water extraction well W-109, activation of the TFA West Pipeline extension, and pumping of ground water extraction well W-404, continues to effectively clean up the offsite plume (Figure 10). PCE in monitor well W-1701 began rising in late 2012 as extraction well W-404 was activated, suggesting that concentrations that were previously in the stagnation zone between extraction wells W-109 and W-404 are now being captured at extraction well W-404 (Bourne et al., 2011). PCE at extraction well W-404 again remained below 4 ppb throughout the year, and at downgradient ground water monitor well W-151, where PCE was first detected in July 2012, concentrations remain at or below the 0.5 ppb detection level. The concentration trend at monitor well W-151 indicates that ground

water extraction at extraction well W-404 is effectively hydraulically containing PCE at the leading edge of the HSU-2 offsite plume.

In the onsite TFA area, VOC concentrations remain essentially unchanged. Elevated concentrations of 1,1-dichloroethane (1,1-DCA) rose slightly at ground water monitor well W-260 (28 ppb to 31 ppb between October 2015 and November 2016). While the origin of this plume is not known, 1,1-DCA has been present since at least 1986 when the well was installed. VOC concentrations there are being captured by TFA ground water extraction well W-1009 (Figure 10).

At TFB, concentrations of TCE along the western boundary of the site continue to decline due to ground water extraction at extraction wells W-2501 and W-2502. TCE concentrations at ground water monitor wells W-422 and W-1420 dropped below the 5 ppb cleanup standard for the first time since 2004 (4 ppb, August 2016, and 3 ppb, May 2016 respectively). Elsewhere in the TFB and TFC areas, VOC concentrations remained essentially unchanged during the year.

In the northwestern TFD area, TCE increased from 11 ppb (August 2015) to 54 ppb (December 2016) at monitor well W-568. Concentrations of chloroform were also elevated, at 63 ppb in December 2016. While concentrations have fluctuated there since 2013, this appears to be the start of an upward trend. Concentrations at ground water monitor well W-568 are being captured for treatment at downgradient TFC East ground water extraction well W-413.

To the east at ground water monitor well W-355, TCE concentrations fell from 36 ppb (January 2015) to 6 ppb (November 2016). Concentrations there will be monitored in 2017 to determine whether the decline is related to the activation of new TFD HSU-2 ground water extraction well W-3102 in February 2016.

At TFD Southeast piezometer SIP-ETC-201, concentrations of VOCs above cleanup standards increased from 560 ppb (August 2015) to 669 ppb (January 2016). This likely represents a fluctuation in concentrations similar to those commonly observed at Livermore Site source areas. Concentrations in the area are being hydraulically contained by TFD Southeast ground water extraction well W-1308 and downgradient TFD East ground water extraction well W-1303.

In the TFD South area, TCE at ground water extraction well W-1510 declined from 22 ppb (July 2015) to 14 ppb (October 2016) due to ongoing ground water extraction and treatment in this area.

TCE concentrations continued to slowly decline in the TFE East area due to ground water extraction, soil vapor extraction, and possibly mass removal associated with the ongoing thermally enhanced ESAR treatability test (Appendix H). TCE fell from 130 ppb (July 2015) to 96 ppb (October 2016) at ground water extraction well W-1109 and from 44 ppb (September 2015) to 32 ppb (June 2016) in nearby ground water monitor well W-909. To the west, in the mobile HSU-2 plume emanating from the TFE East area, TCE concentrations fell slightly at ground water extraction well W-305 (from 29 ppb, April 2015, to 22 ppb, October 2016), while rising somewhat at ground water monitor well W-1901-2 (from 0.8 ppb, September 2015, to 5.1 ppb, October 2016). The leading edge of the plume remains under hydraulic containment by TFG North ground water extraction well W-1807.

Elsewhere in the TFE, TFG and TFH areas, VOC concentrations remained largely unchanged during the year.

As shown on Figures 9 and 10, the HSU-2 contaminant plumes in the TFA and TFB areas remain entirely within the estimated capture areas except for a small portion of the TCE plume south of ground water monitor well W-1226. While this area is interpreted to be within the stagnation zone of ground water extraction well W-2502, any contamination migrating westward would be captured by TFA Arroyo Seco Pipeline ground water extraction wells W-903, W-457, or W-904. In the TFD area, areas of the plume adjacent to ground water monitor well W-568 not being hydraulically contained will be captured downgradient at HSU-2 TFC East ground water extraction well W-413. To the south in the TFE area, any portions of the mobile HSU-2 plume emanating from TFE East not under immediate hydraulic containment will be captured downgradient at TFG North ground water extraction well W-1807. HSU-2 ground water elevations continue to decline due to over-drafting of the aquifer exacerbated by limited recharge owing to the ongoing California drought.

4.3.3. Hydrostratigraphic Unit 3A

The overall size, geometry and location of the HSU-3A VOC ground water plumes were essentially unchanged in 2016. However, several concentration changes were noted during the year. Most significantly, ground water data from newly installed ground water monitor well W-3205 (Figure 12) replaces the ground water equivalent concentration from the 2014 borehole B-3010 (3,500 ppb, July 2014). TCE concentrations at W-3205 were 1,500 ppb in September 2016 and 1,000 ppb in December 2016, which are the highest observed TCE concentrations in the TFD area. As it often takes three or four quarters for lower-permeability Livermore Site wells to equilibrate chemically with the surrounding aquifer following well development, ground water concentrations may change significantly at ground water monitor well W-3205 over the coming year.

To the north, a rise in TCE concentrations at TFD ground water monitor well W-2103 (from 230 ppb to 330 ppb between September 2015 and August 2016) appears to reflect fluctuations in concentration rather than being indicative of a concentration trend. TCE in this area is hydraulically captured for treatment by downgradient TFD West ground water extraction well W-1902 and TFD ground water extraction well W-1208.

TCE concentrations in the Eastern TFE and Trailer 5475 areas increased at several wells during the year while remaining unchanged or declining slightly in other nearby wells:

- At ground water monitor well W-1225, TCE rose from 230 ppb (September 2015) to 960 ppb (August 2016);
- At ground water monitor well W-1117, TCE rose slightly from 450 ppb (September 2015) to 480 ppb (August 2016); and
- At well W-2302, TCE rose from 280 ppb (September 2015) to 450 ppb (November 2016).

Except for the concentration rise at monitor well W-1225, these increases are interpreted to represent fluctuations that commonly occur in Livermore Site source areas and are not necessarily indicative of a significant concentration trend. Monitor well W-1225 will be closely monitored during 2017 to determine whether the steady rise observed there continues. As shown on Figure 12, concentrations at monitor well W-1225 are interpreted to be hydraulically contained within a long-standing HSU-3A ground water depression present in the Trailer 5475 area since the 1990s.

In the former Building 419 area, TCE concentrations at ground water monitor well W-3004 dropped from 510 ppb (August 2015) to 130 ppb (August 2016) during the review period. The reason for the concentration drop is not clear, but concentrations will continue to be closely monitored during 2017. Conversely, at ground water monitor well W-1414, TCE concentrations rose from 760 ppb in August 2015 to 1,900 ppb in August 2016. The change in concentrations, however, is consistent with previous fluctuations observed at that well. The implementation of CERCLA clean-up activities in the former Building 419 area awaits resolution of mixed-waste management issues.

Elsewhere in the TFD, TFE and TFH areas, concentrations were essentially unchanged in 2016.

Figures 11 and 12 show the estimated hydraulic capture areas in HSU-3A during the third quarter of 2016. In the western TFE and eastern TFG areas, the plume adjacent to ground water monitor well W-276 remains outside of the hydraulic capture area. However, TCE at ground water monitor well W-2603, located at the downgradient edge of the plume, has remained consistently below the 5 ppb TCE cleanup standard (2 ppb, February 2016), indicating that additional hydraulic containment is currently not needed in this area. VOC concentrations at guard well W-315 are back within the capture zone of ground water extraction well W-1208 once it was re-activated following completion of the TFD REVAL in February 2016.

4.3.4. Hydrostratigraphic Unit 3B

Similar to HSU-3A, while the overall size, geometry and location of the HSU-3B ground water VOC plumes did not change appreciably in 2016, several changes in concentration were noted within these plumes (Figure 14).

In the TFD Southeast area, the boundary between HSU-3B and HSU-4 was revised upward after the installation and hydraulic testing of new HSU-4 ground water monitor well W-3204. As a result, ground water equivalent concentrations from borehole B-3018 saturated soil were reassigned to HSU-4 and the 1,000-ppb contour moved southward towards TFD East ground water extraction well W-2006 on Figure 14.

In the TFH area, the 1,000 ppb contour no longer appears in the former Building 419 area due to declining concentrations. At ground water monitor well W-2617, TCE concentrations declined from 950 ppb (December 2015) to 650 ppb (October 2016), while TCE concentrations fell slightly at soil vapor extraction well W-2205 from 820 ppb (August 2015) to 790 ppb (October 2016). Based on a review of previous concentration fluctuations at these two wells, the observed decrease is not likely permanent. The distal portion of the VOC plume is being hydraulically contained and extracted for treatment by HSU-3B TFE Southwest ground water extraction well W-1522.

Elsewhere in the TFD, TFE and TFH areas, concentrations remained essentially unchanged during the year.

With the re-activation of TFD following completion of REVAL-related activities in early 2016, all HSU-3B ground water contaminant plumes are either under hydraulic control of extraction wells associated with TFD, TFE and TFH treatment facilities or hydraulically contained within the pumping-induced ground water depression shown on Figures 13 and 14.

4.3.5. Hydrostratigraphic Unit 4

Several noteworthy changes or trends were observed within the HSU-4 VOC plumes during 2016.

Very high VOC concentrations continue to be present in several HSU-4 monitor wells located at the TFD Helipad source area. TCE concentrations at ground water monitor well W-1250 reached their highest level yet (3,200 ppb in February 2016), while at ground water monitor well W-1253 TCE declined slightly, from 1,800 ppb (August 2015) to 1,500 ppb (November 2016). To the west at ground water monitor well W-1252, TCE concentrations remain essentially unchanged, at 430 ppb in May 2015 and 410 ppb in May 2016.

Post-REVAL analytical samples taken from TFD ground water extraction wells W-1206 and W-351 indicate that no significant increases in concentration occurred there during the hiatus in pumping. TCE concentrations at extraction well W-351 fell from 460 ppb (April 2015) to 83 ppb (February 2016). Concentrations then rose steadily over the next three quarters (190 ppb, April 2016; 480 ppb, July 2016; and 530 ppb, October 2016) suggesting that the VOC plume may have been diverted southward due to pumping at TFD East and TFD Southshore while TFD was offline. This interpretation is consistent with an increase in TCE concentrations observed at TFD Southshore ground water extraction well W-1523 during the shutdown, followed by a decrease in concentrations once the TFD wells restarted (increasing steadily from 140 ppb in April 2015, to 200 ppb in January 2016, then declining steadily to 110 ppb in October 2016).

Further to the west, downgradient of TFD, TCE at ground water monitor well W-1803-1 also remained essentially unchanged during the review period (120 ppb, August 2015; 140 ppb, May 2016), suggesting that no significant westward migration of the TCE plume occurred during and following the TFD REVAL upgrade, and that the plume remains contained within the pumping-induced ground water depression that encompasses much of the central and southern TFD area (Figure 16).

A large concentration change occurred in eastern TFD, where 330 ppb of TCE (December 2016) from newly installed HSU-4 ground water monitor well W-3204 replaces ground water equivalent concentrations of 2,600 ppb at borehole B-3018. As it often takes three or four quarters for lower-permeability Livermore Site wells to equilibrate chemically with the surrounding aquifer following well development, ground water concentrations may change significantly at monitor well W-3204 during the coming year.

Elsewhere in the TFD, TFE and TFH areas, concentrations remained essentially unchanged during the review period.

Figures 15 and 16 show the estimated hydraulic capture areas in HSU-4 during third quarter 2016. The pumping-induced ground water depression associated with extraction at TFD, TFD South, TFD Southshore and TFE Northwest continued to provide additional hydraulic containment in large portions of the TFD, TFE and TFH areas during 2016.

4.3.6. Hydrostratigraphic Unit 5

Several subtle, but consistent trends and changes in the HSU-5 isoconcentration contour map were evident this review period.

In the TFD area, a TCE concentration decline occurred at new HSU-5 ground water extraction well W-3101 (from 72 ppb, June 2015, to 18 ppb, October 2016) while at ground water monitor well W-1803-2, TCE fell slightly (20 ppb, June 2015, to 12 ppb, May 2016). TCE

concentrations at W-1803-2 suggest that extraction well W-3101, which replaced former ground water extraction well W-907-2, appears to be hydraulically containing the distal portions of the plume to the west (Figure 18).

In the TFD South area, a minor concentration decline occurred at ground water extraction well W-2601 (from 47 ppb to 38 ppb between July 2015, and July 2016), while concentrations at downgradient ground water monitor well W-3001 remained unchanged (13 ppb, September 2015; 11 ppb, June 2016). The data suggest that ongoing ground water extraction is hydraulically containing the HSU-5 VOC plume in this area.

To the south in the TFE East and Trailer 5475 areas, TCE concentrations either declined or remained essentially the same in all area monitor and extraction wells:

- At ground water extraction well W-1108, TCE fell from 310 ppb (July 2015) to 170 ppb (October 2016);
- At ground water monitor well W-3106, TCE fell from 100 ppb (November 2015) to 85 ppb (November 2016);
- At ground water injection well W-1610, TCE declined from 130 ppb (September 2015) to 95 ppb (November 2016); and
- At ground water monitor well W-912, TCE fell from 72 ppb (June 15) to 58 ppb (May 2016).

The widespread declines in concentration are attributed to the ongoing ground water extraction and treatment in these areas.

South of TF406 on property operated by Sandia National Laboratory, concentrations at ground water monitor well W-509 rose slightly above the TCE cleanup standard for the first time since 2009 (7 ppb, March 2016). This may be in response to the decline in sustainable yield from TF406 ground water extraction well W-1310 (from 13 gpm to 8 gpm) due dropping water levels owing to limited recharge associated with the California drought. However, the W-1310 flow rate at this well was increased to 10 gpm in mid-December to increase its hydraulic influence over the area.

Elsewhere in the TFD, TFE and TFH areas, concentrations remained essentially unchanged during the review period.

Figures 17 and 18 show the estimated hydraulic capture areas in HSU-5 during the third quarter 2016. All HSU-5 VOC plumes fall within extraction well capture areas or the pumping-induced ground water depression in HSU-5 shown on Figure 18.

4.4. Tritium

Due to ongoing radioactive decay, tritium activities in ground water remain below the 20,000 picocuries per liter (pCi/L) cleanup standard at all Livermore Site wells, including those in the Building 292, former Building 419, and the Trailer 5475 areas (Figure 1).

In the Trailer 5475 area, tritium activities remained relatively high in two wells, soil vapor extraction well W-2211 and soil vapor extraction well W-2302. Tritium in extraction well W-2211 (Figure 12) was measured at 14,400 pCi/L in May 2016, down from a high of 21,400 pCi/L (March 2012), while tritium in extraction well W-2302 was 11,800 pCi/L in August 2016, down from a high of 21,600 pCi/L in March 2012. Elsewhere in the Trailer 5475 area, all wells were below 4,000 pCi/L.

Tritium activities in the Building 292 area continue to decline. Tritium at HSU-1B monitor well UP-292-007, where the highest activities onsite had previously been observed (24,000 pCi/L, October 2000), was 5,760 pCi/L in February 2013 (Figure 8). The well remains dry since that time. The most recent, highest tritium activity in the Building 292 area is less than 100 pCi/L (ground water monitor well W-607, February, 2014).

As part of the Building 419 RCRA Closure agreement (California Department of Substances Control, 2013), DOE/LLNL installed a well to monitor tritium activities beneath the former Building 419 area. Tritium was detected in 2011 at approximately 60,000 pCi/L in bailed ground water samples from pre-closure characterization boreholes B-419-040 and B-419-041 (Figure 12). In the fall of 2014, ground water monitor well W-3004 was installed between these two borehole locations. The initial tritium activity in monitor well W-3004 was 12,400 pCi/L (September 2014), and is currently 16,600 pCi/L (August 2016), which is consistent with other activities in the Building 419 area, including piezometer SIP-419-202, where tritium was 15,500 pCi/L in October 2016.

During 2016, DOE/LLNL conducted a direct-push survey consisting of eight drilling locations between former Building 419 and Building 511, and in the former Building 419 yard north of monitor well W-3004 to help further delineate the distribution of tritium in soil and ground water (Figure 3). Three drilling locations were successfully sampled for ground water:

- 39,600 pCi/L tritium was present at location borehole B-3258, north of monitor well W-3004;
- 1,990 PCi/L tritium was present at location borehole B-3253, about midway between the two buildings; and
- Non-detect for tritium at location borehole B-3257, east of borehole B-3258.

Tritium activities in soil were detected at three drilling locations:

- At borehole B-3258, soil moisture tritium activities ranged from 72,885 and 18,381 pCi/L between the depths of 18 ft to 104 ft (if the pore space within the soil were fully saturated, these activities would range from 48,210 and 11,604 pCi/L);
- At borehole B-3253, soil moisture tritium activities were 1,218 pCi/L at 62.5 ft; and
- At borehole B-3251, soil moisture tritium activities ranged from 1,964 and 5,913 pCi/L between the depths of 20 and 57 ft.

In summary, the highest tritium activities in both ground water and soil moisture encountered during this CPT survey were found north of the former Building 419 location, in borehole B-3258 (Figure 3).

A direct-push drilling survey was also conducted in the Trailer 5425 area (Figure 4). Fifteen drilling locations were sampled for tritium and VOCs. Of the 130 soil samples collected, only eight had detections, ranging from 0.23 to 4.6 pCi/g. The highest detection occurred in borehole B-3229 at a depth of 15 ft, where the soil moisture activity was 93,347 pCi/L. If the pore space within the soil were fully saturated, this activity would be 20,500 pCi/L. Tritium activities dropped off rapidly to non-detect with increasing depth at this location. Borehole B-3229 is located where solar evaporation trays were formerly used to reduce the volume of radioactive liquid waste stored at this part of LLNL between about 1953 and 1976 (Buerer, 1983; and Berg et al., 1998).

All the analytical data collected during all the direct-push drilling surveys discussed above is presented in Attachment B.

4.5. Decision Support Analysis

A variety of decision support tools are utilized to analyze data and evaluate the performance of the Livermore Site remediation systems. These tools improve the quality, efficiency and consistency of routine tasks and result in significant cost savings for DOE/LLNL. Decision support tools were also used extensively during REVAL (Appendix E) for each treatment facility and for ESAR activities. These decision support activities and associated tools are grouped into five categories:

- The Environmental Information Management System (TEIMS);
- Automated Data Review and Mapping Tools;
- Predictive Analysis Tools;
- Treatment Facility Real-Time (TFRT) data acquisition system; and
- Mobile data collection systems.

The TEIMS database and associated data entry and review tools are routinely used for work tasks ranging from data management to report preparation. For example, the treatment facility self-monitoring reporting tool allows facility operators to enter data using a web-based interface, and to automatically generate reports that are included in the quarterly self-monitoring reports (Yow and Wong, 2016[a-d]).

The next level of decision-support tools consists of sophisticated graphical, statistical and numerical data analysis tools used for remedial performance evaluations. The CES algorithm (Appendix C) enables ERD personnel to quickly review concentration trends in wells and set sampling frequencies on a quarterly basis. The OPERA tool (Appendix F) enables personnel to quickly view HSU-specific plume maps for each contaminant-of-concern and compare current conditions with historical distributions. Plume and ground water elevation maps, and animations that span the entire Livermore Site GWP history, are updated each quarter. The plume map library was updated quarterly during 2016 with the most recent sampling information available. The HSU conceptual model constitutes the basic framework for all decision support tools, and is continually updated using information from recently installed wells and hydraulic tests.

The TEIMS environmental database and the data analysis tools significantly reduce the effort required to develop analytical or numerical models for predictive analyses. Regional-scale flow and transport models are used to evaluate the effectiveness and startup order of wells in extraction wellfields. The results of these analyses allow personnel to prioritize the maintenance and operation of critical facilities to ensure hydraulic containment.

In 2016, the TFRT data acquisition system continued to provide significant value to the Livermore Site cleanup project. TFRT data are used to optimize and maintain treatment facilities, and to quickly provide important information for diagnosing facility-related issues. Improvements were also implemented for controlling operation of ground water extraction wells. The operational mode of multiple wells in the eastern portion of the site, where well yields are typically lower, was converted from constant flow rate to water-level-controlled pumping. In this operational mode, the water level in the well is maintained at a desired elevation while the treatment facility electronic control system automatically adjusts the flow rate of the pump. This

capability resulted in two significant improvements: 1) extraction wells operate continuously and require fewer adjustments and less technician oversight, and 2) plume capture is maintained at all times without further exacerbating the ongoing over-drafting of the aquifer.

DOE/LLNL deployed a mobile data collection tool for recording manual water level measurements in 2015. The Water Level COllection (WLCO) tool allows field personnel to plan their activities, record water level measurements, and update the database daily. The tool has built-in decision support capabilities to minimize data measurement and data entry errors. WLCO also provides significant cost-savings by reducing the time required to get high-quality measurements into the database. In 2016, DOE/LLNL expanded the capabilities of WLCO and improved water level quality control processes.

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6. Acronyms and Abbreviations

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CES	Cost effective sampling
DOE	U.S. Department of Energy
DWFO	Dynamic Well-Field Operation
ELM	Eastern Landing Mat
EPA	U.S. Environmental Protection Agency
ESAR	Enhanced Source Area Remediation
ETC	East Traffic Circle
ETCS	East Traffic Circle South
FFA	Federal Facility Agreement
GPM	Gallons per minute
GWP	Ground Water Project
HSU	Hydrostratigraphic unit
ISB01	*In situ* bioremediation facility
kg	Kilogram
LLNL	Lawrence Livermore National Laboratory
MCL	Maximum contaminant level
Mcf	Millions of cubic feet
Mgal	Millions of gallons
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
OPERA	Optimized environmental restoration analysis
PCE	Perchloroethylene or tetrachloroethylene
pCi/L	Picocuries per liter
ppb	Parts per billion
RCRA	Resource Conservation and Recovery Act
REVAL	Remediation evaluation
RPM	Remedial Project Manager
RWQCB	California Regional Water Quality Control Board
SDGS	Specific depth grab sampling
TCE	Trichloroethylene
TF	Treatment facility
µg/L	Micrograms per liter
VES	Vapor extraction system
VIP	Vertical inclusion process
VOC	Volatile organic compound
VTF	(Soil) vapor treatment facility
ZVI	Zero valent iron

Figures

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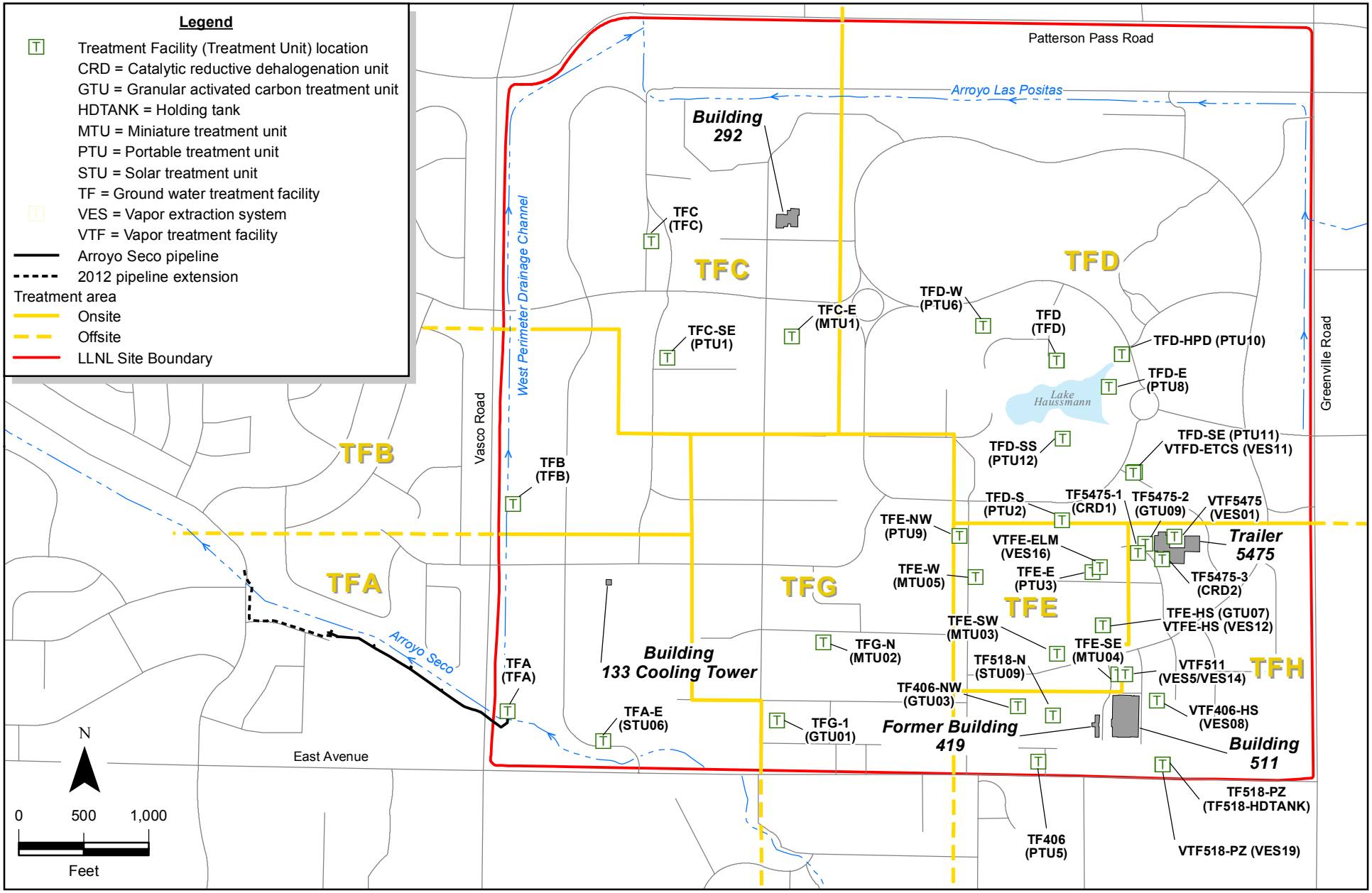
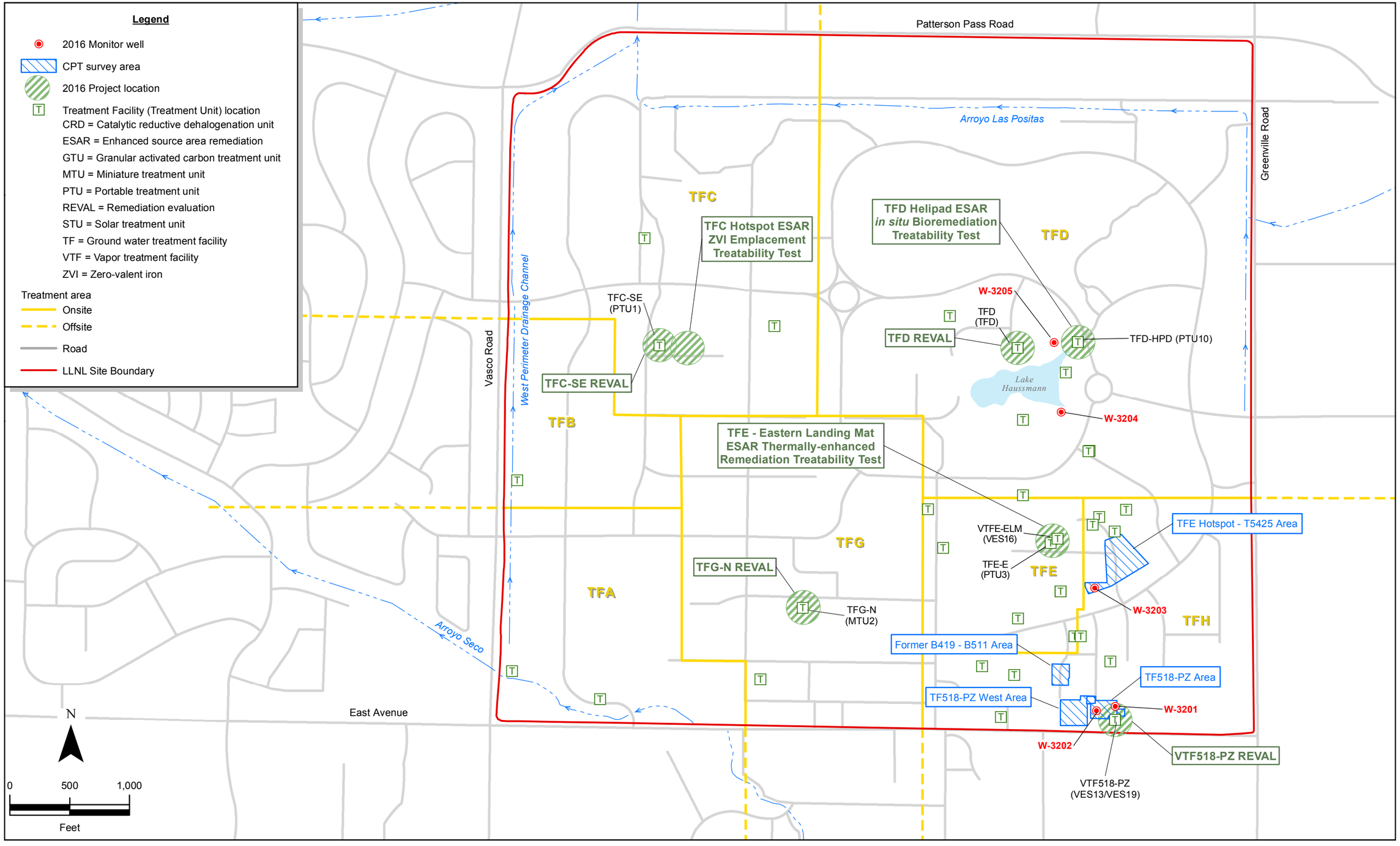


Figure 1. Livermore Site treatment areas and treatment facility locations.



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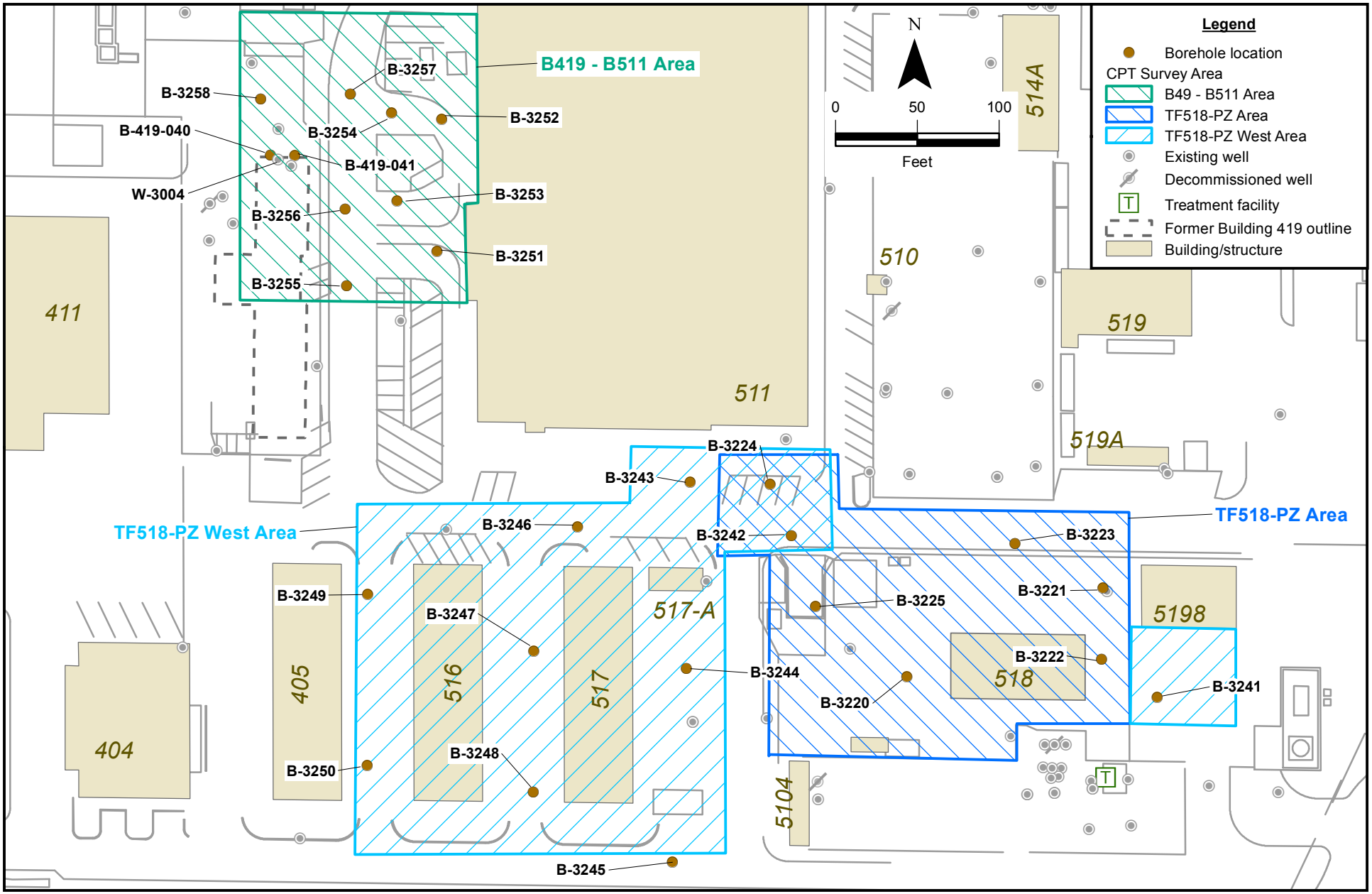

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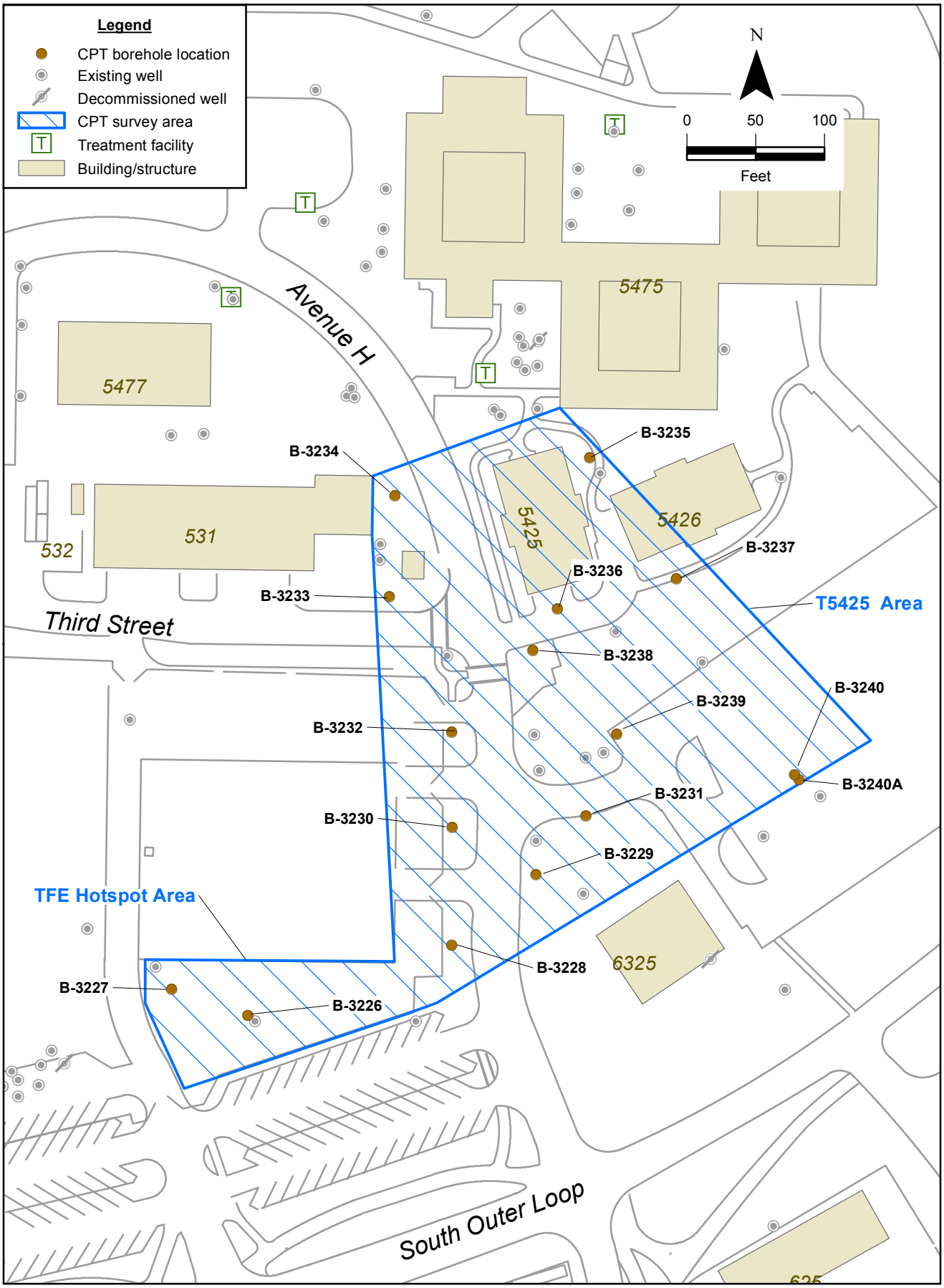

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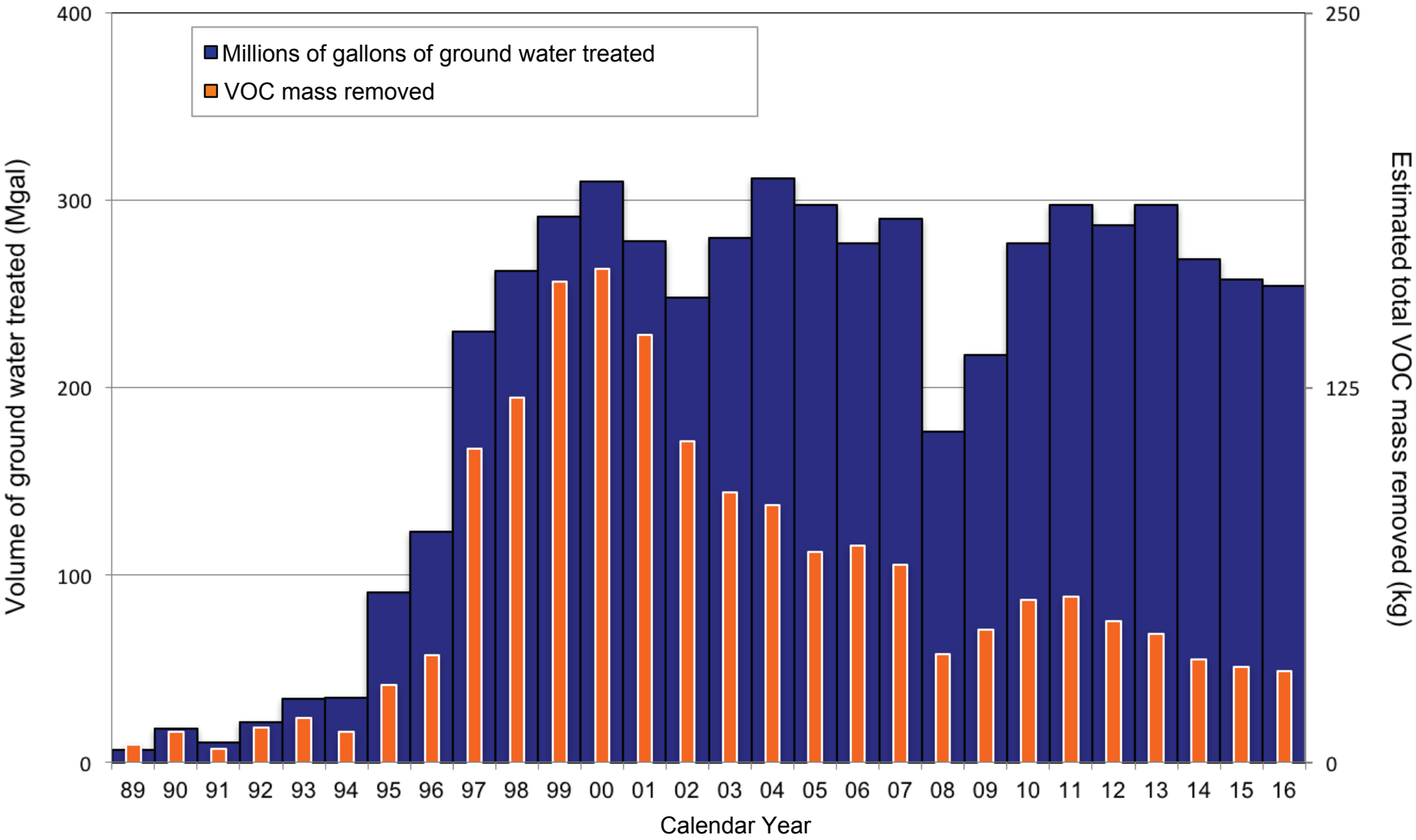

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Figure 5. Estimated total VOC mass removed from Livermore Site ground water since 1989.

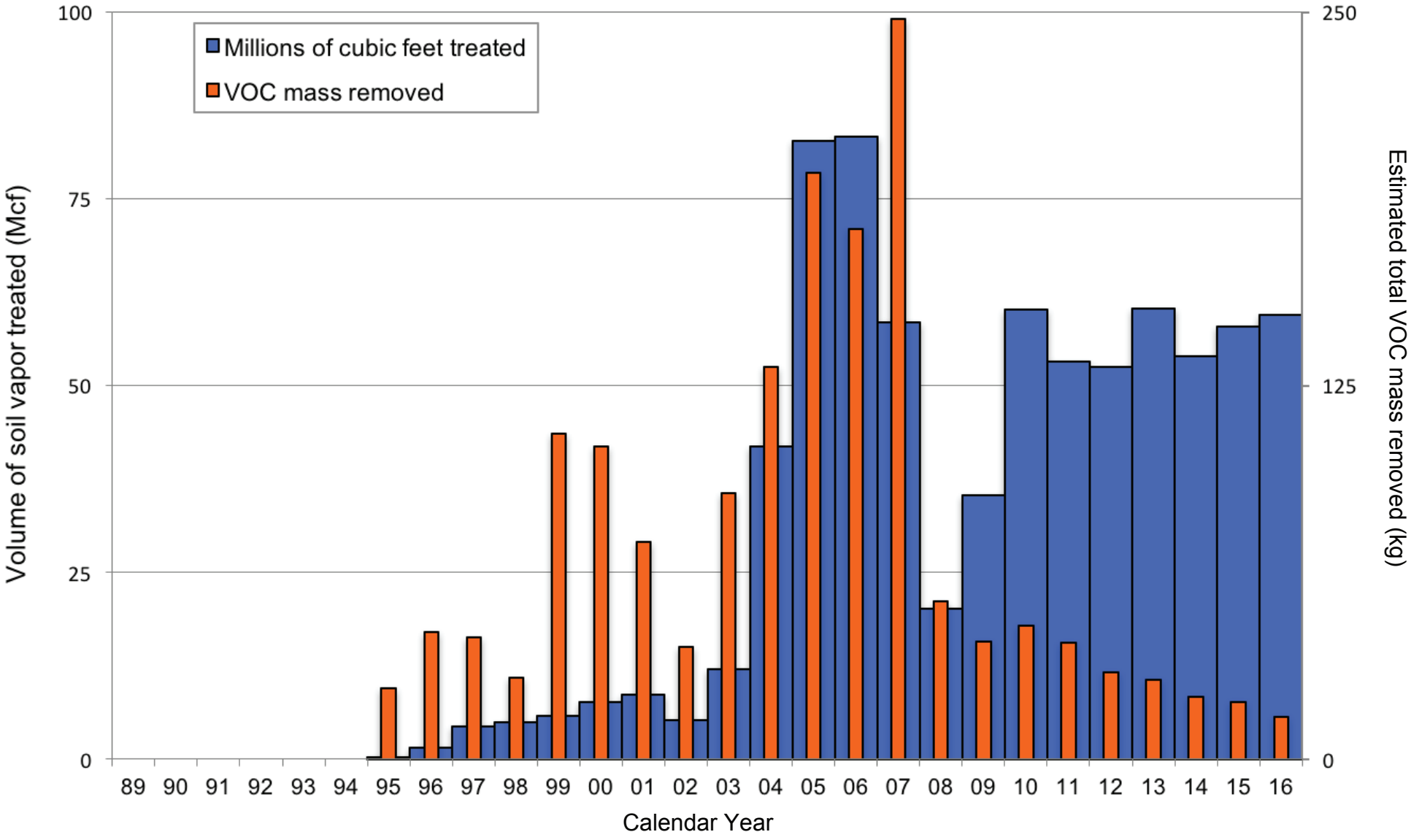

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Figure 6. Estimated total VOC mass removed from Livermore Site soil vapor since 1989.

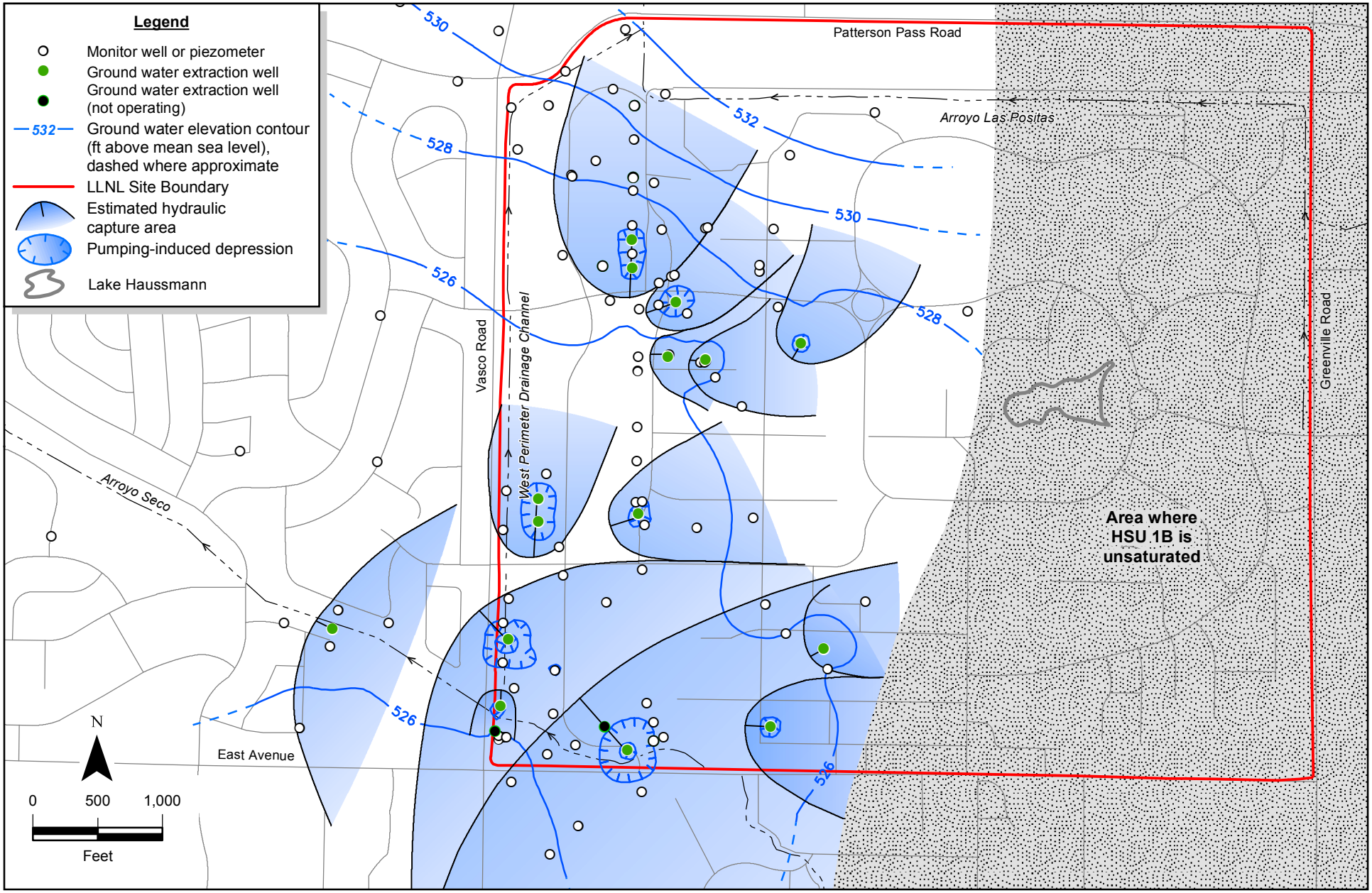
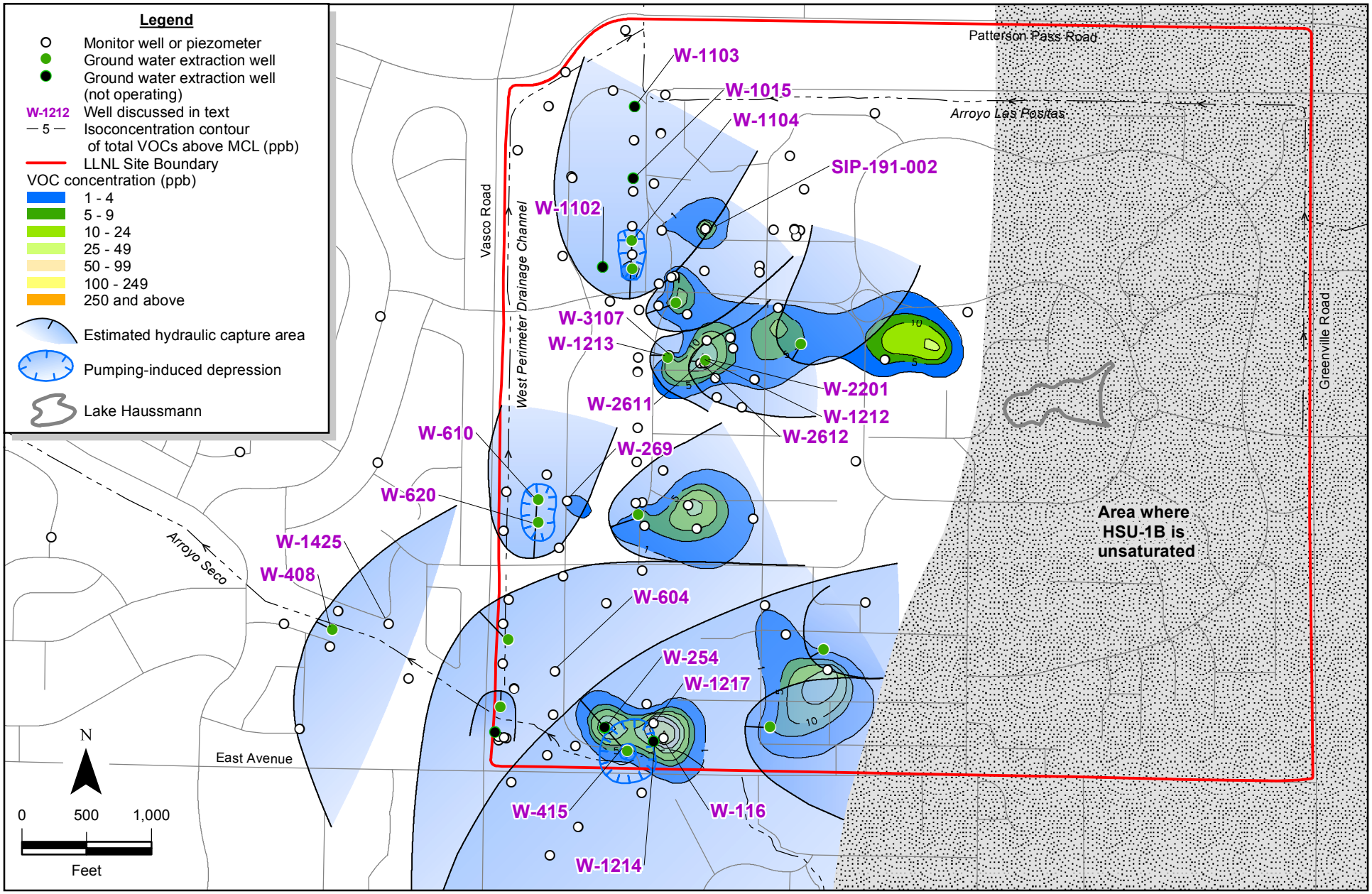


Figure 7. Ground water elevation contour map based on 112 wells completed within HSU-1B showing estimated hydraulic capture areas, LLNL and vicinity, third quarter 2016.



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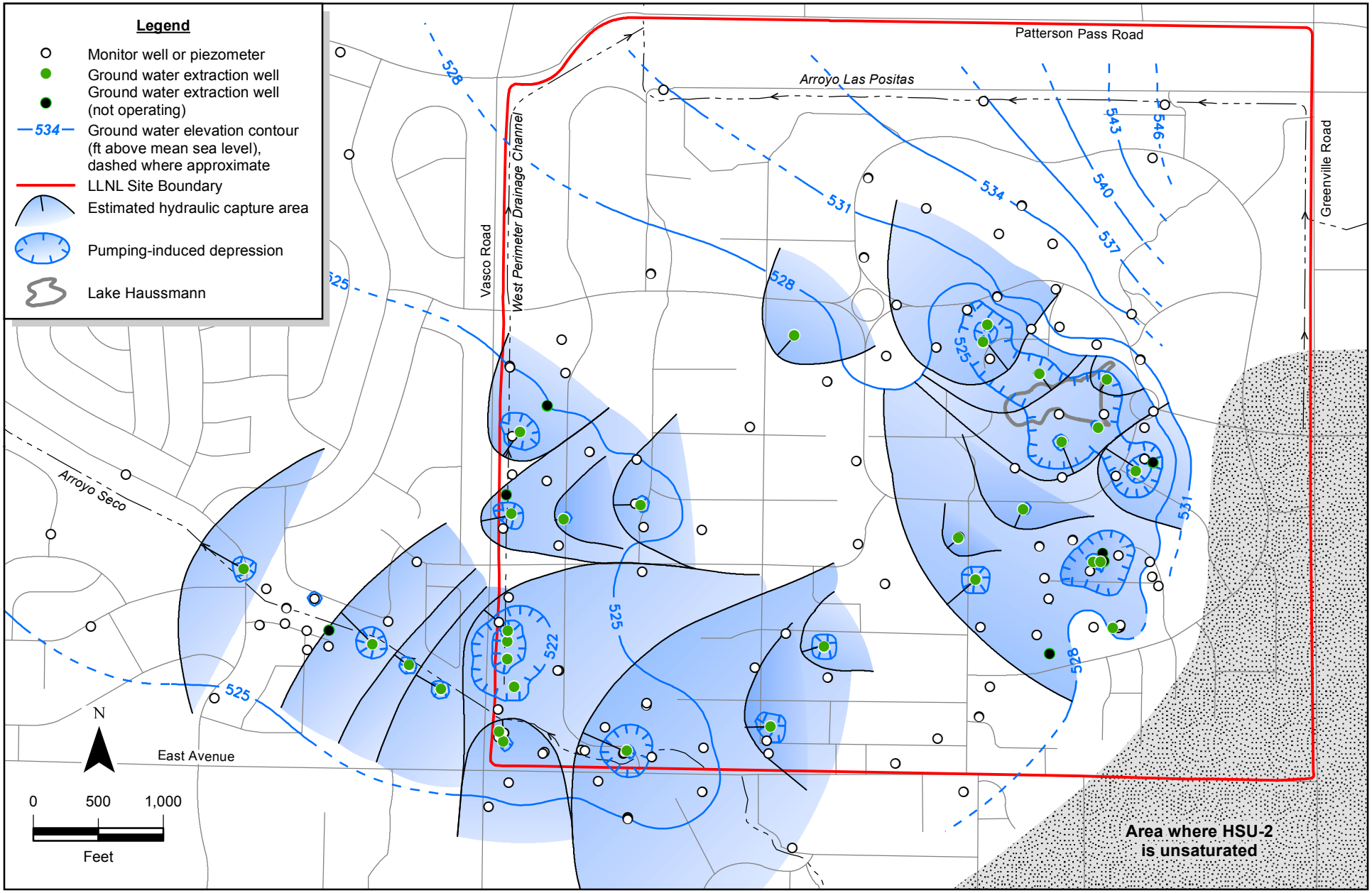

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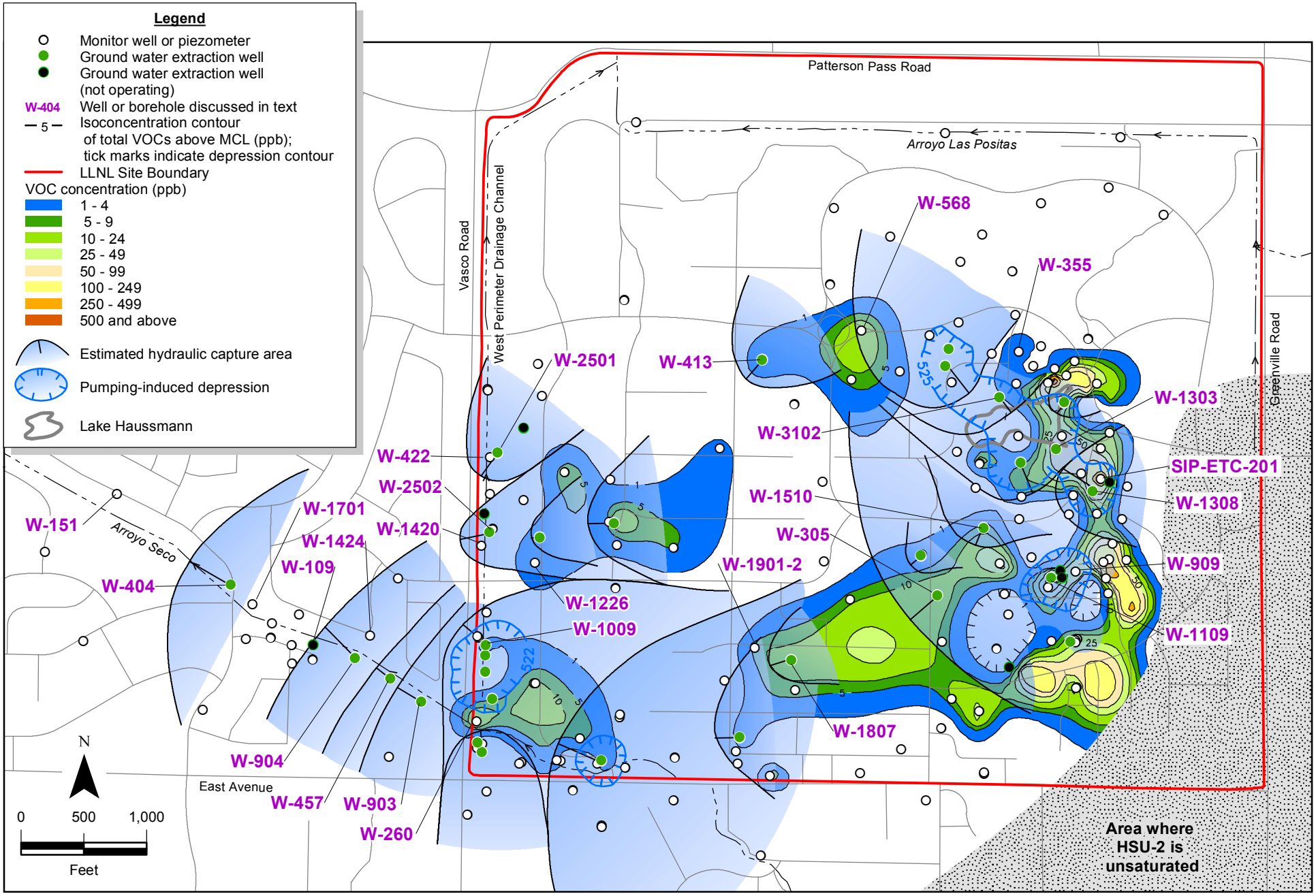

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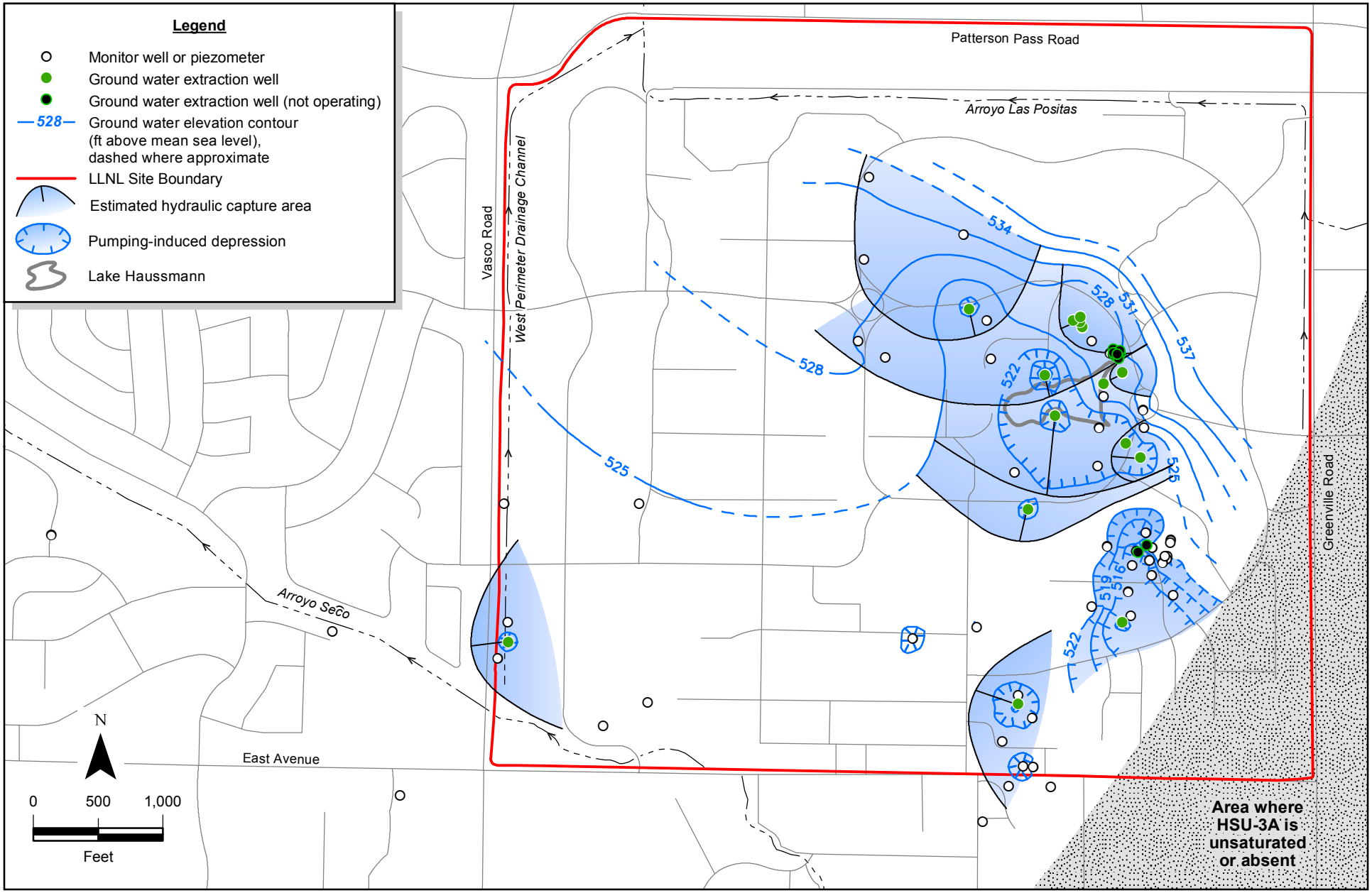

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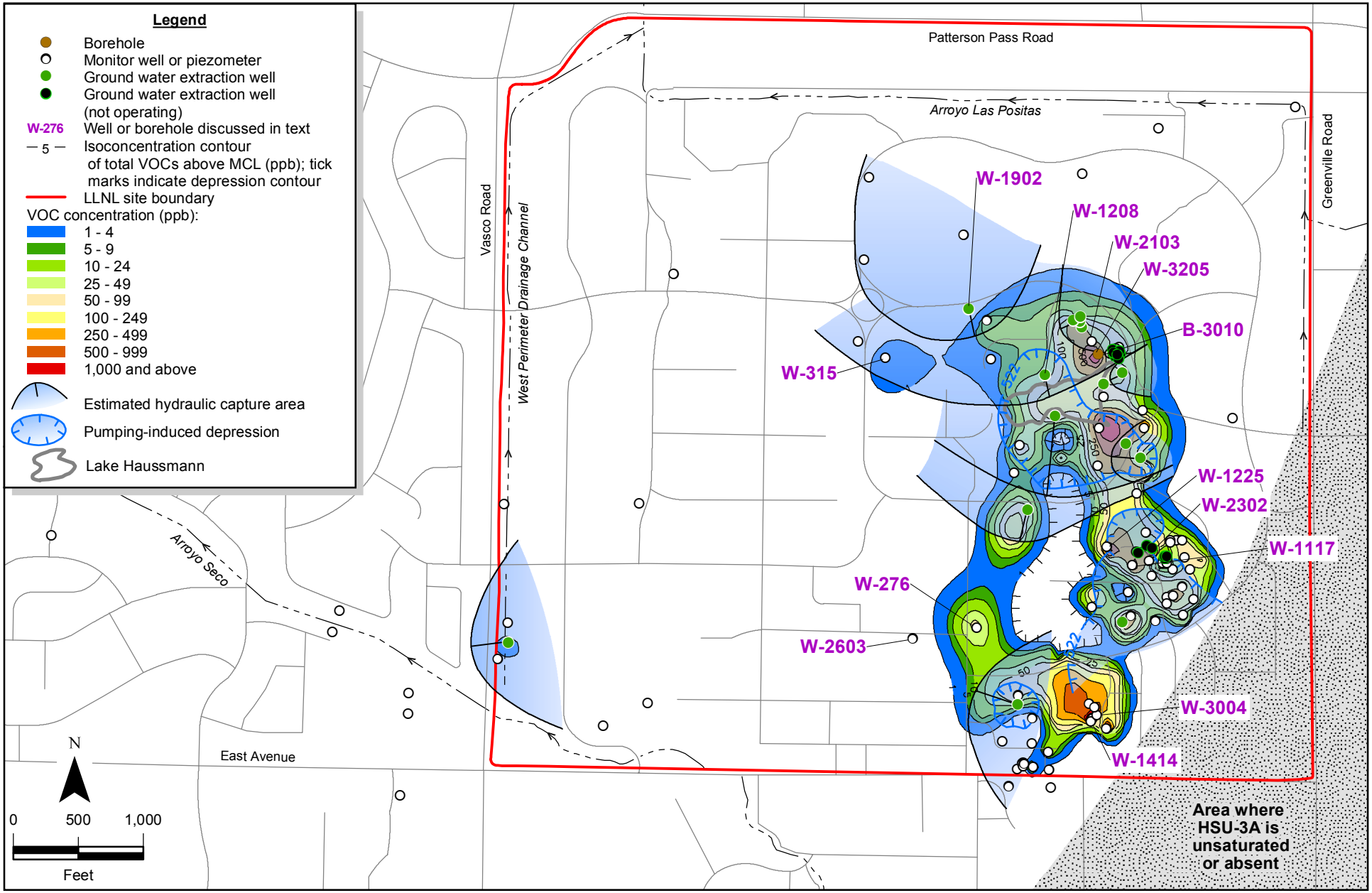

Figure 12. Isoconcentration contour map of total VOCs above MCLs from 119 wells completed within HSU-3A, third quarter 2016 (or the next most recent data), and supplemented with soil chemistry data from 143 borehole locations.

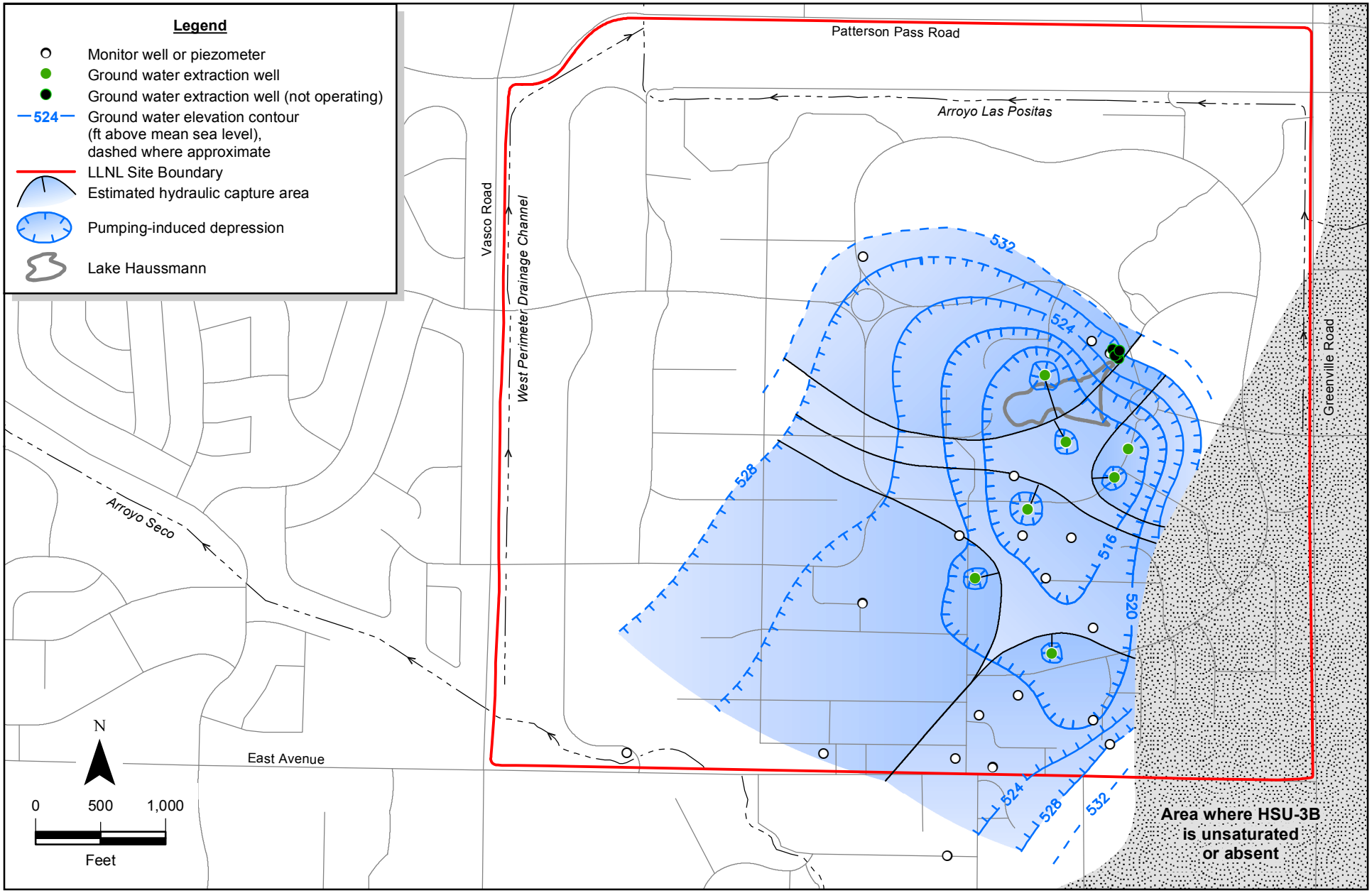

Figure 13. Ground water elevation contour map based on 31 wells completed within HSU-3B showing estimated hydraulic capture areas, LLNL and vicinity, third quarter 2016.

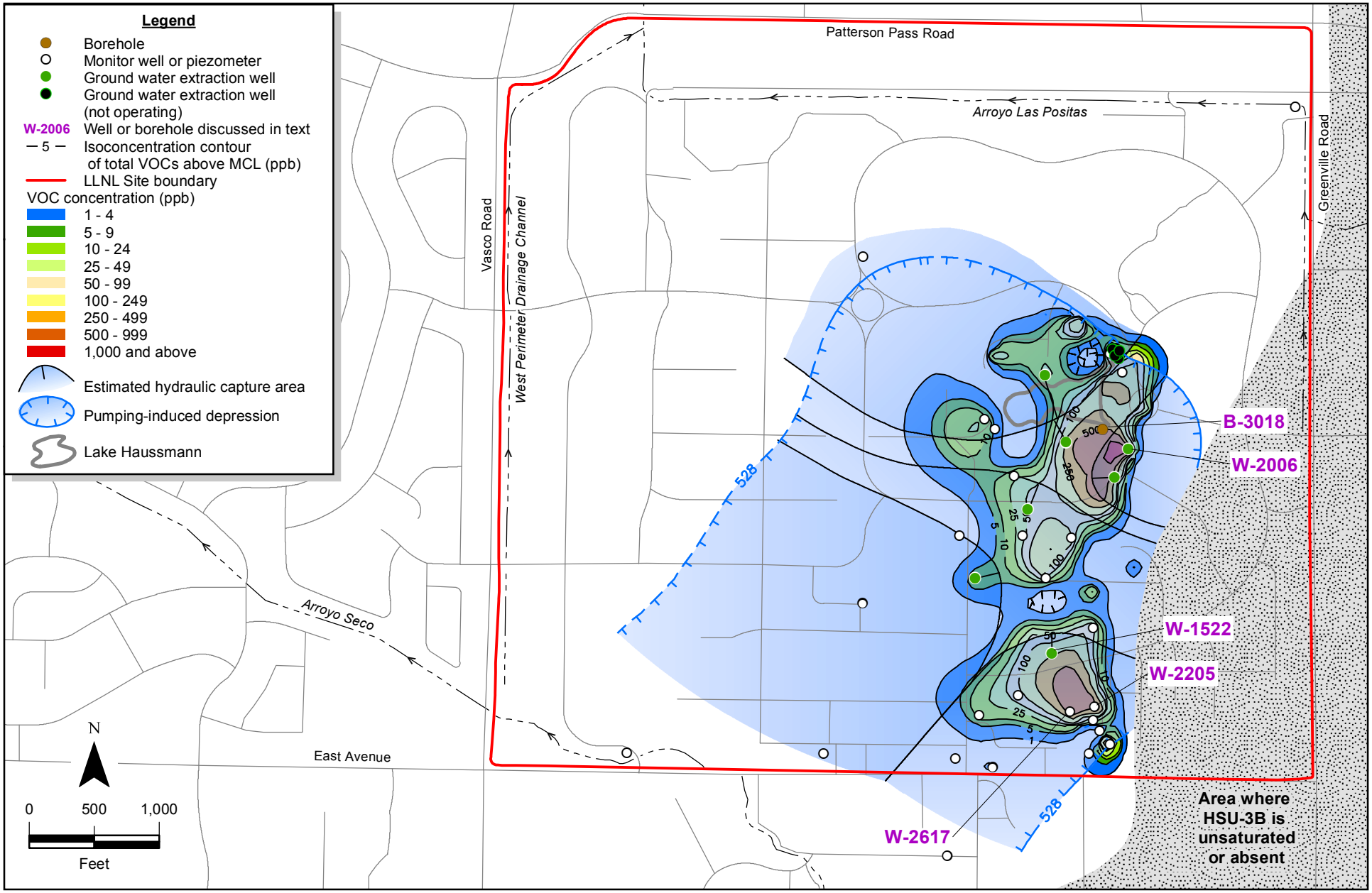

Figure 14. Isoconcentration contour map of total VOCs above MCLs from 43 wells completed within HSU-3B, third quarter 2016 (or the next most recent data), and supplemented with soil chemistry data from 110 borehole locations.

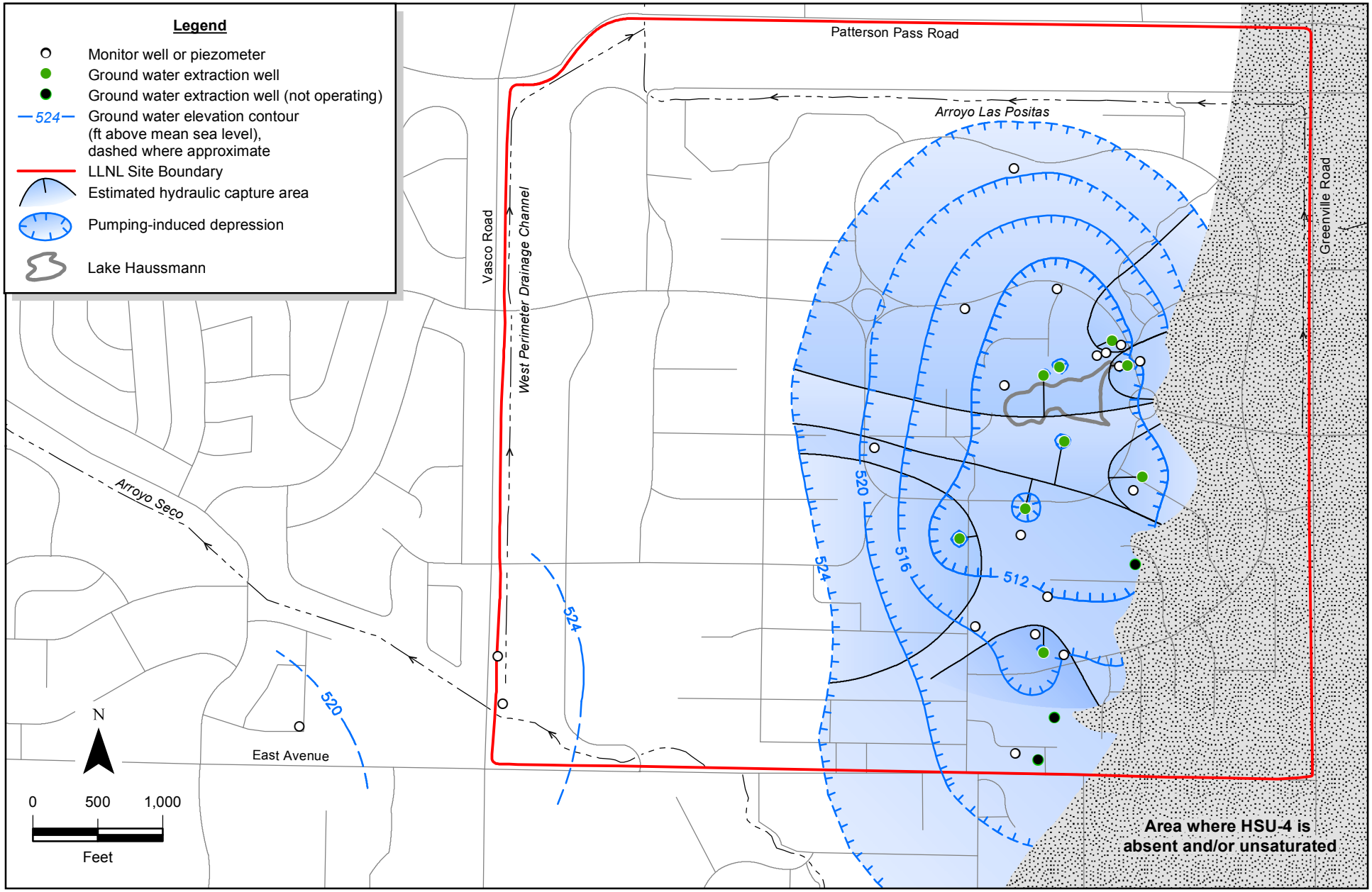

Figure 15. Ground water elevation contour map based on 33 wells completed within HSU-4 showing estimated hydraulic capture areas, LLNL and vicinity, third quarter 2016.

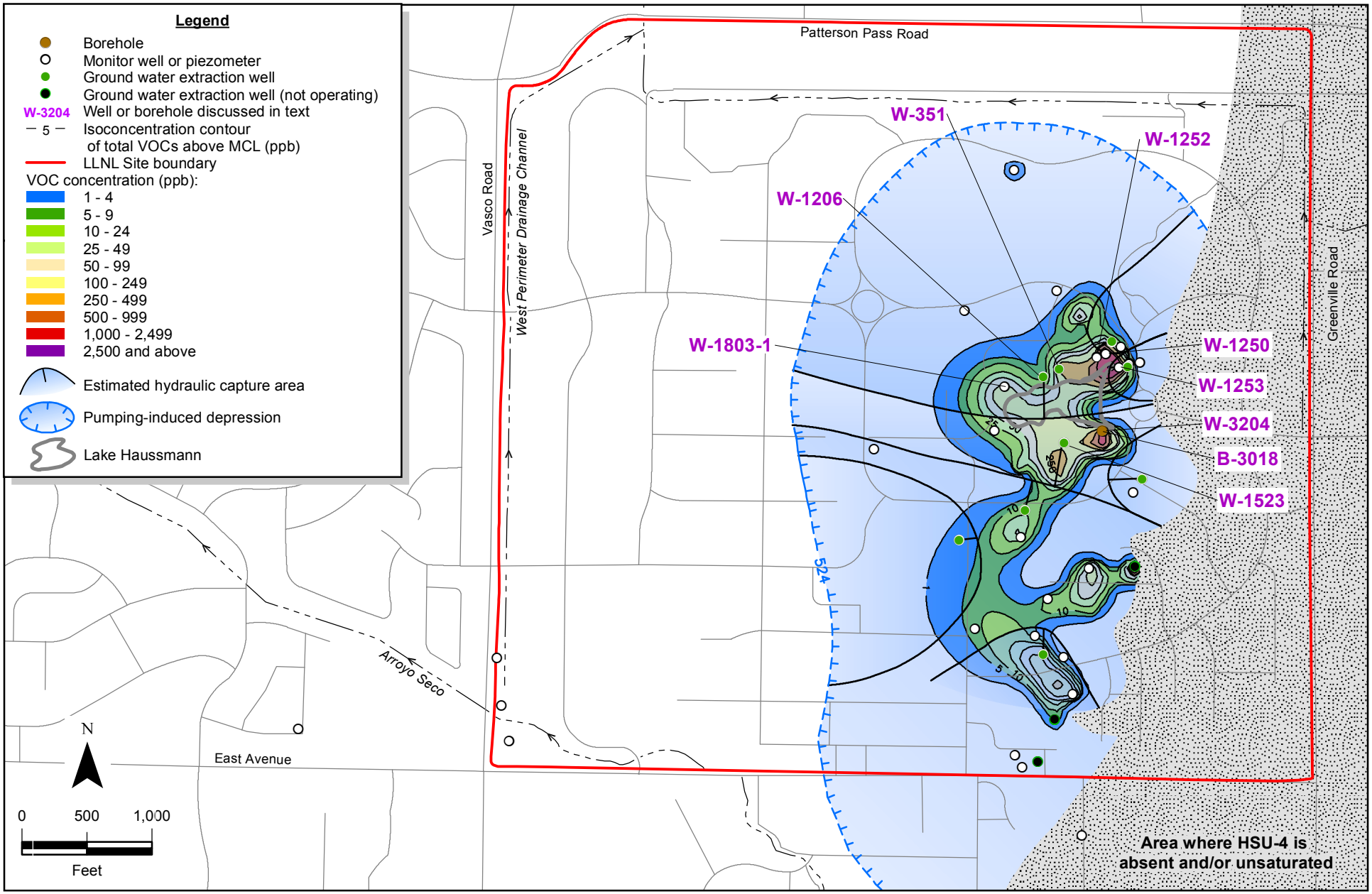

Figure 16. Isoconcentration contour map of total VOCs above MCLs from 43 wells completed within HSU-4, third quarter 2016 (or the next most recent data), and supplemented with soil chemistry data from 62 borehole locations.

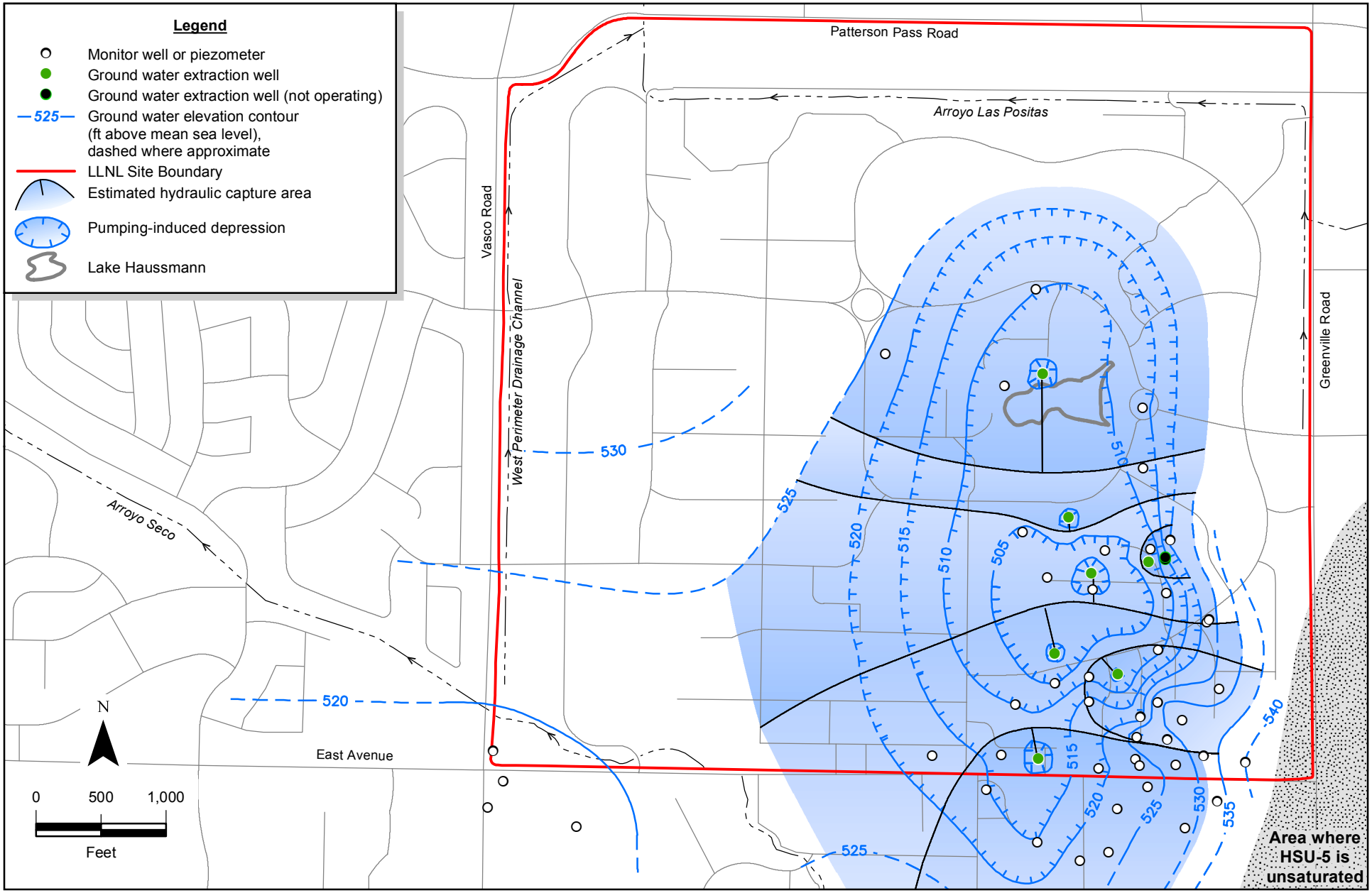

Figure 17. Ground water elevation contour map based on 54 wells completed within HSU-5 showing estimated hydraulic capture areas, LLNL and vicinity, third quarter 2016.

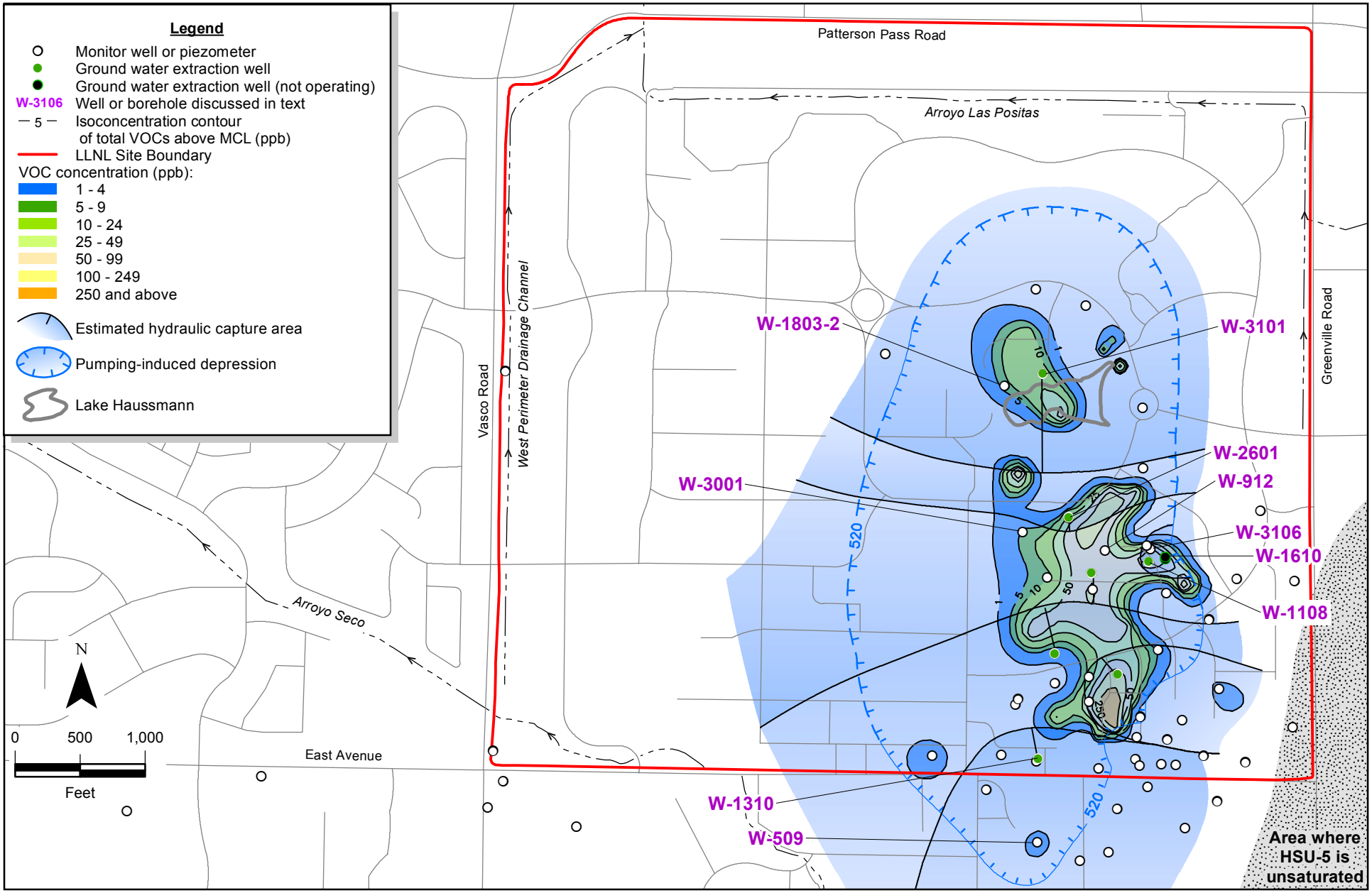

Figure 18. Isoconcentration contour map of total VOCs above MCLs from 62 wells completed within HSU-5, third quarter 2016 (or the next most recent data), and supplemented with soil chemistry data from 93 borehole locations.

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Table 1. Livermore Site treatment facility abbreviations.

Treatment facility	Abbreviation
TFA	TFA
TFA East	TFA-E
TFB	TFB
TFC	TFC
TFC East	TFC-E
TFC Southeast	TFC-SE
TFD	TFD
TFD East	TFD-E
TFD Helipad	TFD-HPD
TFD South	TFD-S
TFD Southeast	TFD-SE
TFD Southshore	TFD-SS
TFD West	TFD-W
VTFD East Traffic Circle South	VTFD-ETCS
VTFD Helipad	VTFD-HPD
TFE East	TFE-E
TFE Hotspot	TFE-HS
TFE Northwest	TFE-NW
TFE Southeast	TFE-SE
TFE Southwest	TFE-SW
TFE West	TFE-W
VTFE Eastern Landing Mat	VTFE-ELM
VTFE Hotspot	VTFE-HS
TFG-1	TFG-1
TFG North	TFG-N
TF406	TF406
TF406 Northwest	TF406-NW
VTF406 Hotspot	VTF406-HS
VTF511	VTF511
TF518 North	TF518-N
TF518 Perched Zone	TF518-PZ
VTF518 Perched Zone	VTF518-PZ
TF5475-1	TF5475-1
TF5475-2	TF5475-2
TF5475-3	TF5475-3
VTF5475	VTF5475

Notes:

TF = Ground water treatment facility.

VTF = Soil vapor treatment facility.

Table 2. Types and numbers of Livermore Site wells.

Well type	Number of wells
Anode wells (cathodic protection)[a]	9
Dual Extraction[b]	13
Ground Water Extraction	94
Ground Water Injection	2
Ground Water Monitor[c]	382
Ground Water Guard	20
Solinst CMT[d] Multiwell System®	1
Piezometer	100
Soil Vapor Extraction	34
Soil Vapor Injection	1
Soil Vapor Monitor	39
Total	695

Notes:

The number of Livermore Site wells is current through the end of December 2016.

Table A-1 of Appendix A summarizes construction information for all wells.

[a] **These wells protect metallic objects (e.g. pipelines) in contact with the ground from electrolytic corrosion.**

[b] **Extraction of ground water using a downhole pump with concurrent application of vacuum to the well. Ground water and soil vapor are removed in separate pipe manifolds and treated.**

[c] **Does not include 33 offsite private or regulatory agency wells that are occasionally monitored by ERD.**

[d] **CMT = Continuous Multichannel Tubing.**

Table 3. Summary of treatment facility discharge sampling locations.

Treatment facility		Discharge sampling location[a]
TFA	TFA	Arroyo Seco (TFG-ASW) and West Perimeter Drainage Channel (TFB-R002)
	TFA East	Arroyo Seco (TFG-ASW)
TFB	TFB	West Perimeter Drainage Channel (TFB-R002) and Building 133 Cooling Tower (TFB-E-B133CT)
TFC	TFC	Arroyo Las Positas (TFC-R003)
	TFC East	Arroyo Las Positas (TFC-R003)
	TFC Southeast	Arroyo Las Positas (TFC-R003)
TFD	TFD	Arroyo Las Positas (TFC-R003) and TFD irrigation supply (TFD-IRR)
	TFD East	Arroyo Las Positas (TFC-R003)
	TFD Helipad	Arroyo Las Positas (TFC-R003)
	TFD South	Arroyo Las Positas (TFC-R003)
	TFD Southeast	Arroyo Las Positas (TFC-R003)
	TFD Southshore	Arroyo Las Positas (TFC-R003)
	TFD West	Arroyo Las Positas (TFC-R003)
	VTFD East Traffic Circle South	Treated vapor to atmosphere
	VTFD Helipad	Treated vapor to atmosphere
TFE	TFE East	Arroyo Las Positas (TFC-R003)
	TFE Hotspot	Arroyo Las Positas (TFC-R003)
	TFE Northwest	Arroyo Las Positas (TFC-R003)
	TFE Southeast	Arroyo Las Positas (TFC-R003)
	TFE Southwest	Arroyo Las Positas (TFC-R003)
	TFE West	Arroyo Las Positas (TFC-R003)
	VTFE Eastern Landing Mat	Treated vapor to atmosphere
	VTFE Hotspot	Treated vapor to atmosphere
TFG	TFG-1	Arroyo Seco (TFG-ASW)
	TFG North	Arroyo Las Positas (TFC-R003)
TFH	TF406	Arroyo Las Positas (TFC-R003)
	TF406 Northwest	Arroyo Las Positas (TFC-R003)
	VTF406 Hotspot	Treated vapor to atmosphere
	VTF511	Treated vapor to atmosphere
	TF518 North	Arroyo Las Positas (TFC-R003)
	TF518 Perched Zone	Tankered to TFB
	VTF518 Perched Zone	Treated vapor to atmosphere
	TF5475-1	CRD-1 injection (W-1302-1)
	TF5475-2	Arroyo Las Positas (TFC-R003)
	TF5475-3	CRD-2 injection (W-1610)
	VTF5475	Injection (SVI-ETS-505)

Note:

[a] **See Attachment A – LLNL Livermore Site Well Location Map, for water discharge locations to ground surface.**

Table 4. 2016 Livermore Site performance summary.

HSU	Extraction well	Volume of ground water treated (kgal)	Estimated VOC mass removed from ground water (kg)	Volume of soil vapor treated (kcf)	Estimated VOC mass removed from soil vapor (kg)
		Treatment Facility A (TFA)			
1B	W-262	<1	0	-	-
1B	W-408	13,996	0.03	-	-
1B	W-1001	550	0	-	-
1B	W-1004	3,227	0.02	-	-
1B/2	W-415	15,833	0.78	-	-
2	W-109	5	<0.01	-	-
2	W-404	15,276	0.26	-	-
2	W-457	3,690	0.07	-	-
2	W-518	2,057	0.09	-	-
2	W-522	5,053	0.09	-	-
2	W-605	4,495	0.19	-	-
2	W-614	5,155	0.07	-	-
2	W-714	2,372	0.04	-	-
2	W-903	5,440	0.10	-	-
2	W-904	6,745	0.11	-	-
2	W-1009	11,235	0.76	-	-
3A	W-712	13,996	0.11	-	-
		Treatment Facility A East (TFA-E)			
1B	W-254	0	0	-	-
		Treatment Facility B (TFB)			
1B	W-610	3,206	0.03	-	-
1B	W-620	2,484	0.05	-	-
1B	W-704	7,949	0.89	-	-
2	W-357	4,155	0.57	-	-
2	W-621	<1	<0.01	-	-
2	W-655	<1	<0.01	-	-
2	W-1423	1,377	0.11	-	-

Table 4. 2016 Livermore Site performance summary. (Continued)

HSU	Extraction well	Volume of ground water treated (kgal)	Estimated VOC mass removed from ground water (kg)	Volume of soil vapor treated (kcf)	Estimated VOC mass removed from soil vapor (kg)
		Treatment Facility B (TFB) (continued)			
2	W-2501	7,713	0.12		
2	W-2502	1,781	0.04		
		Treatment Facility C (TFC)			
1B	W-701	6,861	1.05	-	-
1B	W-1104	9,954	0.42	-	-
1B	W-1116	789	0.05	-	-
		Treatment Facility C East (TFC-E)			
1B	W-368	1,322	0.16	-	-
2	W-413	5,042	0.65	-	-
		Treatment Facility C Southeast (TFC-SE)			
1B	W-1213	1,043	0.11	-	-
1B	W-2201	4,560	0.66	-	-
		Treatment Facility D (TFD)			
2	W-3102	564	0.04	-	-
3A	W-653	28	0.04	-	-
3A	W-2011	63	<0.01	-	-
3A	W-2101	73	0.03	-	-
3A	W-2102	139	0.17	-	-
3A/3B	W-1208	9,552	2.17	-	-
4	W-351	759	1.08	-	-
4	W-1206	6,863	0.34	-	-
5	W-3101	2,883	0.32	-	-

Table 4. 2016 Livermore Site performance summary. (Continued)

HSU	Extraction well	Volume of ground water treated (kgal)	Estimated VOC mass removed from ground water (kg)	Volume of soil vapor treated (kcf)	Estimated VOC mass removed from soil vapor (kg)
		Treatment Facility D East (TFD-E)			
2	W-1303	459	0.18	-	-
2	W-1306	36	<0.01	-	-
3A	W-1301	331	0.43	-	-
3A	W-1550	58	0.03	-	-
3A	W-2203	14	<0.01	-	-
3B	W-2006	9	0.02	-	-
4	W-1307	2,603	0.37	-	-
		Treatment Facility D Helipad (TFD-HPD)[a]		**Vapor Treatment Facility D Helipad (VTFD-HPD)[b]**	
1B	W-HPA-002A	-	-	-	-
2	W-HPA-002B	-	-	-	-
2/3A	W-1655	<1	0	-	-
2/3A/3B	W-1651	-	-	-	-
3A	W-1551	-	-	-	-
3A	W-1552	0	0	-	-
3A	W-1650	9	0	-	-
3A	W-1653	4	0	-	-
3A	W-1654	-	-	-	-
3A	W-1656	-	-	-	-
3A/3B	W-1652	-	-	-	-
3A/3B	W-1657	<1	0	-	-
4	W-1254	1,882	0.24	-	-
		Treatment Facility D South (TFD-S)			
2	W-1510	793	0.06	-	-
3A/3B	W-1504	3,136	0.87	-	-
4	W-1503	3,829	0.48	-	-
5	W-2601	1,130	0.23		

Table 4. 2016 Livermore Site performance summary. (Continued)

HSU	Extraction well	Volume of ground water treated (kgal)	Estimated VOC mass removed from ground water (kg)	Volume of soil vapor treated (kcf)	Estimated VOC mass removed from soil vapor (kg)
		Treatment Facility D Southeast (TFD-SE)		**Vapor Treatment Facility D East Traffic Circle South (VTFD-ETCS)**	
1B	W-ETC-2003	-	-	5,232	0.10
1B/2	W-ETC-2004A	-	-	2,133	0.12
2	W-ETC-2004B	-	-	5,612	1.61
2	W-1308	406	0.26	-	-
2	W-1904	0	0	0	0
2	SIP-ETC-201	0	0	0	0
3A	W-2005	355	0.08	-	-
3B	W-1403	459	0.72	-	-
4	W-314	1,819	0.04	-	-
		Treatment Facility D Southshore (TFD-SS)			
2	W-1602	934	0.05	-	-
3A	W-1603	4,326	2.40	-	-
3B	W-1601	387	0.45	-	-
4	W-1523	2,312	1.70	-	-
		Treatment Facility D West (TFD-W)			
2	W-1215	4,450	0.45	-	-
2	W-1216	4,350	0.40	-	-
3A	W-1902	6,178	0.93	-	-
		Treatment Facility E East (TFE-E)		**Vapor Treatment Facility E Eastern Landing Mat (VTFE-ELM)**	
1B	W-543-1908	-	-	<1	<0.01
2	W-543-001	-	-	<1	<0.01
2	W-543-003	-	-	577	0.15
2	W-1109	522	0.27	-	-
2	W-1903	81	0.02	1,693	0.47
2	W-1909	0	0	297	0.03
2	W-2305	<1	<0.01	38	<0.01

Table 4. 2016 Livermore Site performance summary. (Continued)

HSU	Extraction well	Volume of ground water treated (kgal)	Estimated VOC mass removed from ground water (kg)	Volume of soil vapor treated (kcf)	Estimated VOC mass removed from soil vapor (kg)
		Treatment Facility E East (TFE-E) (continued)		**Vapor Treatment Facility E Eastern Landing Mat (VTFE-ELM)**	
5	W-566	4,052	1.89	-	-
		Treatment Facility E Hotspot (TFE-HS)		**Vapor Treatment Facility E Hotspot (VTFE-HS)**	
1B	W-ETS-2008A	-	-	<1	<0.01
1B/2	W-ETS-2008B	-	-	3,549	0.51
1B/2	W-ETS-2010A	-	-	684	0.01
2	W-ETS-2009	-	-	750	0.04
2	W-ETS-2010B	-	-	2,726	0.11
2	W-2105	5	<0.01	379	0.08
3A	W-2801	407	0.36	-	-
		Treatment Facility E Northwest (TFE-NW)			
2	W-1409	794	0.07	-	-
4	W-1211	3,306	0.12	-	-
		Treatment Facility E Southeast (TFE-SE)			
5	W-359	4,404	2.77	-	-
		Treatment Facility E Southwest (TFE-SW)			
2	W-1518	<1	<0.01	-	-
3B	W-1522	308	0.26	-	-
4	W-1520	349	0.15	-	-
5	W-1516	5,049	0.16		
		Treatment Facility E West (TFE-W)			
2	W-305	5,762	0.92	-	-
3B	W-292	2,939	0.25	-	-

Table 4. 2016 Livermore Site performance summary. (Continued)

HSU	Extraction well	Volume of ground water treated (kgal)	Estimated VOC mass removed from ground water (kg)	Volume of soil vapor treated (kcf)	Estimated VOC mass removed from soil vapor (kg)
		Treatment Facility G-1 (TFG-1)			
1B/2	W-1111	1,116	0.08	-	-
		Treatment Facility G North (TFG-N)			
1B	W-1806	187	<0.01	-	-
2	W-1807	1,609	0.16	-	-
		Treatment Facility 406 (TF406)			
4	W-1309	<1	<0.01	-	-
5	W-1310	4,124	0.05	-	-
		Treatment Facility 406 Northwest (TF406-NW)			
3A	W-1801	2,392	0.21	-	-
				Vapor Treatment Facility 406 Hotspot (VTF406-HS)	
1B/2	W-514-2007A	-	-	0	0
2/5	W-514-2007B	-	-	6,357	0.91
5	W-217	-	-	8,236	1.92
				Vapor Treatment Facility 511 (VTF511)	
1B	W-2207A	-	-	<1	<0.01
2	W-2204	-	-	0	0
2	W-2205	-	-	0	0
2	W-2206	-	-	0	0
2	W-2208A	-	-	<1	<0.01
2/3A	W-2207B	-	-	7,421	0.85
2/3A	W-2208B	-	-	7,322	4.15

Table 4. 2016 Livermore Site performance summary. (Continued)

HSU	Extraction well	Volume of ground water treated (kgal)	Estimated VOC mass removed from ground water (kg)	Volume of soil vapor treated (kcf)	Estimated VOC mass removed from soil vapor (kg)
		Treatment Facility 518 North (TF518-N)[c]			
4	W-1410	0	0	-	-
		Treatment Facility 518 Perched Zone (TF518-PZ)		**Vapor Treatment Facility 518 Perched Zone (VTF518-PZ)**	
1B	W-518-1914	0	0	0	0
1B/2	W-1615	<1	<0.01	1,569	1.13
2	W-2215A	-	-	2,436	1.55
2	W-3201	-	-	5	<0.01
2	W-3202			6	0.07
2	W-518-1913	0	0	0	0
2	W-518-1915	<1	<0.01	297	0.07
2	SVB-518-201	-	-	0	0
2	SVB-518-204	-	-	0	0
5	W-2215B	-	-	559	0.04
		Treatment Facility 5475-1 (TF5475-1)[c]			
3A	W-1302-2	0	0	-	-
		Treatment Facility 5475-2 (TF5475-2)			
2/3A	W-1415	0	0	-	-
5	W-1108	635	0.59		
		Treatment Facility 5475-3 (TF5475-3)[c]			
3A	W-1605	0	0	-	-
3A	W-1608	0	0	-	-
4	W-1604	0	0	-	-
5	W-1609	0	0	-	-

Table 4. 2016 Livermore Site performance summary. (Continued)

HSU	Extraction well	Volume of ground water treated (kgal)	Estimated VOC mass removed from ground water (kg)	Volume of soil vapor treated (kcf)	Estimated VOC mass removed from soil vapor (kg)
				Vapor Treatment Facility 5475 (VTF5475)[c]	
1B/2	W-ETS-507	-	-	0	0
2	W-2211	-	-	0	0
2	W-2302	-	-	0	0
2	W-2303	-	-	0	0
2	SVI-ETS-504	-	-	0	0
3A	W-1605	-	-	0	0
3A	W-1608	-	-	0	0
3A	W-2212	-	-	0	0

Notes:

- = Not applicable.

HSU = Hydrostratigraphic Unit.

kg = Kilogram.

kgal = Thousands at gallons.

kcf = Thousands of cubic feet.

VOC = Volatile Organic Compound.

[a] **Wells W-1552, W-1650, W-1653, W-1655 and W-1657 are part of the *in situ* bioremediation treatability test being performed at the former Helipad area (see Section 3.2.2.).**

[b] **VTFD-HPD was secured in year 2010 to perform an ongoing *in situ* bioremediation treatability test at the TFD Helipad area.**

[c] **TF518-N, TF5475-1, TF5475-3 and VTF5475 are secured due to mixed waste issues (LLNL, 2009).**

Table 5. 2016 Summary of treatment facility operations.

Area	Treatment facility	Operated?	In compliance?	Facility highlights
TFA	TFA	Yes	Yes	• Upgraded TFA extraction well W-522 to the standard wellhead completion in November.
	TFA East	No	-	• TFA East did not operate in 2016 due to lack of available ground water in extraction well W-254, the sole source of water for this facility.
TFB	TFB	Yes	Yes	• None
TFC	TFC	Yes	Yes	• None
	TFC East	Yes	Yes	• None
	TFC Southeast	Yes	Yes	• As part of the REVAL process, TFC Southeast was secured in late November to perform system upgrades, connect well W-3107 as an extraction well, and install water-level-based control at all of the extraction wells. Testing and verification of the facility and extraction wellfield is scheduled to begin in early 2017.
TFD	TFD	Yes	Yes	• As part of the REVAL process: o Performed testing and verification of the facility and extraction wellfield modifications in January and February; and o Conducted hydraulic testing of the TFD extraction wellfield in March.
	TFD East	Yes	Yes	• None
	TFD Helipad	Yes	Yes	• None
	TFD South	Yes	Yes	• Redeveloped TFD South extraction well W-2601 using sulfamic acid in late November to mitigate mineral encrustation of the well screen and to restore the sustainable yield.
	TFD Southeast	Yes	Yes	• None
	TFD Southshore	Yes	Yes	• Secured TFD Southshore for a few days in late March to perform piping and control system modifications to convey TFD Southshore treated effluent water to a nearby sustainable landscape garden.
	TFD West	Yes	Yes	• Initiated a comprehensive hydraulic test to evaluate and optimize the hydraulic capture of the TFD West extraction wells in late October. The test will conclude in January 2017.
	VTFD East Traffic Circle South	Yes	Yes	• Installed automatic condensate purge systems (ACPS) at VTFD East Traffic Circle South extraction wells W-ETC-2003 and W-ETC-2004A in May to remove condensate water from the extraction well instrumentation, which will improve data quality and reduce operation & maintenance costs. • Facility secured November 11, 2016, due to nearby construction project.

Table 5. 2016 Summary of treatment facility operations. (Continued)

Area	Treatment facility	Operated?	In compliance?	Facility highlights
TFD	VTFD Helipad	No	-	• VTFD Helipad did not operate in 2016 to facilitate the TFD Helipad *in situ* bioremediation ESAR treatability test (Section 3.2). Restart of VTFD Helipad will depend upon residual VOC concentrations in the subsurface once the ESAR test is complete.
TFE	TFE East	Yes	Yes	• None
	TFE Hotspot	Yes	Yes	• None
	TFE Northwest	Yes	Yes	• None
	TFE Southeast	Yes	Yes	• None
	TFE Southwest	Yes	Yes	• Upgraded TFE Southwest extraction well W-1516 to flow-based control in early October.
	TFE West	Yes	Yes	• None
	VTFE Eastern Landing Mat	Yes	Yes	• Installed ACPS at VTFE Eastern Landing Mat extraction wells W-1903 and W-543-003 in June to remove condensate water from the extraction well instrumentation, which will improve data quality and reduce operation & maintenance costs.
	VTFE Hotspot	Yes	Yes	• Installed ACPS at VTFE Hotspot extraction wells W-2105 and W-ETS-2008B in March to improve data quality and reduce operation and maintenance costs. • Performed a temporarily shut down of VTFE Hotspot in mid-August to replace the failing liquid-ring treatment facility vacuum pump with a new regenerative blower. The new style blower began operating in early September. Wellfield operations expanded in late October to include several soil vapor extraction wells that were idle. • Performed vapor flow matrix test at recently installed well W-3203 in mid-September.
TFG	TFG-1	Yes	Yes	• None
	TFG North	Yes	Yes	• As part of the REVAL process: o Secured TFG North in late June to perform system upgrades and install water-level-based control for extraction well W-1806 and W-1807; o Conducted testing and verification of the facility and extraction wellfield in August and September; o Conducted hydraulic tests for extraction wells W-1806 and W-1807 in early October.
TFH	TF406	Yes	Yes	• None
	TF406 Northwest	Yes	Yes	• Redeveloped TF406 Northwest extraction well W-1801 using glycolic acid in February and December to mitigate biofouling of the well screen and to restore the sustainable yield.

Table 5. 2016 Summary of treatment facility operations. (Continued)

Area	Treatment facility	Operated?	In compliance?	Facility highlights
TFH	VTF406 Hotspot	Yes	Yes	• Installed ACPS at VTF406 Hotspot extraction well W-217 in April to improve data quality and reduce operation & maintenance costs by periodically removing condensate water from the extraction well instrumentation.
	VTF511	Yes	Yes	• Installed ACPS at VTF511 extraction wells W-2207B and W-2208B in June to improve data quality and reduce operation & maintenance costs by periodically removing condensate water from the extraction well instrumentation.
	TF518 North	No	-	• TF518 North did not operate during 2016 due to mixed waste issues (LLNL, 2009).
	TF518 Perched Zone	Yes	Yes	• Ground water extraction pumps were removed from the soil vapor extraction wells in February in preparation for the VTF518 Perched Zone facility upgrade.
	VTF518 Perched Zone	Yes	Yes	• Performed a 6-month soil vapor extraction test from December 2015 through May 2016, primarily on well W-2215A. Also, tested well W-2215B during April 2016. • As part of the REVAL process: o Conducted a detailed engineering assessment of the facility; o Procured equipment and parts necessary for treatment facility upgrades; and o Removed vaults and rebuilt extraction wellheads as above-grade completions. • Temporarily secured VTF518 Perched Zone mid-August to early September for drilling activities, and soil and soil vapor sampling (Section 3.3). • Performed vapor flow matrix tests at recently installed wells W-3201 and W-3202 in late September. VTF518 Perched Zone was temporarily secured during these tests.
	TF5475-1	No	-	• TF5475-1 did not operate during 2016 due to mixed waste issues (LLNL, 2009).
	TF5475-2	Yes	Yes	• Upgraded TF5475-2 data acquisition system to wireless communications in mid-January.
	TF5475-3	No	-	• TF5475-3 did not operate during 2016 due to mixed waste issues (LLNL, 2009).
	VTF5475	No	-	• VTF5475 did not operate during 2016 due to mixed waste issues (LLNL, 2009).

Notes:

- = Not applicable.
ESAR = Enhanced Source Area Remediation.
MCL = Maximum contaminant level.
REVAL = Remediation Evaluation.
TF = Ground water treatment facility.
VOC = Volatile organic compound.
VTF = Soil vapor treatment facility.
ZVI = Zero valent iron.

Appendices

Appendices

Appendix A

Well Construction and Closure Data

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-001	GW Monitor	21-Oct-80	122.5	116	1	95-100	1B	6
					2	104-114	2	6
W-001A	GW Monitor	12-Apr-84	180	156	1	145-156	2	5.3
W-002	GW Monitor	29-Aug-80	102.5	101	1	86-101	1B	2.8
W-002A	GW Monitor	2-Apr-84	185	164	1	150-164	2	9.3
W-004	GW Monitor	28-Jul-80	92	92	1	75-90	1B	7
W-005	GW Monitor	24-Oct-80	93.5	90	1	56-71	1B	7
					2	81-86	1B	7
W-005A	GW Monitor	9-Apr-84	115	105	1	95-105	2	11.5
W-008	GW Monitor	14-May-81	110	105	1	72-77	3A	7
					2	92-102	3B	7
W-011	GW Monitor	3-Jun-81	252	191	1	136-141	5	8.5
					2	177-187	5	8.5
W-012	GW Monitor	14-Aug-80	115.8	115	1	99-114	2	5
W-016	GW Monitor	30-Oct-80	122.7	119	1	NA	NA	NA
W-017	GW Monitor	8-Oct-80	114	109	1	94-109	5	0.4
W-017A	GW Monitor	20-May-81	181.4	160	1	127-132	7	5.5
					2	147-157	7	5.5
W-101	GW Monitor	25-Jan-85	77	72	1	62-72	1B	2
W-102	GW Monitor	14-Feb-85	396.5	171.5	1	151.5-171.5	2	6.6
W-103	GW Monitor	14-Feb-85	96	89.5	1	79.5-89.5	1B	6.2
W-104	GW Monitor	21-Feb-85	61.5	56.5	1	38.75-56.5	1B	3.1
W-105	GW Monitor	26-Feb-85	69	62	1	42-62	1B	1
W-106	GW Monitor	6-Mar-85	144	134.5	1	127.5-134.5	5	0.3
W-107	GW Monitor	13-Mar-85	128	122	1	115-122	5	2.5
W-108	GW Monitor	21-Mar-85	113.5	69	1	57-69	1A	13
W-109	GW Extraction	2-Apr-85	289	147	1	137-147	2	13
W-110	GW Monitor	26-Apr-85	371	365	1	340-365	5	16
W-111	GW Monitor	2-May-85	122	117	1	97-117	2	3.4
W-112	GW Monitor	10-May-85	129	123.5	1	111-123.5	5	3.5
W-113	GW Monitor	16-May-85	124	115	1	100-115	5	0.4
W-114	GW Monitor	23-May-85	70.5	66	1	51-63	1B	0.5
W-115	GW Monitor	3-Jun-85	106	95	1	88-95	1B	5.4
W-116	GW Monitor	14-Jun-85	181	92.6	1	86-91	1B	0.3
W-117	GW Monitor	27-Jun-85	202	150.1	1	138-148	7	6

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-118	GW Monitor	19-Jul-85	206.5	110	1	99-110	2	10
W-119	GW Monitor	2-Aug-85	139	102.5	1	87.5-102.5	2	9
W-120	GW Monitor	19-Aug-85	195	153	1	147-153	2	3.5
W-121	GW Monitor	23-Aug-85	194	171	1	159-171	2	6
W-122	GW Monitor	17-Aug-85	189	132	1	125-132	2	13.4
W-123	GW Monitor	1-Oct-85	174	47.7	1	37.3-47.7	1A	6
W-141	GW Monitor	23-Mar-85	61.5	60	1	45-60	1B	0.5
W-142	GW Monitor	29-Mar-85	74.2	72	1	62-72	2	0.5
W-143	GW Monitor	12-Apr-85	130	126	1	121-126	2	6
W-146	GW Monitor	16-Jul-85	225	125	1	115-125	2	9.4
W-147	GW Monitor	26-Jul-85	137	87	1	77-87	1B	0.5
W-148	GW Monitor	8-Aug-85	152	98	1	83-98	1B	0.5
W-151	GW Monitor	30-Sep-85	247	158	1	148.5-157.5	2	8
W-201	GW Monitor	17-Oct-85	211	161	1	151-161	2	14
W-202	GW Monitor	7-Nov-85	191	109	1	99-109	2	0.4
W-204	GW Monitor	22-Nov-85	160	110	1	100-110	2	2.5
W-205	GW Monitor	9-Dec-85	180	117	1	107-117	3B	0.3
W-206	GW Monitor	19-Dec-85	188	118	1	106-118	3A	NA
W-207	GW Monitor	24-Jan-86	150	85	1	69-85	2	0.4
W-210	GW Monitor	11-Mar-86	176	113	1	108-113	3B	0.3
W-212	GW Monitor	28-Mar-86	183	136	1	124-136	5	1.3
W-213	GW Monitor	4-Apr-86	174	100	1	94-100	1B	4
W-214	GW Monitor	11-Apr-86	146	141.5	1	134-141.5	2	18
W-217	SV Extraction	20-May-86	200	112.5	1	98.5-112.5	5	0.3
W-218	GW Monitor	30-May-86	201	71	1	64.5-71	1B	10
W-219	GW Monitor	13-Jun-86	214	148	1	141-148	5	4.5
W-220	GW Monitor	25-Jun-86	196	92.5	1	82.5-92.5	2	0.4
W-221	GW Monitor	7-Jul-86	178	95	1	82-95	3A	2
W-222	GW Monitor	17-Jul-86	197	83	1	63-83	2	15
W-223	GW Monitor	15-Aug-86	202	153	1	146-153	2	4.2
W-224	GW Monitor	26-Aug-86	199	88	1	78-88	2	8.1
W-225	GW Monitor	9-Sep-86	238	166	1	152-166	5	4.2
W-226	GW Monitor	25-Sep-86	173	86	1	71-86	1B	0.5
W-251	GW Monitor	3-Oct-85	50	47.5	1	35.5-47.5	1A	7.9
W-252	GW Monitor	18-Oct-85	197	126	1	108-126	2	6

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-253	GW Monitor	30-Oct-85	180	128	1	112.5-128	2	2.3
W-254	GW Extraction	21-Nov-85	277	89	1	82-89	1B	2
W-255	GW Monitor	5-Dec-85	187	124	1	115-124	5	10
W-256	GW Monitor	19-Dec-85	187	137	1	132-137	5	6
W-257	GW Monitor	15-Jan-86	197	96.5	1	82.5-96.5	2	0.5
W-258	GW Monitor	31-Jan-86	157	121.5	1	116.5-121.5	3A	NA
W-259	GW Monitor	7-Feb-86	200	99	1	93.5-99	2	0.3
W-260	GW Monitor	27-Feb-86	215	151	1	141-151	2	5.1
W-261	GW Monitor	12-Mar-86	225	118.5	1	109-118.5	5	0.5
W-262	GW Extraction	20-Mar-86	256	100	1	91-100	1B	12
W-263	GW Monitor	7-Apr-86	146	130	1	123-130	2	3
W-264	GW Monitor	14-Apr-86	170	151	1	141-151	2	15
W-265	GW Monitor	25-Apr-86	216	211	1	205-211	3B	2.5
W-267	GW Monitor	27-May-86	196	179	1	172.5-179	3A	3.3
W-268	GW Monitor	4-Jun-86	213	150.5	1	138-150.5	5	6
W-269	GW Monitor	16-Jun-86	185	92	1	79-92	1B	6.8
W-270	GW Monitor	26-Jun-86	185	127	1	113-127	5	0.3
W-271	GW Monitor	7-Jul-86	201	112	1	105-112	2	7.2
W-272	GW Monitor	18-Jul-86	226	110	1	95-110	2	1.3
W-273	GW Monitor	11-Aug-86	203	84	1	64-84	2	3.4
W-274	Dual Extraction	21-Aug-86	217	95	1	90-95	2	NA
W-275	GW Monitor	5-Sep-86	262	184	1	179-184	5	5.9
W-276	GW Monitor	17-Sep-86	267	170	1	153.5-169.5	3A	12
W-277	GW Monitor	3-Oct-86	254	169	1	163-169	3B	6
W-290	GW Monitor	8-Jul-86	181	126	1	119.5-126	5	0.3
W-291	GW Monitor	24-Jul-86	194	137	1	127-137	5	0.3
W-292	GW Extraction	10-Aug-86	250	184.5	1	176-184.5	3B	NA
W-293	GW Monitor	27-Aug-86	229	155	1	145-155	5	5
W-294	GW Monitor	15-Sep-86	251	139	1	122-139	5	6
W-301	GW Monitor	7-Oct-86	203	141	1	136-141	2	10
W-302	GW Monitor	22-Oct-86	191	83.5	1	78-83.5	1B	2
W-303	GW Monitor	28-Oct-86	197	128	1	124-128	2	24
W-304	GW Monitor	12-Nov-86	207	200	1	195-200	4	0.7
W-305	GW Extraction	18-Nov-86	146	138	1	128-138	2	16.2
W-306	GW Monitor	4-Dec-86	207	110	1	98-110	2	8.3

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-307	GW Monitor	15-Dec-86	214	102	1	93-102	1B	1.4
W-308	GW Monitor	13-Jan-87	194	113	1	107-113	2	2.4
W-310	GW Monitor	4-Feb-87	202	184.5	1	176.5-184.5	3A	20
W-311	GW Monitor	20-Feb-87	226.5	147.5	1	134.5-147.5	3A	NA
W-312	GW Monitor	5-Mar-87	224.5	168	1	160-168	4	16.7
W-313	GW Monitor	12-Mar-87	99	85	1	80-85	2	7.8
W-314	GW Extraction	20-Mar-87	228	142	1	129-142	4	19
W-315	GW Monitor	3-Apr-87	215	156	1	141-156	3A	15
W-316	GW Monitor	15-Apr-87	196	72	1	68-71	2	7
W-317	GW Monitor	20-Apr-87	100	95	1	88-95	2	14
W-318	GW Monitor	28-Apr-87	200	81	1	74-81	2	6
W-319	GW Monitor	5-May-87	198	125	1	119-125	3A	15
W-320	GW Monitor	11-May-87	106	99	1	94-99	2	5
W-321	GW Monitor	29-May-87	356	321.5	1	305-321.5	5	17
W-322	GW Monitor	1-Jul-87	565.5	152	1	142-152	2	8
W-323	GW Monitor	4-Aug-87	200	127	1	122-127	2	5.6
W-324	GW Monitor	17-Aug-87	219	189	1	184-189	3A	15
W-325	GW Monitor	28-Aug-87	312	170	1	158-170	3A	10
W-351	GW Extraction	17-Oct-86	191	152	1	146-152	4	6.5
W-353	GW Monitor	12-Nov-86	205	101	1	95.5-101	2	2.4
W-354	GW Monitor	24-Nov-86	185	179	1	163-179	4/5	17.6
W-355	GW Monitor	5-Dec-86	202	107	1	102-107	2	1.7
W-356	GW Monitor	18-Dec-86	237	137	1	133-137	3B	5
W-357	GW Extraction	12-Jan-87	197	123	1	107-123	2	13.6
W-359	GW Extraction	10-Feb-87	195	150.5	1	138-150.5	5	5
W-361	GW Monitor	5-Mar-87	257	135	1	125-135	3A	6
W-362	GW Monitor	13-Mar-87	151	145	1	131-145	4	15
W-363	GW Monitor	24-Mar-87	195	129	1	117-129	3A	6
W-364	GW Monitor	31-Mar-87	195	165	1	155-165	3B	6.5
W-365	GW Monitor	9-Apr-87	187	125	1	120-125	2	10
W-366	GW Monitor	20-Apr-87	273	251	1	240-251	4	17.6
W-368	GW Extraction	6-May-87	206	78	1	70-78	1B	3.5
W-369	GW Monitor	14-May-87	204	113	1	107-113	2	7
W-370	GW Monitor	29-May-87	286	208	1	196.5-208	4	10
W-371	GW Monitor	12-Jun-87	233	162	1	155-162	3A	5

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-372	GW Monitor	25-Jun-87	218	152.5	1	147.5-152.5	4	7.5
W-373	GW Monitor	6-Jul-87	178	99	1	89-99	1B	9
W-375	GW Monitor	29-Jul-87	223	71	1	65-71	2	0.4
W-376	GW Monitor	27-Aug-87	249	172	1	162-172	2	4
W-377	GW Monitor	4-Sep-87	159	144	1	141.5-144	2	0.5
W-378	GW Monitor	9-Sep-87	155	150	1	146-150	2	0.5
W-379	GW Monitor	14-Sep-87	155	150	1	146-150	2	0.5
W-380	GW Monitor	1-Oct-87	195	182	1	170-182	3A	9.1
W-401	GW Monitor	5-Nov-87	159	153	1	109-153	2	18
W-402	GW Monitor	13-Oct-87	104	102	1	92-102	1B	20
W-403	GW Monitor	16-Nov-87	585	495	1	485-495	7	15
W-404	GW Extraction	4-Dec-87	245	158	1	150-158	2	20
W-405	GW Monitor	4-Jan-88	244	162	1	132-162	2	20
W-406	GW Monitor	20-Jan-88	213	94	1	79-84	1B	5
W-407	GW Monitor	4-Feb-88	215	205	1	192-205	3A	10
W-408	GW Extraction	16-Feb-88	131	122.5	1	103-122.5	1B	20
W-409	GW Monitor	7-Mar-88	272	78	1	71-78	1B	20
W-410	GW Monitor	30-Mar-88	369	205	1	193-205	3A	16
W-411	GW Monitor	12-Apr-88	192	138	1	131-138	2	20
W-412	GW Monitor	18-Apr-88	104	74	1	67-74	1B	4
W-413	GW Extraction	28-Apr-88	163	115	1	100-115	2	12
W-415	GW Extraction	12-Aug-88	205	183.7	1	79-179	1B/2	50
W-416	GW Monitor	10-Jun-88	152	80.5	1	72-80.5	1B	20
W-417	GW Monitor	20-Jun-88	152	60	1	51-60	1B	5
W-418	GW Monitor	24-Jun-88	124	124	1	108-118	2	0.5
W-419	GW Monitor	29-Jun-88	82	82	1	62.5-75.5	1B	0.5
W-420	GW Monitor	26-Jul-88	127	111	1	105-111	2	4
W-421	GW Monitor	23-Aug-88	181	90	1	75-90	1B	5
W-422	GW Monitor	2-Sep-88	203	139.5	1	133-139.5	2	9
W-423	GW Monitor	9-Sep-88	308	118	1	106-118	2	19
W-424	GW Monitor	4-Oct-88	208	144	1	137-144	3A	6
W-441	GW Monitor	14-Oct-87	250	144	1	135-144	5	3
W-446	GW Monitor	18-Dec-87	202	196	1	186-196	3A	0.5
W-447	GW Monitor	05-Feb-88	353	274	1	256-274	4	8
W-448	GW Monitor	17-Feb-88	235	127.5	1	120.5-127.5	2	20

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-449	GW Monitor	7-Mar-88	172	165	1	152-165	2	6
W-450	GW Monitor	21-Mar-88	300	200	1	193-200	5	6
W-451	GW Monitor	6-Apr-88	202	112	1	106-112	2	3
W-452	GW Monitor	15-Apr-88	210	79.5	1	64-79.5	1B	7
W-453	GW Monitor	27-Apr-88	185	130	1	121-130	2	8
W-454	GW Monitor	9-May-88	196	83	1	73-83	1B	3
W-455	GW Monitor	19-May-88	184	162.5	1	148-162.5	2	5
W-457	GW Extraction	22-Jun-88	289	149.5	1	130-149.5	2	20
W-458	GW Monitor	30-Jun-88	212.5	116	1	108-116	2	2
W-459	GW Monitor	20-Jul-88	76	73	1	59.5-73	1B	0.5
W-461	GW Monitor	16-Aug-88	133	50.5	1	41.5-50.5	2	0.5
W-462	GW Monitor	12-Sep-88	385	337	1	331-336.5	5	10
W-463	GW Monitor	16-Sep-88	93	92.8	1	87-92.5	1B	20
W-464	GW Monitor	30-Sep-88	253	104.5	1	96-104.5	2	7
W-481	GW Monitor	4-Nov-87	224.5	105	1	100-105	1B	2
W-482	GW Monitor	15-Jan-88	218	170	1	165-170	2	0.5
W-483	GW Monitor	26-Jan-88	140	130	1	115-130	2	0.5
W-484	GW Monitor	11-Feb-88	255	188	1	185-188	3A	0.5
W-485	GW Monitor	25-Feb-88	249	157	1	151-157	2	0.5
W-486	GW Monitor	11-Mar-88	167	110	1	100-108	2	6
W-487	GW Monitor	17-Mar-88	180	151	1	148-151	3B	5
W-501	GW Monitor	13-Oct-88	174	92	1	84-92	1B	6
W-502	GW Monitor	25-Oct-88	158	59	1	55-59	1B	0.5
W-503	GW Monitor	2-Nov-88	187	80	1	74-80	1B	2
W-504	GW Monitor	21-Nov-88	358	167	1	157-167	2	8
W-505	GW Monitor	15-Dec-88	278	180	1	167-180	2/3A	18
W-506	GW Monitor	22-Dec-88	120	115	1	101-115	1B	9
W-507	GW Monitor	18-Jan-89	158	139	1	129-139	2	15
W-508	GW Monitor	17-Feb-89	316	306	1	287-305	7	18
W-509	GW Monitor	3-Mar-89	305	184	1	179-184	5	2
W-510	GW Monitor	15-Mar-89	300	119.1	1	111-119	2	0.5
W-511	GW Monitor	31-Mar-89	316	176	1	167-176	3B	2
W-512	GW Monitor	13-Apr-89	261	176.5	1	166-176	5	2.5
W-513	GW Monitor	26-Apr-89	259	115	1	102-115	2	1
W-514	GW Monitor	17-May-89	386	115.5	1	92-115.5	1B	2

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-515	GW Monitor	30-May-89	211	78	1	68-78	1B	3
W-516	GW Monitor	9-Jun-89	203	119	1	114-119	2	10
W-517	GW Monitor	20-Jun-89	215	88.2	1	80-88	1B	8
W-518	GW Extraction	8-Aug-89	251	139.3	1	131-139	2	6.7
W-519	GW Monitor	14-Aug-89	186.5	80.6	1	60-80.5	1B	20
W-520	GW Extraction	30-Aug-89	160	101.5	1	94-101.5	1B	10
W-521	GW Monitor	13-Sep-89	166	95.4	1	86-95	1B	1.5
W-522	GW Extraction	5-Oct-89	145.5	141.5	1	134-141.5	2	16
W-551	GW Monitor	18-Oct-88	308	155.5	1	151-155.5	2	9
W-552	GW Monitor	25-Oct-88	70.5	64.5	1	48.5-64	1B	15
W-553	GW Monitor	3-Nov-88	186	106.5	1	99-106.5	2	2
W-554	GW Monitor	22-Nov-88	239	141.5	1	126.5-141.4	2	15
W-555	GW Monitor	5-Dec-88	122	116.5	1	102.5-116.5	1B	14.5
W-556	GW Monitor	15-Dec-88	192	81.5	1	76-81.5	1B	15
W-557	GW Monitor	22-Dec-88	122.5	118	1	102-118	2	10
W-558	GW Monitor	17-Jan-89	117	110.5	1	101-110.5	1B	20.5
W-559	GW Monitor	24-Jan-89	105	100	1	93-100	1B	1.2
W-560	GW Monitor	7-Feb-89	263	206.5	1	201-206.5	3B	5
W-561	GW Monitor	23-Feb-89	180	152	1	143-152	5	1
W-562	GW Monitor	8-Mar-89	263	158.5	1	145-158	5	1.5
W-563	GW Monitor	17-Mar-89	192	105.5	1	95-105	2	8
W-564	GW Monitor	30-Mar-89	184	85	1	79.5-85	1B	3.5
W-565	GW Monitor	6-Apr-89	177	82.5	1	75-82.5	1B	15
W-566	GW Extraction	19-Apr-89	317	207.5	1	197-207	5	15
W-567	GW Monitor	27-Apr-89	194	61.5	1	51-61	1B	10.5
W-568	GW Monitor	5-Jun-89	156	101	1	97-101	2	10
W-569	GW Monitor	16-May-89	215	109.5	1	101-109.5	2	3
W-570	GW Monitor	9-Jun-89	180	175	1	161-175	5	2
W-571	GW Monitor	15-Jun-89	223.5	107.5	1	102-107	1B	20
W-592	GW Monitor	12-Dec-88	136.5	113	1	101-112	2	1.2
W-593	GW Monitor	6-Feb-89	159	92.5	1	82-92.5	3A	2.1
W-594	GW Monitor	27-Feb-89	156	61	1	55-61	2	0.5
W-601	GW Extraction	13-Oct-89	146	96	1	88-96	1B	12
W-602	GW Extraction	6-Nov-89	268	100.2	1	90-100	1B	11
W-603	GW Extraction	15-Nov-89	150	147	1	141-147	2	6

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-604	GW Monitor	27-Nov-89	111	83	1	76-82	1B	0.4
W-605	GW Extraction	8-Dec-89	246	136	1	130-136	2	5
W-606	GW Monitor	21-Dec-89	145	89	1	73-89	1B	0.4
W-607	GW Monitor	24-Jan-90	186	55.1	1	49-55	1B	2
W-608	GW Monitor	7-Feb-90	162	66.3	1	55-66	1B	2
W-609	GW Extraction	21-Feb-90	120	112	1	104-112	2	3
W-610	GW Extraction	16-Mar-90	453	84.5	1	69-84.5	1B	5
W-611	GW Monitor	4-Apr-90	161	98	1	87.5-98	1B	3
W-612	GW Monitor	19-Apr-90	222	137	1	126-136	2	10
W-613	GW Monitor	2-May-90	93	88	1	81.5-88	1B	4.5
W-614	GW Extraction	18-May-90	262	123	1	100-123	2	6
W-615	GW Monitor	1-Jun-90	121	99.3	1	91-99	1B	5
W-616	GW Monitor	14-Jun-90	255	188	1	178-188	3A	4
W-617	GW Monitor	26-Jun-90	200	110	1	103-110	2	3
W-618	GW Monitor	17-Jul-90	357	205	1	201-205	3B	3
W-619	GW Monitor	7-Aug-90	330	252	1	232-252	3B/4	20
W-620	GW Extraction	30-Aug-90	206	88.5	1	75-88.5	1B	6
W-621	GW Extraction	9-Sep-90	149	120	1	113-120	2	3.5
W-622	GW Monitor	28-Sep-90	206	112.25	1	104-112	5	0.3
W-651	GW Monitor	22-Feb-90	155	89	1	82-89	1B	0.4
W-652	GW Monitor	15-Mar-90	318	256	1	245-256	7	2
W-653	GW Extraction	29-Mar-90	225	128	1	122-128	3A	1
W-654	GW Monitor	11-Apr-90	240	158	1	140-158	2	20
W-655	GW Extraction	25-Apr-90	193	130	1	121-129.5	2	15
W-701	GW Extraction	10-Oct-90	159	86	1	74-86	1B	14
W-702	GW Monitor	24-Oct-90	180.5	95	1	77-95	1B	4
W-703	GW Monitor	3-Dec-90	586	325	1	298-325	5	NA
W-704	GW Extraction	2-Feb-91	135	107	1	67-76	1B	20
					2	88-97	1B	20
W-705	GW Monitor	26-Dec-90	126	90	1	77-90	1B	1
W-706	GW Monitor	25-Jan-91	178	85	1	71-85	1B	NA
W-712	GW Extraction	28-Aug-91	200	185.5	1	170-185.5	3A	8
W-714	GW Extraction	5-Dec-91	128.5	128	1	107-128	2	NA
W-750	GW Monitor	10-Apr-91	152	150	1	130-150	5	NA
W-901	GW Monitor	24-Feb-93	97.8	88	1	80-83	1B	1

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-902	GW Monitor	22-Jan-93	95.5	88	1	80-83	1B	1
W-903	GW Extraction	28-Apr-93	223	145	1	132-140	2	20
W-904	GW Extraction	6-May-93	212	154	1	121-133	2	30
					2	140-149	2	30
W-905	GW Monitor	7-Apr-93	221	144.5	1	134-144	2	3.5
W-908	GW Monitor	17-Aug-93	239	197	1	180-197	5/6	0.4
W-909	GW Monitor	11-Nov-93	252	113.5	1	80.5-113.5	2	2.5
W-911	GW Monitor	20-Sep-93	180	113.65	1	73.65-108.65	2	1.5
W-912	GW Monitor	7-Sep-93	239	174	1	168-174	5	3.5
W-913	GW Monitor	24-Nov-93	454	255	1	235-255	4	30
W-1001	GW Extraction	15-Dec-93	105	92	1	85-92	1B	1.5
W-1002	GW Monitor	12-Nov-93	293	260	1	246-260	5	20
W-1003	GW Monitor	2-Feb-94	184	147	1	140-147	2	1.5
W-1004	GW Extraction	23-Feb-94	100	97	1	71-91	1B	5
W-1008	GW Monitor	13-Apr-94	246	238	1	229.5-238	7	9.5
W-1009	GW Extraction	27-Apr-94	191	140	1	134-140	2	25
W-1010	GW Monitor	24-May-94	463	142	1	130-142	2	25
W-1011	GW Monitor	6-Jun-94	106	89	1	75-89	1B	2
W-1012	GW Monitor	20-Jun-94	161	117	1	96-112	2	2.5
W-1013	GW Monitor	29-Jun-94	147	73	1	65-73	1B	1.5
W-1014	GW Monitor	12-Jul-94	99	89	1	65-89	1B	30
W-1015	GW Extraction	10-Aug-94	437	94	1	84-94	1B	25
W-1101	GW Monitor	10-Nov-94	200	79	1	76-79	1B	1
W-1102	GW Extraction	29-Nov-94	163	95.6	1	76-94	1B	11
W-1103	GW Extraction	15-Dec-94	200	82	1	70-82	1B	4.5
W-1104	GW Extraction	18-Jan-95	165	99.3	1	77-87	1B	35
					2	92-98	1B	35
W-1105	GW Monitor	18-Jan-95	105	93	1	78-93	1B	3.75
W-1106	GW Monitor	17-Jan-95	245	86	1	76-85	1B	17.5
W-1107	GW Monitor	6-Mar-95	199.5	93	1	74-88	1B	1.5
W-1108	GW Extraction	17-Mar-95	250	156	1	142-156	5	22.5
W-1109	GW Extraction	11-Apr-95	121	113	1	94-113	2	6.5
W-1110	GW Monitor	4-Apr-95	252	92.9	1	68-92	1B	NA
W-1111	GW Extraction	1-June-95	152	129	1	88-108	1B/2	NA
					2	120-124	2	NA

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-1112	GW Monitor	28-Jun-95	263	210	1	201-210	5	NA
W-1113	GW Monitor	12-Jul-95	260	214	1	204-214	5	NA
W-1115	GW Monitor	12-Oct-95	126.5	118	1	108-118	3A	0.5
W-1116	GW Extraction	17-Aug-95	214.8	101	1	72-98	1B	NA
W-1117	GW Monitor	21-Aug-96	154	132.2	1	122-132	3A	1
W-1118	GW Monitor	27-Sep-95	225	125	1	115-125	3A	NA
W-1201	GW Monitor	18-Oct-95	225	133	1	125-133	3A	1
W-1202	GW Monitor	25-Oct-95	99.3	99	1	83-99	2	5
W-1203	GW Monitor	7-Nov- 95	224	206.2	1	196-206	5	18
W-1204	GW Monitor	20-Nov-95	225	126.2	1	118-126	3A	2.5
W-1205	GW Monitor	27-Nov-95	91	82	1	72-82	2	1
W-1206	GW Extraction	6-Dec-95	220	191	1	174-186	4	40
W-1207	GW Monitor	13-Dec-95	92	90	1	70-90	2	1
W-1208	GW Extraction	9-Jan-96	166	163	1	135-163	3A/3B	40
W-1209	GW Monitor	26-Jan-96	210	164	1	148-164	4	3
W-1210	GW Monitor	12-Feb-96	250	223	1	213-223	5	3
W-1211	GW Extraction	5-Mar-96	273	205	1	185-200	4	25
W-1212	GW Monitor	19-Mar-96	150	75	1	52-75	1B	3
W-1213	GW Extraction	2-Apr-96	129	76	1	64-76	1B	5
W-1214	GW Monitor	22-Apr-96	180	100	1	80-100	1B	2
W-1215	GW Extraction	17-Apr-96	175	120	1	108-118	2	8.5
W-1216	GW Extraction	7-May-96	200	124	1	94-124	2	14
W-1217	GW Monitor	15-May-96	182	98.5	1	78-98	1B	0.25
W-1219	GW Monitor	4-Jun-96	201	142	1	138-142	4	0.18
W-1222	GW Monitor	26-Jun-96	175	125.2	1	115-125	3A	6
W-1223	GW Monitor	23-Jul-96	175	102	1	87-97	2	4
W-1224	GW Monitor	5-Sep-96	125	104.5	1	99-104	1B	4.3
W-1225	GW Monitor	14-Aug-96	150	121.2	1	113-121	3A	2
W-1226	GW Monitor	6-Aug-96	155	126.5	1	116-126	2	1
W-1227	GW Monitor	9-Oct-96	200	134	1	126-134	2	11
W-1250	GW Monitor	7-Jun-96	210	200.3	1	130-135	4	0.25
W-1251	GW Monitor	3-Jul-96	210	200.3	1	134-139	4	1.3
W-1252	GW Monitor	25-Jul-96	208	202.3	1	135-140	4	0.15
W-1253	GW Monitor	15-Aug-96	206	200.3	1	127-132	4	0.15
W-1254	GW Extraction	28-Aug-96	210	200	1	131-141	4	26

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-1255	GW Monitor	27-Aug-96	208	200.7	1	124-129	4	0.2
W-1301	GW Extraction	4-Dec-96	180	120.3	1	112-120	3A	15
W-1302	GW Extraction	21-Jan-97	145	138.9	1	116.5-121.2	3A	7.5
					2	125.8-133.8	3A	7.5
W-1303	GW Extraction	6-Feb-97	199.5	107	1	78-102	2	10
W-1304	GW Monitor	20-Feb-97	149.5	125	1	120-125	3A	0.75
W-1306	GW Extraction	6-May-97	200	106	1	81-101	2	3.3
W-1307	GW Extraction	2-Jul-97	150	141	1	126-136	4	20
W-1308	GW Extraction	22-Jul-97	154	116	1	81-111	2	7
W-1309	GW Extraction	11-Aug-97	220	157	1	142-152	4	6
W-1310	GW Extraction	15-Sep-97	220	198	1	173-193	5	28
W-1311	GW Monitor	1-Oct-97	150	120.5	1	100-120	2	14
W-1401	GW Monitor	21-Oct-97	254	120	1	105-120	2	7.8
W-1402	GW Monitor	6-Nov-97	135	112	1	102-112	3A	4.1
W-1403	GW Extraction	13-Nov-97	175	142.5	1	132-142	3B	5
W-1404	GW Monitor	24-Nov-97	162	97.7	1	87-97	2	3.1
W-1405	GW Monitor	24-Nov-97	100	97.8	1	87-97	2	4.5
W-1406	GW Monitor	15-Dec-97	201	150	1	139.2-149.2	4	9.2
W-1407	GW Monitor	18-Dec-97	224	118	1	105-118	2	2
W-1408	GW Monitor	12-Jan-98	134	128	1	118-128	3A	3.8
W-1409	GW Extraction	23-Jan-98	143	140	1	80-135	2	13
W-1410	GW Extraction	19-Feb-98	208.5	131.1	1	126-131	4	9
W-1411	GW Monitor	4-Feb-98	133	128.1	1	114-128	3A	10.6
W-1412	GW Monitor	11-Mar-98	201	108	1	92-107	3A	1
W-1413	GW Monitor	26-Mar-98	163.5	163.5	1	147-157	5	1
W-1414	GW Monitor	31-Mar-98	128	107.5	1	97-107	3A	0.018
W-1415	GW Extraction	15-Apr-98	182	104.72	1	74.5-104.5	2	2
W-1416	GW Monitor	2-Jun-98	194.5	105	1	85-100	2	10.8
W-1417	GW Monitor	23-Apr-98	225	155	1	130-150	3A	8.9
W-1418	GW Monitor	5-May-98	252.5	190	1	176-190	4	9
W-1419	GW Monitor	13-May-98	175	115.5	1	90-110	2	4.45
W-1420	GW Monitor	17-Jun-98	175.5	112.5	1	102-112	2	20
W-1421	GW Monitor	28-May-98	230	172	1	157-167	3B	2.1
W-1422	GW Monitor	14-May-98	173.5	169.1	1	162-169	3B	11
W-1423	GW Extraction	2-Jul-98	175	134.5	1	99.5-109.5	2	22.4

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
					2	119.5-129.5	2	22.4
W-1424	GW Monitor	13-Aug-98	225.3	146	1	126-146	2	6.2
W-1425	GW Monitor	26-Aug-98	115	100.5	1	88.5-100.5	1B	1
W-1426	GW Monitor	3-Sep-98	89	85	1	70-85	1B	10
W-1427	GW Monitor	7-Sep-98	104	80.2	1	70-80	1B	17.7
W-1428	GW Monitor	29-Sep-98	104	78.2	1	63-78	1B	30
W-1501	GW Monitor	12-Oct-98	126.1	88	1	72-88	1B	7.5
W-1502	GW Monitor	27-Oct-98	204	98.7	1	88-98	2	1.7
W-1503	GW Extraction	16-Nov-98	234	181.5	1	171-181	4	24
W-1504	GW Extraction	14-Dec-98	165.2	162.5	1	140-160.4	3A/3B	21.7
W-1505	GW Monitor	20-Jan-99	276	184.5	1	174-184	4	10
W-1506	GW Monitor	3-Feb-99	160	120.5	1	110-120	2	3
W-1507	GW Monitor	19-Feb-99	201.5	169.5	1	159-169	5	0.5
W-1508	GW Monitor	3-Mar-99	135	128.5	1	118-128	2	0.75
W-1509	GW Monitor	24-Mar-99	175	88.5	1	73-88	1B	8
W-1510	GW Extraction	9-Apr-99	114.5	113.5	1	93-113	2	5
W-1511	GW Monitor	27-Apr-99	229	146	1	138-146	3B	15
W-1512	GW Monitor	3-May-99	100	100	1	88-98	2	0.5
W-1516	GW Extraction	17-Jun-99	204.5	200.25	1	188-200	5	17
W-1517	Dual Extraction	6-Jun-99	154	122.4	1	87-97	2	0.1
W-1518	GW Extraction	8-Jul-99	184	115	1	84-107	2	3
W-1519	GW Monitor	3-Aug-99	245	238	1	222-237	5	30
W-1520	GW Extraction	27-Jul-99	178.3	173	1	160-168	4	3.5
W-1522	GW Extraction	11-Aug-99	169	161	1	141-156	3B	9
W-1523	GW Extraction	7-Sep-99	216	172.3	1	164-172	4	15
W-1550	GW Extraction	24-Jun-99	200	130	1	98-125	3A	10
W-1551	GW Extraction	15-Jul-99	153	129	1	93-124	3A	10.5
W-1552	Dual Extraction	24-Jun-99	153.5	130	1	97.2-124.5	3A	2
W-1553	GW Monitor	17-Aug-99	153	130	1	98-125	3A/3B	1
W-1601	GW Extraction	13-Oct-99	169	160	1	150-155	3B	2.7
W-1602	GW Extraction	2-Nov-99	115.5	110.7	1	80-90	2	8
W-1603	GW Extraction	16-Nov-99	144	140	1	130-135	3A	71.2
W-1604	GW Extraction	2-Dec-99	194	148.7	1	138-148	4	8
W-1605	Dual Extraction	7-Mar-00	120.5	112	1	90-107	3A	NA
W-1606	SV Monitor	27-Jan-00	175	112	1	90-107	3A	NA

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-1607	SV Monitor	10-Feb-00	155.4	112	1	90-107	3A	0.1
W-1608	Dual Extraction	28-Feb-00	155	112	1	90-107	3A	NA
W-1609	GW Extraction	17-Apr-00	155	135	1	110-130	5	0.1
W-1610	GW Injection	4-May-00	155.3	135	1	110-130	5	0.5
W-1613	GW Monitor	27-Apr-00	219	173.4	1	168.4-173.4	3B	NA
W-1614	GW Monitor	18-May-00	100	89.8	1	79-89	1B	3
W-1615	Dual Extraction	15-Aug-00	55	48	1	15-48	1B/2	NA
W-1650	Dual Extraction	19-Jan-00	145	126	1	96-121	3A	2
W-1651	Dual Extraction	27-Jan-00	145	129	1	94-124	2/3A/3B	1
W-1652	Dual Extraction	9-Feb-00	145	127	1	92-122	3A/3B	0.5
W-1653	Dual Extraction	24-Feb-00	144	124	1	94-119	3A	1.2
W-1654	Dual Extraction	25-Feb-00	146.5	128	1	93-123	3A	1
W-1655	Dual Extraction	8-Mar-00	145	125	1	90-120	2/3A	0.5
W-1656	Dual Extraction	14-Mar-00	145	125.3	1	95.1-120.1	3A	5
W-1657	Dual Extraction	23-Mar-00	145	128	1	95-123	3A/3B	0.5
W-1701	GW Monitor	3-Jul-01	185	180.8	1	140-155	2	15
					2	165-175	2	15
W-1702	GW Monitor	15-Jun-01	15	14.25	1	4-13	2	NA
W-1703	GW Monitor	23-Aug-01	358	341.5	1	331-341	LL	22.6
W-1704	GW Monitor	19-Sep-01	240	118.8	1	98-118	2	2
W-1705	CMT Monitor	16-Oct-01	225	208.8	1	93-103	2	5
					2	123-128	3A	5
					3	138-143	3B	5
W-1801	GW Extraction	18-Mar-02	143	134.4	1	124-134	3A	5
W-1802	GW Monitor	2-Apr-02	175	162.2	1	147-157	3A	NA
W-1803	GW Monitor	24-Apr-02	245	240.8	1	175-185	4	15
					2	225-235	5	15
W-1804	GW Monitor	22-May-02	155	110.8	1	80-95	3A	0.5
					2	100-105	3B	0.5
W-1805	GW Monitor	20-Aug-02	110	100.8	1	70-80	1B	6
					2	85-95	1B	6
W-1806	GW Extraction	12-Sep-02	260	106.2	1	80.7-101.2	1B	3
W-1807	GW Extraction	7-Oct-02	165	130	1	115-125	2	10
W-1901	GW Monitor	31-Oct-02	175	127	1	92-97	1B	7
					2	107-122	2	7

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-1902	GW Extraction	21-Nov-02	175	165	1	140-145	3A	20
					2	150-160	3A	20
W-1903	Dual Extraction	16-Dec-02	120	109	1	84-104	2	0.5
W-1904	Dual Extraction	23-Jan-03	120	101	1	75-100	2	0.5
W-1905	GW Monitor	20-May-03	210	123.5	1	103-113	3A	2.5
					2	118-123	3A	2.5
W-1909	Air Inlet	24-Jun-03	110	106.35	1	86-106	2	1.5
W-2005	GW Extraction	3-Feb-04	160	125	1	109-119	3A	2
W-2006	GW Extraction	24-Feb-04	160	132.5	1	122-132	3B	NA
W-2011	GW Extraction	29-Feb-04	155	116.3	1	106-116	3A	0.3
W-2101	GW Extraction	18-Nov-04	160	135.3	1	110-130	3A	0.25
W-2102	GW Extraction	14-Dec-04	160	138.35	1	118-133	3A	0.33
W-2103	GW Monitor	18-Jan-05	160	133.35	1	113-128	3A	0.5
W-2104A	SV Monitor	8-Feb-05	80	45.5	1	30-45	1B	NA
W-2104B	SV Monitor	8-Feb-05	80	72.55	1	52-72	2	NA
W-2105	Dual Extraction	9-Mar-05	126	115.33	1	90-110	2	0.25
W-2110A	SV Monitor	14-Jun-05	100	58.49	1	38-58	1B/2	NA
W-2110B	SV Monitor	14-Jun-05	100	85.49	1	65-85	2	NA
W-2111A	SV Monitor	22-Jun-05	90	40.3	1	25-40	1B	NA
W-2111B	SV Monitor	22-Jun-05	90	75.3	1	60-75	2	NA
W-2112A	SV Monitor	28-Jun-05	100	58.49	1	38-58	1B/2	NA
W-2112B	SV Monitor	28-Jun-05	100	78.49	1	68-78	2	NA
W-2113	GW Monitor	21-Jul-05	220	201.5	1	190.5-200.5	4	9
W-2201	GW Extraction	26-Jan-06	130	98.8	1	43.4-53.4	1B	12
					2	73.4-93.4	1B	12
W-2202	GW Monitor	15-Dec-05	140	122.25	1	102-107	3A	0.4
					2	112-117	3A	0.4
W-2203	GW Extraction	10-Jan-06	136.5	131.4	1	121-126	3A	1
W-2204	SV Extraction	26-Jan-06	120	111.38	1	41-66	2	0.1
					2	71-76	2	0.1
					3	91-106	2/3A	0.1
W-2205	SV Extraction	3-Apr-06	127	125.4	1	40-65	2	NA
					2	70-80	2	NA
					3	90-120	2/3A	NA
W-2206	SV Extraction	16-Feb-06	91.5	78.05	1	40-75	2	NA

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Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-2207A	SV Extraction	9-Mar-06	103	60.41	1	25-35	1B	NA
					2	45-60	1B	NA
W-2207B	SV Extraction	9-Mar-06	103	100.4	1	65-95	2	NA
W-2208A	SV Extraction	30-Mar-06	104	71.38	1	36-66	2	0.1
W-2208B	SV Extraction	30-Mar-06	104	95.63	1	75.2-95.2	2	0.25
W-2211	SV Extraction	30-May-06	106.5	105.3	1	75-105	2	NA
W-2212	SV Extraction	6-Jun-06	115.4	115.4	1	90-115	3A	1
W-2214A	SV Monitor	24-Jul-06	135	39.3	1	6-39	1B/2	NA
W-2214B	SV Monitor	24-Jul-06	135	88.3	1	48-83	2	NA
W-2215A	SV Monitor	9-Aug-06	121.5	82.4	1	47-82	2	NA
W-2215B	SV Monitor	9-Aug-06	121.5	120.5	1	100-120	5	NA
W-2216A	SV Monitor	18-Sep-06	131.5	65.4	1	40-65	2	NA
W-2216B	GW Monitor	18-Sep-06	131.5	126.4	1	106-121	3A	0.2
W-2217A	SV Monitor	12-Oct-06	131.5	48.4	1	18-48	2	NA
W-2217B	SV Monitor	12-Oct-06	131.5	95.4	1	55-75	5	NA
					2	85-95	5	NA
W-2301A	SV Monitor	31-Oct-06	121	57.4	1	32-57	2	NA
W-2301B	SV Monitor	31-Oct-06	121	94.8	1	64.5-94.5	2/3A	NA
W-2302	SV Extraction	1-Feb-07	130	107.3	1	82-102	2	0.1
W-2303	SV Extraction	14-Feb-07	100	79.8	1	45-74.5	2	NA
W-2304	GW Monitor	19-Dec-06	130	124.3	1	114-119	3A	0.15
W-2305	Dual Extraction	23-Jan-07	115	108.3	1	83-103	2	0.5
W-2501	GW Extraction	9-Dec-09	175	144.2	1	128-133	2	15
W-2502	GW Extraction	28-Dec-09	177	164	1	101-106	2	15
					2	116-126	2	15
					3	143-153	2	15
W-2601	GW Extraction	2-Feb-10	225	220.1	1	179-189	5	20
					2	195-211	5	20
W-2602	GW Monitor	3-Mar-10	175	162.6	1	152-157	4	1
W-2603	GW Monitor	17-Mar-10	251	189.1	1	179-183.9	3A	3.4
W-2604A	GW Monitor	5-Apr-10	130	60.5	1	35-55	2	0.02
W-2604B	GW Monitor	5-Apr-10	130	100.9	1	65-95	2/5	0.03
W-2605A	GW Monitor	14-Apr-10	125	58.2	1	23-53	1B/2	NA
W-2605B	GW Monitor	14-Apr-10	125	110.3	2	70-105	2/5	0.16
W-2606 (a)	GW Monitor	28-Apr-10	113.1	112.6	1	59.9-110.3	2/5	NA

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
W-2607 (a)	GW Monitor	11-May-10	120.2	104.1	1	50.9-101.8	2/5	NA
W-2608 (a)	GW Monitor	27-May-10	160.1	82.1	1	31.1-80.6	2/5	NA
W-2611	GW Monitor	13-Jul-10	90	75.2	1	50-75	1B	1.66
W-2612	GW Monitor	21-Jul-10	137	73.8	1	43.8-73.5	1B	0.22
W-2616	GW Monitor	12-Aug-10	187	145.4	1	130-140.5	4	0.09
W-2617	GW Monitor	24-Aug-10	177	127.2	1	117-121.9	3B	0.04
W-2618	GW Monitor	29-Oct-10	111	103.8	1	77.3-103.3	2	NA
W-2619	GW Monitor	1-Nov-10	110	105.5	1	75-105	2	NA
W-2620A	GW Monitor	11-Oct-10	110	105.3	1	75-105	2	NA
W-2621	GW Monitor	12-Oct-10	110	105.2	1	75-105	2	NA
W-2622	GW Monitor	20-Oct-10	111	105.2	1	75-105	2	NA
W-2623	GW Monitor	24-Oct-10	111	105.2	1	75-105	2	NA
W-2801	GW Extraction	18-Oct-11	140	135	1	114-119	3A	NA
					2	124.5-129.5	3A	NA
W-3001	GW Monitor	4-Apr-14	250	230	1	224-229	5	6
W-3002	GW Monitor	21-May-14	252	182.4	1	177-182	3B	0.9
W-3003	GW Monitor	7-May-14	252	204.5	1	199-204	5	0.9
W-3004	GW Monitor	12-Sep-14	107	105.5	1	94-104	3A	0.1
W-3101	GW Extraction	20-May-15	225	213	1	207.5-212.5	5	2
W-3102	GW Extraction	4-Jun-15	225	109.3	1	104-109	2	2
W-3103	GW Monitor	22-Jun-15	200.4	153.26	1	147.9-152.9	3A	5
W-3104	GW Monitor	14-Jul-15	225	208.5	1	203-208	5	1.83
W-3105	GW Monitor	23-Sep-15	140	130.52	1	120-130	5	NA
W-3106	GW Monitor	15-Sep-15	168	153.58	1	148.1-153.1	5	NA
W-3107	GW Monitor	17-Sep-15	125	89.38	1	84-89	1B	3
W-3201	SV Monitor	2-Aug-16	75	65.47	1	35-64.9	2	NA
W-3202	SV Monitor	4-Aug-16	94	85.5	1	40-85	2	NA
W-3203	SV Monitor	5-Aug-16	105	85.5	1	55-85	2	NA
W-3204	GW Monitor	26-Jul-16	160	133.88	1	131-133.5	4	0.65
W-3205	GW Monitor	13-Jul-16	135.4	118.88	1	116-118.5	3A	0.25
SIP-141-201	Piezometer	2-Feb-96	77	74.2	1	57-74	1B	0.5
SIP-141-202	Piezometer	12-Feb-96	80	74	1	64-74	1B	0.5
SIP-141-203	Piezometer	20-Feb-96	87	83	1	72-83	1B	NA
SIP-191-002	Piezometer	21-Apr-94	66	61	1	45-61	1B	NA
SIP-212-101	Piezometer	14-Mar-96	94	90.5	1	87-90.5	2	NA

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Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
SIP-293-001	Piezometer	5-Dec-90	56.5	50	1	45-50	1B	NA
SIP-331-001	Piezometer	21-Sep-95	122	116.5	1	106.5-116.5	2	NA
SIP-419-101	Piezometer	8-Sep-95	127	123	1	112-123	3B	NA
SIP-419-202	Piezometer	6-Mar-96	110	106.5	1	97-106.5	3A	NA
SIP-490-101	Piezometer	1-Nov-95	60	58	1	53-56	2	NA
SIP-490-102	Piezometer	8-Nov-95	75	73.5	1	53.5-73.5	2	0.5
SIP-501-004	Piezometer	20-Oct-92	60	56.9	1	48.5-56.9	1B	NA
SIP-501-006	Piezometer	11-Nov-92	59.5	56	1	50-56	1B	NA
SIP-501-007	Piezometer	16-Nov-92	64	59	1	53-59	1B	NA
SIP-501-101	Piezometer	10-May-94	77.5	73	1	69-73	1B	NA
SIP-501-102	Piezometer	16-May-94	77	73	1	67-73	1B	NA
SIP-501-103	Piezometer	20-May-94	63	57.5	1	51-57.5	1B	NA
SIP-501-104	Piezometer	15-Jul-94	67	62	1	50-62	1B	NA
SIP-501-105	Piezometer	1-Sep-94	73	68	1	63-68	1B	NA
SIP-501-201	Piezometer	29-Nov-94	65	58.5	1	54-58.5	1B	NA
SIP-501-202	Piezometer	1-Jul-95	70	64.5	1	58-64.5	1B	NA
SIP-511-101	Piezometer	25-Jan-96	110	106.7	1	100-106.7	3A	0.5
SIP-511-102	Piezometer	2-Apr-96	114	110	1	108-110	3B	0.5
SIP-514-107	Piezometer	3-Jan-90	21.5	17	1	9-17	1B	NA
SIP-514-109	Piezometer	5-Jan-90	21.5	21.5	1	7-21.5	1B	NA
SIP-514-112	Piezometer	8-Jan-90	21.5	18	1	7-18	1B	NA
SIP-514-114	Piezometer	9-Jan-90	21.5	17	1	4-17	1B	NA
SIP-514-116	Piezometer	10-Jan-90	21.5	17	1	7-17	1B	NA
SIP-514-117	Piezometer	11-Jan-90	21.5	17.5	1	6-17.5	1B	NA
SIP-514-119	Piezometer	12-Jan-90	21.5	16	1	5-16	1B	NA
SIP-514-123	Piezometer	17-Jan-90	26.5	23	1	11.5-23	1B	NA
SIP-514-124	Piezometer	17-Jan-90	21.5	17	1	6-17	1B	NA
SIP-514-125	Piezometer	19-Jan-90	21.5	15	1	6-15	1B	NA
SIP-514-126	Piezometer	18-Jan-90	26.5	21.5	1	4-21.5	1B	NA
W-514-2007A	SV Extraction	18-Mar-04	110	45.5	1	15-45	1B/2	NA
W-514-2007B	SV Extraction	18-Mar-04	110	102.5	1	72-102	2/5	NA
SIP-518-101	Piezometer	20-Sep-90	125	61	1	55-61	2	NA
SVB-518-201	Dual Extraction	3-Mar-93	59.8	50	1	34-50	2	NA
SVB-518-202	SV Monitor	3-Nov-93	120.6	73.7	1	19-73.7	1B/2	NA
SIP-518-203	Piezometer	21-Oct-93	132.1	127	1	121-127	5	NA

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Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
SVB-518-204	Dual Extraction	5-Nov-93	121.5	50	1	24-46	2	NA
SVB-518-302	GW Monitor	22-Jun-95	104.5	39.5	1	11-39	NA	NA
W-518-1914	Dual Extraction	9-Oct-03	18	16	1	5.5-15.5	1B	NA
W-518-1915	Dual Extraction	15-Oct-93	104.5	41	1	30.5-40.5	2	NA
W-543-001	SV Extraction	25-Feb-03	71.5	67.5	1	52-67	2	NA
W-543-002A	SV Monitor	10-Mar-03	96	65.4	1	45-65	2	NA
W-543-002B	SV Monitor	10-Mar-03	96	82.5	1	72-82	2	NA
W-543-003	SV Extraction	20-Mar-03	95	80	1	69-79	2	NA
W-543-004A	SV Monitor	27-Mar-03	95	64.5	1	49-64	2	NA
W-543-004B	SV Monitor	27-Mar-03	95	80.5	1	70-80	2	NA
SIP-543-101	Piezometer	1-Jul-95	111	104	1	93-103	2	NA
W-543-1908	SV Extraction	12-Jun-03	40.8	40.4	1	20-40	1B	9
SIP-ALP-001	Piezometer	3-May-90	66.5	60	1	45-60	2	NA
SIP-ALP-002	Piezometer	7-May-90	62	57.5	1	47.5-57.5	2	NA
SIP-AS-001	Piezometer	30-Apr-90	100.5	90.5	1	81-90.5	1B	NA
SIP-CR-049	Piezometer	26-Feb-90	41.5	40	1	36-40	1B	NA
SIP-EGD-001	Piezometer	16-Oct-90	101.5	85	1	75-85	2	NA
SIP-ETC-201	Dual Extraction	26-Mar-96	106	100	1	80-100	2	0.5
SIP-ETC-301	Piezometer	9-Apr-99	102	NA	1	NA	NA	NA
SIP-ETC-303	Piezometer	24-May-99	111	88	1	82-88	2	NA
W-ETC-2001A	SV Monitor	10-Nov-03	95	23.5	1	18-23	1B	NA
W-ETC-2001B	SV Monitor	10-Nov-03	95	88.5	1	78-88	2	NA
W-ETC-2002A	SV Monitor	25-Nov-03	95	64.5	1	34-64	1B/2	NA
W-ETC-2002B	SV Monitor	25-Nov-03	95	85.5	1	75-85	2	NA
W-ETC-2003	SV Extraction	9-Dec-03	95	45.5	1	20-45	1B	NA
W-ETC-2004A	SV Extraction	17-Dec-03	95	53.5	1	28-53	1B/2	NA
W-ETC-2004B	SV Extraction	17-Dec-03	95	88.5	1	63-68	2	NA
SIP-ETS-201	Piezometer	5-Feb-91	95	90	1	85-90	3A	NA
SIP-ETS-204	Piezometer	7-May-91	102.5	97	1	87-97	3A	NA
SIP-ETS-205	Piezometer	20-Jun-91	103	95	1	89.5-95	3A	NA
SIP-ETS-209	Piezometer	25-Jul-91	96.6	90.5	1	79.5-89.8	2	NA
SIP-ETS-211	Piezometer	6-Aug-91	103	98.5	1	95-98.5	3A	NA
SIP-ETS-212	Piezometer	14-Aug-91	106.5	102.5	1	97.5-102.25	2	NA
SIP-ETS-213	Piezometer	15-Nov-91	118.5	116.5	1	108.5-116.5	3A	NA
SIP-ETS-214	Piezometer	22-Nov-91	101	101	1	86-101	3A	NA

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Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
SIP-ETS-215	Piezometer	3-Dec-91	94.5	94.5	1	84.5-94.5	3A	NA
SIP-ETS-302	Piezometer	30-Mar-92	117.4	113	1	97-113	3A	NA
SIP-ETS-303	Piezometer	2-Apr-92	110.7	102	1	95-102	3A	NA
SIP-ETS-304	Piezometer	27-Aug-92	100	97	1	90-97	3A	NA
SIP-ETS-306	Piezometer	11-Sep-92	101	93	1	80.5-93	3A	NA
SIP-ETS-401	Piezometer	2-Aug-95	122	122	1	116-121	3A	NA
SIP-ETS-402	Piezometer	8-Aug-95	110	110	1	97-107	2	NA
SIP-ETS-404	Piezometer	22-Aug-95	99	99	1	83.5-95.5	2	NA
SIP-ETS-405	Piezometer	29-Aug-95	126	126	1	114.5-123	3A	NA
SIP-ETS-501	Piezometer	16-Nov-95	110	106.5	1	100-106.5	3A	NA
SIP-ETS-502	Piezometer	5-Dec-95	95	88	1	80-88	2	NA
SVI-ETS-504	SV Extraction	9-Jul-96	76.5	67	1	42-67	2	NA
SVI-ETS-505	SV Injection	18-Jul-96	80	77.5	1	45-75	2	NA
W-ETS-305A	SV Monitor	30-May-07	80.5	50	1	14.7-49.7	1B/2	NA
W-ETS-305B	SV Monitor	30-May-07	85	79.7	1	59.3-79.3	2	NA
W-ETS-506A	SV Monitor	29-May-07	75	37.5	1	17.1-37.1	1B/2	NA
W-ETS-506B	SV Monitor	29-May-07	75	63.3	1	43-63	2	NA
W-ETS-507	SV Extraction	27-Apr-96	75	65.5	1	25.1-65.1	1B/2	NA
SIP-ETS-601	Piezometer	7-Jun-99	115.5	104.8	1	98.3-104.8	2	NA
W-ETS-2008A	SV Extraction	7-Apr-04	110	40.5	1	20-40	1B	NA
W-ETS-2008B	SV Extraction	7-Apr-04	110	85.5	1	50-85	2	NA
W-ETS-2009(a)	SV Extraction	3-May-04	103	79.5	1	54-79	2	NA
W-ETS-2010A	SV Extraction	19-May-04	110.3	70.5	1	35-70	1B/2	NA
W-ETS-2010B	SV Extraction	19-May-04	110.3	100.5	1	80-100	2	NA
SIP-HPA-001	Piezometer	20-Apr-90	92.75	75	1	65-75	2	NA
W-HPA-001A	SV Monitor	15-Apr-03	80	45.5	1	30-45	1B	NA
W-HPA-001B	SV Monitor	15-Apr-03	80	73.5	1	63-73	2	NA
W-HPA-002A	SV Extraction	29-Apr-03	80	43	1	32.5-42.5	1B	NA
W-HPA-002B	SV Extraction	29-Apr-03	80	72.5	1	52-72	2	NA
SIP-HPA-003	Piezometer	19-Apr-90	91.5	66	1	61-66	2	NA
SIP-HPA-201	Piezometer	14-May-96	97.5	76	1	71-76	2	NA
SIP-IES-001	Piezometer	16-Sep-92	50	46.5	1	44-46.5	1B	NA
SIP-ITR-001	Piezometer	19-Apr-91	121.5	115	1	105-115	5	NA
SIP-ITR-002	Piezometer	2-Apr-91	100	84	1	79-84	5	NA
SIP-ITR-003	Piezometer	25-Apr-91	121.5	106	1	98.66-106	5	NA

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
SIP-NEB-101	Piezometer	23-Sep-92	68.7	66	1	57-66	2	NA
SIP-PA-002	Piezometer	29-Jan-90	16.5	16.5	1	4-16.5	1B	NA
SIP-PA-003	Piezometer	26-Jan-90	18	14	1	4-14	1B	NA
SIP-PA-005	Piezometer	4-Jan-90	11.5	8	1	3-8	1B	NA
SIP-PA-006	Piezometer	4-Jan-90	13.5	12	1	5-12	1B	NA
SIP-PA-007	Piezometer	4-Jan-90	11.5	5	1	1-5	1B	NA
SIP-PA-010	Piezometer	25-Jan-90	11.5	9	1	3-9	1B	NA
SIP-PA-012	Piezometer	29-Jan-90	11.5	9	1	2-9	1B	NA
SIP-PA-013	Piezometer	24-Jan-90	16.5	13	1	8-13	1B	NA
SIP-PA-015	Piezometer	25-Jan-90	21.5	17.5	1	2-17.5	1B	NA
SIP-PA-016	Piezometer	24-Jan-90	11.5	11.5	1	7-11.5	1B	NA
SIP-PA-017	Piezometer	24-Jan-90	16.5	14	1	7-14	1B	NA
SIP-PA-018	Piezometer	25-Jan-90	11.5	8	1	6-8	1B	NA
SIP-PA-019	Piezometer	26-Jan-90	16.5	12	1	2-12	1B	NA
SIP-PA-021	Piezometer	23-Jan-90	11.5	10	1	2-10	1B	NA
SIP-PA-024	Piezometer	23-Jan-90	16.5	15	1	5-15	1B	NA
SIP-PA-025	Piezometer	23-Jan-90	11.5	7	1	4-7	1B	NA
SIP-PA-026	Piezometer	29-Jan-90	11.5	10	1	2-10	1B	NA
SIP-PA-027	Piezometer	29-Jan-90	8.5	7	1	2-7	1B	NA
SIP-PA-028	Piezometer	23-Jan-90	11	8	1	5-8	1B	NA
SIP-PA-029	Piezometer	22-Jan-90	11.5	7	1	5-7	1B	NA
SIP-PA-030	Piezometer	24-Jan-90	11.5	8	1	4-8	1B	NA
SIP-PA-034	Piezometer	4-Jan-90	6.5	5	1	3-5	1B	NA
SIP-PA-035	Piezometer	4-Jan-90	11.5	11.5	1	6.5-11.5	1B	NA
TW-11	GW Monitor	9-Jun-81	112.5	107	1	97-107	2	NA
TW-11A	GW Monitor	16-Mar-84	163	160	1	133-160	2	6
TW-21	GW Monitor	12-Jun-81	111.5	95	1	85-95	1B	3
UP-292-006	Piezometer	7-Jan-91	74	57.5	1	47.5-57.5	1B	NA
UP-292-007	Piezometer	7-Jan-91	71	56	1	46-56	1B	NA
UP-292-012	Piezometer	29-Jan-92	67.7	60	1	45-60	1B	NA
UP-292-014	Piezometer	29-Jan-92	66	66	1	50-60	1B	NA
UP-292-015	Piezometer	29-Jan-92	61.5	61.5	1	49.5-60.5	1B	NA
UP-292-020	Piezometer	3-Feb-93	68.5	68.5	1	56.5-64	1B	NA
GSW-001A	GW Monitor	12-Jun-86	208	133	1	115-133	3A	14
GSW-006	GW Monitor	28-Feb-86	212	137	1	121-137	3A	11

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
GSW-007	GW Monitor	14-Mar-86	176.5	123.4	1	110.8-123.4	3A	5
GSW-008	GW Monitor	1-Apr-86	176	133	1	127.5-133	3A	2
GSW-009	GW Monitor	14-Apr-86	197.5	152.5	1	147-152.5	3B	5
GSW-011	GW Monitor	7-May-86	182.5	126	1	116-126	3A	5
GSW-013	GW Monitor	27-Jun-86	198	134.5	1	125-134.5	3A	NA
GSW-215	GW Monitor	22-Apr-86	214	133.5	1	127-133.5	3A	6
GSW-216	GW Monitor	9-May-86	193	120.5	1	110.5-120.5	3A	7
GSW-266	GW Monitor	8-May-86	220	166	1	159-166	3B	3
GSW-326	GW Monitor	2-Oct-87	230	134	1	129-134	4	NA
GSW-367	GW Monitor	29-Apr-87	159	124	1	114-124	2	7
GSW-442	GW Monitor	27-Oct-87	270	145	1	138-145	3A	1
GSW-443	GW Monitor	9-Nov-87	291	141	1	123-141	2	5
GSW-444	GW Monitor	20-Nov-87	278	120	1	110-120	3B	NA
MW-NLF-1	GW Monitor	13-Mar-91	26	NA	1	NA	NA	NA
MW-NLF-2	GW Monitor	13-Mar-91	NA	NA	1	NA	NA	NA
MW-NLF-3	GW Monitor	13-Mar-91	20	NA	1	NA	NA	NA
MW-NLF-4	GW Monitor	13-Mar-91	26	NA	1	NA	NA	NA
MW-NLF-20	GW Monitor	NA	NA	NA	1	NA	NA	NA
MW-NLF-21	GW Monitor	NA	NA	NA	1	NA	NA	NA
MW-NLF-22	GW Monitor	NA	NA	NA	1	NA	NA	NA
					2	118-131	NA	NA
SNL-1B	Piezometer	NA	NA	NA	1	NA	NA	NA
SNL-2A	Piezometer	NA	NA	NA	1	NA	NA	NA
SNL-4D	Piezometer	NA	NA	NA	1	NA	NA	NA
MW-SNL-20B	GW Monitor	28-Jun-84	140	140	1	90-105	NA	NA
MW-SNL-20C	GW Monitor	16-Jul-84	165	156	1	140-155	NA	NA
11C1	GW Monitor	8-Jun-76	68	66	1	56.2-61.2	1B	1
11J2	GW Monitor	26-Apr-79	112	112	1	90-92	1B	5
					2	102-108	2	5
14A3	GW Monitor	7-Dec-77	110	110	1	100-105	1B	NA
14B1	Water-supply (pumping)	13-Aug-59	300	300	1	146-149	2	NA
					2	192-195	3A	NA
					3	209-213	3A	NA
14B4	Water-supply (pumping)	1-Aug-60	260	260	1	143-148	2	NA
					2	155-159	2	NA

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
					3	186-189	3A	NA
					4	205-215	3A	NA
					5	245-250	4	NA
14B7	GW Monitor	25-Aug-87	NA	NA	NA	NA	NA	NA
14C2	Water-supply (pumping)	7-Jan-88	217	NA	1	135-150	2	NA
14C3	Water-supply (pumping)	19-Jan-88	405	NA	1	160-388	2/3A/3B/4/5	NA
14H1	GW Monitor	21-Dec-83	NA	288	1	0-288	NA	NA
14H2	GW Monitor	28-Aug-87	NA	NA	NA	NA	NA	NA
14JD1	GW Monitor	NA	NA	NA	NA	NA	NA	NA
14K1	GW Monitor	NA	372	361	1	153-157	NA	NA
					2	193-202	NA	NA
					3	217-251	NA	NA
					4	279-290	NA	NA
					5	300-336	NA	NA
					6	345-349	NA	NA
					7	354-361	NA	NA
15B1	GW Monitor	24-Jun-49	423	NA	NA	NA	NA	NA
18D1	Water-supply (pumping)	20-Apr-84	NA	NA	1	NA	7	12
2J2	GW Monitor	4-Jan-90	NA	NA	1	NA	NA	NA
2K3	GW Monitor	6-Mar-91	35	NA	1	NA	NA	NA
2K4	GW Monitor	6-Mar-91	35	NA	1	NA	1B	NA
2Q2	GW Monitor	6-Mar-91	40	NA	1	NA	1B	NA
2R3	GW Monitor	5-Mar-91	37	NA	1	NA	1B	NA
2R4	GW Monitor	5-Mar-91	37	NA	1	NA	NA	NA
2R8	GW Monitor	6-Mar-91	40	NA	1	NA	1B	NA
3S1E-1P2	Water-supply (pumping)	7-Oct-60	144	NA	NA	NA	NA	NA
3S2E-16B1	Water-supply (pumping)	1-Jul-44	410	410	1	140-235	NA	NA
					2	275-287	NA	NA
					3	304-320	NA	NA
					4	333-338	NA	NA
					5	347-352	NA	NA
					6	380-390	NA	NA

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Well	Well type	Date completed	Borehole depth (ft)	Casing depth (ft)	Screen position	Screen interval (ft)	HSU	Initial flow rate (gpm)
3S2E-16C1	Water-supply (pumping)	18-Feb-58	584	580	1	288-298	NA	950
					2	316-327	NA	950
					3	347-353	NA	950
					4	432-454	NA	950
					5	517-523	NA	950
3S2E-7C2	Water-supply (pumping)	NA	NA	49	1	39-44	NA	NA
3S2E-8P1	Water-supply (pumping)	NA	NA	273	1	122-263	NA	NA
3S2E-9Q1	Water-supply (pumping)	13-Jan-60	576	516	1	180-492	NA	510
7D2	GW Monitor	7-Jun-76	74	72	1	63-68	3A	NA
AW-1906	Anode Well	17-Jun-03	270	258	NA	NA	NA	NA
AW-1910	Anode Well	23-Jul-03	270	258	NA	NA	NA	NA
AW-1911	Anode Well	NA	290	NA	NA	NA	NA	NA
AW-1912	Anode Well	28-Aug-03	280	258	NA	NA	NA	NA
AW-2106	Anode Well	11-Apr-05	290	257.5	NA	NA	NA	NA
AW-2107	Anode Well	4-May-05	290	NA	NA	NA	NA	NA
AW-2108	Anode Well	2-Jun-05	290	258	NA	NA	NA	NA
AW-2306	Anode Well	31-Aug-07	280	261	NA	NA	NA	NA

Notes and footnotes are on the following page.

Table A-1. Well construction data, LLNL Livermore Site and vicinity, Livermore, California.

Notes:

ft = Feet (All depths reported are in feet below ground surface).
gpm = Gallons per minute.
GW = Ground Water.
HSU = Hydrostratigraphic Unit.
NA = Not Available.
SV = Soil Vapor.
CMT = Continuous Multichannel Tubing.

In wells with more than one screen, the screen positions are numbered consecutively downward within a single well. Well numbers ending in A and B, indicate two wells in the same borehole. The "A" refers to the shallow well and "B" refers to the deeper well.

HSUs are numbered consecutively downward from ground surface. An HSU is defined as sediments that are grouped together based on their hydrogeologic and contaminant transport properties. The permeable layers within an HSU are considered to be in good hydraulic communication, whereas permeable layers in different HSUs are considered to be in poor hydraulic communication. HSU contacts are interpreted and are periodically revised based on new data.

Well numbers were changed in December 1988 to be consistent with Alameda County Flood Control and Water Conservation District, Zone 7 well identification. Well number changes made on this table are:

4A6 ------> 14H2
18D81 ------> 18D1
14A84 ------> 14A11

Wells installed for the Dynamic Underground Stripping Demonstration Project (1992-1993) include extraction wells (GEW series), injection wells (GIW series), gasoline spill piezometer (GSP series), and heating wells (HW series).

CMT was installed to monitor ground water chemistry in multiple HSUs. When the CMT was installed in well W-1705 in 2010, the fourth screen position (203-208 ft) monitoring HSU-5 was properly abandoned.

Piezometer SVB-518-303 was drilled out and replaced by well W-518-1915 in 2003.

(a) Wells W-2606, W-2607, and W-2608 were drilled at an angle 45 degrees from vertical; depths shown are calculated true vertical depth.

(b) Well W-ETS-2009 was drilled at an angle 20 degrees from vertical; depths shown are calculated true vertical depth.

Table A-2. Well closure data, LLNL Livermore Site and vicinity, Livermore, California.

Well number	Well type	Date installed	Borehole depth (ft)	Casing depth (ft)	Screen interval(s) (ft)	HSU monitored	Closure date
11A1	Other non-LLNL	8-Jun-76	66	64.7	54.7-59.7	NA	18-Aug-88
11BA[a]	Other non-LLNL	2-Mar-87	NA	NA	NA	NA	10-Jun-87
11H1	Other non-LLNL	4-Nov-41	NA	519	157-161	2/3A/4/5/6/7	31-Oct-88
					169-177		
					224-228		
					243-245		
					254-256		
					306-314		
					319-327		
					339-342		
					414-419		
					424-431		
					477-479		
11H4	Other non-LLNL	5-Apr-60	272	272	166-170	3/4/5	7-Oct-88
					174-176		
					183-185		
					200-202		
					211-214		
					224-230		
					250-252		
					260-265		
11J1	Other non-LLNL	1-Jan-41	160	160	NA	2	3-Aug-88
11J4	Other non-LLNL	1-Jan-65	NA	NA	NA	NA	11-Oct-88
11K1	Other non-LLNL	6-Jan-42	621	621	247-255	4/5/6	26-Sep-88
					272-276		
					297-304		
					322-339		
					554-557		
					580-602		
11K2	Other non-LLNL	NA	NA	232	NA	NA	3-Oct-88
11Q2	Other non-LLNL	20-Dec-83	NA	264	NA	NA	16-Aug-88
11Q3	Other non-LLNL	20-Dec-83	NA	120	NA	NA	10-Aug-88
11Q6	Other non-LLNL	20-Dec-83	NA	280	NA	NA	11-Jan-89
11R3	Other non-LLNL	8-May-61	140	117	NA	NA	3-Sep-85
11R4	Other non-LLNL	28-Oct-58	268	NA	165-177	NA	3-Sep-85
					252-258		
11R5	Other non-LLNL	19-Dec-83	NA	NA	NA	NA	26-Jul-85

Table A-2. Well closure data, LLNL Livermore Site and vicinity, Livermore, California.

Well number	Well type	Date installed	Borehole depth (ft)	Casing depth (ft)	Screen interval(s) (ft)	HSU monitored	Closure date
12M1	Other non-LLNL	12-Sep-42	702	702	375-378		15-Apr-84
					420-426		
					452-473		
					560-564		
					609-621		
					626-657		
12N1	Other non-LLNL	14-Apr-42	702	NA	392-399	7	24-Jan-89
					478-483		
					492-496		
					514-518		
					527-536		
					666-670		
					678-681		
13D1	Other non-LLNL	29-Oct-56	402	400	200-400	3B/4/5/6	23-Aug-88
14A1	Other non-LLNL	12-Jul-43	246	227	102-107		13-Sep-88
					113-119		
					144-148		
					176-179		
					188-190		
					192-194		
					219-222		
					223-227		
14A2	Other non-LLNL	15-Nov-56	229	229	122-130	2/3A	12-Sep-88
					140-150		
					160-180		
14A4	Other non-LLNL	15-Jun-59	252	248	167-170	3/4	29-Aug-88
					175-179		
					192-202		
					235-246		
14A8	Other non-LLNL	NA	NA	86	NA	NA	22-Jul-88
14B2	Other non-LLNL	22-Aug-56	312	312	185-312	3A/3B/4/5	11-Nov-88
14B8	Other non-LLNL	3-May-88	385	306	NA	NA	NA
14C1	Other non-LLNL	31-Jul-91	523	NA	NA	2/3A/4	NA
1N1	Other non-LLNL	15-Jan-88	600	600	427-442	7	21-Oct-88
					450-453		
					465-469		

Table A-2. Well closure data, LLNL Livermore Site and vicinity, Livermore, California.

Well number	Well type	Date installed	Borehole depth (ft)	Casing depth (ft)	Screen interval(s) (ft)	HSU monitored	Closure date
					500-515		
					575-588		
3S2E01P2	Other non-LLNL	7-Oct-60	144	144	124-144	NA	22-May-86
2R9 (11A5)	Other non-LLNL	NA	NA	NA	NA	NA	19-Jul-88
HW-GP-001	Monitor	16-Apr-92	120	113	NA	NA	25-Jan-10
HW-GP-002	Monitor	12-Jan-95	120	117	NA	NA	20-Jan-10
HW-GP-003	Monitor	18-May-92	119	119	NA	NA	29-Jul-15
HW-GP-102	Monitor	24-Jan-95	140	142.5	70-132.5	NA	25-Feb-10
HW-GP-103	Monitor	24-Jan-95	138	141.5	71.5-131.5	NA	29-Jul-15
HW-GP-104	Monitor	24-Jan-95	138	142.2	72.2-132.5	NA	21-Jan-10
HW-GP-105	Monitor	24-Jan-95	138	142.2	72.2-132.5	NA	20-Jan-10
GEW-710	Monitor	23-Sep-91	159	158	94-137	3A/3B	22-Feb-10
GEW-711	Extraction	24-May-91	167.5	157	94-137	3A/3B	16-Jun-92
GEW-808	Monitor	5-Jun-92	150	150	50-140	2/3A	18-Feb-10
GEW-816	Monitor	4-Aug-92	161.7	150	50-140	2/3A	22-Feb-10
GIW-813	Monitor	5-Aug-92	140.7	127	67-87	2	17-Feb-10
					89-99	2	
					120-127	2/3A	
GIW-814	Monitor	5-Aug-92	149.6	141	86.5-106.5	2	17-Feb-10
					110-120	2	
					121-141	2/3A	
GIW-815	Monitor	5-Aug-92	143	137.5	77-97	2	17-Feb-10
					102-112	2/3A	
					112.8-132.5	3A	
GIW-817	Monitor	NA	121	NA	NA	NA	NA
GIW-818	Monitor	5-Aug-92	150	140	82-102	2	20-Jan-10
					120-140	3A/3B	
GIW-819	Monitor	5-Aug-92	150	141	78.6-98.6	2	27-Jan-10
					108-118	2/3A	
GIW-820	Monitor	5-Aug-92	143.3	141	85-105	2	25-Jan-10
					112-132	3A	
GSB-804	NA	NA	145.5	NA	NA	NA	19-Jan-10
GSB-807	NA	NA	151.8	NA	NA	NA	21-Jan-10
GSB-811	NA	NA	140.1	NA	NA	NA	NA
GSP-SNL-001	Piezometer	10-Jan-92	147	131	99-104	NA	23-Sep-15
					118-131	NA	
GSW-001	Monitor	5-Feb-85	112	109	85-106	2	6-Jun-86

Table A-2. Well closure data, LLNL Livermore Site and vicinity, Livermore, California.

Well number	Well type	Date installed	Borehole depth (ft)	Casing depth (ft)	Screen interval(s) (ft)	HSU monitored	Closure date
GSW-002	Monitor	14-Feb-85	113	107	87-107	2	21-Jun-10
GSW-003	Monitor	7-Feb-85	115	105	85-105	2	22-Jun-10
GSW-004	Monitor	22-Feb-85	112	106	86-106	2	3-Aug-15
GSW-005	Monitor	19-Mar-85	110	104	94-104	2	9-Sep-10
GSW-010	Monitor	29-Apr-86	205.5	127.5	114-127.5	3A	28-Jan-98
GSW-012	Monitor	27-May-86	205	191	186.5-191	5	25-Jan-10
GSW-014	Monitor	17-Jul-86	141	NA	NA	NA	23-Feb-10
GSW-015	Monitor	14-Aug-87	148	145	20.5-28	1B/2/3A	18-Feb-10
					38-44		
					50-56		
					60-64		
					68-73		
					77-83		
					95-105		
					120-130		
GSW-016	Monitor	19-Oct-87	146	145	23-28	1B	18-Feb-10
					38-43	1B	
					50-55	2	
					61-66	2	
					78-83	2	
					95-105	2	
					120-130	3A	
GSW-020	Monitor	18-May-84	134	101.3	95-101.3	2	3-Sep-87
GSW-208	Monitor	6-Feb-86	211	123	108-118	3A	16-Feb-10
GSW-209	Monitor	27-Feb-86	204	135.2	112.8-132.8	3A	9-Sep-10
GSW-403-6	Monitor	11-May-84	138	100	90-110	2	21-Jan-10
GSW-445	Extraction	9-Dec-87	319	161	155-161	4	9-Sep-10
IMS-518-1616	IMS	16-Aug-00	55	NA	3-3.5	NA	31-May-07
					8-8.5		
					13-13.5		
					18-18.5		
					23-23.5		
					28-28.5		
					33.33.5		
					38-38.5		

Table A-2. Well closure data, LLNL Livermore Site and vicinity, Livermore, California.

Well number	Well type	Date installed	Borehole depth (ft)	Casing depth (ft)	Screen interval(s) (ft)	HSU monitored	Closure date
					48-48.5		
S-14-7	NA	NA	40	NA	NA	NA	24-Feb-10
SEA-518-301	SEAMIST	22-Jun-95	102.6	39.3	1	NA	4-Jun-07
SEA-518-304	SEAMIST	11-Sep-95	104.5	NA	1	NA	31-May-07
SEA-ETS-305	SEAMIST	2-Sep-92	85	NA	1	NA	30-May-07
SEA-ETS-506	SEAMIST	24-Jul-96	75	75	NA	1B/2	29-May-07
SEA-ETS-507	SEAMIST	30-Jul-96	75	75	7-8	1B/2	27-Apr-06
					20-21	1B/2	
					25-26	1B/2	
					32-33	1B/2	
					38-39	1B/2	
					47-48	1B/2	
					52-53	1B/2	
					59-60	1B/2	
SIB-INF-001	NA	NA	67	66.8	NA	NA	7-Jan-10
SIB-INF-002	NA	NA	67	66.4	NA	NA	7-Jan-10
SIB-INF-003	NA	NA	67	66	NA	NA	7-Jan-10
SIB-INF-008	NA	NA	92	91.9	NA	NA	6-Jan-10
SIB-INF-009	NA	NA	92	92	NA	NA	6-Jan-10
SIB-INF-010	NA	NA	95	81.8	NA	NA	6-Jan-10
SIB-INF-012	NA	NA	16	11.2	NA	NA	7-Jan-10
SIB-INF-103	NA	NA	103.5	91.5	NA	NA	6-Jan-10
SIB-INF-104	NA	NA	92	91.7	NA	NA	6-Jan-10
SIB-INF-201	NA	NA	87.4	85.7	NA	NA	6-Jan-10
SIB-INF-203	NA	NA	63	62.7	NA	NA	7-Jan-10
SIB-INF-301	Piezometer	NA	NA	95	NA	NA	21-Dec-09
SIP-INF-011	Monitor	Apr-97	93.4	92	NA	NA	23-Dec-09
SIP-INF-101	Piezometer	NA	NA	95	NA	NA	23-Dec-09
SIP-INF-102	Piezometer	NA	NA	90	NA	NA	23-Dec-09
SIP-INF-202	Piezometer	NA	NA	85	NA	NA	23-Dec-09
SIP-INF-302	Monitor	Mar-95	NA	89	NA	NA	23-Dec-09
SIB-INF-001	NA	NA	67	66.8	NA	NA	7-Jan-10
SIP-191-001	Piezometer	1-Aug-94	50	NA	NA	1A	24-Sep-15
SIP-191-003	Piezometer	24-Apr-94	50.5	45	35-45	1B	21-Aug-13
SIP-191-004	Piezometer	15-Jul-94	57.5	55	47.5-53.5	1B	19-Aug-13
SIP-191-005	Piezometer	4-May-94	54	48	42-48	1A	24-Sep-15
SIP-191-101	Piezometer	18-Nov-94	68.5	64	58-64	1B	20-Aug-13

Table A-2. Well closure data, LLNL Livermore Site and vicinity, Livermore, California.

Well number	Well type	Date installed	Borehole depth (ft)	Casing depth (ft)	Screen interval(s) (ft)	HSU monitored	Closure date
SIP-419-201	Piezometer	29-Feb-96	126	107	97-107	3A/3B	NA
SIP-490-101	Piezometer	1-Nov-95	59	56	53–56	2	21-Dec-95
SIP-514-101	Piezometer	28-Dec-89	26	22	7-22	1B	3-Sep-96
SVB-518-303	Monitor	29-Jun-95	104.5	40	6-40	1B/2	15-Oct-03
SIP-ETC-302	Piezometer	22-Apr-99	104	89.4	79–89	2	26-Apr-99
SIP-ETS-105	Piezometer	11-Dec-90	110	103	87-103	3A	6-Dec-93
SIP-ETS-207	Piezometer	11-Jul-91	103	98.5	89.75-98.5	3A	5-Jan-00
SIP-HPA-102	Piezometer	8-Dec-94	76	72	67-72	2	9-Apr-02
SIP-HPA-103	Piezometer	1-Mar-95	77	73.5	67-72.5	2	9-Apr-02
SIP-IES-002	Piezometer	5-Oct-92	41.5	39.2	33-39.2	1A	24-Sep-15
SIP-INF-011	NA	NA	NA	92	NA	NA	23-Dec-09
SIP-INF-202	NA	NA	NA	85	NA	NA	23-Dec-09
SIP-INF-301	NA	NA	NA	95	NA	NA	23-Dec-09
SIP-INF-302	NA	NA	NA	89	NA	NA	23-Dec-09
SVB-GP-001	NA	NA	20	NA	NA	NA	22-Feb-10
SVB-GP-002	NA	NA	20	NA	NA	NA	23-Feb-10
SVB-GP-006	NA	NA	30	NA	NA	NA	2-Sep-10
SVB-GP-008	NA	NA	20	NA	NA	NA	23-Feb-10
SVB-GP-008A	NA	NA	90.1	NA	NA	NA	24-Feb-10
SVB-GP-009	NA	NA	30	NA	NA	NA	2-Sep-10
SVB-GP-010	NA	NA	30	NA	NA	NA	2-Sep-10
SVB-GP-012	NA	NA	51	NA	NA	NA	2-Sep-10
SVB-GP-013	NA	NA	89	NA	NA	NA	24-Feb-10
TOM-001	Tomography	NA	NA	52	NA	NA	17-Dec-09
TOM-002	Tomography	NA	NA	55	NA	NA	17-Dec-09
TOM-003	Tomography	NA	NA	55	NA	NA	17-Dec-09
TOM-004	Tomography	NA	NA	54.6	NA	NA	17-Dec-09
TOM-005	Tomography	NA	NA	55	NA	NA	16-Dec-09
TOM-006	Tomography	NA	NA	55	NA	NA	16-Dec-09
TOM-007	Tomography	NA	NA	55	NA	NA	23-Dec-09
UP-292-001	Piezometer	7-Jan-91	54.5	49.5	44.5-49.5	1B	25-Sep-95
W-007	Monitor	3-Oct-80	110.5	100	76-81	2	29-Sep-15
					88-98	3A	
W-010A	Monitor	8-Sep-80	110.7	110	85-95	2	26-Feb-02
					100-105		
W-014A	Monitor	26-Aug-80	112.8	109	NA	2	11-Dec-87
					NA	2	

Table A-2. Well closure data, LLNL Livermore Site and vicinity, Livermore, California.

Well number	Well type	Date installed	Borehole depth (ft)	Casing depth (ft)	Screen interval(s) (ft)	HSU monitored	Closure date
					NA	2	
W-015	Monitor	17-Nov-80	285	267	239-265	7	13-May-88
W-018	Monitor	22-Aug-80	161	152	80-90	2	11-Nov-85
					100-105	2	
					112-117	3A	
					128-133	5	
					143-152	5	
W-019	Monitor	19-Sep-80	164.8	161	147-157	7	22-Jun-06
W-149	Monitor	23-Aug-85	201	169	161-169	2	3-Sep-96
W-150	Monitor	13-Sep-85	212	162	157-162	2	11-Apr-90
W-203	Monitor	15-Nov-85	87	41	31-41	1A	29-Sep-15
W-211	Monitor	19-Mar-86	215.5	193	183-193	7	13-Jun-02
W-352	Monitor	29-Oct-86	235	201	181-201	4	5-Jan-98
W-358	Monitor	4-Feb-87	248	239	230-239	7	13-Apr-94
W-360	Monitor	24-Feb-87	260	204.5	181.5-204.5	4	26-Feb-02
W-414	Monitor	20-May-88	179	74	69.5-74	2	26-Feb-02
W-456	Monitor	9-Jun-88	343	180.5	172-180.5	3A	15-Nov-00
W-460	Monitor	22-Jul-88	361	140.5	135-140.5	2	15-Nov-00
W-508	Monitor	17-Feb-89	316	306	287-305	7	NA
W-591	Monitor	29-Nov-88	112	107.5	97-107.5	2	18-Apr-06
W-906	GW Extraction	23-Jul-93	200	132	58-132	2/3A	30-Apr-15
W-907	GW Extraction	3-Aug-93	239	22	172.7-188.7	4	30-Apr-15
					204.5-215	5	
W-1005	Monitor	14-Mar-94	192	110	98-110	1B	13-Nov-00
W-1006	Monitor	10-Mar-94	154	149	141-149	2	14-Nov-00
W-1007	Monitor	31-Mar-94	199.5	182	172-182	3A	14-Nov-00
W-1114	Monitor	7-Aug-95	223	205	177-200	5	23-Apr-97
W-1218	Monitor	29-May-96	240	145.5	127-145	3A	27-Feb-02
W-1220	Monitor	12-Jun-96	120	117	90-112	2	27-Feb-02
W-1221	Monitor	1-Jul-96	220	172	162-172	4	28-Feb-02
W-1513	Monitor	11-May-99	122	120	108-120	2/3A	30-Jul-15
W-1514	Monitor	24-May-99	127.5	126	103-121	2/3A	30-Jul-15
W-1515	Monitor	8-Jun-99	130	121.5	102-120	2/3A	30-Jul-15
W-2012	GW Extraction	21-Oct-04	155	136.6	111-116	3A	20-Oct-11
					126-131	3A	
TEP-GP-001	Dynamic Stripping	15-Jan-92	165	160.5	NA	NA	25-Jan-10
				117	107-117	2/3A	

Table A-2. Well closure data, LLNL Livermore Site and vicinity, Livermore, California.

Well number	Well type	Date installed	Borehole depth (ft)	Casing depth (ft)	Screen interval(s) (ft)	HSU monitored	Closure date
				160.5	NA	NA	
TEP-GP-002	Dynamic Stripping	24-Jun-92	161.4	NA	102-112.5	2/3A	25-Feb-10
				133	122-133	3A	
				161	NA	NA	
TEP-GP-003	Dynamic Stripping	28-Jan-92	161	129.5	124.5-129.5	3A	3-Aug-15
				161	NA	NA	
TEP-GP-004	Dynamic Stripping	5-Feb-92	161	106	96-106	2	3-Aug-15
				134	124-134	3A	
				161	NA	NA	
TEP-GP-005	Dynamic Stripping	18-Feb-92	161	124.5	114.5-124.5	3A	25-Jan-10
				161	NA	NA	
TEP-GP-006	Dynamic Stripping	26-Feb-92	161	127	107-127	2/3A	9-Sep-10
				161	NA	NA	
TEP-GP-007	Dynamic Stripping	13-Mar-92	161	125.5	115.5-125.5	3A	29-Jul-15
				161	NA	NA	
TEP-GP-008	Dynamic Stripping	3-Mar-92	161	110	100-110	2	23-Sep-15
				129	119-129	3A	
				161	NA	NA	
TEP-GP-009	Dynamic Stripping	6-May-92	161.7	107	98-107	2	20-Jan-10
				130.5	120.5-130.5	3A	
				161	NA	NA	
TEP-GP-010	Dynamic Stripping	24-Mar-92	161	124.5	114.5-124.5	3A	21-Jan-10
				161	NA	NA	
TEP-GP-011	Dynamic Stripping	7-Apr-92	161	108	98-108	2	4-Aug-15
				161	NA	NA	
TEP-GP-106	Dynamic Stripping	21-Sep-93	137.5	135.5	NA	NA	19-Jan-10
CPRS-02	Anode Well	NA	290	NA	NA	NA	
CPRS-03 (B482)	Anode Well	NA	180	NA	NA	NA	26-Sep-03
CPRS-06 (B543)	Anode Well	NA	NA	NA	NA	NA	29-Aug-06
CPS-1-325CT (B323)	Anode Well	24-Feb-77	290	NA	NA	NA	30-Oct-03
CPS-622	Anode Well	14-Feb-77	290	NA	NA	NA	15-Jan-04
CPS SC-5	Anode Well	NA	290	NA	NA	NA	21-Jul-05

Notes and footnotes appear on the following page.

Table A-2. Well closure data, LLNL Livermore Site and vicinity, Livermore, California.

Notes:

ft = Feet (All depths reported are in feet below ground surface).
HSU = Hydrostratigraphic Unit.
IMS = Instrumented Membrane System.
NA = Not Available.

Well numbers were changed in December 1988 to be consistent with Alameda County Flood Control and Water. Conservation District, Zone 7 well identification. Well number changes made on this table are:

11J81 ------> 11J4
11R81 ------> 11R5
11Q81 ------> 11Q6
13D81 ------> 13D1
14A81 ------> 14A1
14A82 ------> 14A2
14A83 ------> 14A4

Well 11A5 was renamed 2R9 by the Alameda County Flood Control and Water Conservation District, Zone 7 in November 1997. Well 11A5 now applies to monitor well W-409.

"Other non-LLNL" refers to agricultural, private or agency wells.

IMSs were installed in the vadose zone to measure moisture content, pressure, temperature, and VOCs.

Piezometer SVB-518-303 was drilled out and replaced by well W-518-1915 in 2003.

Temperature monitoring wells (TEP series) consist of a blank fiberglass 2-in. inside diameter (ID) casing instrumented with geophysical sensors. The blank fiberglass casing has no screened interval. Some boreholes also had one or two 1-inch piezometers installed adjacent to the blank casing. Therefore, the casing depths with accompanying screened intervals refer to the piezometers.

[a] **Well 11BA not recognized by Alameda County Flood Control and Water Conservation District, Zone 7.**

Appendix B

Hydraulic Test Results

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-001	1-Dec-83	Drawdown	5.7	2,000	110	Fair
W-001	23-Jan-85	Drawdown	7.1	3,100	170	Good
W-001A	22-Jan-85	Drawdown	1.4	190	19	Good
W-002	1-Dec-83	Slug	NA	110	34	Poor
W-002A	24-Jan-85	Drawdown	10.3	2,700	200	Good
W-004	1-Dec-83	Drawdown	3.3	63	13	Good
W-005	1-Dec-83	Drawdown	4.3	110	20	Good
W-005	24-Jan-85	Drawdown	7.9	1,100	210	Fair
W-005A	23-Jan-85	Drawdown	13.0	1,300	130	Poor
W-007	1-Dec-83	Slug	NA	43	14	Fair
W-008	1-Dec-83	Drawdown	2.9	29	4.9	Fair
W-011	1-Dec-83	Drawdown	4.1	130	15	Good
W-017	1-Dec-83	Slug	NA	38	2.5	Good
W-017	21-Feb-86	Slug	NA	85	5.7	Good
W-018	1-Dec-83	Drawdown	2.6	20	2.7	Poor
W-102	25-Mar-86	Drawdown	6.4	1,100	76	Good
W-102	5-Sep-86	Drawdown	24.0	770	53	Good
W-102	15-Sep-86	Long-term	27.5	4,200	290	Good
W-103	25-Apr-86	Drawdown	6.7	15,000	1,500	Good
W-104	3-Mar-88	Drawdown	5.4	1,200	170	Fair
W-104	25-Mar-88	Drawdown	3.3	450	45	Fair
W-105	6-Apr-87	Drawdown	0.8	73	7.3	Fair
W-106	19-Feb-86	Slug	NA	7.4	1.3	Excel
W-107	17-Jun-85	Drawdown	1.0	94	9.4	Poor
W-108	29-Oct-85	Drawdown	7.9	750	63	Poor
W-109	5-Mar-86	Drawdown	8.1	3,200	530	Good
W-109	4-Sep-87	Drawdown	20.0	1,600	270	Good
W-109	29-Sep-87	Long-term	11.6	130	22	Fair
W-109	16-Oct-87	Drawdown	8.0	2,300	380	Fair
W-110	18-Jun-85	Drawdown	5.0	1,300	130	Good
W-111	13-Jun-85	Drawdown	1.0	370	37	Good
W-111	21-Nov-85	Drawdown	1.0	370	37	Good
W-112	18-Nov-86	Drawdown	13.4	2,100	170	Fair
W-112	15-Dec-86	Long-term	13.2	3,100	260	Fair
W-112	5-Nov-96	Long-term	13.7	3,300	260	Fair
W-113	17-Apr-86	Slug	NA	7.4	1.2	Excel

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-115	5-Mar-86	Drawdown	1.1	180	30	Good
W-116	24-Dec-85	Slug	NA	37	7.5	Good
W-117	20-Feb-86	Slug	NA	2	0.4	Good
W-118	18-Sep-85	Drawdown	16	1,200	120	Poor
W-118	27-Sep-85	Drawdown	13	1,900	190	Poor
W-118	5-Mar-86	Drawdown	10.0	2,100	230	Good
W-119	8-Aug-85	Drawdown	2.0	1,600	110	Good
W-120	22-Apr-86	Drawdown	1.1	23	5.6	Poor
W-121	10-Sep-85	Drawdown	2.0	120	7.5	Good
W-121	23-Sep-85	Drawdown	4.0	23	1.5	Excel
W-121	14-Oct-85	Drawdown	3.0	34	2.2	Excel
W-121	15-Oct-85	Drawdown	4.5	45	3.0	Excel
W-122	28-Oct-85	Drawdown	10.8	490	49	Good
W-123	28-Oct-85	Drawdown	5.8	40	4.4	Poor
W-142	3-Mar-88	Slug	NA	2,600	330	Excel
W-143	3-Mar-88	Slug	NA	1,200	240	Excel
W-149	9-Sep-85	Drawdown	4.0	120	19	Good
W-149	11-Sep-85	Drawdown	8.0	95	16	Excel
W-149	11-Oct-85	Drawdown	4.8	58	9.7	Excel
W-149	11-Oct-85	Drawdown	7.0	70	12	Good
W-150	2-Oct-85	Drawdown	3.1	640	210	Fair
W-150	3-Oct-85	Drawdown	6.0	720	240	Fair
W-150	10-Oct-85	Drawdown	8.8	630	210	Fair
W-150	10-Oct-85	Drawdown	12.0	620	210	Fair
W-151	28-Oct-85	Drawdown	5.8	550	61	Poor
W-201	5-Mar-86	Drawdown	10.0	740	86	Excel
W-203	2-Mar-88	Drawdown	6.6	1,100	110	Good
W-204	23-Jan-86	Drawdown	1.9	100	15	Fair
W-205	14-Feb-86	Slug	NA	5.9	1.9	Good
W-205	18-Feb-86	Slug	NA	5.9	1.9	Good
W-206	14-Apr-86	Slug	NA	120	11	Good
W-206	27-Sep-93	Drawdown	0.19	3.0	0.20	Fair
W-206	18-Oct-93	Drawdown	0.3	4.0	0.30	Fair
W-207	2-Mar-88	Slug	NA	380	32	Excel
W-210	9-Jun-86	Slug	NA	0.6	0.1	Good
W-211	22-Oct-86	Drawdown	2.9	37	12	Fair

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-211	8-Dec-86	Long-term	1.0	44	15	Fair
W-211	16-Sep-97	Long-term	1.1	14	1.4	Good
W-212	12-May-86	Drawdown	0.8	18	3.1	Poor
W-213	22-Apr-86	Drawdown	3.8	190	38	Good
W-214	7-Oct-86	Long-term	27.6	2,300	350	Good
W-217	15-Jul-86	Slug	NA	750	120	Good
W-218	17-Jun-86	Drawdown	11.7	6,400	1,100	Good
W-218	12-Nov-86	Long-term	7.7	4,000	670	Good
W-219	15-Jul-86	Drawdown	4.3	620	76	Good
W-219	23-Feb-87	Long-term	5.2	66	8.0	Fair
W-220	21-Aug-86	Slug	NA	28	5.5	Excel
W-221	5-Aug-86	Drawdown	2.1	120	16	Fair
W-222	12-Aug-86	Drawdown	16.0	1,700	160	Excel
W-222	8-Mar-85	Long-term	7.7	1,100	180	Good
W-223	27-Aug-86	Drawdown	4.0	510	110	Good
W-224	28-Oct-86	Drawdown	7.6	3,600	400	Excel
W-225	23-Oct-86	Drawdown	4.0	85	11	Good
W-225	12-Jan-87	Long-term	2.0	62	8.5	Fair
W-226	31-Mar-87	Slug	NA	1,700	160	Fair
W-252	4-Nov-85	Drawdown	4.0	920	50	Fair
W-252	19-Nov-85	Drawdown	5.6	800	43	Fair
W-254	27-Jan-86	Drawdown	4.2	340	38	Fair
W-254	27-Feb-86	Drawdown	3.2	370	41	Good
W-255	21-Jan-86	Drawdown	5.0	2,800	250	Fair
W-255	21-Jan-86	Drawdown	6.0	2,000	180	Fair
W-255	6-Jan-87	Long-term	2.0	400	36	Fair
W-256	11-Apr-86	Slug	NA	11	5.5	Good
W-257	15-Apr-86	Slug	NA	120	24	Good
W-258	5-Jun-86	Slug	NA	35	9.0	Excel
W-258	29-Oct-86	Slug	NA	32	8.0	Good
W-259	26-Mar-88	Slug	NA	15	5.0	Good
W-260	25-Mar-86	Drawdown	3.0	140	22	Good
W-260	1-Oct-86	Long-term	1.4	120	18	Good
W-261	27-May-86	Slug	0.0	7	2.3	Excel
W-262	11-Apr-86	Drawdown	12.5	2,000	250	Excel
W-262	23-Sep-86	Long-term	22.0	2,750	340	Good

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-262	27-Apr-87	Long-term	23.1	6,800	810	Good
W-263	22-Apr-86	Drawdown	1.2	37	7.4	Poor
W-263	4-Nov-86	Long-term	1.8	76	15	Excel
W-264	7-May-86	Drawdown	8.1	930	100	Good
W-264	29-Oct-86	Long-term	23.0	480	50	Good
W-265	19-May-86	Drawdown	0.7	180	34	Fair
W-267	2-Jun-86	Drawdown	0.5	420	85	Poor
W-268	14-Nov-86	Drawdown	5.0	230	18	Good
W-269	14-Jul-86	Drawdown	5.0	570	95	Good
W-270	30-Dec-86	Slug	NA	14	2.0	Good
W-271	4-Aug-86	Drawdown	5.5	340	76	Fair
W-272	19-Aug-86	Drawdown	0.8	150	30	Fair
W-273	27-Aug-86	Drawdown	3.2	600	90	Good
W-274	25-Mar-85	Slug	NA	38	7.6	Fair
W-274	2-Feb-99	Slug	NA	10	2	Fair
W-275	30-Oct-86	Drawdown	7.0	730	150	Fair
W-275	2-Mar-87	Long-term	5.5	830	170	Fair
W-276	21-Nov-86	Drawdown	13.0	960	110	Good
W-276	04-May-87	Long-term	24.0	2,700	300	Fair
W-277	3-Nov-86	Drawdown	0.9	74	25	Fair
W-290	5-Jan-87	Slug	NA	14	4.0	Excel
W-291	27-Jan-87	Slug	NA	25	7.1	Fair
W-292	28-Aug-86	Drawdown	6.0	400	56	Excel
W-294	29-Dec-86	Drawdown	5.3	5,300	29	Fair
W-294	29-Dec-86	Drawdown	5.9	5,400	300	Good
W-301	30-Oct-86	Drawdown	6.0	460	100	Good
W-302	18-Nov-86	Drawdown	1.0	100	27	Good
W-302	18-Nov-86	Drawdown	2.0	76	21	Fair
W-303	12-Nov-86	Drawdown	11.1	210	70	Good
W-304	13-Mar-87	Drawdown	0.9	74	25	Fair
W-305	26-Nov-86	Drawdown	19.0	720	72	Excel
W-305	18-May-87	Long-term	20.1	640	64	Excel
W-306	31-Mar-87	Drawdown	9.5	270	68	Good
W-307	26-Mar-87	Drawdown	0.9	66	33	Fair
W-308	4-Dec-87	Drawdown	2.6	27	5.4	Good
W-310	17-Feb-87	Drawdown	6.7	58	850	Good

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-310	29-Jul-10	Drawdown	6.0	170	24	Fair
W-311	19-Mar-87	Drawdown	9.8	130	12	Good
W-311	17-Nov-87	Long-term	9.9	370	26	Good
W-312	27-Mar-87	Drawdown	20.5	1,800	300	Poor
W-312	3-Nov-87	Long-term	18.8	1,700	280	Good
W-313	25-Mar-87	Drawdown	7.9	3,000	600	Good
W-313	5-Oct-87	Long-term	9.6	3,400	680	Good
W-314	10-Apr-87	Drawdown	26.4	2,900	390	Good
W-314	13-Jul-87	Long-term	13.6	2,500	330	Fair
W-314	14-Oct-97	Long-term	12	1,400	100	Fair
W-315	9-Apr-87	Drawdown	15.4	150	11	Good
W-315	5-Jan-85	Long-term	24.5	571	41	Excel
W-316	4-May-87	Drawdown	7.8	1,400	280	Good
W-317	12-May-87	Drawdown	12.1	300	43	Fair
W-317	15-Dec-87	Long-term	8.2	120	17.1	Good
W-318	7-Aug-87	Slug	NA	120	16	Good
W-319	29-Jul-87	Drawdown	48.0	7,200	1,500	Good
W-320	15-May-87	Drawdown	1.8	58	17	Fair
W-320	15-May-87	Drawdown	3.0	22	3.7	Fair
W-320	26-Jun-87	Drawdown	2.1	49	14	Fair
W-321	28-Jul-87	Drawdown	40.0	6,600	450	Good
W-322	3-Aug-87	Drawdown	3.1	85	15	Good
W-323	11-Aug-87	Drawdown	3.4	205	59	Good
W-324	10-Sep-87	Drawdown	6.6	200	50	Good
W-325	10-Sep-87	Drawdown	6.0	160	13	Excel
W-351	12-Nov-86	Drawdown	5.7	27	14	Poor
W-351	20-Jun-09	Step	2.7	200	34	Good
W-352	30-Dec-86	Drawdown	20.0	280	14	Good
W-352	7-Jul-87	Long-term	19.5	120	6.0	Excel
W-353	20-Nov-86	Drawdown	2.1	60	17	Good
W-354	30-Dec-86	Drawdown	17.6	2,000	220	Fair
W-354	30-Dec-86	Drawdown	18.0	2,400	260	Good
W-354	20-Apr-87	Long-term	17.8	310	34	Good
W-355	29-Dec-86	Drawdown	2.1	19	5.0	Fair
W-356	17-Mar-87	Drawdown	5.7	180	59	Good
W-356	16-Jul-96	Long-term	4.9	230	57	Poor

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-357	18-Feb-87	Drawdown	15.0	1,300	110	Good
W-357	21-Jul-87	Long-term	9.2	210	18	Good
W-358	18-Mar-87	Drawdown	9.2	210	32	Excel
W-359	9-Mar-87	Long-term	19.0	2,800	290	Fair
W-359	20-Mar-87	Drawdown	18.6	1,100	110	Good
W-359	5-Jun-09	Drawdown	10.0	1,200	95	Fair
W-360	22-May-87	Drawdown	30.0	4,800	210	Excel
W-361	16-Mar-87	Drawdown	4.3	67	11	Good
W-361	12-Jan-85	Long-term	5.3	178	30	Good
W-362	23-Mar-87	Drawdown	16.4	470	49	Good
W-362	21-Sep-87	Long-term	13.6	370	39	Good
W-363	24-Jul-87	Slug	NA	20	3.0	Excel
W-364	8-Apr-87	Drawdown	8.6	51	10	Fair
W-364	1-Jun-87	Long-term	4.8	110	22	Good
W-365	14-May-87	Drawdown	10.0	36	15	Fair
W-366	11-May-87	Drawdown	19.0	780	92	Fair
W-368	11-May-87	Drawdown	2.9	81	8.5	Fair
W-368	31-Jul-01	Step	6.0	2,600	350	Fair
W-368	15-Apr-09	Step	3.8	410	51	Fair
W-369	25-Jun-87	Drawdown	7.0	580	96	Good
W-369	10-Nov-87	Long-term	5.5	89	18	Good
W-370	23-Jun-87	Drawdown	4.4	84	10	Fair
W-371	24-Jun-87	Drawdown	3.3	15	3.0	Good
W-372	23-Nov-87	Slug	NA	310	62	Excel
W-373	28-Jul-87	Drawdown	4.0	660	77	Fair
W-373	28-Jul-87	Drawdown	6.5	50	6.0	Poor
W-376	26-Jan-88	Drawdown	2.9	65	8.5	Fair
W-380	23-Oct-87	Drawdown	4.0	33	4.7	Excel
W-401	23-Oct-87	Drawdown	42.0	950	24	Excel
W-402	22-Oct-87	Drawdown	41.0	13,500	1,400	Good
W-403	3-Dec-87	Drawdown	9.7	370	26	Good
W-404	4-Feb-85	Drawdown	45.0	3,200	530	Good
W-405	16-Feb-85	Drawdown	47.2	546	14	Good
W-406	28-Jan-85	Drawdown	7.4	7,500	940	Fair
W-407	23-Feb-85	Drawdown	14.4	75	7.5	Fair
W-408	5-Apr-85	Drawdown	45.0	43,000	3,100	Good

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-409	22-Mar-85	Drawdown	20.0	230	38	Good
W-410	28-Apr-85	Drawdown	35.0	6,800	570	Fair
W-411	5-May-85	Drawdown	14.0	50	83	Good
W-412	6-May-88	Drawdown	4.1	700	64	Fair
W-413	30-Aug-01	Drawdown	20.0	9,400	790	Good
W-413	15-Apr-09	Step	10.0	5,500	370	Good
W-414	27-Jul-85	Slug	NA	150	38	Good
W-415	31-Aug-85	Drawdown	10.0	3,100	78	Fair
W-416	11-Jul-85	Drawdown	50.0	2,600	330	Good
W-417	27Jun-88	Drawdown	5.3	340	57	Fair
W-420	16-Aug-85	Drawdown	3.5	710	100	Excel
W-421	12-Sep-85	Drawdown	4.8	320	27	Excel
W-422	19-Sep-85	Drawdown	8.6	230	42	Good
W-423	12-Oct-85	Drawdown	22.0	1,500	130	Good
W-424	17-Oct-85	Drawdown	4.5	130	19	Good
W-441	30-Oct-87	Drawdown	6.0	500	56	Good
W-441	13-Apr-88	Drawdown	13.0	2,200	240	Poor
W-441	19-Apr-88	Long-term	14.0	470	52	Good
W-447	26-Feb-88	Drawdown	7.1	124	850	Poor
W-448	24-Mar-85	Drawdown	24.5	4,200	600	Good
W-449	21-Mar-85	Drawdown	6.2	170	11	Good
W-450	14-Apr-88	Drawdown	3.3	38	650	Fair
W-451	27-Apr-88	Drawdown	2.1	80	16	Good
W-452	2-May-88	Drawdown	5.2	310	21	Excel
W-453	3-May-88	Drawdown	5.8	67	7.4	Fair
W-455	22-Jun-88	Drawdown	5.8	160	13	Good
W-456	14-Jul-85	Drawdown	4.5	260	33	Fair
W-457	29-Jul-85	Drawdown	20.5	450	24	Excel
W-458	2-Aug-85	Drawdown	0.8	24	150	Fair
W-460	1-Sep-85	Drawdown	17.0	1,900	380	Fair
W-461	7-Sep-85	Slug	NA	690	140	Good
W-462	27-Sep-85	Drawdown	19.0	360	60	Good
W-463	11-Oct-85	Drawdown	24.0	1,600	200	Good
W-464	8-Nov-88	Drawdown	9.0	370	53	Good
W-481	2-Dec-87	Drawdown	1.1	8	1.7	Good
W-486	23-Mar-85	Drawdown	6.0	230	30	Good

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-487	14-Apr-88	Drawdown	2.2	45	15	Good
W-501	21-Oct-85	Drawdown	9.7	170	21	Good
W-502	14-Nov-85	Slug	NA	12	30	Good
W-503	11-Nov-88	Drawdown	1.3	15	3.0	Fair
W-504	8-Dec-85	Drawdown	10.0	590	84	Good
W-505	21-Mar-89	Drawdown	34.2	653	76	Good
W-506	10-Feb-89	Drawdown	31.0	7,423	460	Good
W-507	6-Feb-89	Drawdown	39.0	2,900	290	Good
W-508	29-Mar-89	Drawdown	30.0	47,000	2,600	Good
W-509	11-May-89	Drawdown	0.9	10	2.0	Fair
W-510	11-May-89	Slug	NA	220	110	Good
W-511	11-May-89	Drawdown	1.7	63	11	Fair
W-512	27-Apr-89	Drawdown	2.9	85	9.4	Good
W-513	9-May-89	Drawdown	0.6	33	3.0	Fair
W-514	26-May-89	Drawdown	1.4	84	530	Fair
W-515	6-Jun-89	Drawdown	2.8	37	4.2	Fair
W-516	19-Jun-89	Drawdown	19.5	1,428	286	Good
W-517	27-Jun-89	Drawdown	7.3	370	53	Good
W-518	10-Aug-89	Drawdown	6.2	1,421	178	Good
W-519	31-Aug-89	Drawdown	31.5	5,700	475	Excel
W-520	24-Jan-90	Drawdown	22.8	3,300	560	Excel
W-521	1-Feb-90	Drawdown	0.6	44	4.9	Fair
W-522	5-Feb-90	Drawdown	20.0	3,700	620	Fair
W-551	8-Nov-85	Drawdown	37.0	350	88	Good
W-552	12-Dec-88	Drawdown	38.0	4,700	390	Good
W-553	17-Nov-85	Drawdown	2.2	55	7.9	Fair
W-554	10-Jan-89	Drawdown	21.5	1,800	150	Good
W-555	28-Dec-88	Drawdown	14.0	460	23	Fair
W-556	25-Jan-89	Drawdown	17.0	850	170	Fair
W-557	23-Jan-89	Drawdown	1.2	570	36	Poor
W-558	23-Mar-89	Drawdown	24.7	5,200	650	Good
W-560	8-Mar-89	Drawdown	1.7	30	7.6	Fair
W-561	13-Mar-89	Drawdown	1.1	12	2.1	Fair
W-562	28-Mar-89	Drawdown	1.0	16	2.3	Fair
W-563	31-Mar-89	Drawdown	1.1	14	2.3	Fair
W-564	26-Apr-89	Drawdown	1.6	44	5.0	Poor

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-565	18-Apr-89	Drawdown	15.6	1,600	260	Good
W-566	2-May-89	Drawdown	17.0	780	86	Good
W-566	31-Aug-93	Long-term	22.5	2,580	520	Fair
W-566	11-Aug-09	Step	8.2	860	86	Good
W-567	4-May-89	Drawdown	10.4	2,600	320	Excel
W-568	20-Jun-89	Drawdown	18.3	620	160	Fair
W-569	24-May-89	Drawdown	2.8	100	15	Fair
W-570	8-Jun-89	Drawdown	1.1	7	1.1	Fair
W-571	17-Jul-89	Drawdown	17.7	1,000	200	Excel
W-592	23-Jan-89	Drawdown	2.2	2,200	280	Poor
W-593	22-Feb-89	Drawdown	2.2	57	11.4	Good
W-594	16-Mar-89	Slug	NA	380	54	Excel
W-601	8-Feb-90	Drawdown	22.5	6,900	770	Excel
W-602	29-Jan-90	Drawdown	24.0	5,300	620	Good
W-603	7-Feb-90	Drawdown	6.1	100	20	Fair
W-604	20-Feb-90	Slug	NA	380	63	Good
W-605	28-Feb-90	Drawdown	4.8	50	12	Good
W-606	21-Feb-90	Slug	NA	120	20	Fair
W-607	22-Feb-90	Drawdown	1.4	800	100	Good
W-608	28-Feb-90	Drawdown	1.2	230	30	Fair
W-609	9-Mar-90	Drawdown	6.7	470	70	Good
W-610	28-Mar-90	Drawdown	5.8	5,500	380	Good
W-611	16-Apr-90	Drawdown	3.5	1,000	110	Fair
W-612	24-May-90	Drawdown	13.5	550	55	Good
W-612	5-Apr-94	Long-term	14	230	40	Good
W-613	23-May-90	Drawdown	4.8	2,550	360	Good
W-614	7-Jun-90	Drawdown	6.7	1,650	130	Good
W-615	21-Jun-90	Drawdown	1.3	130	19	Fair
W-616	27-Jun-90	Drawdown	2.0	390	40	Fair
W-617	12-Jul-90	Drawdown	2.8	53	6.8	Good
W-618	1-Aug-90	Drawdown	1.9	24	4.8	Fair
W-619	30-Aug-90	Drawdown	11.8	190	11	Good
W-620	1-Oct-90	Drawdown	5.8	6,500	650	Good
W-621	4-Oct-90	Drawdown	3.8	310	39	Good
W-622	12-Oct-90	Slug	NA	130	16	Fair
W-651	16-Mar-90	Slug	NA	530	180	Fair

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-652	22-Mar-90	Drawdown	1.0	11	3.8	Good
W-653	11-Apr-90	Drawdown	0.3	2	2.0	Fair
W-653	16-Mar-05	Drawdown	0.45	1.0	1.0	Good
W-654	25-Apr-90	Drawdown	21.7	390	25	Fair
W-655	12-May-90	Drawdown	12.2	1,000	220	Good
W-701	23-Oct-90	Drawdown	14.5	6,800	650	Good
W-701	3-Oct-92	Step	16.5	5,200	430	Good
W-701	1-Apr-93	Drawdown	24.0	3,700	370	Good
W-702	29-Nov-90	Drawdown	2.5	150	30	Good
W-702	25-Feb-93	Step	4.6	36	7	Poor
W-703	19-Dec-90	Drawdown	7.0	230	9.1	Good
W-704	4-Mar-91	Drawdown	19.0	1,800	140	Fair
W-705	20-Feb-91	Drawdown	0.8	40	6.1	Fair
W-706	29-Jan-91	Drawdown	0.2	8	1	Fair
W-712	25-Feb-92	Drawdown	7.8	750	48	Good
W-712	18-Mar-93	Long-term	15.1	1,440	93	Good
W-714	6-Dec-91	Drawdown	2.9	140	6.7	Good
W-902	25-Mar-93	Drawdown	0.6	6	2	Fair
W-906	20-Jun-09	Step	8.6	290	4.0	Good
W-909	18-Oct-95	Drawdown	2.7	150	5.1	Good
W-911	2-Feb-96	Drawdown	1.4	53	2.1	Good
W-912	10-Nov-95	Drawdown	4.1	65	11	Poor
W-913	16-Aug-95	Drawdown	23.5	730	36	Good
W-1001	13-Aug-95	Drawdown	1.3	170	25	Fair
W-1002	19-Jun-97	Drawdown	16.8	680	49	Good
W-1003	26-Jun-97	Drawdown	1.2	5.1	0.7	Poor
W-1005	16-Jun-97	Drawdown	17	110,000	91,000	Poor
W-1006	17-Jun-97	Drawdown	17.4	180	23	Fair
W-1007	23-Sep-95	Drawdown	1.6	13	1.3	Fair
W-1007	4-May-99	Drawdown	6.6	4,300	540	Fair
W-1008	17-Jan-97	Drawdown	7.3	110	13	Good
W-1010	10-Jul-95	Drawdown	20.3	1,650	140	Fair
W-1011	11-Jul-95	Drawdown	3.8	240	17	Good
W-1012	13-Jul-95	Drawdown	3.3	35	2.2	Fair
W-1013	13-Jul-95	Drawdown	2.7	2,000	250	Poor
W-1014	28-Aug-96	Drawdown	31.1	7,700	320	Good

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-1101	22-Nov-95	Drawdown	0.8	9.9	3.3	Good
W-1102	29-Jan-96	Drawdown	14.7	81	4.5	Fair
W-1103	29-Nov-95	Drawdown	3	19	1.6	Fair
W-1105	17-Jul-95	Drawdown	2.4	320	26	Fair
W-1106	24-Jul-96	Drawdown	7.1	5,200	580	Good
W-1107	9-Apr-97	Drawdown	6.7	3,500	250	Poor
W-1107	4-May-99	Drawdown	6.6	4,300	310	Fair
W-1108	3-Nov-95	Drawdown	12.3	950	68	Good
W-1108	25-Jun-96	Long-term	11.6	1,000	70	Poor
W-1108	1-Nov-05	Drawdown	7.1	800	57	Fair
W-1108	26-Jun-09	Step	2.9	1,300	89	Fair
W-1109	26-Jun-95	Drawdown	8.7	460	33	Fair
W-1109	4-Jun-96	Long-term	6.8	760	40	Poor
W-1109	11-Aug-09	Step	1.5	650	72	Good
W-1110	22-Jan-96	Drawdown	6.3	690	29	Fair
W-1111	20-Oct-95	Drawdown	15.8	2,100	95	Good
W-1111	9-Dec-96	Long-term	11.2	160	7.9	Poor
W-1112	24-May-96	Drawdown	6.4	94	10	Fair
W-1113	26-Aug-96	Drawdown	1	5.5	0.6	Good
W-1114	27-Oct-95	Long-term	15.1	270	12	Fair
W-1116	23-Feb-96	Drawdown	6.6	290	11	Fair
W-1117	23-Aug-96	Drawdown	0.7	3.4	0.34	Fair
W-1118	18-Jan-96	Drawdown	5.6	350	35	Good
W-1201	1-Nov-96	Drawdown	1	8.3	0.92	Poor
W-1203	2-May-96	Drawdown	18.8	900	90	Good
W-1204	22-Feb-96	Drawdown	1.3	17	2.2	Poor
W-1205	27-Nov-96	Slug	NA	330	33	Fair
W-1206	20-Jun-09	Step	18	1,900	160	Fair
W-1207	27-Nov-96	Slug	NA	900	45	Poor
W-1208	20-Jun-09	Step	23	784	28	Fair
W-1209	17-May-96	Drawdown	0.98	11	0.69	Good
W-1210	30-May-96	Drawdown	3.8	7.3	0.73	Fair
W-1211	26-Jul-96	Drawdown	28.6	5,000	330	Good
W-1212	14-May-96	Drawdown	1.9	35	2.5	Good
W-1212	10-Sep-96	Long-term	1.3	85	3.6	Poor
W-1213	22-Jul-96	Drawdown	11.6	500	42	Fair

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-1213	30-Jul-96	Long-term	9.6	440	37	Poor
W-1213	9-Feb-09	Step	3.3	4,400	360	Fair
W-1214	28-Apr-97	Drawdown	2.2	110	5.4	Fair
W-1215	15-Aug-96	Drawdown	11.6	610	61	Fair
W-1215	8-Oct-96	Long-term	9.8	3,000	300	Poor
W-1216	14-Aug-96	Drawdown	11.4	210	6.9	Good
W-1216	15-Oct-96	Long-term	11.1	160	5.4	Poor
W-1218	11-Nov-96	Drawdown	5.8	83	4.6	Fair
W-1218	8-Jul-97	Long-term	4.8	210	12	Fair
W-1219	27-May-97	Drawdown	0.4	2.5	0.63	Poor
W-1220	13-Nov-96	Drawdown	20.3	2,600	120	Good
W-1220	15-Jul-97	Long-term	20.0	4,700	210	Fair
W-1221	27-Dec-96	Drawdown	3.1	29	2.9	Fair
W-1222	31-Oct-96	Drawdown	6.1	430	43	Good
W-1224	22-May-97	Drawdown	5.0	55	11	Good
W-1225	31-Mar-97	Drawdown	4.1	83	10	Good
W-1226	27-Feb-97	Drawdown	2.2	14	1.4	Excel
W-1227	11-Apr-97	Drawdown	15.1	380	48	Fair
W-1254	19-Nov-96	Long-term	18.9	1,130	110	Fair
W-1301	10-Mar-97	Long-term	4.7	120	15	Fair
W-1303	18-Mar-97	Long-term	7.8	490	21	Fair
W-1304	2-Jul-97	Drawdown	0.7	2.6	0.52	Poor
W-1306	30-Apr-97	Drawdown	2.8	24	1.2	Good
W-1306	18-Jun-97	Long-term	1.6	54	2.7	Poor
W-1307	31-Jul-97	Drawdown	11.6	1,100	110	Good
W-1308	14-Aug-97	Drawdown	6.5	150	5.1	Good
W-1308	7-Oct-97	Long-term	4.0	530	18	Fair
W-1309	15-Oct-97	Drawdown	9.1	90	8.9	Fair
W-1310	10-Mar-97	Drawdown	27.9	1,060	53	Good
W-1310	17-Nov-08	Drawdown	5.1	1,200	62	Poor
W-1311	29-Oct-97	Drawdown	12.2	290	15	Good
W-1401	11-Nov-97	Drawdown	7.0	100	6.8	Excel
W-1402	12-Dec-97	Drawdown	2.6	100	10.2	Fair
W-1403	21-Jul-98	Drawdown	5.4	95	13	Good
W-1404	21-Apr-98	Drawdown	6.5	210	84	Good
W-1405	23-Apr-98	Drawdown	6.4	1,300	360	Fair

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-1406	17-Apr-98	Drawdown	11.1	3,600	360	Good
W-1407	3-Apr-98	Drawdown	1.1	8.7	1.0	Excellent
W-1408	15-Apr-98	Drawdown	2.7	85	28	Fair
W-1410	29-Jun-98	Drawdown	11.5	3,000	500	Poor
W-1410	8-Sep-99	Step	6.5	3,800	650	Poor
W-1411	15-May-98	Drawdown	12.3	14,700	1,300	Poor
W-1412	29-May-98	Slug	NA	2	0.67	Fair
W-1413	8-Jun-98	Drawdown	0.63	8.7	3.5	Fair
W-1415	11-Jun-98	Drawdown	0.87	18	1.2	Fair
W-1416	28-Jul-98	Drawdown	12.3	1,300	180	Good
W-1417	1-Jul-98	Drawdown	15.1	130	11	Good
W-1417	16-Jul-98	Step	5.9	150	13	Fair
W-1418	25-Sep-98	Drawdown	10.7	78	6.5	Excellent
W-1418	16-Dec-98	Step	10.5	490	41	Fair
W-1419	15-Jul-98	Step	6.1	47	3	Poor
W-1420	12-Aug-98	Drawdown	13.1	3,000	220	Poor
W-1421	14-Jul-98	Step	1.82	14	1.8	Poor
W-1421	17-Jul-98	Step	3.8	22	2.8	Poor
W-1422	18-Sep-98	Drawdown	12.0	170	33	Excellent
W-1422	18-Dec-98	Step	11.7	160	32	Good
W-1423	12-Nov-98	Drawdown	24.6	540	39	Fair
W-1424	1-Oct-98	Drawdown	6	48	6.9	Excellent
W-1425	1-Oct-98	Drawdown	1.4	15	2.4	Fair
W-1426	13-Nov-98	Drawdown	6.5	840	56	Good
W-1427	11-Jan-99	Drawdown	7.9	2,100	300	Good
W-1428	13-Jan-99	Drawdown	8.1	8,200	550	Good
W-1501	20-Nov-98	Drawdown	7.2	68	11	Good
W-1502	17-May-99	Drawdown	1.5	360	60	Good
W-1503	12-Feb-99	Drawdown	17.6	1,700	180	Good
W-1503	21-Apr-09	Step	14	1,000	100	Fair
W-1504	18-Feb-99	Drawdown	15.4	600	60	Fair
W-1504	21-Apr-09	Step	3.2	370	18	Good
W-1505	29-Apr-99	Drawdown	11.2	280	35	Fair
W-1506	19-Apr-99	Drawdown	3.1	50	5.4	Good
W-1507	27-Apr-99	Drawdown	0.65	15	1.9	Fair
W-1508	28-Jun-01	Slug	NA	160	16	Good

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-1509	9-Apr-99	Drawdown	7.2	7,000	700	Good
W-1510	14-Apr-99	Drawdown	6.6	280	20	Fair
W-1510	21-Apr-09	Step	4.5	3,200	160	Fair
W-1512	21-Jun-01	Slug	NA	230	23	Good
W-1514	23-Jun-99	Long-term	5.8	440	90	Good
W-1515	18-Jan-00	Drawdown	1.5	26	1.5	Poor
W-1515	2-Feb-00	Long-term	1.1	75	4.1	Fair
W-1518	22-Mar-00	Step	6.0	440	19	Good
W-1520	21-Mar-00	Long-term	4.0	165	20	Poor
W-1522	20-Mar-00	Step	10.5	3,500	235	Good
W-1550	28-Dec-99	Drawdown	10.0	330	35	Fair
W-1601	25-Feb-00	Drawdown	3.0	35	3.6	Good
W-1602	3-Mar-00	Drawdown	8.3	3,100	310	Fair
W-1604	2-Apr-01	Drawdown	4.0	1,600	220	Fair
W-1609	14-Dec-05	Injection	0.30	1.90	0.10	Fair
W-1610	14-Jul-00	Injection	2.0	17	0.8	Good
W-1610	17-Jul-00	Injection	3.0	17	0.8	Excel
W-1610	7-Dec-05	Injection	1.5	17	0.80	Fair
W-1614	25-Aug-00	Drawdown	1.9	75	8.3	Good
W-1654	20-Apr-00	Drawdown	0.5	12	2.0	Good
W-1655	21-Apr-00	Drawdown	1.5	27	4.9	Good
W-1701	23-Jul-01	Drawdown	9.0	160	40	Good
W-1701	26-Sep-01	Long-term	15.0	60	15	Fair
W-1703	25-Oct-01	Drawdown	12.0	16,000	2,300	Fair
W-1801	3-May-02	Drawdown	10.0	6,600	660	Fair
W-1801	18-Jun-09	Step	7	1,100	110	Good
W-1802	30-Sep-02	Drawdown	1.3	11	1.1	Fair
W-1805	22-Jan-03	Drawdown	11.1	13,000	800	Fair
W-1806	15-Apr-03	Drawdown	3.1	450	77	Good
W-1807	24-Aug-09	Step	3	3,200	320	Good
W-1902	19-Mar-03	Step	11.0	1,100	29	Good
W-2012	8-Jul-10	Drawdown	NA	83.0	27.7	Fair
W-2201	9-Feb-09	Step	3.0	12,000	680	Fair
W-2202	2-Mar-06	Drawdown	0.95	65	6.5	Poor
W-2203	23-Feb-06	Drawdown	1.04	15	1.4	Fair
W-2501	5-May-10	Drawdown	35.00	240	12	Good

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
W-2502	23-Apr-10	Drawdown	24	51	2.1	Good
W-2601	15-May-10	Drawdown	34	760	51	Fair
W-2602	2-Jun-10	Drawdown	5	38	7.6	Poor
W-2603	5-May-10	Drawdown	4.8	68.8	14.0	Good
W-2611	22-Oct-10	Drawdown	2.0	125	10.2	Good
W-2612	19-Oct-10	Slug	NA	3.9	0.13	Good
W-2801	18-Nov-11	Drawdown	3.1	339	33.9	Good
W-2801	22-Nov-11	Step	1.0	256	25.6	Good
W-3001	22-May-14	Drawdown	4.0	70	14	Good
W-3002	17-Jun-14	Drawdown	1.1	48	9.5	Excellent
W-3003	18-Jun-14	Drawdown	0.79	35	7	Excellent
W-3004	23-Sep-14	Slug	NA	28	2.8	Good
W-3101	17-Jun-15	Drawdown	5.9	38.5	7.7	Good
W-3102	18-Jun-15	Drawdown	2.1	44.5	8.9	Good
W-3104	23-Dec-15	Drawdown	2.0	24	4.8	Good
W-3107	15-Dec-15	Drawdown	1.7	65.3	13.1	Good
SIP-ETC-201	1-Apr-04	Drawdown	1.0	200	10	Fair
SIP-ETS-201	13-Mar-96	Drawdown	0.0	430	89	Fair
SIP-ETS-204	13-Mar-96	Drawdown	0.0	150	15	Poor
SIP-ETS-207	26-Oct-93	Drawdown	0.58	710	68	Fair
SIP-ETS-207	10-Nov-93	Drawdown	2.7	440	51	Fair
SIP-ETS-207	13-Mar-96	Slug	0.0	1,800	200	Poor
SIP-ETS-601	15-Jun-10	Slug	NA	5.3	0.82	Fair
SIP-ETS-601	16-Jun-10	Slug	NA	2.4	0.36	Fair
SIP-ETS-601	17-Jun-10	Slug	NA	3.0	0.46	Fair
TW-11	24-Jan-85	Drawdown	0.3	200	20	Good
TW-11A	24-Jan-85	Drawdown	10.0	3,100	110	Fair
GSW-01	11-Dec-85	Slug	NA	72	0.2	Fair
GSW-01A	14-Jul-86	Drawdown	13.4	12,000	790	Good
GSW-02	17-Dec-85	Slug	NA	240	10	Good
GSW-03	23-Dec-85	Slug	NA	510	41	Good
GSW-04	19-Dec-85	Slug	NA	17	0.9	Good
GSW-05	12-Feb-86	Slug	NA	99	9	Excel
GSW-06	23-Iun-86	Drawdown	25.0	4,800	310	Good
GSW-06	16-Jun-87	Long-term	20.0	5,500	350	Good
GSW-07	3-Apr-86	Drawdown	4.3	230	23	Excel

Table B-1. Results of hydraulic tests[a].

Well	Date	Type of test[b]	Flow rate (Q) (gpm)	Transmissivity (T) (gpd/ft)	Hydraulic conductivity (K)[c] (gpd/sq ft)	Data quality[d]
GSW-08	19-Nov-86	Drawdown	2.0	230	38	Good
GSW-09	28-May-86	Drawdown	1.9	500	63	Poor
GSW-10	22-May-86	Drawdown	14.3	21,000	2,000	Good
GSW-11	2-Jun-86	Drawdown	4.7	390	45	Excel
GSW-12	7-Jun-86	Drawdown	0.8	51	11	Fair
GSW-13	4-Aug-86	Slug	NA	110	13	Excel
GSW-13	8-Aug-86	Slug	NA	62	7	Good
GSW-15	23-Feb-88	Drawdown	25.8	1,500	190	Good
GSW-208	8-May-86	Drawdown	1.9	440	80	Good
GSW-209	8-May-86	Drawdown	6.1	1,200	120	Good
GSW-215	4-Jun-86	Drawdown	1.9	220	40	Poor
GSW-216	16-Jan-92	Drawdown	10.5	3,500	440	Fair
GSW-266	20-Jun-86	Drawdown	2.1	470	72	Good
GSW-266	18-Nov-86	Drawdown	3.0	450	64	Good
GSW-266	18-Nov-86	Drawdown	4.7	410	59	Good
GSW-367	11-May-87	Drawdown	6.9	200	29	Fair
GSW-403-6	8-Dec-85	Slug	NA	4	0.2	Good
GSW-442	23-Nov-87	Drawdown	1.2	32	4.6	Good
GSW-443	30-Nov-87	Drawdown	10.3	260	8.7	Good
GSW-444	28-Jan-88	Slug	NA	9	0.86	Good
GSW-445	26-Jan-85	Drawdown	4.7	43	4.30	Fair
GEW-710	23-Sept-91	Step	36.0	4,800	220	Excel
GEW-816	15-Aug-92	Drawdown	39.0	12,000	1,100	Good
11H4	15-Jan-85	Drawdown	24.6	2,000	77	Good
11H4	19-Jan-85	Long-term	29.5	1,780	18	Good
11J4	10-Jun-88	Drawdown	17.0	1,000	15	Excel
11J4	14-Jun-85	Long-term	16.0	1,100	16	Good
13D1	9-Feb-85	Long-term	50.0	4,800	48	Excel

Notes and footnotes appear on the following page.

Table B-1. Results of hydraulic tests[a].

Notes:

gpd = Gallons per day.
gpm = Gallons per minute.
NA = Not Applicable.
sq ft = Square feet.

[a] **The pumping test results were obtained by using the analytic techniques of Theis (1935), Cooper and Jacob (1946), Papadopulos and Cooper (1967), Hantush and Jacob (1955), Hantush (1960), or Boulton (1963). The particular method used depends on the character of the data obtained. The slug test results were obtained using the method of Cooper et al. (1967) (See references below).**

[b] **"Drawdown" denotes 1-hr pumping tests; "Long-term" denotes 24- to 48-hr pumping tests; "Slug" denotes monitoring and recovery after an instantaneous change in ground water elevations; "Step" denotes a step-drawdown test, flow rate given is the maximum or final step. "Injection" denotes the introduction of treated ground water under gravity into a well.**

[c] **K is calculated by dividing T by the thickness of permeable sediments intercepted by the sand pack of the well. This thickness is the sum of all sediments with moderate to high estimated conductivities determined from the geologic and geophysical logs of the well.**

[d] **Hydraulic test quality criteria:**

Excel: High confidence that type curve match is unique. Data are smooth and flow rate well controlled.

Good: Some confidence that curve match is unique. Data are not too "noisy." Well bore storage effects, if present, do not significantly interfere with the curve match. Boundary effects can be separated from properties of the pumped zone.

Fair: Low confidence that curve match is unique. Data are "noisy." Multiple leakiness and other boundary effects tend to obscure the curve match.

Poor: Unique curve match cannot be obtained due to multiple boundaries, well bore storage, uneven flow rate, or equipment problems. Usually, the test is repeated.

References

Boulton, N. (1963), "Analysis of Data from Non-Equilibrium Pumping Tests Allowing for Delayed Yield from Storage," *Proc. Inst. Civ. Eng.* 26, 469–482.

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Hantush, M. (1960), "Modification of the Theory of Leaky Aquifers," *J. of Geophys. Res.* 65, 3173–3725.

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Appendix C

Ground Water Sampling Monitoring Algorithm

Appendix C

Ground Water Sampling Monitoring Algorithm

C-1. Introduction

LLNL uses a statistically based methodology, referred to as the cost-effective sampling (CES) frequency algorithm, to estimate the lowest-frequency sampling schedule for ground water monitoring locations that meets regulatory and cleanup monitoring needs.

The CES algorithm first generates an initial, or "raw", recommendation separately for each location using a computer program that evaluates patterns in the available data. The raw recommendation at each location may be for quarterly, semi-annual, annual, or biennial (every other year) sampling. Project personnel then review the raw recommendations and are permitted to increase, but not decrease, the sampling frequency based on other (non-statistical) considerations (McConachie, 1993). In some instances the computer program is unable to make a raw recommendation, in which case project personnel determine a sampling frequency.

The CES algorithm is applied every quarter to obtain recommendations that will take effect in the following quarter. Thus, the sampling frequency determinations are updated regularly as new data are obtained.

The algorithm is a dynamic tool that can be modified as remediation continues and technical advances occur.

C-2. Use of the CES Algorithm

The CES algorithm is applied separately to each location. Concentration trend, variability, and magnitude statistics are calculated for each of thirteen key contaminants of concern (COCs): carbon tetrachloride, chloroform, 1,1-DCA, 1,2-DCA, 1,1-DCE, 1,2-DCE (total), Freon 113, PCE, 1,1,1-TCA, 1,1,2-TCA, TCE, Freon 11 (trichloroflouromethane), and vinyl chloride. The statistics are then evaluated to produce a raw recommended sampling frequency for each COC. The raw CES recommendation for each location is the greatest sampling frequency among the individual COC recommendations at that location.

Two time periods are defined: "recent" and "long-term". Recent data consist of the most recent 1.5 to 2.5 years and at least 2 data points. Long-term data consist of at least 4.5 to 6 years and at least 4 data points. The time periods are extended if necessary to obtain at least the required minimum number of data points.

C-2.1. Analyzing trend, variability, and magnitude

The basic CES principle is that the greater the rate of change, whether up or down, the greater the potential need for more frequent sampling. Where little change is observed, less frequent sampling is warranted. Similarly, the greater the variability in concentrations, the greater the potential need for more frequent sampling.

Trends are obtained by calculating a linear regression of concentration as a function of time. The slope of the regression line represents an average rate of concentration change per

year. The magnitude of the concentration affects whether a given rate of change is environmentally significant. For example, a yearly change of 50 parts per billion (ppb) is more significant for a well in which concentrations are around 100 ppb than for one in which concentrations are around 1,000 ppb. In a well with a concentration of 100 ppb, a 50 ppb/year rate of change would be considered large, whereas in a 1,000 ppb well it would be considered small. Therefore, trends are categorized as high, medium-high, medium-low, or low, depending on both the slope and their concentration range (as indicated by the median concentration), as shown in Table C-1.

Table C-1. Trend categories as a function of regression slope and median concentration.

	Annual Rate of Change Category (ppb)			
Concentration range	**Low**	**Medium-low**	**Medium-high**	**High**
<100	<5	5-10	10-30	>30
<300	<15	15-30	40-90	>90
>300	<50	50-100	100-300	>300

Variability is evaluated by an index of relative variability defined as the concentration range divided by the median concentration. For example, data with a range of 50 ppb at a median of 5,000 ppb are considerably less variable than data with a range of 50 ppb at a median of 100 ppb. "High" variability is defined as a variability index greater than 1, and "low" variability is defined as a variability index less than or equal to 1.

Finally, trend and variability are considered together to determine an initial sampling frequency recommendation, as shown in Table C-2.

Table C-2. Trend and variability determine a sampling frequency.

Trend category	**Variability index**	**Sampling Frequency**
High	Any	Quarterly
Medium-high	High (>1)	Quarterly
Medium-high	Low (<1)	Semi-annual
Medium-low	High (>1)	Semi-annual
Medium-low	Low (<1)	Annual
Low	Any	Annual

C-2.2. Determining a CES raw recommendation

The CES recommendation for an individual COC at a single location is determined in four steps:

Step 1 consists of applying the trend and variability evaluation of Section C-2.1 to recent data to obtain an initial sampling frequency of quarterly, semi-annual, or annual (this is the "Step 1 frequency").

Step 2 consists of applying the trend and variability evaluation of Section C-2.1 to long-term data and comparing with the results of Step 1.

- If the sampling frequency based on recent data (the Step 1 frequency) is semi-annual or annual, it is used for the CES raw recommendation.
- If the recent trend is greater than the overall trend (in absolute value), the Step 1 frequency is used for the CES raw recommendation.
- If recent and long-term trends are in the same category, the Step 1 frequency is used for the CES raw recommendation.

Otherwise, the recent and long-term trends are compared using the absolute value of the ratio of the recent slope to the long-term slope.

- If the ratio is ≥0.25 then the sampling frequency based on the long-term data is used for the CES raw recommendation.
- If the ratio is <0.25 and the median recent concentration is <10 ppb, the Step 1 sampling frequency is used.
- If the ratio is <0.25 but the median recent concentration is ≥ 10 ppb, then CES does not make a recommendation; project personnel review the data and set the frequency.

Step 3 consists of reducing the sampling frequency for the low-risk compounds chloroform, Freon 11, and Freon 113.

Not all compounds in the analytical target list are equally harmful. For example, an average rate of change of 25 ppb per year for TCE (5 ppb MCL) is more significant than the same trend for chloroform, Freon 11 or Freon 113 (100 ppb, 150 ppb, and 1,200 ppb MCL, respectively). If the maximum concentration in the recent data is less than half of the MCL then quarterly and semiannual sampling frequencies are reduced to semi-annual and annual respectively.

Step 4 consists of reducing the sampling frequency to biennial if the following conditions are met.

- The result of Steps 1 through 3 must be an annual frequency recommendation.
- The average rates of change for both recent and long-term data sets must be in the annual category.
- There must be no indication of upward trend. The recent median concentration must be less than the long-term median concentration plus 2.5 ppb. Small fluctuations of

slopes within the low annual category are expected, but there should be no indication of a larger upward trend.

- The median recent concentration must be low (less than 20 ppb).

After all four steps have been completed for every analyte at a location, the CES raw recommendation for the location is the greatest sampling frequency among the individual COC recommendations at that location. If the algorithm was unable to determine a sampling frequency for any of the COCs, no CES raw recommendation is established for that location.

Finally, project personnel review the raw recommendations and are permitted to increase, but not decrease, the sampling frequency based on other (non-statistical) considerations.

C-3. Applicability

Some locations will have sampling frequencies driven by regulatory or remedial needs regardless of their concentration history. For example, wells located downgradient of the leading edge of a plume can be designated as "guard" wells and will remain on a quarterly sampling schedule regardless of the CES analyses. Sampling frequencies for ground water extraction wells associated with treatment facilities always remain quarterly for use in mass removal estimates, and are not included in the CES algorithm analysis. Each quarter, the list of wells evaluated by the CES algorithm is reviewed and adjusted based on such considerations.

C-4. Reference

McConachie, W.A. (1993), LLNL Environmental Restoration Division: letter to M. Gill of U.S. Environmental Protection Agency, B. Cook of the Department of Toxic Substances Control, and S. Ritchie of the Regional Water Quality Control Board, describing the sampling schedule for the LLNL Livermore Site monitor wells, dated February 10, 1993.

Appendix D

2016 and 2017 Ground Water Sampling Schedules

Table D-1. 2016 and 2017 LLNL Livermore Site VOC ground water sampling schedules.

Well number	2016		2017		Additional analytes (Q1-10)
	VOC sampling frequency	Next quarter sample date	VOC sampling frequency	Next quarter sample date	
W-001	A	1-16	E	1-18	
W-001A	A	1-16	E	1-18	
W-002	A	1-16	Q	1-17	
W-002A	O	3-17	E	2-18	
W-004	O	2-17	E	3-18	
W-005	E	3-16	E	3-18	
W-005A	E	4-16	E	4-18	
W-008	E	3-16	E	3-18	EFA
W-011	O	3-17	O	3-17	
W-012	A	1-16	A	1-17	
W-017	E	1-16	E	1-18	EFA
W-017A	O	1-17	O	1-17	
W-101	E	1-16	O	1-17	
W-102	O	1-17	O	1-17	
W-103	O	1-17	O	1-17	
W-104	Q	1-16	Q	1-17	
W-105	S	1-16	S	1-17	
W-106	O	1-17	O	1-17	
W-107	E	1-16	O	1-17	
W-108	O	3-17	S	1-17	
W-110	Q	1-16	Q	1-17	
W-111	A	2-16	A	2-17	
W-112	A	4-16	A	1-17	
W-113	E	1-16	O	1-17	
W-114	E	1-16	O	1-17	
W-115	O	2-17	O	2-17	
W-116	Q	1-16	Q	1-17	
W-117	O	3-17	O	3-17	
W-118	O	2-17	E	2-18	
W-119	A	1-16	A	1-17	EFA
W-120	S	1-16	E	3-18	
W-121	Q	1-16	Q	1-17	EFA
W-122	E	1-16	E	1-18	
W-123	E	1-16	E	1-18	
W-141	O	3-17	A	3-17	
W-142	E	1-16	O	1-17	
W-143	A	1-16	E	1-18	
W-146	Q	1-16	O	4-18	
W-147	S	1-16	A	1-17	
W-148	E	1-16	E	1-18	
W-151	Q	1-16	Q	1-17	EFA
W-201	O	2-17	E	2-18	

Table D-1. 2016 and 2017 LLNL Livermore Site VOC ground water sampling schedules.

Well number	2016		2017		Additional analytes (Q1-10)
	VOC sampling frequency	Next quarter sample date	VOC sampling frequency	Next quarter sample date	
W-202	E	1-16	O	1-17	
W-204	A	1-16	A	1-17	
W-205	Q	2-16	S	3-17	
W-206	S	1-16	S	1-17	
W-207	E	1-16	O	1-17	
W-210	O	4-17	O	4-17	
W-212	O	1-17	O	1-17	
W-213	E	3-16	E	3-18	
W-214	A	1-16	A	1-17	
W-218	A	1-16	A	1-17	
W-219	O	3-17	O	3-17	
W-220	A	1-16	A	2-17	
W-221	E	1-16	E	1-18	EFA
W-222	A	1-16	A	3-17	
W-223	O	3-17	O	3-17	
W-224	E	1-16	A	3-17	
W-225	E	2-16	E	2-18	
W-226	O	1-17	O	1-17	
W-251	Q	1-16	Q	1-17	
W-252	A	3-16	O	3-17	
W-253	O	3-17	O	3-17	
W-255	O	1-17	O	1-17	
W-256	O	4-17	O	4-17	
W-257	A	1-16	A	1-17	
W-258	A	2-16	A	2-17	
W-259	S	1-16	A	1-17	
W-260	A	4-16	A	1-17	
W-261	Q	1-16	E	3-18	
W-263	Q	1-16	Q	1-17	
W-264	A	1-16	S	1-17	
W-265	O	3-17	O	3-17	
W-267	O	3-17	A	1-17	
W-268	S	1-16	E	2-18	
W-269	S	1-16	A	1-17	
W-270	O	1-17	O	1-17	
W-271	A	1-16	A	1-17	
W-272	O	3-17	E	3-18	
W-273	E	1-16	E	1-18	
W-274	Q	1-16	Q	1-17	
W-275	O	4-17	A	1-17	
W-276	S	1-16	S	1-17	
W-277	O	1-17	E	2-18	

Table D-1. 2016 and 2017 LLNL Livermore Site VOC ground water sampling schedules.

Well number	2016		2017		Additional analytes (Q1-10)
	VOC sampling frequency	Next quarter sample date	VOC sampling frequency	Next quarter sample date	
W-290	O	1-17	O	1-17	
W-291	O	1-17	O	1-17	
W-293	O	1-17	O	1-17	
W-294	O	1-17	O	1-17	
W-301	O	3-17	E	4-18	
W-302	O	4-17	O	4-17	
W-303	E	3-16	E	3-18	
W-304	O	2-17	A	2-17	
W-306	E	2-16	E	2-18	
W-307	A	1-16	S	1-17	
W-308	O	3-17	E	3-18	
W-310	S	1-16	Q	1-17	
W-311	A	1-16	A	1-17	
W-312	O	2-17	O	2-17	
W-313	O	1-17	O	1-17	
W-315	Q	1-16	Q	1-17	
W-316	A	1-16	O	1-17	
W-317	A	1-16	A	1-17	
W-319	E	3-16	E	3-18	
W-320	A	1-16	O	4-17	
W-321	E	1-16	E	1-18	
W-322	Q	1-16	Q	1-17	
W-323	Q	1-16	Q	1-17	
W-324	E	4-16	E	4-18	
W-325	O	2-17	A	1-17	
W-353	A	3-16	E	3-18	
W-354	Q	1-16	Q	1-17	
W-355	A	1-16	Q	1-17	
W-356	A	4-16	S	1-17	
W-362	E	2-16	E	2-18	
W-363	Q	2-16	S	1-17	EFA
W-364	A	3-16	A	3-17	
W-365	O	3-17	E	3-18	
W-366	E	2-16	E	2-18	
W-369	O	1-17	A	3-18	
W-370	O	2-17	O	2-17	
W-371	E	1-16	E	1-18	
W-372	O	1-17	O	1-17	
W-373	A	1-16	A	1-17	EFA
W-375	E	1-16	E	1-18	
W-376	O	2-17	O	2-17	
W-377	O	4-17	O	4-17	

Table D-1. 2016 and 2017 LLNL Livermore Site VOC ground water sampling schedules.

Well number	2016		2017		Additional analytes (Q1-10)
	VOC sampling frequency	Next quarter sample date	VOC sampling frequency	Next quarter sample date	
W-378	A	1-16	A	1-17	
W-379	A	2-16	E	3-18	
W-380	O	2-17	O	2-17	
W-401	E	4-16	O	1-17	
W-402	O	2-17	O	2-17	
W-403	O	2-17	O	2-17	
W-405	Q	1-16	Q	1-17	
W-406	E	1-16	E	1-18	
W-407	Q	1-16	Q	1-17	
W-409	A	1-16	A	4-17	
W-410	Q	1-16	Q	1-17	
W-411	A	1-16	A	2-17	
W-412	E	4-16	O	1-17	
W-416	O	4-17	A	1-17	
W-417	O	4-17	O	4-17	
W-418	O	4-17	E	4-18	
W-419	O	2-17	O	2-18	
W-420	O	4-17	A	1-17	
W-421	Q	1-16	Q	1-17	
W-422	Q	1-16	S	1-17	
W-423	A	1-16	A	1-17	
W-424	A	1-16	A	3-17	
W-446	O	1-17	O	1-17	
W-447	O	2-17	E	2-18	
W-448	A	1-16	A	1-17	
W-449	A	1-16	A	1-17	
W-450	E	2-16	E	2-18	
W-451	O	1-17	O	1-17	
W-452	A	1-16	A	1-17	
W-453	E	4-16	E	4-18	
W-454	S	1-16	Q	1-17	
W-455	O	2-17	O	2-17	
W-458	E	2-16	E	2-18	
W-459	O	4-15	E	1-18	
W-462	E	1-16	E	1-18	
W-463	O	1-17	O	1-17	
W-464	A	1-16	A	1-17	
W-481	Q	1-16	Q	1-17	
W-482	O	2-17	E	3-18	
W-483	E	1-16	O	4-17	
W-484	O	3-17	O	3-17	
W-485	O	1-17	O	1-17	
W-486	E	2-16	E	2-18	

Table D-1. 2016 and 2017 LLNL Livermore Site VOC ground water sampling schedules.

Well number	2016		2017		Additional analytes (Q1-10)
	VOC sampling frequency	Next quarter sample date	VOC sampling frequency	Next quarter sample date	
W-487	O	2-17	O	2-17	
W-501	A	1-16	A	1-17	
W-502	A	1-16	O	1-17	
W-503	O	4-17	S	1-17	
W-504	E	1-16	E	1-18	
W-505	E	3-16	E	3-18	
W-506	O	4-17	E	3-18	
W-507	O	4-17	O	4-17	
W-509	A	1-16	Q	1-17	
W-510	O	1-17	O	1-17	
W-511	E	1-16	E	1-18	
W-512	O	1-17	O	1-17	
W-513	O	1-17	O	1-17	
W-514	E	1-16	E	1-18	
W-515	Q	1-16	A	2-17	
W-516	S	2-16	Q	1-17	
W-517	Q	1-16	Q	1-17	
W-519	O	1-17	O	1-17	
W-520	E	1-16	E	1-18	
W-521	O	1-17	O	1-17	
W-551	O	2-17	E	4-18	
W-552	O	2-17	E	3-18	
W-553	O	2-17	O	2-17	
W-554	E	4-16	O	1-17	
W-555	O	4-17	O	4-17	
W-556	O	2-17	E	2-18	EFA
W-557	O	1-17	O	1-17	
W-558	Q	1-16	Q	1-17	
W-559	O	1-17	O	1-17	
W-560	O	1-17	O	1-17	
W-561	E	4-16	O	1-17	
W-562	O	1-17	O	1-17	
W-563	A	4-16	A	1-17	
W-564	E	2-16	E	2-18	
W-565	O	1-17	S	1-17	
W-567	O	3-17	O	3-17	
W-568	Q	1-16	Q	1-17	
W-569	A	1-16	A	1-17	
W-570	O	1-17	O	1-17	
W-571	A	1-16	A	1-17	EFA
W-592	E	1-16	E	1-18	
W-593	O	1-17	O	1-17	
W-594	E	1-16	E	1-18	

Table D-1. 2016 and 2017 LLNL Livermore Site VOC ground water sampling schedules.

Well number	2016		2017		Additional analytes (Q1-10)
	VOC sampling frequency	Next quarter sample date	VOC sampling frequency	Next quarter sample date	
W-601	E	1-16	E	1-18	
W-602	E	1-16	E	1-18	
W-603	O	4-17	O	4-17	
W-604	A	1-16	A	1-17	
W-606	A	1-16	A	1-17	
W-607	E	3-16	O	1-17	
W-608	O	1-17	O	1-17	
W-609	E	1-16	E	1-18	
W-611	A	1-16	A	1-17	
W-612	O	3-17	E	3-18	
W-613	A	1-16	O	1-17	
W-615	A	1-16	A	1-17	
W-616	E	1-16	E	1-18	
W-617	O	2-17	E	1-18	
W-618	Q	1-16	Q	1-17	
W-619	O	3-17	O	3-17	
W-622	A	1-16	O	1-17	
W-651	Q	1-16	Q	1-17	
W-652	O	2-17	O	2-17	
W-654	S	2-16	Q	1-17	
W-702	O	2-17	E	2-18	
W-703	A	3-16	A	3-17	
W-705	A	1-16	A	1-17	
W-706	A	1-16	O	1-17	
W-750	O	3-17	E	3-18	
W-901	O	1-17	O	1-17	
W-902	A	2-16	E	2-18	
W-905	O	4-17	O	4-17	
W-908	O	1-17	O	1-17	
W-909	S	2-16	Q	1-17	
W-911	Q	1-16	A	3-17	
W-912	S	1-16	Q	1-17	
W-913	Q	1-16	Q	1-17	
W-1002	O	1-17	O	4-17	
W-1003	O	4-17	O	4-17	
W-1008	O	1-17	O	1-17	
W-1010	E	1-16	E	1-18	
W-1011	E	2-16	E	2-18	
W-1012	A	1-16	A	1-17	EFA
W-1013	A	1-16	A	1-17	
W-1014	A	3-16	A	3-18	

Table D-1. 2016 and 2017 LLNL Livermore Site VOC ground water sampling schedules.

Well number	2016		2017		Additional analytes (Q1-10)
	VOC sampling frequency	Next quarter sample date	VOC sampling frequency	Next quarter sample date	
W-1015			Q	1-17	
W-1101	O	4-17	Q	1-17	
W-1102			Q	1-17	
W-1103			Q	1-17	
W-1105	O	3-17	O	3-17	
W-1106	O	1-17	A	1-17	
W-1107	A	2-16	A	1-17	
W-1110	A	1-16	A	1-17	
W-1112	O	3-17	E	3-18	
W-1113	A	1-16	A	1-17	
W-1115	O	1-17	O	1-17	
W-1117	S	1-16	S	1-17	
W-1118	A	4-16	A	1-17	
W-1201	S	1-16	Q	1-17	
W-1202	A	1-16	S	1-17	
W-1203	A	2-16	A	2-17	
W-1204	O	1-17	S	1-17	
W-1205	A	1-16	A	1-17	
W-1207	O	4-17	E	4-18	
W-1209	A	1-16	A	1-17	
W-1210	S	2-16	A	2-17	
W-1212	Q	1-16	Q	1-17	
W-1214	Q	1-16	Q	1-17	
W-1217	S	1-16	S	1-17	
W-1219	S	1-16	E	3-18	
W-1222	A	3-16	S	1-17	
W-1223	A	1-16	A	1-17	
W-1224	O	2-17	E	2-18	
W-1225	Q	1-16	Q	1-17	
W-1226	O	2-17	S	1-17	
W-1227	O	3-17	E	3-18	
W-1250	Q	1-16	Q	1-17	
W-1251	A	1-16	Q	1-17	
W-1252	A	2-16	A	2-17	
W-1253	Q	1-16	S	1-17	
W-1255	A	1-16	Q	1-17	
W-1303	Q	1-16	Q	1-17	EFA
W-1304	Q	1-16	A	1-17	
W-1306	Q	1-16	Q	1-17	EFA
W-1308	Q	1-16	Q	1-17	EFA
W-1311	A	1-16	A	1-17	
W-1401	A	4-15	A	2-17	
W-1402	O	3-17	A	3-17	

Table D-1. 2016 and 2017 LLNL Livermore Site VOC ground water sampling schedules.

Well number	2016		2017		Additional analytes (Q1-10)
	VOC sampling frequency	Next quarter sample date	VOC sampling frequency	Next quarter sample date	
W-1404	A	1-16	A	1-17	
W-1405	A	1-16	A	3-17	
W-1406	A	1-16	A	1-17	
W-1407	A	1-16	A	1-17	
W-1408	A	1-16	A	3-17	
W-1411	E	2-16	E	3-18	
W-1412	S	1-16	S	1-17	
W-1413	A	1-16	A	1-17	
W-1414	Q	1-16	Q	1-17	
W-1416	E	3-16	E	3-18	
W-1417	O	3-17	E	3-18	
W-1418	A	1-16	A	1-17	
W-1419	E	3-16	E	3-18	
W-1420	Q	1-16	S	1-17	
W-1421	A	1-16	A	1-17	
W-1422	S	1-16	A	3-17	
W-1424	Q	1-16	Q	1-17	
W-1425	O	4-17	Q	1-17	
W-1426	A	1-16	A	1-17	
W-1427	O	4-17	E	3-18	
W-1428	O	2-17	E	4-18	
W-1501	O	3-17	E	3-18	
W-1502	E	2-16	A	1-17	
W-1505	Q	1-16	Q	1-17	
W-1506	O	4-17	A	1-17	
W-1507	Q	1-16	S	1-17	
W-1508	E	3-16	E	3-18	
W-1509	A	1-16	A	1-17	
W-1511	A	4-16	A	2-17	
W-1512	E	4-16	O	1-17	
W-1517	A	1-16	A	1-17	
W-1519	Q	1-16	Q	1-17	
W-1551	S	1-16	Q	1-17	
W-1553	Q	1-16	Q	1-17	
W-1604	S	1-16	Q	1-17	
W-1605	Q	1-16	Q	1-17	
W-1606	S	2-16	Q	1-17	
W-1607	S	1-16	A	1-17	
W-1608	A	4-16	Q	1-17	
W-1609	Q	1-16	Q	1-17	
W-1610	A	4-16	Q	1-17	
W-1613	O	1-17	O	1-17	
W-1614	A	1-16	A	1-17	

Table D-1. 2016 and 2017 LLNL Livermore Site VOC ground water sampling schedules.

Well number	2016		2017		Additional analytes (Q1-10)
	VOC sampling frequency	Next quarter sample date	VOC sampling frequency	Next quarter sample date	
W-1701	Q	1-16	Q	1-17	
W-1703	O	1-17	O	1-17	
W-1704	E	3-16	E	3-18	
W-1705-1	E	3-16	O	1-17	
W-1705-2	Q	1-16	Q	1-17	
W-1705-3	Q	1-16	Q	1-17	
W-1802	A	4-16	A	1-17	
W-1803-1[a]	A	3-16	S	1-17	
W-1803-2[a]	A	2-16	S	1-17	
W-1804-1[a]	A	3-16	A	3-17	
W-1804-2[a]	Q	1-16	Q	1-17	
W-1805	A	1-16	A	1-17	
W-1901-1[a]	A	1-16	Q	1-17	
W-1901-2[a]	S	1-16	S	2-17	
W-1905-1[a]	A	2-16	S	1-17	
W-1905-2[a]	Q	1-16	A	3-17	
W-2103	Q	1-16	Q	1-17	
W-2113	O	4-17	O	4-17	
W-2202	Q	1-16	Q	1-17	
W-2211	A	1-16	Q	1-17	
W-2212	Q	1-16	Q	1-17	
W-2216B	Q	1-16	Q	1-17	
W-2302	Q	1-16	Q	1-17	
W-2304	Q	1-16	Q	1-17	
W-2602	A	2-16	S	1-17	
W-2603	A	1-16	A	1-17	
W-2604A	A	2-16	A	1-17	
W-2604B	A	2-16	A	2-17	
W-2605A	A	1-16	Q	1-17	
W-2606	S	1-16	Q	1-17	
W-2607	A	4-16	A	4-17	
W-2611	Q	1-16	Q	1-17	
W-2612	Q	1-16	Q	1-17	
W-2616	S	1-16	A	1-17	
W-2617	Q	1-16	Q	1-17	
W-2618	A	1-16	A	1-17	
W-2619	Q	1-16	A	1-17	
W-2620A	Q	1-16	A	1-17	
W-2621	A	1-16	A	1-17	

Table D-1. 2016 and 2017 LLNL Livermore Site VOC ground water sampling schedules.

Well number	2016		2017		Additional analytes (Q1-10)
	VOC sampling frequency	Next quarter sample date	VOC sampling frequency	Next quarter sample date	
W-2622	S	2-16	A	3-17	
W-2623	Q	1-16	Q	1-17	
W-3001	Q	1-16	A	2-17	
W-3002	A	3-16	A	2-17	
W-3003	A	3-16	A	2-17	
W-3004	Q	1-16	Q	1-17	
W-3103			A	3-17	
W-3104			A	3-17	
W-3105			Q	1-17	
W-3106			Q	1-17	
W-3107			Q	1-17	
W-3204			Q	1-17	
W-3205			Q	1-17	
TW-11	S	1-16	Q	1-17	
TW-11A	O	2-17	E	2-18	
TW-21	E	1-16	E	1-18	
11C1	O	1-17	O	1-17	
14A11	E	2-16	E	2-18	
14A3	E	1-16	O	4-17	
14B1	O	3-17	O	3-17	EFA
14B4	E	2-16	O	1-17	
14C2	E	1-16	O	4-17	
18D1	O	1-17	O	1-17	
GSW-001A			A	3-17	
GSW-006	E	1-16	E	1-18	
GSW-007	O	1-17	O	1-17	
GSW-008	E	3-16	S	1-17	
GSW-009	Q	1-16	Q	1-17	
GSW-011	E	4-16	E	4-18	
GSW-013	O	1-17	O	1-17	
GSW-215	E	1-16	E	1-18	
GSW-216	O	2-17	O	2-17	
GSW-266	E	3-17	S	1-17	
GSW-326	O	3-17	O	3-17	
GSW-367	E	3-16	E	2-18	
GSW-442	E	1-16	E	1-18	
GSW-443	E	3-16	E	3-18	
GSW-444	O	2-17	O	2-17	

Notes and footnotes appear on the following page.

Table D-1. 2016 and 2017 LLNL Livermore Site VOC ground water sampling schedules.

Notes:

All analyses are by EPA Method 601 for purgeable halocarbons.

E = Even years.

O = Odd years.

A = Annual.

S = Semiannual.

Q = Quarterly.

Q1 = First Quarter.

EFA = Environmental Functional Area. Analyses are for the environmental surveillance monitoring programs carried out at DOE sites to complement restoration activities.

[a] **Wells completed with two discrete screened intervals that are hydraulically isolated from one another by a packer or annular seal and are sampled individually.**

Appendix E

The Remediation Evaluation (REVAL) Process

Appendix E

The Remediation Evaluation (REVAL) Process

DOE/ERD developed the REVAL process (Table E-1) to systematically evaluate treatment facility performance. REVAL ensures that each system operates in a safe and optimal manner to remove and treat contaminated soil vapor and ground water, and ultimately expedite cleanup of the subsurface. The process was designed to ensure that the following procedures and activities are implemented properly at each facility undergoing repairs and upgrades:

- Track maintenance and repair work required for each facility;
- Document existing facility, pipeline and extraction well conditions;
- Standardize equipment, instrumentation, and data acquisition systems;
- When necessary, upgrade and expand system components;
- Collect ground water analytical data from extraction and performance monitor wells to assess potential rebound during a hiatus in operations;
- Collect information on the specific capacity of extraction wells; and
- Collect subsurface hydraulic and pneumatic interference information during extraction wellfield startup.

See Table E-1 on the following page.

Table E-1. Summary of the Remediation Evaluation (REVAL) Process.

REVAL Process Step	Description of Activities
1 - Project Initiation	**The project is initiated with a document that identifies the project objectives and personnel, and details individual roles and responsibilities. The document also refers to all applicable site safety and security procedures, standard operating procedures, and all relevant regulatory documentation.**
2 - Remedial System Review/Design	**The hydrogeology team reviews the effectiveness of the extraction wellfield and recommends adjustments. The engineering team performs a treatment facility assessment to identify necessary repairs, modifications, and upgrades to achieve optimal treatment facility performance. During this step, all facility design, operation, and maintenance documentation is reviewed and updated as necessary. If applicable, wellfield expansion may be incorporated into the design during this step.**
3 - Facility Repairs, Modifications, and Construction	**The engineering team performs the necessary repairs and modifications to the facility and documents "as-built" drawings. Repairs and modifications increase data accuracy and reliability, improve treatment facility and extraction wellfield operations, and standardization of equipment, instrumentation and control systems.**
4 - Initial Wellfield Sampling	**If applicable, the hydrogeology team identifies the extraction and monitor wells that require sampling. Field personnel sample these wells prior to the startup of the facility. The analytical results are used to evaluate potential rebound in contaminant concentrations while the facility was shutdown.**
5 - Facility Testing and Verification	**The engineering team performs testing and verification of the treatment facility components. The facility is then operated on a day-only (test) basis until all facility systems are verified. Once all applicable operational functions and interlocks are verified, the facility can run on a 24-hour basis.**
6 - Extraction Wellfield Startup	**The hydrogeology team prepares an extraction wellfield startup plan using data gathered during the verification and validation step. The startup plan may include specific capacity testing of each well or a phased startup of the entire extraction wellfield to determine hydraulic or pneumatic interference and achieve stable operations of the extraction wellfield and treatment facility. Analysis of the test data provides a foundation for evaluating long-term well performance and improving/optimizing extraction wellfield performance.**

Appendix F

Rule-based Algorithms for Generating Ground Water Elevation and Isoconcentration Contour Maps

Appendix F

Rule-based Algorithms for Generating Ground Water Elevation and Isoconcentration Contour Maps

In 1997, the U.S. Department of Energy/Lawrence Livermore National Laboratory (DOE/LLNL) Environmental Restoration Department (ERD) developed a process to assist hydrogeologists in developing a consistent set of ground water elevation and isoconcentration maps that cover the entire Livermore Site project history. The process is called the Optimized Environmental Restoration Analysis (OPERA) and consists of a set of rule-based algorithms that utilize all site data and knowledge into an automated system for creating representative maps over the project history. It was developed primarily to provide hydrogeologists a means to focus on data analysis rather than data compilation. In addition to generating representative maps in a short period of time, the process also provides consistent interpolations over time and provides a platform for improved quality assurance and quality control. The process and resulting maps also provide a feedback loop where the database and site conceptual model are continually updated.

The resulting maps are used in regulatory reports, presentations, remediation planning, remedial performance evaluation, numerical modeling input, and most importantly, as an overall communication tool between all stakeholders.

The rules for the algorithms have been developed over time and represent the collective experience of the past and present Livermore Site hydrogeologists. In essence, OPERA is DOE/ERD's knowledge management tool for preserving and improving the site conceptual model by maintaining a record of the interpreted subsurface data.

There are four main parts to the OPERA process: 1) environmental database, 2) site conceptual model (i.e., hydrostratigraphic unit (HSU) designations), 3) site and project knowledge, and 4) computer programs that consist of algorithms and visualization packages.

The process is designed to be inherently conservative. For example, the highest observed concentration in a well that was sampled twice in a given quarter (e.g., duplicate samples) is always selected as the representative result. The use of a three-point moving average was incorporated into the rules to prevent concentration fluctuations in a well over time from incorrectly influencing decision-making. As a result, the data set used in generating ground water elevation and isoconcentration maps will not always exactly match the value stored in the database for a given well (Attachment B). OPERA is used to generate the data files and preliminary maps. The final maps are always generated and reviewed by a hydrogeologist. The resulting ground water elevation and isoconcentration maps have been shown to be significantly more effective in evaluating the progress of remediation progress at the Livermore Site because the change in ground water elevations and isoconcentration contours can be viewed as a time-series and temporal variations are minimized.

The OPERA process is run each quarter and ground water elevation and isoconcentration maps for each HSU are updated. During this process, isoconcentration maps for individual volatile organic compounds (VOCs), total VOCs, and total VOCs above their respective

maximum contaminant levels (MCLs) are generated for each HSU. The primary components of the OPERA process are described in Table F-1.

Table F-1. Primary components of the Optimized Environmental Restoration Analysis (OPERA) Process.

OPERA Process Step	Description of Step
1 - Hydrostratigraphic Unit and Hydraulic Analysis (HSUHA)	**A structural representation of the site conceptual model is developed using all the information from site boreholes and wells. The HSU picks are determined using lithological, geophysical, soil chemistry, water level and hydraulic testing data. Using these data, the boundaries, extent and thickness of each HSU are defined. In addition, distribution of hydraulic parameters within an HSU, isopachs for different lithological types, and well-specific parameters such as well losses are also determined in this step.**
2 - Ground Water Elevation History Analysis (GWELHA)	**The ground water elevation history of each well is reviewed and data are interpolated using rule-based algorithms where there is less than adequate areal and temporal coverage. The well loss information is incorporated into the data set for extraction wells. The hydraulic test results are used to draw cones of depression around each extraction well that honors Darcy's Law of ground water flow through porous media. The resulting ground water elevation surfaces are used to define the extent of saturation when combined with the HSU information from step number one above.**
3 - Plume History Analysis (PLUHA)	**The concentration history of each volatile organic compound is reviewed and data are interpolated using conservative assumptions and a rule-based algorithm where there is less than adequate areal and temporal coverage. Ground water chemistry data are augmented with data from bailed ground water and soil samples collected during drilling of a borehole. The extent of HSUs and extent of saturation information from the two steps above are also incorporated into the data files to generate representative plume maps.**

Appendix G

TFD Helipad Enhanced Source Area Remediation

Appendix G

TFD Helipad Enhanced Source Area Remediation

Summary

This Appendix summarizes the Treatment Facility D (TFD) Helipad (HPD) Enhanced Source Area Remediation (ESAR) treatability test. As the yearly ESAR treatability test appendices to the Livermore Site Annual Report are meant to serve as stand-alone status updates for these tests, all relevant information is included from the previous years (McKereghan et al., 2016). Performance monitoring data, analyses and interpretations are updated on an annual basis as new information becomes available.

During 2016, periodic injections of ethyl lactate continued to create anaerobic conditions in the subsurface. As of July of 2016, anerobic conditions in portions of the treatment zone were sufficient to perform bioaugementation. On July 28, 2017, approximately 10 gallons (40 liters) of KB-1®, the dechlorinating microorganism consortium produced by Sirem, was injected into well W-1552.

Prior to bioaugmentation, the nutrient delivery method and frequency included periodic injection of ten gallons of ethyl lactate into injection wells W-1552 and W-1652, followed by injection of formation water to distribute the ethyl lactate in the subsurface. Injections were typically performed every other week by circulating ground water from two extraction wells and injecting into the center well. The two-week interval was determined as the optimal duration based on frequent measurements of field parameters, including dissolved oxygen, pH, temperature, specific conductance, and oxidation-reduction potential (ORP). After bioaugmentation, the nutrient delivery method was modified to continuously inject 5% ethyl lactate solution into injection well W-1552 by using a dosing pump. Routine ground water samples and field parameter measurements are taken in all the wells to evaluate the performance of the *in situ* bioremediation system.

1. Introduction

In situ bioremediation of moderate to low-permeability source area sediments is one of several technologies identified during the Source Area Cleanup Technology Evaluation (SACTE) that may accelerate clean up of Livermore Site source areas, and is one of four technologies being field-tested at the site under the Department of Energy Enhanced Source Area Remediation initiative (see Section 3.2 of the 2016 Annual Report).

The TFD Helipad source area is located crossgradient from a former landfill that operated from the mid-1950s until about 1970. Although sediment and debris in the former landfill were excavated in 1984, subsequent investigations confirmed that the subsurface in the vicinity of the former helipad is impacted by volatile organic compounds (VOCs), primarily trichloroethene (TCE).

Currently, depth to water is approximately 90 feet below ground surface (ft-bgs) and is hydraulically influenced by long-term ground water extraction in the area. The site sedimentary sequence consists of alluvial fan deposits, primarily unconsolidated clay and silt, with minor sand and gravel deposits. The source area extends vertically downwards from the unsaturated zone, in HSU-1B and HSU-2, to the bottom of saturated HSU-3A/3B, approximately 132 ft-bgs.

Source area remediation began in 1999 with ground water extraction from wells W-1551 and W-1552 (Figure G-1). The U.S. Department of Energy (DOE)/Lawrence Livermore (LLNL) (DOE/LLNL) quickly determined that ground water extraction alone would not be adequate to efficiently remediate this source area and began investigating innovative treatment technologies. In 2000, a series of wells, W-1650 through W-1657, were installed as part of a treatability test to evaluate the feasibility of electro-osmosis (EO) as a means of extracting ground water containing VOCs from fine-grained sediments at TFD Helipad (McNab et al., 2001). Between October of 2000 and February of 2001, the EO system operated in combination with ground water extraction from cathode wells W-1552, W-1651, and W-1654 (Figure G-1). After completion of the EO treatability test, these wells continued to operate as ground water extraction wells until 2004. Ground water was treated at the TFD Helipad treatment facility. In 2004, the nine source area wells completed in HSU-3A/3B were converted to dual extraction wells and HSU-2 soil vapor extraction wells W-HPA-002A and W-HPA-002B were connected to the VTFD Helipad soil vapor treatment facility. Both the ground water and soil vapor treatment facilities were operated continuously until October 2007, and a significant reduction in ground water and soil vapor concentrations were observed. Prior to remediation, TCE concentrations in the source area wells ranged between 3,000 and 10,000 parts per billion (ppb). After eight years of pump-and-treat remediation, the TCE concentrations in the TFD Helipad source area wells ranged from 25 to 750 ppb. Because the mass removal rates were declining and VOC concentrations remained above the cleanup levels, DOE/LLNL selected the TFD Helipad source area for an *in situ* bioremediation treatability test.

2. Objectives and Overview

The primary objective of the treatability test is to evaluate the efficacy of *in situ* bioremediation involving the application of lactate and bioaugmentation using the dechlorinating microorganism, KB-1®. In addition, the test was intended to help identify optimal design parameters for potential application of the technology at other LLNL source areas in the future.

Initial tracer test results (see Section 3) indicated that HSU-3A/3B was sufficiently permeable to allow injection of a carbon source (i.e., sodium lactate or ethyl lactate) while the microcosm study determined that bioaugmentation would be necessary at this site since dechlorinating microorganisms were not present in the subsurface.

3. Design and Implementation

In 2007, DOE/LLNL conducted a tracer test and a microcosm study to support the *in situ* bioremediation system design. The TFD Helipad *in situ* bioremediation system (ISB01) was designed and constructed in 2010. The ISB01 system began operating in November 2010 and includes four extraction wells, W-1650, W-1653, W-1655 and W-1657, and one central injection well, W-1552 (Figure G-1). There are four main performance monitor wells: W-1651, W-1652, W-1654 and W-1656. Downgradient and cross-gradient monitor wells completed in the HSU-3A/3B *in situ* bioremediation zone are also being monitored. In addition, there are several HSU-4 wells in the area to monitor deeper intervals for potential vertical migration.

The extraction and injection well pattern is designed to create a circulation cell that is vertically contained within HSU-3A/3B and horizontally contained within the TFD Helipad source area. In August 2012, the extraction pattern was modified from a four-well extraction system to a two-well extraction system, to minimize biofouling and increase the amount of sodium lactate circulation in a portion of treatability zone where most of the hydraulic circulation is occurring. Ground water continues to be extracted in a cyclic mode from wells W-1650 and W-1653, and injected into the central well W-1552. Cessation of pumping at wells W-1655 and W-1657 did not negatively impact the total facility flow rate or hydraulic circulation in the subsurface.

From 2010 to 2013, sodium lactate (4% by volume) was injected into well W-1552. The sodium lactate dose and injection rate were limited due to the viscosity of the product and the reduction of hydraulic conductivity near injection well W-1552 due to biofouling.

In May 2013, DOE/LLNL proposed a change from sodium lactate to ethyl lactate, a less viscous and more effective carbon source. Following regulatory approval, ethyl lactate injection (10% by volume (10%v)) began in August 2013. Between August 2013 and September 2014, more that 60 gallons of 10%v ethyl lactate were injected into the circulation system using a dilute solution. In late 2014, the injection procedure was modified and 55 gallons of pure 100%v ethyl lactate were injected into wells W-1552 and W-1652 in two separate events, September and November 2014.

In 2015, the injection procedure was modified based on the field parameter data (dissolved oxygen, pH, temperature, specific conductivity, and ORP) collected on a bi-weekly basis. Ten gallons of 100%v ethyl lactate was injected into well W-1552 and well W-1652 in sixteen separate events. The timing of the injection events was based on the pH measurements with the goal of maintaining a pH level of 5 or above in injection well W-1652. The injection frequency was approximately every two weeks when the facility was operational.

In 2016, eight ethyl lactate injections were performed following this procedure. As of July 2016, anerobic conditions in portions of the treatment zone were sufficient to perform bioaugementation. On July 28, 2017, approximately 10 gallons (40 liters) of KB-1®**,** the dechlorinating microorganism consortium produced by Sirem, was injected into well W-1552. After the bioaugmentation, the nutrient delivery method was modified to continuously inject 5% ethyl lactate solution into well W-1552 by using a dosing pump.

Routine ground water samples and field parameter measurements are taken in all the wells to evaluate the performance of the *in situ* bioremediation system

4. Results and Conclusions

Since the start of the treatability test, average dissolved oxygen levels in the circulation cell have been reduced from 2.2 parts per million (ppm) to 0.9 ppm. The ORP remains dependent on the continual injection of the carbon source and has been reduced from +150 millivolts to -150 millivolts. Although the parameters above are indicative of subsurface conditions becoming increasingly anaerobic, until 2015, average nitrate and sulfate concentrations have remained at approximately 60 ppm and 100 ppm, respectively.

Field parameters (e.g., dissolved oxygen and ORP) indicate that the system is more amenable to addition of ethyl lactate as opposed to sodium lactate (less biofouling and the ability to inject at higher concentrations at a lower viscosity). The injection of approximately 110 gallons of 100%v ethyl lactate in late 2014 significantly changed the subsurface biogeochemical conditions. TCE concentrations in the treatability test wells ranged from 25 to 1,100 ppb, with an average concentration of about 150 ppb.

In 2015, a significant reduction in nitrate and sulfate concentrations were observed in several wells, attributed mostly to the new ethyl lactate injection procedure. In extraction well W-1650, nitrate concentrations were initially reduced to below 10 ppm, however have since increased to about 50 ppm. Sulfate concentrations had not changed, remaining about 100 ppm. In extraction well W-1653, ideal conditions for anaerobic bioremediation were achieved with nitrate and sulfate concentrations were reduced to below 10 ppm (Figure G-2). In monitor well W-1654, nitrate concentrations were reduced to below 10 ppm and sulfate concentrations initially were reduced to below 20 ppm, however sulfate concentrations have since increased to about 60 ppm (Figure G-3). In addition, extraction well W-1653 and monitor well W-1654 are now both showing the presence of cis-1,2-dichloroethene (cis-1,2-DCE), which is a daughter product of TCE biodegradation.

In 2016, the treatability test results indicate that anaerobic subsurface conditions favorable to the introduction of KB-1 were achieved in the vicinity of wells W-1552, W-1652, W-1653 (Figure G-2), and W-1654 (Figure G-3). However, nitrate and sulfate concentrations remained at levels too high to implement bioaugmention in the vicinity of wells W-1650 and W-1656. Wells W-1651, W-1655, and W-1657 are considered to be outside the area of ground water circulation. On July 28, 2017, *in situ* bioaugmentation was performed using injection well W-1552. After the bioaugmentation, DOE/LLNL modified the nutrient delivery method to continuously inject 5% ethyl lactate solution into well W-1552 by using a dosing pump.

The current nutrient delivery rate is based on a balance of maintaining a pH level above 5 in all the wells, while maintaining anaerobic conditions in the subsurface. The ethyl lactate dose will be adjusted in 2017 to overcome the excess nitrate and sulfate that is present in the treatment zone.

5. References

McNab, W.W. Jr., J. A. Karachewski, and G. S. Weissmann (2001), *Field Measurements of Electro-osmotic Transport of Ground Water Contaminants in a Lithologically Heterogeneous Alluvial-Fan Setting,* Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-ID-144879).

McKereghan, P., C. Noyes, Z. Demir, and M. Dresen (Eds.) (2016), *LLNL Ground Water Project, 2015 Annual Report*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-AR-126020-15).

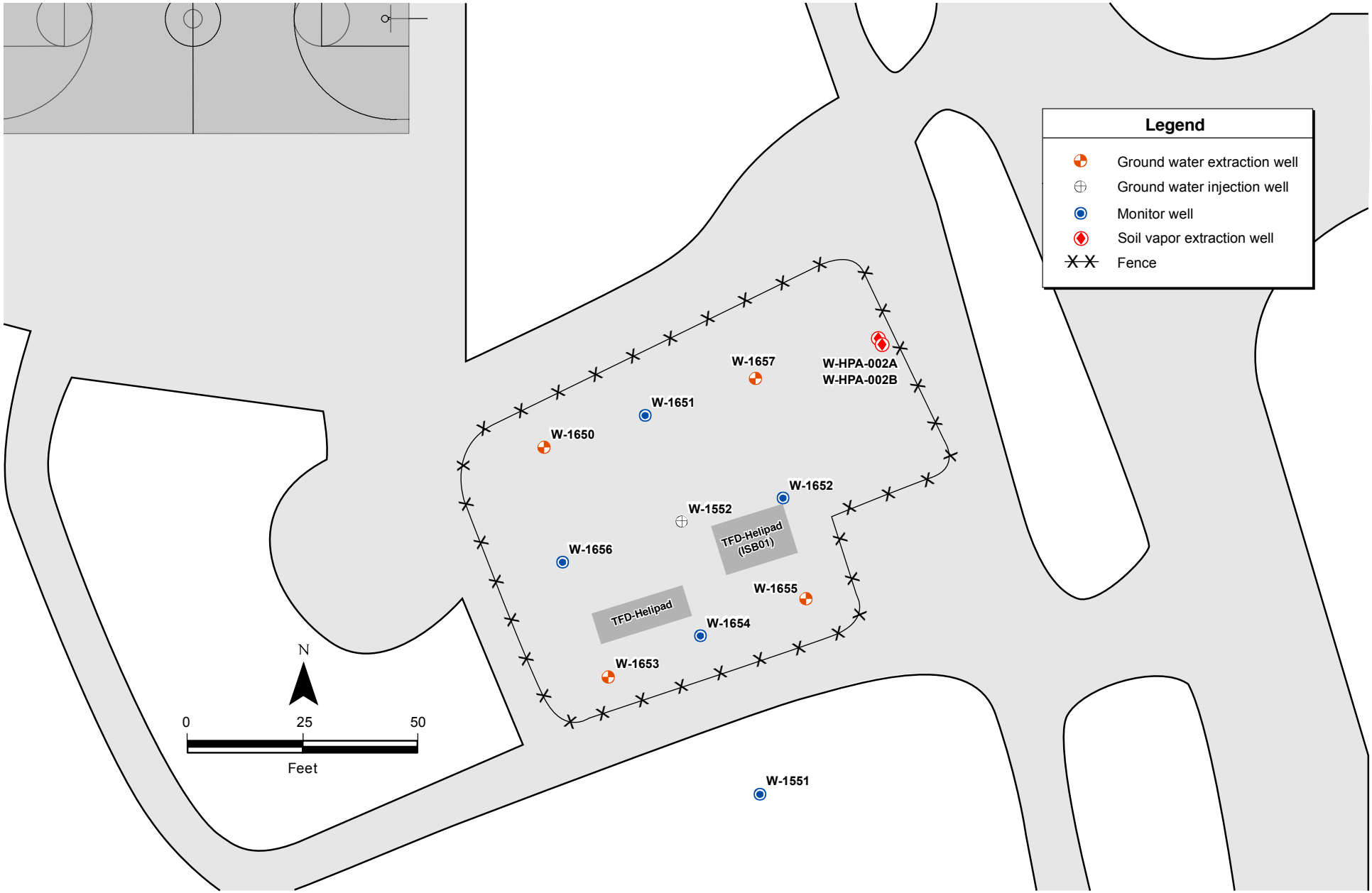

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Figure G-1. Locations of wells and treatment facilities in the TFD Helipad *in situ* bioremediation treatability test area.

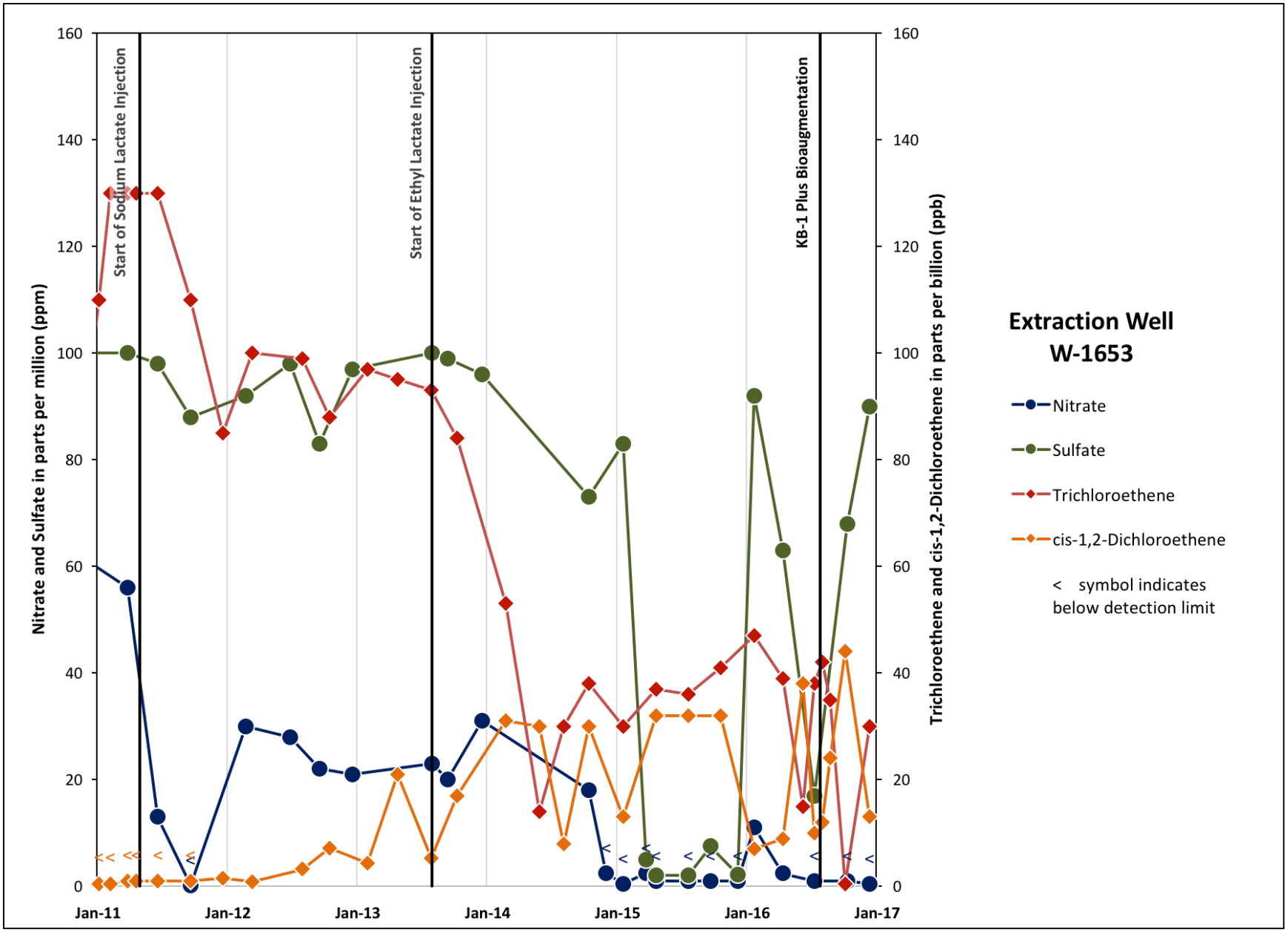

Figure G-2. Concentration trends in extraction well W-1653.

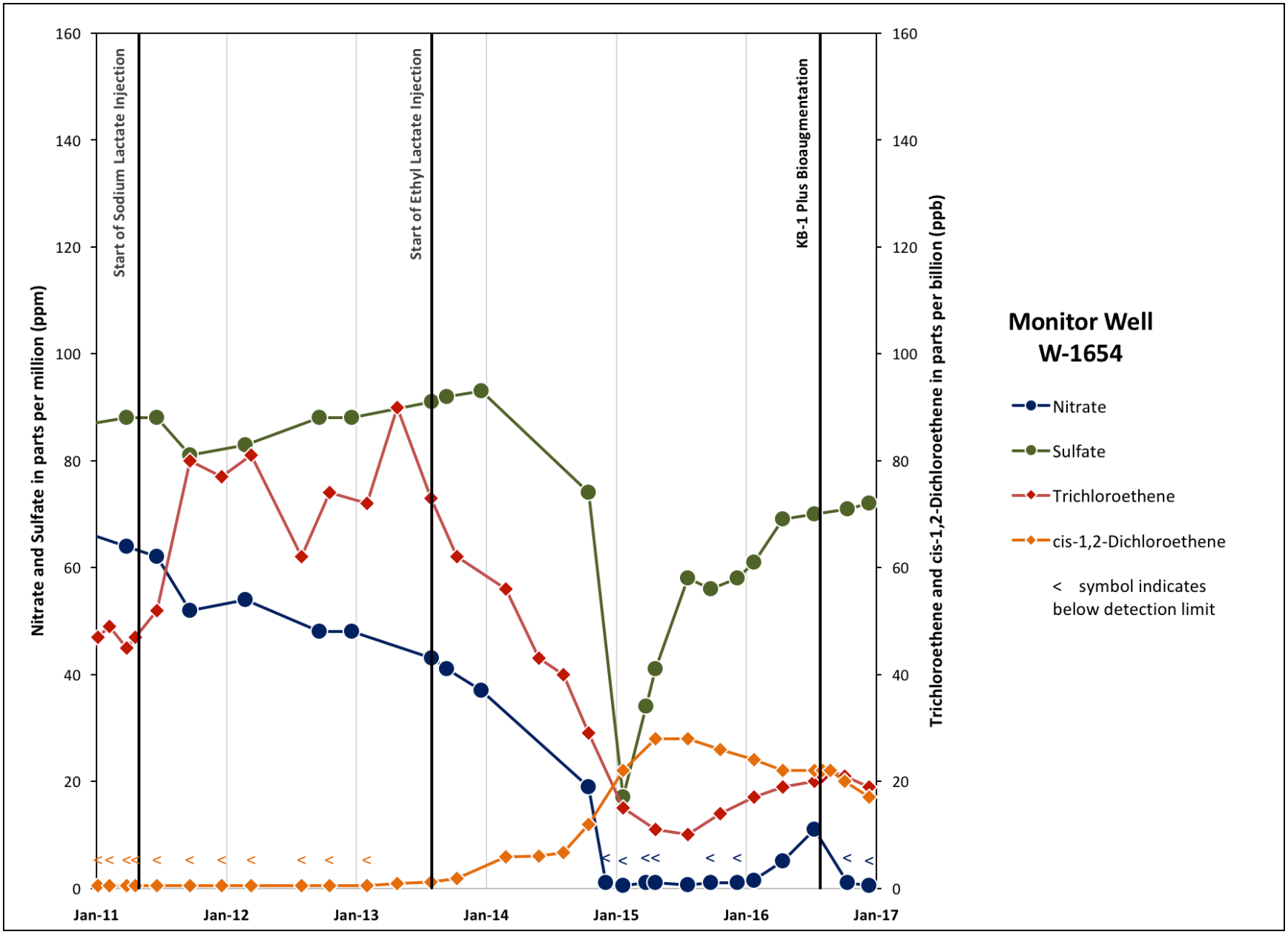

Figure G-3. Concentration trends in monitoring well W-1654.

Appendix H

TFE Eastern Landing Mat Enhanced Source Area Remediation

Appendix H

TFE Eastern Landing Mat Enhanced Source Area Remediation

Summary

This Appendix summarizes the Treatment Facility E (TFE) Eastern Landing Mat (ELM) Enhanced Source Area Remediation (ESAR) treatability test. As the yearly ESAR treatability test appendices to the Livermore Site Annual Report are meant to serve as stand-alone status updates for these tests, all relevant information is included from the previous years (McKereghan et al., 2015). However, performance monitoring data, analyses and interpretations are updated on an annual basis as new information becomes available.

During 2015, ground water and soil vapor were extracted from well W-1903, and ambient air was injected into wells W-1909 and W-2305. Air injected into wells W-1909 and W-2305, and ground water within the wells, were heated using two heating-elements in each well. In December 2015, the operational mode for the system was modified to extract soil vapor from wells W-1903 and W-2305, and ambient air was injected into well W-1909. The injected air and the ground water in well W-1909 were heated using two heating-elements. The soil vapor extraction flow rate from well W-2305 remained significantly lower than the flow rate from well W-1903. In July of 2016, the extraction well-field configuration was changed to extract soil vapor from wells W-1903 and W-1909, and ambient air was injected into well W-2305. Injected air and the ground water in well W-2305 were heated using two heating-elements.

As discussed further in Section 4, the system continued to remove volatile organic compound (VOC) mass at a rate higher than pre-2011 rates. Mass removal rates declined slightly during 2016 as the concentrations in the wells declined.

1. Introduction

Thermally enhanced remediation of lower-permeability source area sediments is one of several technologies identified during the Source Area Cleanup Technology Evaluation (SACTE) that may accelerate the cleanup of Livermore Site source areas, and is one of four technologies being field-tested at the site under the Department of Energy Enhanced Source Area Remediation initiative (see Section 3.2 of the 2016 Annual Report).

The TFE Eastern Landing Mat (TFE-ELM) source area is located at an area formerly used for salvage and storage of reclaimable materials. Source investigations conducted during the late 1980s, 1990s and 2000s, determined that both the unsaturated and saturated zones were impacted by VOCs, primarily trichloroethylene (TCE). Currently, depth to water is approximately 100 feet below ground surface and is influenced by long-

term ground water extraction in the area. The site sedimentary sequence consists of alluvial fan deposits, primarily unconsolidated clay and silt, with minor sand and gravel deposits. The source area vertically extends from the unsaturated zone to the bottom of the first water bearing zone, within Hydrostratigraphic Unit 2 (HSU-2).

Source area control at TFE-ELM began in 1996 with ground water extraction from downgradient well W-1109 (Figure H-1) to capture VOCs emanating from both the low permeability saturated sediments and the unsaturated zone in HSU-2. Source area remediation began in 2004 with dual (soil vapor and ground water) extraction from well W-1903 and soil vapor extraction from shallower wells W-543-001, W-543-003, and W-543-1908 (Figure H-1). From 2004 to 2011, a total of 117 kg of VOCs were removed and treated from the three soil vapor extraction wells. Slightly less than 3 kg of VOCs were removed using dual extraction from well W-1903, and occasionally from well W-2305, during the same period.

In May 2011, before the start of the treatability test, soil vapor concentrations in shallower wells W-543-001, W-543-003 and W-543-1908 were 0.27, 0.43 and 0.73 parts per million by volume (ppmv), respectively. Prior to soil vapor extraction and treatment, VOC concentrations in these wells ranged between 100 to 200 ppmv. The reduction in concentrations is largely due to the effectiveness of soil vapor extraction in the more permeable, unsaturated sediments in the eastern portion of the source area. By contrast, concentrations in the western portion of the source area remained high and the mass removal rates were much lower due the presence of low permeability sediments in the area. Therefore, DOE/LLNL targeted the western portion of the TFE-ELM source area for the thermally enhanced remediation treatability test. The target source area is about 100 feet in diameter centered on the source investigation piezometer SIP-543-101. The remediation wells are W-1903, W-1909 and W-2305 (Figure H-1).

2. Objectives and Overview

The primary objective of the treatability test is to evaluate the additional benefit of thermal heating as a means of reducing clean up time by accelerating contaminant mass transfer from the liquid and adsorbed phases to the vapor phase. The treatability test utilizes the existing ground water and soil vapor treatment systems that are part of the current remedy. A secondary objective is to apply the dynamic well-field operations (DWFO) strategy by changing soil vapor extraction and clean air injection locations to alter the subsurface flow pathways, prevent stagnation zones, and therefore improve mass recovery rates from the subsurface.

Thermally enhanced remediation, for the purposes of the treatability test, is defined as utilizing ambient air temperature as well as using cost-efficient electrical heating elements inside the remediation wells to heat both ground water and injected clean air. Ambient air temperatures in Livermore can be more than 100 degrees Fahrenheit (°F) in summer months, which may boost thermal remediation seasonally. This approach is vastly different than steam injection and electrical resistivity heating which require significantly more energy input and costly infrastructure.

The thermally enhanced remediation treatability test is expected to provide valuable information on the design parameters for future applications of a full-scale system.

3. Design and Implementation

The TFE Eastern Landing Mat treatability test is designed to evaluate thermally enhanced remediation in the saturated and unsaturated zones by injecting heated air and by electrically heating ground water into certain wells, while extracting both soil vapor and ground water from others. The treatability test system consists of the VTFE Eastern Landing Mat soil vapor treatment facility, the TFE East ground water treatment facility, an ambient-air injection blower, and electrical heating elements in remediation wells. In early 2011, TFE Eastern Landing Mat source area wells, W-1903, W-1909 and W-2305, were modified for the treatability test. Well W-1903 is the primary dual extraction well, and wells W-1909 and W-2305 are air injection and heating wells. In addition, well W-2305 can be used for dual extraction and well W-1909 can be used as a soil vapor extraction well. This operational flexibility enables dynamic well-field operation at this source area. Wells W-1909 and W-2305 contain heating elements that are installed both above and below the static water level to facilitate heating of injected air and ground water. All three wells are equipped with thermocouples to monitor subsurface temperatures. Well SIP-543-101, situated at the center of the three wells, serves as the primary performance monitoring well for the test and is equipped with pressure transducers and thermocouples, in both ground water and soil vapor.

Treatability testing began in October 2011 and continued in 2012 through 2016. Between 2011 and 2015, the system has been operated in the primary operational mode of dual extraction from W-1903, and ambient air injection and heating in wells W-1909 and W-2305. Since December of 2015, the extraction well-field configuration has been changed twice to increase the mass removal rate from the source area. In December of 2015, the operational mode for the system was modified to extract soil vapor from wells W-1903 and W-2305, and ambient air was injected into well W-1909. The injected air into well W-1909 and the ground water were heated using two heating-elements. The soil vapor extraction flow rate from well W-2305 remained significantly lower than the flow rate from well W-1903. In July of 2016, the extraction well-field configuration was changed to extract soil vapor from wells W-1903 and W-1909, and ambient air was injected into well W-2305. The injected air into well W-2305 and the ground water were heated using two heating-elements.

The average subsurface soil vapor temperature is 70°F. The injected air is heated up to 100°F in in wells W-1909 and W-2305. The water is heated up to 130°F in W-1909 and up to 110°F in W-2305. These values were determined by the thermal properties of the casing and screen materials next to the heating elements.

The system has been fully operational since 2011, except when taken offline for maintenance and freeze protection.

4. Results and Conclusions

The thermally enhanced remediation system has now been in operation for over five years. During this period, the thermocouples in the dual extraction well W-1903 and the performance monitoring well SIP-543-101 have not measured an increase in temperature. This result is expected since the heat capacitance of the subsurface, especially the saturated zone, is very high and a much-higher energy input is required to increase temperatures in the subsurface. However, several data sets indicate that the thermally enhanced remediation and the DWFO strategy have positively influenced the remediation in the TFE-ELM source area. First, post-implementation VOC concentrations and mass removal rates from dual extraction well W-1903 are consistently higher than those measured prior to the start of the treatability test when the system was operating in an extraction-only configuration without heat. Second, a significant reduction in vapor phase mass removal rates has not occurred, as would be expected due to a short-circuit of ambient clean air from the injection wells to the extraction well. The relatively constant vapor phase mass removal is likely due to heating of the injected air, and potentially due to a new vapor circulation pattern established in the subsurface.

In 2016, VOC mass removal rate from ground water extraction continued to decline due to declining water levels and corresponding lower extraction flow rates. Since October 2011, a total of 0.27 kilograms (kg) of total VOCs were removed from ground water. The majority of the mass was removed from well W-1903 and a small fraction from well W-2305. There was no ground water extraction at well W-1909 during the same period.

In 2016, VOC mass removal changed with each change in the soil vapor extraction wellfield configuration. Figure H-2 shows the total VOC mass removed from soil vapor for each extraction well. Since October 2011, a total of 2.1 kg of total VOCs has been removed by dual extraction well W-1903. A total of 0.04 kg has been removed from well W-1909 during the period it was configured as an extraction well. Mass removal from well W-2305 was minor (0.006 kg) due to the low soil vapor extraction rate.

The system will be operated in its current configuration until a decline of influent concentrations is observed. System performance will be evaluated after each quarter to decide whether to re-configure the injection and extraction wellfield operational status.

5. References

McKereghan, P., C. Noyes, Z. Demir, and M. Dresen (Eds.) (2016), *LLNL Ground Water Project, 2015 Annual Report*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-AR-126020-15).

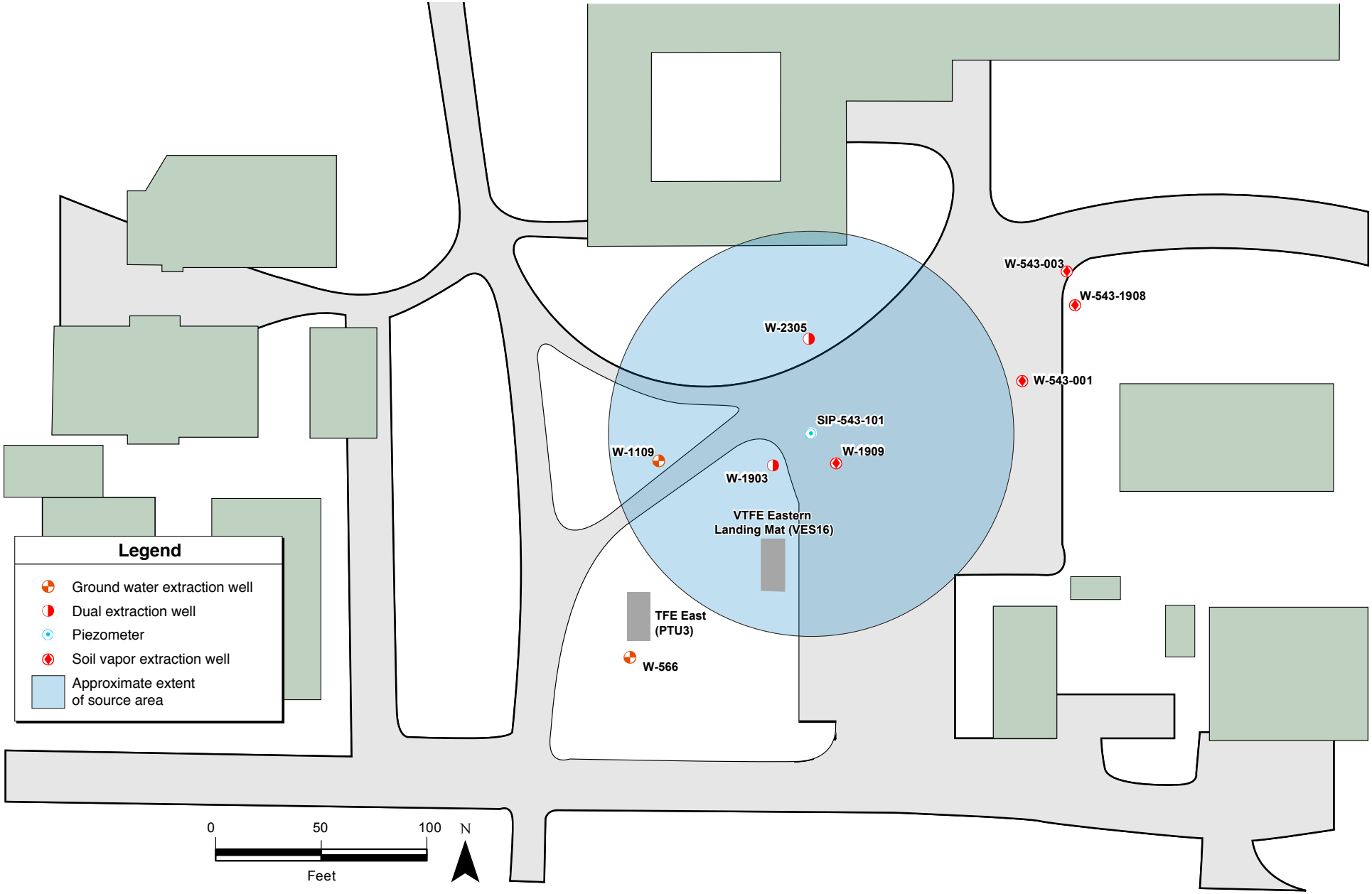

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Figure H-1. Locations of wells and treatment facilities in the TFE Eastern Landing Mat thermally enhanced remediation treatability test area.

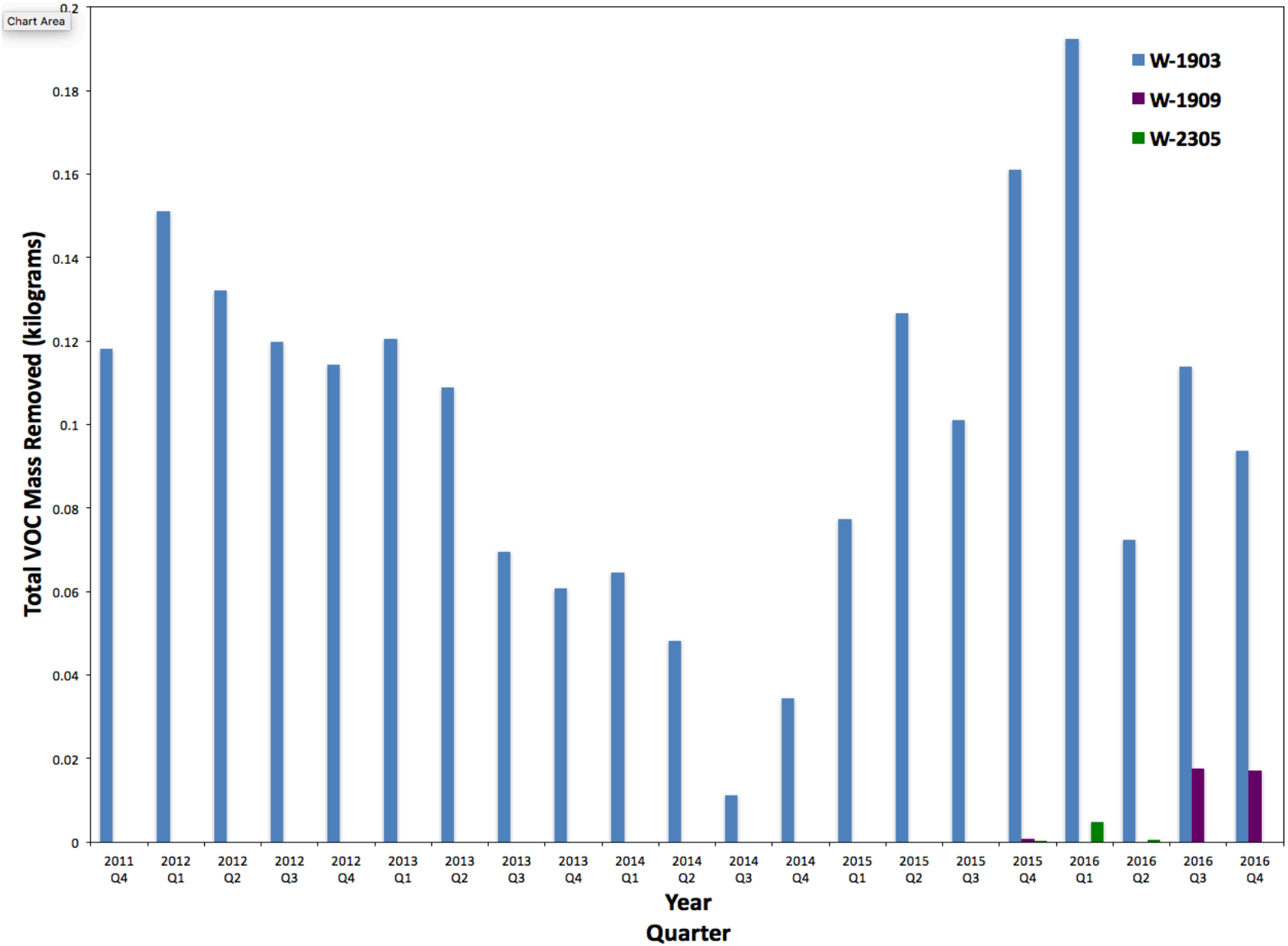


Figure H-2. Quarterly VOC mass removal from soil vapor extraction wells.

Appendix I

TFC Hotspot Enhanced Source Area Remediation

Appendix I

TFC Hotspot Enhanced Source Area Remediation

Summary

This appendix summarizes the Treatment Facility C (TFC) Hotspot Enhanced Source Area Remediation (ESAR) treatability test. As the yearly ESAR treatability test appendices to the Livermore Site Annual Report are meant to serve as stand-alone status updates for these tests, all relevant information is included from the previous years (McKereghan et al., 2016). Performance monitoring data, analyses and interpretations are updated on an annual basis as new information becomes available.

During 2016, post-implementation performance monitoring at the TFC Hotspot source area ESAR treatability test continued, with collection of analytical samples and field parameters at the performance monitor wells (Figure I-1). DOE/LLNL modified the purging methodology of monitor well W-2612 in March 2016 to induce a steeper ground water gradient between the zero-valent iron (ZVI) panels and monitor well W-2612, and presumably reduce the travel time of zero-valent iron (ZVI) impacted ground water to the monitor well.

As discussed further in Section 4, no significant trends attributed to the ZVI emplacement had been observed in the performance monitor wells between late 2014 and early 2016. After changing the purging methodology of well W-2612, analytical sample results and field parameter trends observed at monitor wells W-2612 and W-1212 suggest that either ground water affected by the ZVI panels, or byproducts of the inclusion fluid utilized during the emplacement process, has started to arrive at the performance monitor wells.

1. Introduction

This appendix summarizes the performance-monitoring phase of the ZVI emplacement treatability test that began at the Lawrence Livermore National Laboratory (LLNL) Livermore Site Treatment Facility C (TFC) Hotspot source area in the fall of 2014. The emplacement of a reactive amendment into lower-permeability source area sediments to promote *in situ* destruction of contaminants through abiotic reductive dechlorination is one of several technologies identified during the Source Area Cleanup Technology Evaluation (SACTE) that may accelerate cleanup of Livermore Site source areas. It is one of the technologies being field-tested at the site under the Department of Energy Enhanced Source Area Remediation initiative (see Section 3.2 of the 2016 Annual Report).

DOE/LLNL identified the TFC Hotspot source area during source investigations conducted in the early 1990s. These investigations discovered trichloroethylene (TCE) and other volatile organic compounds (VOCs) in ground water, most likely due to

electronic fabrication activities at Building 171 by the U.S. Navy during the 1940s. TCE concentrations up to 2,800 parts per billion (ppb) were present in the first saturated hydrostratographic unit 1B (HSU-1B) at relatively shallow depths of 50 to 75 feet below ground surface (ft-bgs). The TFC Hotspot VOC source area is dominated by fine-grained sediments consisting of silty sand to sandy silt and clayey silt with occasional coarser-grained units. The ground water yield from wells in this source area is low to very low, less than 0.5 gallons per minute in the zone of interest. The ground water table at the time of treatability test implementation in 2014 was 62 ft-bgs.

While the entire source area is determined to cover approximately 120 feet by 170 feet laterally, the area with elevated TCE concentrations in ground water (i.e., greater than 100 ppb) is reasonably small, approximately 30 feet in diameter and extending to a depth of about 75 ft-bgs. This is the portion of the source area that was targeted for treatment during the treatability test.

DOE/LLNL initiated hydraulic containment using ground water extraction and treatment at the TFC Southeast ground water treatment facility in 1997. Prior to the ESAR test, previous activities removed approximately 18 kilograms of VOCs, and TCE declined from 2,800 ppb in the 1990s to approximately 240 ppb in September 2014. Prior to ZVI emplacement, TCE concentrations in TFC Hotspot ground water wells ranged from about 58 to 240 ppb. In addition, 1,1-dichloroethene and 1,2-dichloroethane were above their maximum contaminant levels in ground water. Although low concentrations (below 6 ppb) of cis-1,2-dichloroethene (cis-1,2 DCE) were present in the area in one well, W-2612 (Figure I-1), vinyl chloride was not detected (less than 0.5 ppb).

Throughout the test, VOC-impacted ground water outside the study area continued to be hydraulically contained using TFC Southeast ground water extraction and treatment infrastructure. Contaminants known to occur in the vadose zone may require soil vapor extraction remediation once the treatability test has been completed.

2. Objectives and Overview

The primary objective of the treatability test is to assess whether VOCs can be effectively dechlorinated in the low permeability, silt- and clay-rich TFC Hotspot source area sediments by emplacing ZVI within dual-azimuth vertical inclusions (see Section 3) and creating chemically reductive zones *in situ*.

Dechlorination of VOCs, such as TCE, may be achieved through i*n situ* chemical reduction (ISCR) using ZVI. The primary degradation pathway of chlorinated ethenes in the presence of the reduced metal is β-elimination. During β-elimination, chlorines on adjacent carbon (C) atoms are removed, forming a third C-C bond. TCE is thereby converted to chloroacetylene, which is further converted to acetylene and ultimately ethene and ethane, benign end products.

To assess the test's primary objective, the treatability test was designed to include the following steps:

- Installing expansion casing in nine emplacement boreholes within the treatment area;

- Installing an interconnected grid network of controlled vertical inclusions between 55 and 75 ft-bgs, and emplacing 21 tons of ZVI;
- Monitoring vertical inclusion emplacement in real time during the ZVI injections by deploying resistivity strings;
- Conducting pre- and post-implementation ground water monitoring of TFC Hotspot wells for VOCs and dechlorination daughter products, metals and general minerals;
- Conducting pre- and post-implementation hydraulic testing of TFC Hotspot wells; and
- Video logging of TFC Hotspot wells to document pre-and post-implementation conditions.

3. Design and Implementation

GeoSierra Environmental (GeoSierra), Inc. of Medford, NJ performed the implementation phase of the treatability test by utilizing its patented controlled vertical inclusion process (VIP) for the injection of ZVI. Figure I-1 shows the location of the emplacement boreholes and resistivity strings installed during the treatability test. The primary benefit of the VIP emplacement technique is that the azimuth (or orientation) of the inclusions (granular ZVI at this location) can be controlled and directed by manipulating pore pressure in the subsurface through the drilling of nearby pressure relief boreholes. The net effect is to coalesce the injected inclusions with that emplaced from adjacent injection boreholes, thereby creating an interconnected network of vertical panels or walls of granular, permeable ZVI throughout the treatment area. The ZVI is emplaced into the subsurface through injection as a highly viscous inclusion fluid/proppant mixture. The inclusion fluid consists of a cross-linked guar gum gel that includes enzymes that break down the gel starches into sugars within about an hour after injection. Emplacement of a reactive amendment in the vertical plane dramatically increases the likelihood that source area ground water containing VOCs travelling laterally will come into direct contact with the amendment.

GeoSierra installed the VIP ZVI emplacement system over an area approximately 45-feet long and 45-feet wide (Figure I-1), between approximately 55 to 75 ft-bgs. GeoSierra constructed the VIP ZVI emplacement as one continuous grid system, with the upper vertical panels of ZVI oriented perpendicular to the lower panels. Well-head pressure and electrical resistance tomography were monitored to track installation of the panels. Construction of the VIP ZVI emplacement system commenced on September 15, 2014, and was completed on September 30, 2014. The ZVI multi-azimuth grid installed in the TFC Hotspot source area included the following materials and processes:

- Nine emplacement boreholes with two 5-foot expansion casings (i.e., upper and lower) installed to a depth of approximately 75 ft-bgs using the mud-rotary drilling technique (GeoSierra, 2014);
- Seven resistivity strings with five receivers each, for a total of 35 receivers, installed approximately 75 ft-bgs using a direct-push drilling rig;

- Injection of 21 tons of granular ZVI, about 33% in the upper zone and 67% in the lower zone; and
- Application of a total of approximately 5,820 gallons of inclusion fluid during the emplacement process.

4. Results and Discussion

Video-logging and re-development of area wells following ZVI emplacement indicate that there were no adverse impacts to existing wells as a result of the implementation process. In addition, DOE/LLNL conducted pre-implementation and post-implementation hydraulic tests of area wells, including extraction well W-2201, and monitor wells W-1212, W-2611, and W-2612. Analyses of the test results indicate that there are no significant changes in hydraulic conductivity or other hydraulic parameters attributable to the ZVI emplacement process.

Post-implementation sampling for VOC analysis, dechlorination daughter products, metals, and general minerals began in November 2014 and continued in 2016. Ground water field parameter measurements, including dissolved oxygen, specific conductance, oxidation-reduction potential, pH, and temperature, also continued in 2016.

In 2015, no significant trends attributed to the ZVI emplacement were observed in the performance monitor wells. Possible degradation daughter products from the dechlorination of TCE by ZVI were absent in the study area, except for low concentrations of cis-1,2-DCE present in monitor well W-2612 (8.2 ppb, February 2015). However, low levels of cis-1,2-DCE have been observed in the well since April 2012 (5.6 ppb), predating the beginning of the test by more than two years. Similarly, there were no significant trends in field parameter measurement data. The lack of change observed during the first year following emplacement suggests that any ground water in contact with ZVI had yet to arrive at the performance monitor wells. This is likely due to the low-permeability, fine-grained nature of the TFC Hotspot source area sediments and the resultant slow ground water flow velocities.

At the beginning of 2016, no significant trends attributed to the ZVI emplacement had been observed in the performance monitor wells. In an attempt to reduce the time frame necessary to obtain ZVI-impacted ground water samples by inducing a steeper ground water gradient between the ZVI panels and performance monitor well W-2612, DOE/LLNL modified the purging methodology of monitor well W-2612 from a low-volume purge method to a multiple-casing volume purge method in March 2016.[1] DOE/LLNL deployed an automated solar-powered purging system (Figure 1-2) at monitor well W-2612 to maintain a lower water level in the well and implement the multiple casing volume purge on a continuous basis.

Trends in analytical results from two performance monitor wells, W-2612 and W-1212, were markedly different following this change, though results from the other

[1] McKereghan, P., and P. Wong (2016), *Proposed Sampling Method Change to Zero-Valent Iron Emplacement Treatability Test at Treatment Facility C Hotspot*, Letter to A. Bain, EPA, N. King, RWQCB-SFB, and J. Soto, DTSC, dated February 12, 2016.

wells in the treatment area remain unchanged. For example, changes in methane concentrations are shown in Figure I-3. Similarly, dissolved organic carbon at monitor well W-2612 increased from 2.7 parts per million (ppm) (February 2015) to 12 ppm (August 2016), and chloride increased from 48 ppm (November 2014) to 130 ppm (April 2016) (Figure I-4). The increases in dissolved organic carbon and chloride at W-2612 most likely represent byproducts of the inclusion fluid utilized during the emplacement process, which contained cross-linked guar gum gel (a thickening agent and subsequent carbon source upon break down) and salt (for monitoring the emplacement process with resistivity strings).

In addition, reducing conditions are also observed at monitor wells W-2612 and W-1212. Nitrate levels significantly decreased at these wells. Sulfate levels decreased at monitor well W-2612, while sulfate at monitor well W-1212 remained unchanged (Figure I-5). Cis-1,2-DCE increased slightly at monitor well W-2612 (Figure 1-5), possibly due to biotic degradation of TCE, as evidenced by concurrent increases in methane and dissolved organic carbon (Figure I-3 and I-4). Further evidence of reducing conditions in the treatment zone include a decrease of both chromium concentrations and dissolved oxygen levels. Increases in barium and boron were also observed.

In summary, analytical results of ground water samples from monitor wells within the TFC Hotspot treatment zone indicate that ground water affected by the ZVI panels or byproducts of the inclusion fluid utilized during the emplacement process are arriving at the performance monitor wells. Changing the purging methodology at monitor well W-2612 likely increased the ground water transport velocity and decreased the time needed to observe these results.

In 2017, DOE/LLNL plans to continue analytical sampling and ground water field parameter measurements at the performance monitor wells. The sampling frequency will be based on responses to changing conditions in the field. Further analysis and interpretation of post-implementation performance monitoring data will be presented in 2017 Remedial Project Manager meetings and in subsequent status reports.

5. References

GeoSierra Environmental, Inc. (2014), *Final Completion Report, Vertical Inclusion Propagation ZVI Emplacement Project, TFC-HS Area, Lawrence Livermore National Laboratory, Livermore, California,* GeoSierra Environmental, Inc., Medford NJ, December 19, 2014.

McKereghan, P., C. Noyes, Z. Demir, and M. Dresen (Eds.) (2016), *LLNL Ground Water Project, 2015 Annual Report*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-AR-126020-15).

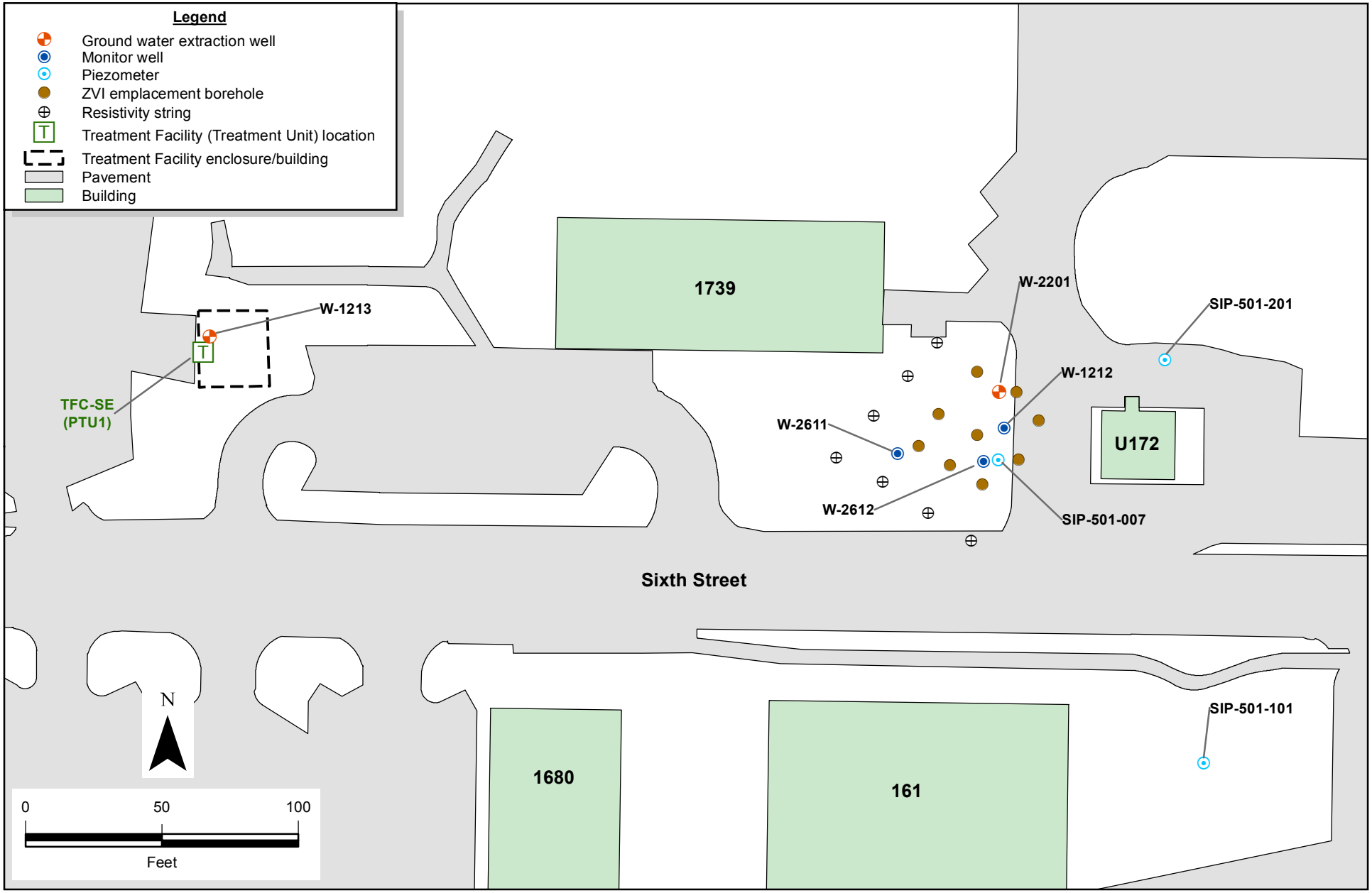


Figure I-1. TFC Hotspot Enhanced Source Area Remediation treatability test site and performance monitoring well locations.

Figure I-2. Automated solar-powered purging system deployed at performance monitor well W-2612.

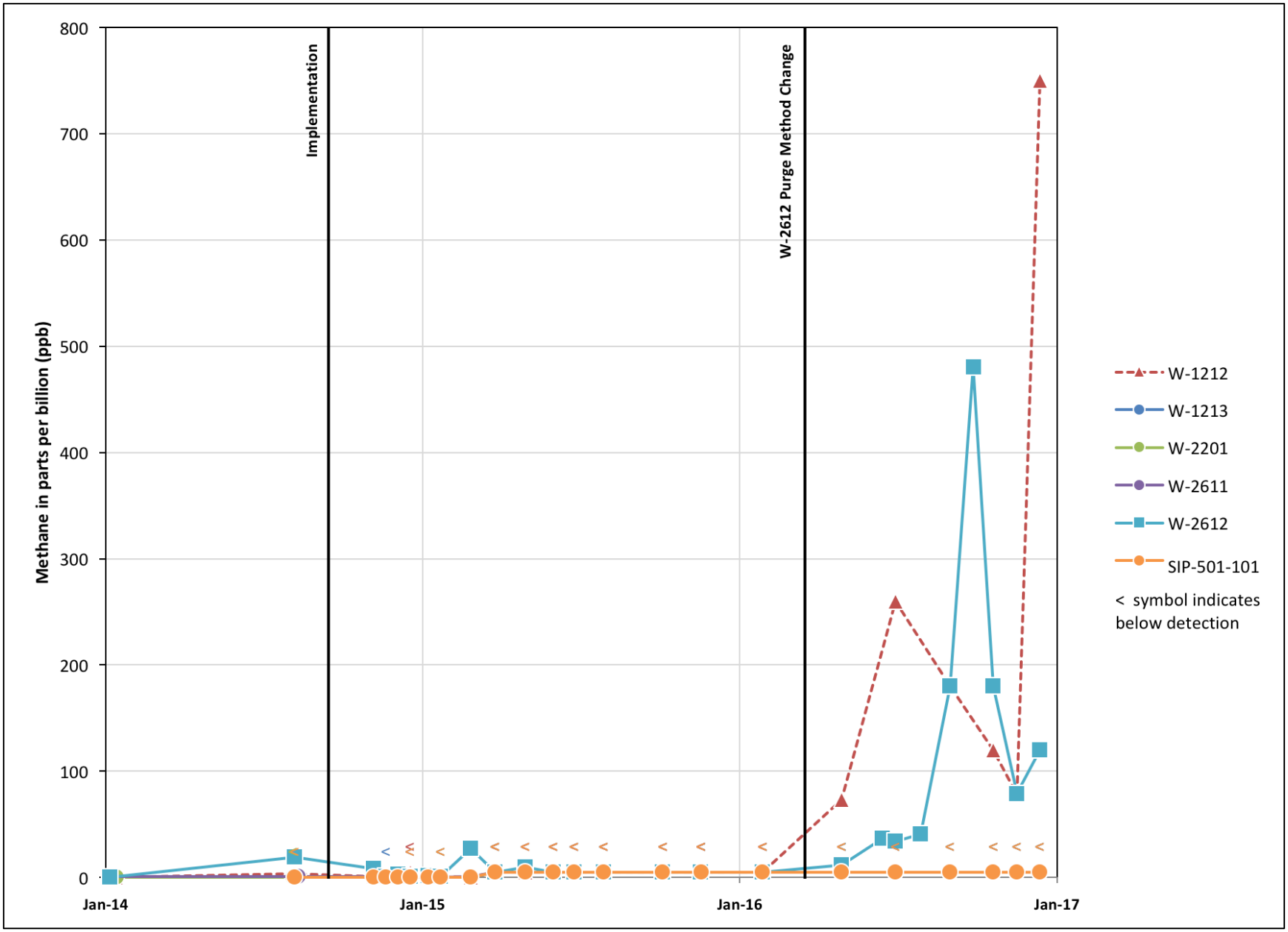


Figure I-3. Methane concentration trends at TFC Hotspot performance monitor wells.

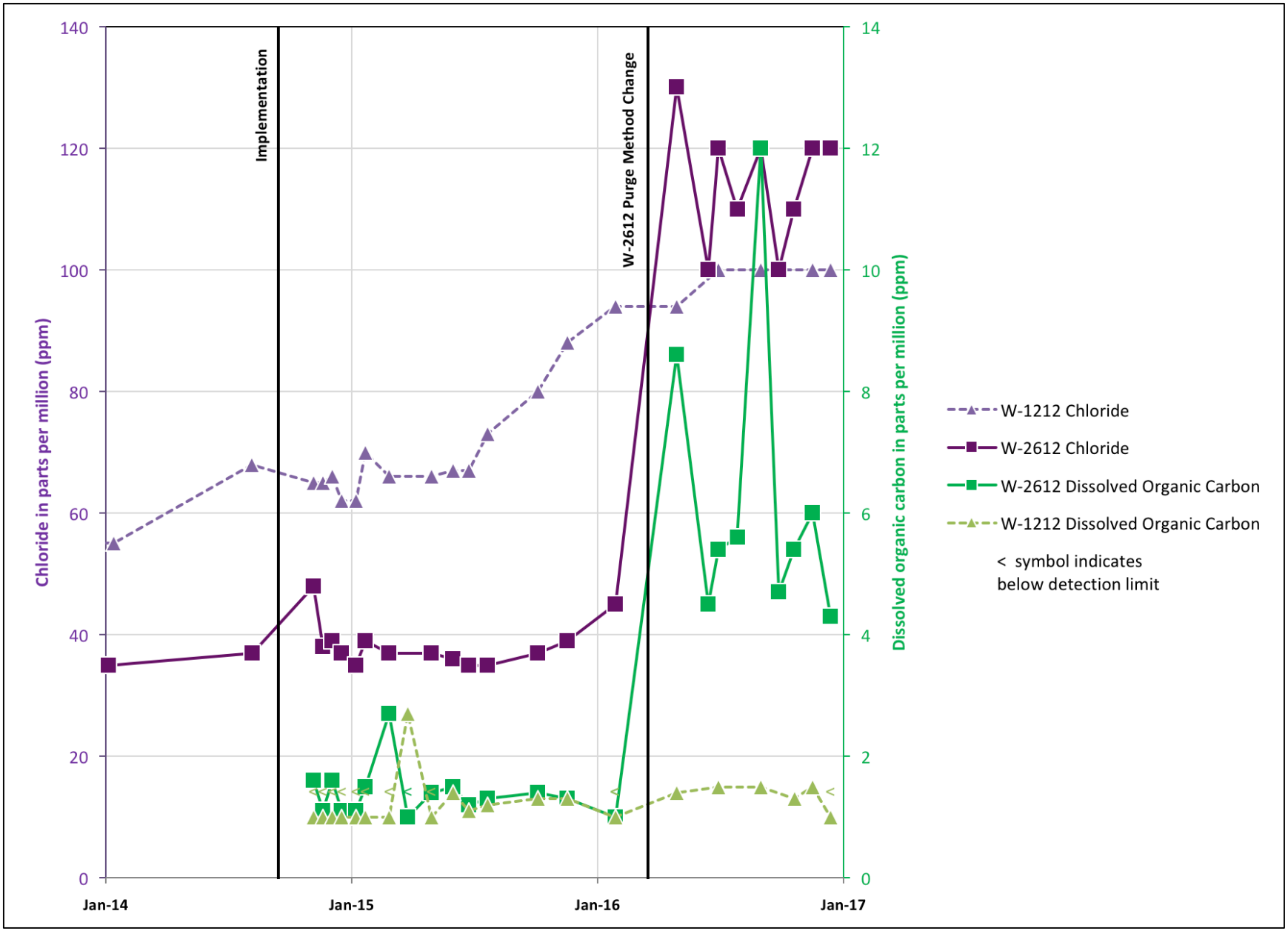


Figure I-4. Chloride and Dissolved Organic Carbon concentration trends at TFC Hotspot performance monitor wells W-1212 and W-2612.

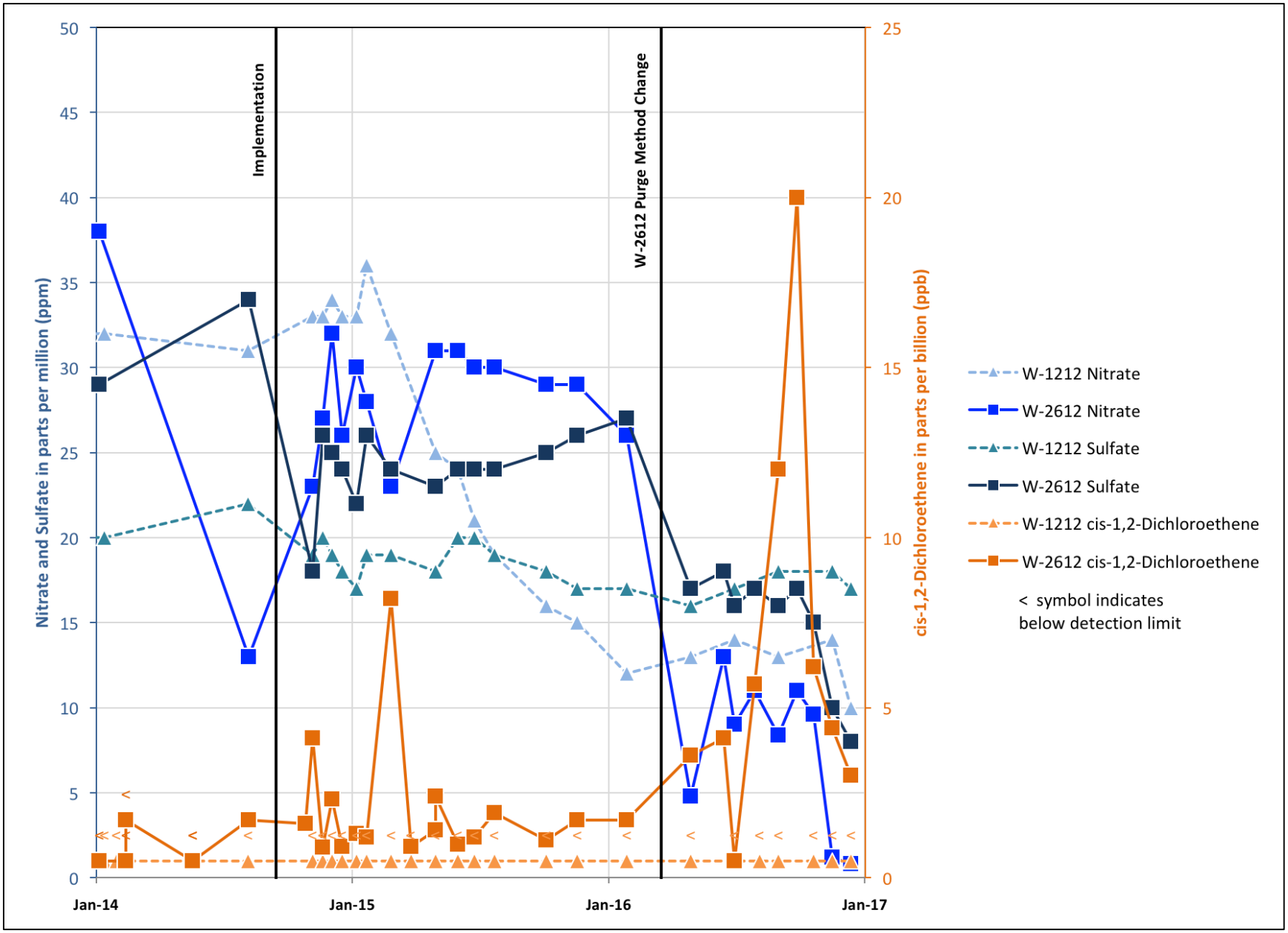


Figure I-5. Nitrate, sulfate, and cis-1,2-Dichloroethene concentration trends at TFC Hotspot performance monitor wells W-1212 and W-2612.

Attachments A, B, and C

(see attached CD)

Attachments

Attachment A—LLNL Livermore Site well location map (see attached CD)

Attachment B—2016 ground water monitoring analytical results (see attached CD)

Attachment C—Direct-push soil and soil vapor sampling analytical results (see attached CD)

Attachment A

LLNL Livermore Site well location map

LLNL Livermore Site Well Location Map

- Ground water extraction well
- Dual extraction well
- Injection well
- Piezometer
- Monitor well
- Anode well
- Multiport system
- Guard well
- Water supply well (active)
- Soil vapor extraction well
- Soil vapor injection well
- Soil vapor monitor well
- Includes abandoned or decommissioned well

Hydrostratigraphic unit (HSU) in which the well is screened:

- 1A
- 1B
- 2
- 3A
- 3B
- 4
- 5
- 6
- 7
- Multiple HSUs

Light gray well label indicates well is abandoned or decommissioned.
Dark gray well label indicates HSU is unknown/insufficient data.

- Treatment facility
- Offsite road
- LLNL Site Boundary
- Treatment facility area (dashed offsite)
- Stream (ephemeral)
- Stream (perennial)
- Building/structure
- Lake Haussmann
- A-6 Parking lot designation

N

1:2,400

1 inch on the map = 200 feet on the ground when printed on a sheet 55 by 42 inches

0 200 400 800

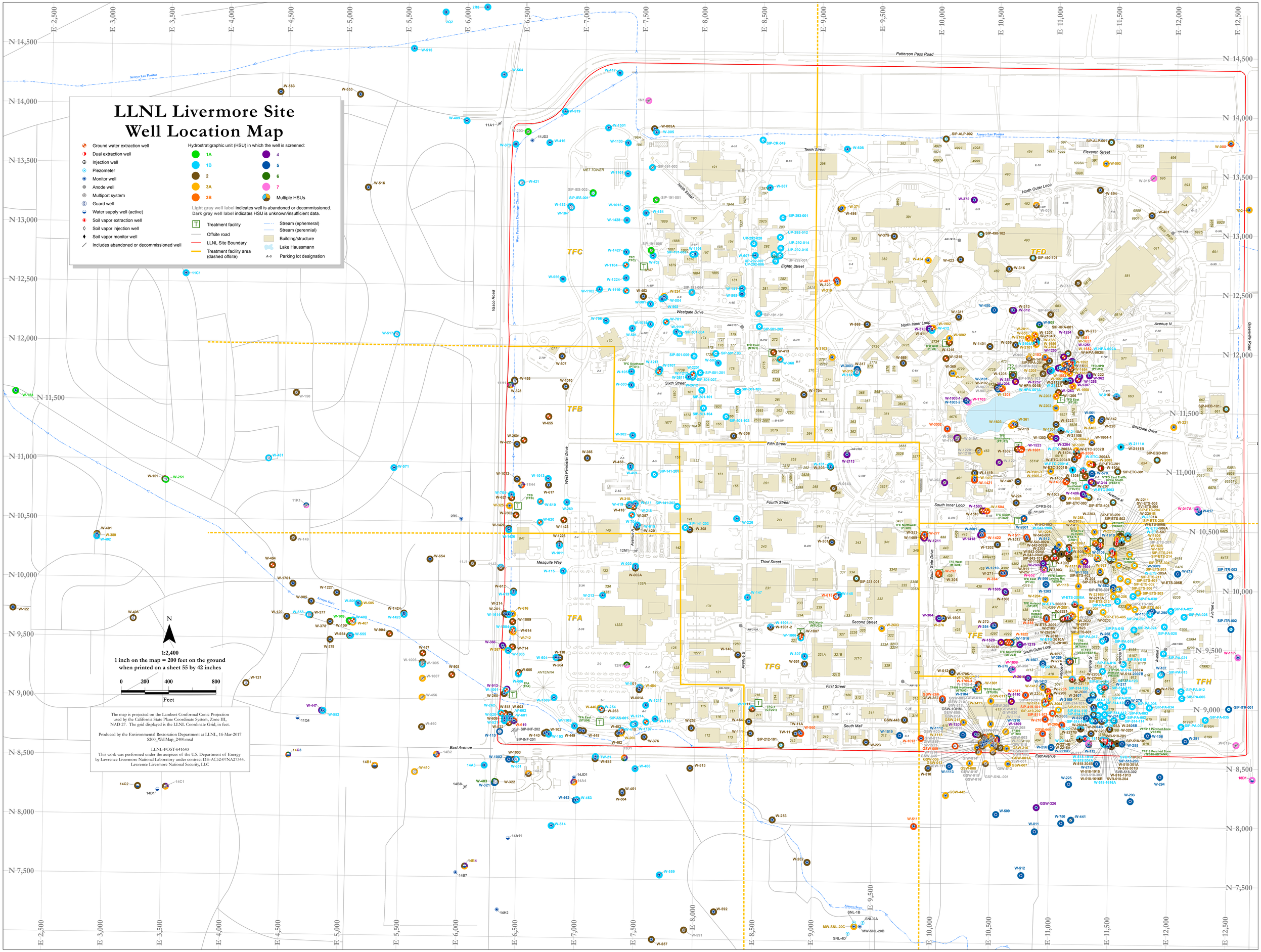
Feet

The map is projected on the Lambert Conformal Conic Projection used by the California State Plane Coordinate System, Zone III, NAD 27. The grid displayed is the LLNL Coordinate Grid, in feet.

Produced by the Environmental Restoration Department at LLNL, 16-Mar-2017
S200_WellMap_2400.mxd

LLNL-POST-641643

This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344.
Lawrence Livermore National Security, LLC



Attachment B

2016 ground water monitoring analytical results

Attachment B Table 1. 2016 direct-push drilling survey analytical results for VOCs in ground water.

Year	Type	Well Name	Date	Depth (ft)	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloro ethene (µg/L)	Trichloro ethene (µg/L)	Trichloro fluoromethane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	CP	B-3253	9/13/16	85.8	<0.5	<0.5	0.65	20	<0.5	<1	30	12	0.79	22	1,200 D	1.2	<0.5	<0.5
2016	CP	B-3253	9/27/16	85.3	<0.5	<0.5	<0.5	1.4	<0.5	<1	7.4	9.9	<0.5	13	460 D	<0.5	<0.5	<0.5
2016	CP	B-3257	9/29/16	84.7	<0.5	<0.5	<0.5	11	3	<1	18	11	<0.5	9.2	1,400 D	1.2	<0.5	<0.5
2016	CP	B-3258	9/28/16	99	<0.5	<0.5	<0.5	<0.5	90 D	<1	1.1	3.2	<0.5	11	210 D	<0.5	<0.5	<0.5

Attachment B Table 2. 2016 direct-push drilling survey analytical results for VOCs in soil.

Year	Well Name	Type	Date	Depth (ft)	1,1,1-Trichloroethane (mg/kg)	1,1,2-Trichloroethane (mg/kg)	1,1-Dichloroethane (mg/kg)	1,1-Dichloroethene (mg/kg)	1,2-Dichloroethane (mg/kg)	1,2-Dichloroethene (total) (mg/kg)	Carbon tetrachloride (mg/kg)	Chloroform (mg/kg)	Freon 113 (mg/kg)	Tetrachloro ethene (mg/kg)	Trichloro ethene (mg/kg)	Trichloro fluoromethane (mg/kg)	cis-1,2-Dichloroethene (mg/kg)	trans-1,2-Dichloroethene (mg/kg)
2016	B-3220	CP	5/3/16	16	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00056	<0.00043	<0.00087	<0.00043	<0.00043	0.0024	<0.00043	<0.00043	<0.00043
2016	B-3220	CP	5/3/16	26	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00057	<0.00045	<0.0009	<0.00045	<0.00045	0.0019	<0.00045	<0.00045	<0.00045
2016	B-3220	CP	5/3/16	34	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00072 D	<0.00056 D	<0.0011 D	<0.00056 D	<0.00056 D	0.0016 D	<0.00056 D	<0.00056 D	<0.00056 D
2016	B-3220	CP	5/3/16	48	<0.00036	<0.00036	<0.00036	<0.00036	<0.00036	<0.00046	<0.00036	<0.00072	<0.00036	<0.00036	0.1	<0.00036	<0.00036	<0.00036
2016	B-3220	CP	5/3/16	56	<0.00038	<0.00038	<0.00038	<0.00038	<0.00038	<0.00049	<0.00038	<0.00077	<0.00038	<0.00038	0.005	<0.00038	<0.00038	<0.00038
2016	B-3220	CP	5/3/16	68	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00053	<0.00041	<0.00082	<0.00041	0.00064	0.021	<0.00041	<0.00041	<0.00041
2016	B-3220	CP	5/3/16	86	<0.00039	<0.00039	<0.00039	0.00085	<0.00039	<0.00051	<0.00039	<0.00079	<0.00039	<0.00039	0.0017	<0.00039	<0.00039	<0.00039
2016	B-3220	CP	5/3/16	109	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00054	<0.00042	<0.00084	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042
2016	B-3221	CP	5/5/16	15	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00057	<0.00045	<0.0009	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
2016	B-3221	CP	5/5/16	32	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00053	<0.00041	<0.00083	<0.00041	<0.00041	0.0023	<0.00041	<0.00041	<0.00041
2016	B-3221	CP	5/5/16	48	<0.00038	<0.00038	<0.00038	<0.00038	<0.00038	<0.00049	<0.00038	<0.00077	<0.00038	<0.00038	0.0027	<0.00038	<0.00038	<0.00038
2016	B-3221	CP	5/5/16	56	<0.00038	<0.00038	<0.00038	<0.00038	<0.00038	<0.00048	<0.00038	<0.00076	<0.00038	<0.00038	0.0011	<0.00038	<0.00038	<0.00038
2016	B-3221	CP	5/5/16 DUP	56	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.0016	<0.0005	<0.0005	<0.0005
2016	B-3221	CP	5/5/16	68	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00054	<0.00042	<0.00084	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042
2016	B-3221	CP	5/5/16	74	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.00051	<0.0004	<0.0008	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
2016	B-3221	CP	5/5/16	84	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00056	<0.00043	<0.00087	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043
2016	B-3221	CP	5/5/16	89	<0.00056 D	<0.00056 D	<0.00056 D	0.0042 D	<0.00056 D	<0.00072 D	<0.00056 D	<0.0011 D	<0.00056 D	0.0039 D	0.0075 D	<0.00056 D	<0.00056 D	<0.00056 D
2016	B-3221	CP	5/5/16	94	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00055	<0.00043	<0.00085	<0.00043	<0.00043	0.0017	<0.00043	<0.00043	<0.00043
2016	B-3222	CP	5/9/16	28	<0.00076 D	<0.00076 D	<0.00076 D	0.0012 D	<0.00076 D	<0.00098 D	<0.00076 D	<0.0015 D	<0.00076 D	<0.00076 D	0.001 D	<0.00076 D	<0.00076 D	<0.00076 D
2016	B-3222	CP	5/9/16	32.5	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00089 D	<0.00069 D	<0.0014 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D
2016	B-3222	CP	5/9/16	38	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00087 D	<0.00068 D	<0.0014 D	<0.00068 D	<0.00068 D	0.0034 D	<0.00068 D	<0.00068 D	<0.00068 D
2016	B-3222	CP	5/9/16	50	<0.0012 D	<0.0012 D	<0.0012 D	<0.0012 D	<0.0012 D	<0.0016 D	<0.0012 D	<0.0025 D	<0.0012 D	<0.0012 D	0.0085 D	<0.0012 D	<0.0012 D	<0.0012 D
2016	B-3222	CP	5/9/16	62	<0.00035	<0.00035	<0.00035	<0.00035	<0.00035	<0.00045	<0.00035	<0.0007	<0.00035	<0.00035	0.00039	<0.00035	<0.00035	<0.00035
2016	B-3222	CP	5/9/16 DUP	62	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0016 D	<0.0013 D	<0.0026 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D
2016	B-3222	CP	5/9/16	80	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.00077	<0.0005	<0.0005	<0.0005
2016	B-3222	CP	5/9/16	103.5	<0.00033	<0.00033	<0.00033	<0.00033	<0.00033	<0.00042	<0.00033	<0.00065	<0.00033	<0.00033	<0.00033	<0.00033	<0.00033	<0.00033
2016	B-3222	CP	5/9/16	112	<0.00064 D	<0.00064 D	<0.00064 D	0.0032 D	<0.00064 D	<0.00081 D	<0.00064 D	<0.0013 D	<0.00064 D	<0.00064 D	<0.00064 D	<0.00064 D	<0.00064 D	<0.00064 D
2016	B-3223	CP	5/10/16	26	<0.00089 D	<0.00089 D	<0.00089 D	<0.00089 D	<0.00089 D	0.0036 D	<0.00089 D	<0.0018 D	<0.00089 D	<0.00089 D	0.038 D	<0.00089 D	0.0036 D	<0.00089 D
2016	B-3223	CP	5/10/16	39.5	<0.00067 D	<0.00067 D	<0.00067 D	<0.00067 D	<0.00067 D	0.0047 D	<0.00067 D	<0.0013 D	0.0013 D	<0.00067 D	0.096 D	<0.00067 D	0.0047 D	<0.00067 D
2016	B-3223	CP	5/10/16 DUP	39.5	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	0.0052 D	<0.0005 D	<0.001 D	0.0019 D	<0.0005 D	0.11 D	<0.0005 D	0.0052 D	<0.0005 D
2016	B-3223	CP	5/10/16	52	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	0.00061	<0.00044	<0.00088	<0.00044	0.00072	0.025	<0.00044	0.00061	<0.00044
2016	B-3223	CP	5/10/16	58.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.0017	<0.0005	<0.0005	<0.0005
2016	B-3223	CP	5/10/16	74	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00052	<0.00041	<0.00082	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041
2016	B-3223	CP	5/10/16	82	<0.00088 D	<0.00088 D	<0.00088 D	0.013 D	<0.00088 D	<0.0011 D	<0.00088 D	<0.0018 D	<0.00088 D	0.0095 D	0.005 D	<0.00088 D	<0.00088 D	<0.00088 D
2016	B-3223	CP	5/10/16	104	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3223	CP	5/10/16	108	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00052	<0.00041	<0.00082	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041
2016	B-3224	CP	5/11/16	19	<0.00078 D	<0.00078 D	<0.00078 D	<0.00078 D	<0.00078 D	<0.001 D	<0.00078 D	<0.0016 D	<0.00078 D	<0.00078 D	0.003 D	<0.00078 D	<0.00078 D	<0.00078 D
2016	B-3224	CP	5/11/16	28	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	0.0014	<0.00044	<0.00089	0.0093	<0.00044	0.0038	<0.00044	0.0014	<0.00044
2016	B-3224	CP	5/11/16	42	<0.00087 D	<0.00087 D	<0.00087 D	<0.00087 D	<0.00087 D	0.0013 D	<0.00087 D	<0.0017 D	<0.00087 D	0.0055 D	0.0075 D	<0.00087 D	0.0013 D	<0.00087 D
2016	B-3224	CP	5/11/16 DUP	42	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	0.00083	<0.00039	<0.00079	<0.00039	<0.00039	0.0039	<0.00039	0.00083	<0.00039
2016	B-3224	CP	5/11/16	48	<0.00039	<0.00039	0.0018	<0.00039	<0.00039	0.068	<0.00039	<0.00078	0.0013	0.015	0.036 IJ	<0.00039	0.068	<0.00039
2016	B-3224	CP	5/11/16	51.5	<0.00033	<0.00033	0.0022	0.0015	<0.00033	0.093	<0.00033	<0.00066	<0.00033	0.0096	0.023	<0.00033	0.091	0.0015
2016	B-3224	CP	5/11/16	58.5	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	0.0025 D	<0.00073 D	<0.0015 D	<0.00073 D	<0.00073 D	0.0008 D	<0.00073 D	0.0025 D	<0.00073 D
2016	B-3224	CP	5/11/16	68	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0014 D	<0.0011 D	<0.0022 D	<0.0011 D	<0.0011 D	0.0014 D	<0.0011 D	<0.0011 D	<0.0011 D
2016	B-3224	CP	5/11/16	86	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	0.0039	<0.00039	<0.00079	<0.00039	0.001	0.0049 IJ	<0.00039	0.0039	<0.00039
2016	B-3225	CP	5/17/16	19.5	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00086 D	<0.00068 D	<0.0014 D	<0.00068 D	<0.00068 D	0.055 D	<0.00068 D	<0.00068 D	<0.00068 D
2016	B-3225	CP	5/17/16	28	<0.00037	<0.00037	<0.00037	<0.00037	<0.00037	<0.00047	<0.00037	<0.00074	<0.00037	<0.00037	0.066	<0.00037	<0.00037	<0.00037
2016	B-3225	CP	5/17/16	42	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0014 D	<0.0011 D	<0.0022 D	<0.0011 D	<0.0011 D	0.33 D	<0.0011 D	<0.0011 D	<0.0011 D
2016	B-3225	CP	5/17/16	57	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00094 D	<0.00073 D	<0.0015 D	<0.00073 D	<0.00073 D	0.061 D	<0.00073 D	<0.00073 D	<0.00073 D
2016	B-3225	CP	5/17/16	76	<0.00064 D	<0.00064 D	<0.00064 D	<0.00064 D	<0.00064 D	<0.00082 D	<0.00064 D	<0.0013 D	<0.00064 D	<0.00064 D	0.048 D	<0.00064 D	<0.00064 D	<0.00064 D
2016	B-3225	CP	5/17/16	98	<0.00035	<0.00035	<0.00035	0.0012	<0.00035	<0.00045	<0.00035	<0.0007	<0.00035	<0.00035	0.044	<0.00035	<0.00035	<0.00035
2016	B-3225	CP	5/17/16	103	<0.00057 D	<0.00057 D	<0.00057 D	<0.00057 D	<0.00057 D	<0.00073 D	<0.00057 D	<0.0011 D	<0.00057 D	<0.00057 D	0.011 D	<0.00057 D	<0.00057 D	<0.00057 D
2016	B-3225	CP	5/17/16 DUP	103	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00071 D	<0.00056 D	<0.0011 D	<0.00056 D	<0.00056 D	0.0047 D	<0.00056 D	<0.00056 D	<0.00056 D

Attachment B Table 2. 2016 direct-push drilling survey analytical results for VOCs in soil.

Year	Well Name	Type	Date	Depth (ft)	1,1,1-Trichloroethane (mg/kg)	1,1,2-Trichloroethane (mg/kg)	1,1-Dichloroethane (mg/kg)	1,1-Dichloroethene (mg/kg)	1,2-Dichloroethane (mg/kg)	1,2-Dichloroethene (total) (mg/kg)	Carbon tetrachloride (mg/kg)	Chloroform (mg/kg)	Freon 113 (mg/kg)	Tetrachloroethene (mg/kg)	Trichloroethene (mg/kg)	Trichlorofluoromethane (mg/kg)	cis-1,2-Dichloroethene (mg/kg)	trans-1,2-Dichloroethene (mg/kg)
2016	B-3225	CP	5/17/16	111	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.0015	<0.0005	<0.0005	<0.0005
2016	B-3226	CP	5/25/16	7	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.002	<0.0005	<0.0005	<0.0005
2016	B-3226	CP	5/25/16	14	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00095 D	<0.00074 D	<0.0015 D	<0.00074 D	<0.00074 D	0.00075 D	<0.00074 D	<0.00074 D	<0.00074 D
2016	B-3226	CP	5/25/16	24	<0.00064 D	<0.00064 D	<0.00064 D	<0.00064 D	<0.00064 D	<0.00082 D	<0.00064 D	<0.0013 D	<0.00064 D	<0.00064 D	0.0038 D	<0.00064 D	<0.00064 D	<0.00064 D
2016	B-3226	CP	5/25/16	40	<0.00032	<0.00032	<0.00032	<0.00032	<0.00032	<0.00041	<0.00032	<0.00064	<0.00032	<0.00032	<0.00032	<0.00032	<0.00032	<0.00032
2016	B-3226	CP	5/25/16	59	<0.00061 D	<0.00061 D	<0.00061 D	<0.00061 D	<0.00061 D	<0.00078 D	<0.00061 D	<0.0012 D	<0.00061 D	<0.00061 D	0.0048 D	<0.00061 D	<0.00061 D	<0.00061 D
2016	B-3226	CP	5/25/16	62	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00079 D	<0.00062 D	<0.0012 D	<0.00062 D	<0.00062 D	0.0046 D	<0.00062 D	<0.00062 D	<0.00062 D
2016	B-3226	CP	5/25/16	68	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.012	<0.0005	<0.0005	<0.0005
2016	B-3226	CP	5/25/16	88	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00071 D	<0.00055 D	<0.0011 D	<0.00055 D	<0.00055 D	0.0086 D	<0.00055 D	<0.00055 D	<0.00055 D
2016	B-3227	CP	5/31/16	9.5	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00054	<0.00042	<0.00084	<0.00042	<0.00042	0.00077	<0.00042	<0.00042	<0.00042
2016	B-3227	CP	5/31/16	23.5	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00057	<0.00044	<0.00089	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044
2016	B-3227	CP	5/31/16	34.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3227	CP	5/31/16	44	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00087 D	<0.00068 D	<0.0014 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D
2016	B-3227	CP	5/31/16	60	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00053	<0.00042	<0.00083	<0.00042	<0.00042	0.0015	<0.00042	<0.00042	<0.00042
2016	B-3227	CP	5/31/16 DUP	60	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.0015	<0.0005	<0.0005	<0.0005
2016	B-3227	CP	5/31/16	79	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3227	CP	5/31/16	96	<0.00033	<0.00033	<0.00033	<0.00033	<0.00033	<0.00043	<0.00033	<0.00067	<0.00033	<0.00033	0.078	<0.00033	<0.00033	<0.00033
2016	B-3227	CP	5/31/16	111	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.00051	<0.0004	<0.0008	<0.0004	<0.0004	0.0028	<0.0004	<0.0004	<0.0004
2016	B-3228	CP	6/1/16	8	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.00051	<0.0004	<0.00079	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
2016	B-3228	CP	6/1/16	20	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.00051	<0.0004	<0.0008	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
2016	B-3228	CP	6/1/16	27.5	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.00051	<0.0004	<0.00079	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
2016	B-3228	CP	6/1/16	42	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.00051	<0.0004	<0.0008	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
2016	B-3228	CP	6/1/16	53	<0.00037	<0.00037	<0.00037	<0.00037	<0.00037	<0.00047	<0.00037	<0.00074	<0.00037	<0.00037	0.001	<0.00037	<0.00037	<0.00037
2016	B-3228	CP	6/1/16	64	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00054	<0.00042	<0.00084	<0.00042	<0.00042	0.00056	<0.00042	<0.00042	<0.00042
2016	B-3228	CP	6/1/16	77	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.00051	<0.00039	<0.00079	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039
2016	B-3228	CP	6/1/16 DUP	77	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.00051	<0.0004	<0.0008	<0.0004	<0.0004	0.00058	<0.0004	<0.0004	<0.0004
2016	B-3228	CP	6/1/16	90	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00055	<0.00043	<0.00086	<0.00043	<0.00043	0.0039	<0.00043	<0.00043	<0.00043
2016	B-3229	CP	6/2/16	15.5	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00053	<0.00042	<0.00083	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042
2016	B-3229	CP	6/2/16	20	<0.00037	<0.00037	<0.00037	<0.00037	<0.00037	<0.00048	<0.00037	<0.00075	<0.00037	<0.00037	<0.00037	<0.00037	<0.00037	<0.00037
2016	B-3229	CP	6/2/16	29	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.00051	<0.0004	<0.0008	<0.0004	<0.0004	0.00072	<0.0004	<0.0004	<0.0004
2016	B-3229	CP	6/2/16	38	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.00051	<0.0004	<0.0008	<0.0004	<0.0004	0.00054	<0.0004	<0.0004	<0.0004
2016	B-3229	CP	6/2/16	44	<0.00037	<0.00037	<0.00037	<0.00037	<0.00037	<0.00047	<0.00037	<0.00074	<0.00037	<0.00037	0.0011	<0.00037	<0.00037	<0.00037
2016	B-3229	CP	6/2/16	52	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	0.0015 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3229	CP	6/2/16	68	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	0.0066 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3229	CP	6/2/16 DUP	68	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.00051	<0.00039	<0.00079	<0.00039	<0.00039	0.0054	<0.00039	<0.00039	<0.00039
2016	B-3229	CP	6/2/16	92	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.00051	<0.00039	<0.00079	<0.00039	<0.00039	0.0021	<0.00039	<0.00039	<0.00039
2016	B-3230	CP	6/6/16	22	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3230	CP	6/6/16	29.5	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3230	CP	6/6/16	44	<0.00067 D	<0.00067 D	<0.00067 D	<0.00067 D	<0.00067 D	<0.00085 D	<0.00067 D	<0.0013 D	<0.00067 D	<0.00067 D	0.0017 D	<0.00067 D	<0.00067 D	<0.00067 D
2016	B-3230	CP	6/6/16	54	<0.00038	<0.00038	<0.00038	<0.00038	<0.00038	<0.00049	<0.00038	<0.00076	<0.00038	<0.00038	0.0013	<0.00038	<0.00038	<0.00038
2016	B-3230	CP	6/6/16	64	<0.00091 D	<0.00091 D	<0.00091 D	<0.00091 D	<0.00091 D	<0.0012 D	<0.00091 D	<0.0018 D	<0.00091 D	<0.00091 D	<0.00091 D	<0.00091 D	<0.00091 D	<0.00091 D
2016	B-3230	CP	6/6/16 DUP	64	<0.00066 D	<0.00066 D	<0.00066 D	<0.00066 D	<0.00066 D	<0.00084 D	<0.00066 D	<0.0013 D	<0.00066 D	<0.00066 D	0.0019 D	<0.00066 D	<0.00066 D	<0.00066 D
2016	B-3230	CP	6/6/16	69	<0.00058 D	<0.00058 D	<0.00058 D	<0.00058 D	<0.00058 D	<0.00074 D	<0.00058 D	0.0023 D	<0.00058 D	<0.00058 D	0.003 D	<0.00058 D	<0.00058 D	<0.00058 D
2016	B-3230	CP	6/6/16	78.5	<0.0015 D	<0.0015 D	<0.0015 D	<0.0015 D	<0.0015 D	<0.0019 D	<0.0015 D	<0.003 D	<0.0015 D	<0.0015 D	0.0059 D	<0.0015 D	<0.0015 D	<0.0015 D
2016	B-3230	CP	6/6/16	96	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	0.0036	<0.0005	0.012	<0.0005	<0.0005	<0.0005
2016	B-3231	CP	6/7/16	26	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00054	<0.00042	<0.00084	<0.00042	<0.00042	0.001	<0.00042	<0.00042	<0.00042
2016	B-3231	CP	6/7/16	32	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3231	CP	6/7/16	52	<0.0012 D	<0.0012 D	<0.0012 D	<0.0012 D	<0.0012 D	<0.0016 D	<0.0012 D	<0.0025 D	<0.0012 D	<0.0012 D	<0.0012 D	<0.0012 D	<0.0012 D	<0.0012 D
2016	B-3231	CP	6/7/16	61	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00094 D	<0.00073 D	<0.0015 D	<0.00073 D	<0.00073 D	0.0016 D	<0.00073 D	<0.00073 D	<0.00073 D
2016	B-3231	CP	6/7/16	70	<0.00036	<0.00036	<0.00036	<0.00036	<0.00036	<0.00047	<0.00036	<0.00073	<0.00036	<0.00036	0.0041	<0.00036	<0.00036	<0.00036
2016	B-3231	CP	6/7/16	74.5	<0.00037	<0.00037	<0.00037	<0.00037	<0.00037	<0.00047	<0.00037	<0.00074	<0.00037	<0.00037	0.0013	<0.00037	<0.00037	<0.00037
2016	B-3231	CP	6/7/16 DUP	74.5	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00057	<0.00044	<0.00089	<0.00044	<0.00044	0.0019	<0.00044	<0.00044	<0.00044
2016	B-3231	CP	6/7/16	94	<0.0008 D	<0.0008 D	<0.0008 D	<0.0008 D	<0.0008 D	<0.001 D	<0.0008 D	<0.0016 D	<0.0008 D	<0.0008 D	0.0095 D	<0.0008 D	<0.0008 D	<0.0008 D

Attachment B Table 2. 2016 direct-push drilling survey analytical results for VOCs in soil.

Year	Well Name	Type	Date	Depth (ft)	1,1,1-Trichloroethane (mg/kg)	1,1,2-Trichloroethane (mg/kg)	1,1-Dichloroethane (mg/kg)	1,1-Dichloroethene (mg/kg)	1,2-Dichloroethane (mg/kg)	1,2-Dichloroethene (total) (mg/kg)	Carbon tetrachloride (mg/kg)	Chloroform (mg/kg)	Freon 113 (mg/kg)	Tetrachloro ethene (mg/kg)	Trichloro ethene (mg/kg)	Trichloro fluoromethane (mg/kg)	cis-1,2-Dichloroethene (mg/kg)	trans-1,2-Dichloroethene (mg/kg)
2016	B-3231	CP	6/7/16	102	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.011	<0.0005	<0.0005	<0.0005
2016	B-3232	CP	6/13/16	20	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3232	CP	6/13/16	28	<0.00038	<0.00038	<0.00038	<0.00038	<0.00038	<0.00049	<0.00038	<0.00076	<0.00038	<0.00038	<0.00038	<0.00038	<0.00038	<0.00038
2016	B-3232	CP	6/13/16	44	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3232	CP	6/13/16	54	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00055	<0.00043	<0.00086	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043
2016	B-3232	CP	6/13/16	68	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00052	<0.00041	<0.00082	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041
2016	B-3232	CP	6/13/16	74	<0.00098 D	<0.00098 D	<0.00098 D	<0.00098 D	<0.00098 D	<0.0012 D	<0.00098 D	<0.002 D	<0.00098 D	<0.00098 D	<0.00098 D	<0.00098 D	<0.00098 D	<0.00098 D
2016	B-3232	CP	6/13/16 DUP	74	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00057	<0.00044	<0.00089	<0.00044	<0.00044	0.00051	<0.00044	<0.00044	<0.00044
2016	B-3232	CP	6/13/16	96	<0.00057 D	<0.00057 D	<0.00057 D	<0.00057 D	<0.00057 D	<0.00074 D	<0.00057 D	<0.0011 D	<0.00057 D	<0.00057 D	0.0029 D	<0.00057 D	<0.00057 D	<0.00057 D
2016	B-3232	CP	6/13/16	101	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0016 D	<0.0013 D	<0.0025 D	<0.0013 D	<0.0013 D	0.0053 D	<0.0013 D	<0.0013 D	<0.0013 D
2016	B-3233	CP	6/14/16	24	<0.00038	<0.00038	<0.00038	<0.00038	<0.00038	<0.00049	<0.00038	<0.00076	<0.00038	<0.00038	<0.00038	<0.00038	<0.00038	<0.00038
2016	B-3233	CP	6/14/16	37	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00054	<0.00042	<0.00084	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042
2016	B-3233	CP	6/14/16	44	<0.00095 D	<0.00095 D	<0.00095 D	<0.00095 D	<0.00095 D	<0.0012 D	<0.00095 D	<0.0019 D	<0.00095 D	<0.00095 D	<0.00095 D	<0.00095 D	<0.00095 D	<0.00095 D
2016	B-3233	CP	6/14/16	50	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00075 D	<0.00059 D	<0.0012 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D
2016	B-3233	CP	6/14/16	57.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3233	CP	6/14/16	68	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.0012 D	<0.00093 D	<0.0019 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D
2016	B-3233	CP	6/14/16 DUP	68	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00093 D	<0.00073 D	<0.0015 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D
2016	B-3233	CP	6/14/16	79.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3233	CP	6/14/16	94	<0.00036	<0.00036	<0.00036	<0.00036	<0.00036	<0.00046	<0.00036	<0.00071	0.0066	<0.00036	0.00069	<0.00036	<0.00036	<0.00036
2016	B-3234	CP	6/15/16	17.5	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00057	<0.00044	<0.00088	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044
2016	B-3234	CP	6/15/16	26.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3234	CP	6/15/16	37	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3234	CP	6/15/16	44	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.00081 D	<0.00063 D	<0.0013 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D
2016	B-3234	CP	6/15/16	58	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00095 D	<0.00074 D	<0.0015 D	<0.00074 D	<0.00074 D	0.0011 D	<0.00074 D	<0.00074 D	<0.00074 D
2016	B-3234	CP	6/15/16 DUP	58	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3234	CP	6/15/16	70	<0.00043	<0.00043	<0.00043	<0.00043	0.00079	<0.00055	<0.00043	<0.00086	<0.00043	<0.00043	0.00084	<0.00043	<0.00043	<0.00043
2016	B-3234	CP	6/15/16	81.5	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.0005	<0.00039	<0.00079	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039
2016	B-3234	CP	6/15/16	90	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	0.015 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3235	CP	6/16/16	20	<0.00079 D	<0.00079 D	<0.00079 D	<0.00079 D	<0.00079 D	<0.001 D	<0.00079 D	<0.0016 D	<0.00079 D	<0.00079 D	<0.00079 D	<0.00079 D	<0.00079 D	<0.00079 D
2016	B-3235	CP	6/16/16	25.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3235	CP	6/16/16	28	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00054	<0.00042	<0.00084	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042
2016	B-3235	CP	6/16/16	36	<0.001 D	<0.001 D	<0.001 D	<0.001 D	<0.001 D	<0.0013 D	<0.001 D	<0.002 D	<0.001 D	<0.001 D	<0.001 D	<0.001 D	<0.001 D	<0.001 D
2016	B-3235	CP	6/16/16	58	<0.001 D	<0.001 D	<0.001 D	<0.001 D	<0.001 D	<0.0013 D	<0.001 D	<0.0021 D	<0.001 D	<0.001 D	<0.001 D	<0.001 D	<0.001 D	<0.001 D
2016	B-3235	CP	6/16/16	67.5	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00072 D	<0.00056 D	<0.0011 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D
2016	B-3235	CP	6/16/16	88	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00057	<0.00045	<0.00089	<0.00045	<0.00045	0.0015	<0.00045	<0.00045	<0.00045
2016	B-3235	CP	6/16/16 DUP	88	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.0012 D	<0.00093 D	<0.0019 D	<0.00093 D	<0.00093 D	0.0014 D	<0.00093 D	<0.00093 D	<0.00093 D
2016	B-3235	CP	6/16/16	97.5	<0.00086 D	<0.00086 D	<0.00086 D	<0.00086 D	<0.00086 D	<0.0011 D	<0.00086 D	<0.0017 D	<0.00086 D	<0.00086 D	0.001 D	<0.00086 D	<0.00086 D	<0.00086 D
2016	B-3236	CP	6/20/16	27	<0.0006 D	<0.0006 D	<0.0006 D	<0.0006 D	<0.0006 D	<0.00076 D	<0.0006 D	<0.0012 D	<0.0006 D	<0.0006 D	<0.0006 D	<0.0006 D	<0.0006 D	<0.0006 D
2016	B-3236	CP	6/20/16	38	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.00089 D	<0.0007 D	<0.0014 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D
2016	B-3236	CP	6/20/16	44	<0.00058 D	<0.00058 D	<0.00058 D	<0.00058 D	<0.00058 D	<0.00075 D	<0.00058 D	<0.0012 D	<0.00058 D	<0.00058 D	<0.00058 D	<0.00058 D	<0.00058 D	<0.00058 D
2016	B-3236	CP	6/20/16	54	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00083 D	<0.00065 D	<0.0013 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D
2016	B-3236	CP	6/20/16	70	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3236	CP	6/20/16 DUP	70	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3236	CP	6/20/16	75	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.0008 D	<0.00062 D	<0.0012 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D
2016	B-3236	CP	6/20/16	94.5	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.00051	<0.0004	<0.0008	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
2016	B-3236	CP	6/20/16	98	<0.00092 D	<0.00092 D	<0.00092 D	<0.00092 D	<0.00092 D	<0.0012 D	<0.00092 D	<0.0018 D	<0.00092 D	<0.00092 D	0.028 D	<0.00092 D	<0.00092 D	<0.00092 D
2016	B-3237	CP	6/21/16	18	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00056	<0.00044	<0.00087	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044
2016	B-3237	CP	6/21/16	36	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00056	<0.00044	<0.00088	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044
2016	B-3237	CP	6/21/16	50	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3237	CP	6/21/16	64	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3237	CP	6/21/16	73	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00056	<0.00044	<0.00088	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044
2016	B-3237	CP	6/21/16	80	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3237	CP	6/21/16 DUP	80	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3237	CP	6/21/16	87.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3237	CP	6/21/16	98	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3238	CP	6/22/16	19.5	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.00051	<0.0004	<0.00079	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004

Attachment B Table 2. 2016 direct-push drilling survey analytical results for VOCs in soil.

Year	Well Name	Type	Date	Depth (ft)	1,1,1-Trichloroethane (mg/kg)	1,1,2-Trichloroethane (mg/kg)	1,1-Dichloroethane (mg/kg)	1,1-Dichloroethene (mg/kg)	1,2-Dichloroethane (mg/kg)	1,2-Dichloroethene (total) (mg/kg)	Carbon tetrachloride (mg/kg)	Chloroform (mg/kg)	Freon 113 (mg/kg)	Tetrachloro ethene (mg/kg)	Trichloro ethene (mg/kg)	Trichloro fluoromethane (mg/kg)	cis-1,2-Dichloroethene (mg/kg)	trans-1,2-Dichloroethene (mg/kg)
2016	B-3238	CP	6/22/16	22.5	<0.00088 D	<0.00088 D	<0.00088 D	<0.00088 D	<0.00088 D	<0.0011 D	<0.00088 D	<0.0018 D	<0.00088 D	<0.00088 D	<0.00088 D	<0.00088 D	<0.00088 D	<0.00088 D
2016	B-3238	CP	6/22/16	26.5	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00054	<0.00042	<0.00084	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042
2016	B-3238	CP	6/22/16	40	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00057	<0.00044	<0.00089	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044
2016	B-3238	CP	6/22/16	45	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3238	CP	6/22/16	64	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3238	CP	6/22/16	77.5	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00071 D	<0.00055 D	<0.0011 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D
2016	B-3238	CP	6/22/16 DUP	77.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3238	CP	6/22/16	92	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00071 D	<0.00055 D	<0.0011 D	<0.00055 D	<0.00055 D	0.0042 D	<0.00055 D	<0.00055 D	<0.00055 D
2016	B-3239	CP	6/23/16	25	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00056	<0.00043	<0.00087	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043
2016	B-3239	CP	6/23/16	32	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.0012 D	<0.00093 D	<0.0019 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D
2016	B-3239	CP	6/23/16	56	<0.00086 D	<0.00086 D	<0.00086 D	<0.00086 D	<0.00086 D	<0.0011 D	<0.00086 D	<0.0017 D	<0.00086 D	<0.00086 D	<0.00086 D	<0.00086 D	<0.00086 D	<0.00086 D
2016	B-3239	CP	6/23/16	57.5	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3239	CP	6/23/16	75	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00095 D	<0.00074 D	<0.0015 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D
2016	B-3239	CP	6/23/16	83	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00088 D	<0.00069 D	<0.0014 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D
2016	B-3240A	CP	6/27/16	19	<0.00078 D	<0.00078 D	<0.00078 D	<0.00078 D	<0.00078 D	<0.001 D	<0.00078 D	<0.0016 D	<0.00078 D	<0.00078 D	<0.00078 D	<0.00078 D	<0.00078 D	<0.00078 D
2016	B-3240A	CP	6/27/16	27	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00072 D	<0.00056 D	<0.0011 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D
2016	B-3240A	CP	6/27/16	46	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3240A	CP	6/27/16	59	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00075 D	<0.00059 D	<0.0012 D	<0.00059 D	<0.00059 D	0.00065 D	<0.00059 D	<0.00059 D	<0.00059 D
2016	B-3240A	CP	6/27/16	62	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00056	<0.00043	<0.00087	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043
2016	B-3240A	CP	6/27/16	73	<0.00072 D	<0.00072 D	<0.00072 D	<0.00072 D	<0.00072 D	<0.00092 D	<0.00072 D	<0.0014 D	<0.00072 D	<0.00072 D	<0.00072 D	<0.00072 D	<0.00072 D	<0.00072 D
2016	B-3240A	CP	6/27/16	81.5	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0014 D	<0.0011 D	<0.0022 D	<0.0011 D	<0.0011 D	0.0012 D	<0.0011 D	<0.0011 D	<0.0011 D
2016	B-3240A	CP	6/27/16	96.5	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	0.0087 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3241	CP	8/22/16	7.5	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.00051	<0.0004	<0.0008	<0.0004	0.0012	<0.0004	<0.0004	<0.0004	<0.0004
2016	B-3241	CP	8/22/16	22	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3241	CP	8/22/16	37	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00075 D	<0.00059 D	<0.0012 D	<0.00059 D	0.0023 D	0.00077 D	<0.00059 D	<0.00059 D	<0.00059 D
2016	B-3241	CP	8/22/16	46.5	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	0.00059 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3241	CP	8/22/16	52	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3241	CP	8/22/16	55.5	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00054	<0.00042	<0.00084	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042
2016	B-3241	CP	8/22/16	72	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00058	<0.00045	<0.0009	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045
2016	B-3241	CP	8/22/16	92	<0.00095 D	<0.00095 D	<0.00095 D	<0.00095 D	<0.00095 D	<0.0012 D	<0.00095 D	<0.0019 D	<0.00095 D	<0.00095 D	<0.00095 D	<0.00095 D	<0.00095 D	<0.00095 D
2016	B-3242	CP	8/23/16	6.5	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0014 D	<0.0011 D	<0.0022 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D
2016	B-3242	CP	8/23/16	12	<0.001 D	<0.001 D	<0.001 D	<0.001 D	<0.001 D	<0.0013 D	<0.001 D	<0.002 D	<0.001 D	<0.001 D	0.012 D	<0.001 D	<0.001 D	<0.001 D
2016	B-3242	CP	8/23/16	28	<0.00072 D	<0.00072 D	<0.00072 D	0.0071 D	<0.00072 D	<0.00092 D	<0.00072 D	<0.0014 D	<0.00072 D	<0.00072 D	0.0096 D	<0.00072 D	<0.00072 D	<0.00072 D
2016	B-3242	CP	8/23/16	48	<0.0016 D	<0.0016 D	<0.0016 D	<0.0016 D	<0.0016 D	<0.002 D	<0.0016 D	<0.0031 D	<0.0016 D	<0.0016 D	0.0026 D	<0.0016 D	<0.0016 D	<0.0016 D
2016	B-3242	CP	8/23/16	72	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.017	<0.0005	<0.0005	<0.0005
2016	B-3242	CP	8/23/16 DUP	72	<0.00042	<0.00042	<0.00042	<0.00042	<0.00042	<0.00053	<0.00042	<0.00083	<0.00042	<0.00042	0.032	<0.00042	<0.00042	<0.00042
2016	B-3242	CP	8/23/16	92	<0.0015 D	<0.0015 D	<0.0015 D	<0.0015 D	<0.0015 D	<0.002 D	<0.0015 D	<0.0031 D	0.0062 D	<0.0015 D	<0.0015 D	<0.0015 D	<0.0015 D	<0.0015 D
2016	B-3242	CP	8/23/16	113	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.00052	<0.0004	<0.00081	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
2016	B-3243	CP	8/29/16	8	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00053	<0.00041	<0.00083	<0.00041	<0.00041	0.0013	<0.00041	<0.00041	<0.00041
2016	B-3243	CP	8/29/16	16	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	0.0035	0.0016	0.0015	<0.0005	<0.0005	<0.0005
2016	B-3243	CP	8/29/16	28	<0.0006 D	<0.0006 D	0.0012 D	0.00076 D	<0.0006 D	0.061 D	<0.0006 D	<0.0012 D	0.0023 D	0.0049 D	0.024 D	<0.0006 D	0.06 D	0.00064 D
2016	B-3243	CP	8/29/16	44	<0.00038	<0.00038	<0.00038	<0.00038	<0.00038	0.029	<0.00038	<0.00076	0.0015	0.00051	0.0096	<0.00038	0.029	<0.00038
2016	B-3243	CP	8/29/16	50	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0016	<0.0005	<0.001	<0.0005	<0.0005	0.00088	<0.0005	0.0016	<0.0005
2016	B-3243	CP	8/29/16	59	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3243	CP	8/29/16 DUP	59	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00079 D	<0.00062 D	<0.0012 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D
2016	B-3243	CP	8/29/16	72	<0.00078 D	<0.00078 D	<0.00078 D	<0.00078 D	<0.00078 D	<0.001 D	<0.00078 D	<0.0016 D	<0.00078 D	<0.00078 D	0.0011 D	<0.00078 D	<0.00078 D	<0.00078 D
2016	B-3243	CP	8/29/16	88	<0.00079 D	<0.00079 D	<0.00079 D	<0.00079 D	<0.00079 D	<0.001 D	<0.00079 D	<0.0016 D	<0.00079 D	<0.00079 D	0.0043 D	<0.00079 D	<0.00079 D	<0.00079 D
2016	B-3244	CP	8/24/16	8.5	<0.00045	<0.00045	<0.00045	<0.00045	<0.00045	<0.00057	<0.00045	<0.0009	<0.00045	<0.00045	0.00066	<0.00045	<0.00045	<0.00045
2016	B-3244	CP	8/24/16	14	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00095 D	<0.00074 D	<0.0015 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D
2016	B-3244	CP	8/24/16	28	<0.00081 D	<0.00081 D	<0.00081 D	<0.00081 D	<0.00081 D	<0.001 D	<0.00081 D	<0.0016 D	<0.00081 D	<0.00081 D	<0.00081 D	<0.00081 D	<0.00081 D	<0.00081 D
2016	B-3244	CP	8/24/16	39	<0.00067 D	<0.00067 D	<0.00067 D	<0.00067 D	<0.00067 D	<0.00085 D	<0.00067 D	<0.0013 D	<0.00067 D	<0.00067 D	0.0028 D	<0.00067 D	<0.00067 D	<0.00067 D
2016	B-3244	CP	8/24/16	52	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3244	CP	8/24/16	68	<0.00061 D	<0.00061 D	<0.00061 D	<0.00061 D	<0.00061 D	<0.00078 D	<0.00061 D	<0.0012 D	<0.00061 D	<0.00061 D	0.0026 D	<0.00061 D	<0.00061 D	<0.00061 D

Attachment B Table 2. 2016 direct-push drilling survey analytical results for VOCs in soil.

Year	Well Name	Type	Date	Depth (ft)	1,1,1-Trichloroethane (mg/kg)	1,1,2-Trichloroethane (mg/kg)	1,1-Dichloroethane (mg/kg)	1,1-Dichloroethene (mg/kg)	1,2-Dichloroethane (mg/kg)	1,2-Dichloroethene (total) (mg/kg)	Carbon tetrachloride (mg/kg)	Chloroform (mg/kg)	Freon 113 (mg/kg)	Tetrachloro ethene (mg/kg)	Trichloro ethene (mg/kg)	Trichloro fluoromethane (mg/kg)	cis-1,2-Dichloroethene (mg/kg)	trans-1,2-Dichloroethene (mg/kg)
2016	B-3244	CP	8/24/16	74	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00053	<0.00041	<0.00082	<0.00041	<0.00041	0.0018	<0.00041	<0.00041	<0.00041
2016	B-3244	CP	8/24/16	90	<0.00091 D	<0.00091 D	<0.00091 D	<0.00091 D	<0.00091 D	<0.0012 D	<0.00091 D	<0.0018 D	<0.00091 D	<0.00091 D	0.096 D	<0.00091 D	<0.00091 D	<0.00091 D
2016	B-3244	CP	8/24/16 DUP	90	<0.00057 D	<0.00057 D	<0.00057 D	<0.00057 D	<0.00057 D	<0.00073 D	<0.00057 D	<0.0011 D	<0.00057 D	<0.00057 D	0.044 D	<0.00057 D	<0.00057 D	<0.00057 D
2016	B-3244	CP	8/24/16	117	<0.00067 D	<0.00067 D	<0.00067 D	<0.00067 D	<0.00067 D	<0.00086 D	<0.00067 D	<0.0013 D	<0.00067 D	<0.00067 D	0.0014 D	<0.00067 D	<0.00067 D	<0.00067 D
2016	B-3245	CP	8/25/16	18.5	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00057	<0.00044	<0.00089	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044
2016	B-3245	CP	8/25/16	29	<0.0015 D	<0.0015 D	<0.0015 D	<0.0015 D	<0.0015 D	<0.002 D	<0.0015 D	<0.0031 D	<0.0015 D	<0.0015 D	<0.0015 D	<0.0015 D	<0.0015 D	<0.0015 D
2016	B-3245	CP	8/25/16	38.5	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00089 D	<0.00069 D	<0.0014 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D
2016	B-3245	CP	8/31/16	45	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0017 D	<0.0013 D	<0.0026 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D
2016	B-3245	CP	8/31/16	53	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00094 D	<0.00073 D	<0.0015 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D
2016	B-3245	CP	8/31/16	67.5	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0014 D	<0.0011 D	<0.0022 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D
2016	B-3246	CP	8/30/16	6.5	<0.00094 D	<0.00094 D	<0.00094 D	<0.00094 D	<0.00094 D	<0.0012 D	<0.00094 D	<0.0019 D	<0.00094 D	<0.00094 D	<0.00094 D	<0.00094 D	<0.00094 D	<0.00094 D
2016	B-3246	CP	8/30/16	23.5	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0009 D	<0.0007 D	<0.0014 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D
2016	B-3246	CP	8/30/16	34	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.0005	<0.00039	<0.00078	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039
2016	B-3246	CP	8/30/16	43	<0.00075 D	<0.00075 D	<0.00075 D	<0.00075 D	<0.00075 D	<0.00096 D	<0.00075 D	<0.0015 D	<0.00075 D	<0.00075 D	0.0025 D	<0.00075 D	<0.00075 D	<0.00075 D
2016	B-3246	CP	8/30/16	53.5	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	0.00053 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3246	CP	8/30/16	60	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00057	<0.00044	<0.00088	<0.00044	<0.00044	0.00057	<0.00044	<0.00044	<0.00044
2016	B-3246	CP	8/30/16	65.5	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0016 D	<0.0013 D	<0.0026 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D	<0.0013 D
2016	B-3246	CP	8/30/16	82.5	<0.00036	<0.00036	<0.00036	<0.00036	<0.00036	<0.00046	<0.00036	<0.00073	<0.00036	0.00052	0.028	<0.00036	<0.00036	<0.00036
2016	B-3246	CP	8/30/16	108	<0.00034	<0.00034	<0.00034	<0.00034	<0.00034	<0.00043	<0.00034	<0.00068	<0.00034	<0.00034	0.021	<0.00034	<0.00034	<0.00034
2016	B-3247	CP	8/31/16	8	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.0012 D	<0.00093 D	<0.0019 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D	<0.00093 D
2016	B-3247	CP	8/31/16	19	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.00051	<0.0005	<0.0005	<0.0005
2016	B-3247	CP	8/31/16	32	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3247	CP	8/31/16	42	<0.00033	<0.00033	<0.00033	<0.00033	<0.00033	<0.00043	<0.00033	<0.00067	<0.00033	0.00034	0.00084	<0.00033	<0.00033	<0.00033
2016	B-3247	CP	8/31/16	54.5	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00076 D	<0.00059 D	<0.0012 D	<0.00059 D	<0.00059 D	0.0013 D	<0.00059 D	<0.00059 D	<0.00059 D
2016	B-3247	CP	8/31/16	63	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0009 D	<0.0007 D	<0.0014 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D
2016	B-3247	CP	8/31/16	76	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00069 D	<0.00088 D	<0.00069 D	<0.0014 D	<0.00069 D	<0.00069 D	0.00077 D	<0.00069 D	<0.00069 D	<0.00069 D
2016	B-3247	CP	8/31/16 DUP	76	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	0.0011 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3247	CP	8/31/16	108	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.0092	<0.0005	<0.0005	<0.0005
2016	B-3248	CP	9/1/16	9	<0.012 D	<0.012 D	<0.012 D	<0.012 D	<0.012 D	<0.016 D	<0.012 D	<0.025 D	<0.012 D	<0.012 D	<0.012 D	<0.012 D	<0.012 D	<0.012 D
2016	B-3248	CP	9/1/16	18.5	<0.00091 D	<0.00091 D	<0.00091 D	<0.00091 D	<0.00091 D	<0.0012 D	<0.00091 D	<0.0018 D	<0.00091 D	<0.00091 D	<0.00091 D	<0.00091 D	<0.00091 D	<0.00091 D
2016	B-3248	CP	9/1/16	30.5	<0.0018 D	<0.0018 D	<0.0018 D	<0.0018 D	<0.0018 D	<0.0023 D	<0.0018 D	<0.0035 D	<0.0018 D	<0.0018 D	<0.0018 D	<0.0018 D	<0.0018 D	<0.0018 D
2016	B-3248	CP	9/1/16	40	<0.00084 D	<0.00084 D	<0.00084 D	<0.00084 D	<0.00084 D	<0.0011 D	<0.00084 D	<0.0017 D	<0.00084 D	<0.00084 D	<0.00084 D	<0.00084 D	<0.00084 D	<0.00084 D
2016	B-3248	CP	9/1/16	76	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0013 D	<0.0011 D	<0.0021 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D	<0.0011 D
2016	B-3248	CP	9/1/16	96	<0.0006 D	<0.0006 D	<0.0006 D	<0.0006 D	<0.0006 D	<0.00077 D	<0.0006 D	<0.0012 D	<0.0006 D	<0.0006 D	<0.0006 D	<0.0006 D	<0.0006 D	<0.0006 D
2016	B-3248	CP	9/1/16 DUP	96	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00094 D	<0.00073 D	<0.0015 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D
2016	B-3248	CP	9/1/16	116	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.0008 D	<0.00063 D	<0.0013 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D
2016	B-3249	CP	9/6/16	14.5	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00083 D	<0.00065 D	<0.0013 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D
2016	B-3249	CP	9/6/16	21.5	<0.00076 D	<0.00076 D	<0.00076 D	<0.00076 D	<0.00076 D	<0.00097 D	<0.00076 D	<0.0015 D	<0.00076 D	<0.00076 D	<0.00076 D	<0.00076 D	<0.00076 D	<0.00076 D
2016	B-3249	CP	9/6/16	32	<0.00037	<0.00037	<0.00037	<0.00037	<0.00037	<0.00048	<0.00037	<0.00075	<0.00037	<0.00037	<0.00037	<0.00037	<0.00037	<0.00037
2016	B-3249	CP	9/6/16	43.5	<0.00075 D	<0.00075 D	<0.00075 D	<0.00075 D	<0.00075 D	<0.00096 D	<0.00075 D	<0.0015 D	<0.00075 D	<0.00075 D	<0.00075 D	<0.00075 D	<0.00075 D	<0.00075 D
2016	B-3249	CP	9/6/16	48	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00057	<0.00044	<0.00089	<0.00044	<0.00044	0.00082	<0.00044	<0.00044	<0.00044
2016	B-3249	CP	9/6/16	54.5	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	0.0016 D	0.0021 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3249	CP	9/6/16	80	<0.00066 D	<0.00066 D	<0.00066 D	<0.00066 D	<0.00066 D	<0.00084 D	<0.00066 D	<0.0013 D	<0.00066 D	0.0013 D	0.0018 DIJ	<0.00066 D	<0.00066 D	<0.00066 D
2016	B-3249	CP	9/6/16 DUP	80	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00094 D	<0.00074 D	<0.0015 D	<0.00074 D	0.0012 D	0.0013 D	<0.00074 D	<0.00074 D	<0.00074 D
2016	B-3249	CP	9/6/16	100	<0.00084 D	<0.00084 D	<0.00084 D	<0.00084 D	<0.00084 D	<0.0011 D	<0.00084 D	<0.0017 D	<0.00084 D	<0.00084 D	0.0058 D	<0.00084 D	<0.00084 D	<0.00084 D
2016	B-3251	CP	9/21/16	6	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3251	CP	9/21/16	20	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00072 D	<0.00056 D	<0.0011 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D
2016	B-3251	CP	9/21/16	36	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00072 D	<0.00056 D	<0.0011 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D
2016	B-3251	CP	9/21/16	53.5	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00072 D	<0.00056 D	<0.0011 D	<0.00056 D	<0.00056 D	0.0018 D	<0.00056 D	<0.00056 D	<0.00056 D
2016	B-3251	CP	9/21/16	57	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.00087	<0.0005	<0.0005	<0.0005
2016	B-3251	CP	9/21/16	68	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.0013	<0.0005	<0.0005	<0.0005
2016	B-3251	CP	9/21/16	82	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00056	0.0025	<0.00088	<0.00044	0.00048	0.061	<0.00044	<0.00044	<0.00044
2016	B-3251	CP	9/21/16 DUP	82	<0.00058 D	<0.00058 D	<0.00058 D	<0.00058 D	<0.00058 D	<0.00074 D	0.0026 D	<0.0012 D	<0.00058 D	<0.00058 D	0.063 D	<0.00058 D	<0.00058 D	<0.00058 D

Attachment B Table 2. 2016 direct-push drilling survey analytical results for VOCs in soil.

Year	Well Name	Type	Date	Depth (ft)	1,1,1-Trichloroethane (mg/kg)	1,1,2-Trichloroethane (mg/kg)	1,1-Dichloroethane (mg/kg)	1,1-Dichloroethene (mg/kg)	1,2-Dichloroethane (mg/kg)	1,2-Dichloroethene (total) (mg/kg)	Carbon tetrachloride (mg/kg)	Chloroform (mg/kg)	Freon 113 (mg/kg)	Tetrachloro ethene (mg/kg)	Trichloro ethene (mg/kg)	Trichloro fluoromethane (mg/kg)	cis-1,2-Dichloroethene (mg/kg)	trans-1,2-Dichloroethene (mg/kg)
2016	B-3251	CP	9/21/16	108	<0.00038	<0.00038	<0.00038	0.0066	<0.00038	<0.00048	0.0061	<0.00076	<0.00038	0.0017	0.053	<0.00038	<0.00038	<0.00038
2016	B-3252	CP	9/20/16	7	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3252	CP	9/20/16	18	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00071 D	<0.00055 D	<0.0011 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D	<0.00055 D
2016	B-3252	CP	9/20/16	25	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3252	CP	9/20/16	42	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3252	CP	9/20/16	56.5	<0.00039	<0.00039	<0.00039	<0.00039	<0.00039	<0.0005	<0.00039	<0.00079	<0.00039	<0.00039	0.0025 IJ	<0.00039	<0.00039	<0.00039
2016	B-3252	CP	9/20/16	65	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.0015 IJ	<0.0005	<0.0005	<0.0005
2016	B-3252	CP	9/20/16	88	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	0.0096 DIJ	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3252	CP	9/20/16 DUP	88	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.00081 D	<0.00063 D	<0.0013 D	<0.00063 D	<0.00063 D	0.0077 D	<0.00063 D	<0.00063 D	<0.00063 D
2016	B-3252	CP	9/20/16	114	<0.00037	<0.00037	0.0022 IJ	0.07 IJ	0.00067 IJ	<0.00047	0.021 IJ	0.0019 IJ	<0.00037	0.0047	0.2 IJ	<0.00037	<0.00037	<0.00037
2016	B-3253	CP	9/22/16	14	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00057	<0.00044	<0.00089	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044
2016	B-3253	CP	9/22/16	23.5	<0.00076 D	<0.00076 D	<0.00076 D	<0.00076 D	<0.00076 D	<0.00097 D	<0.00076 D	<0.0015 D	<0.00076 D	<0.00076 D	<0.00076 D	<0.00076 D	<0.00076 D	<0.00076 D
2016	B-3253	CP	9/22/16	40	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00052	<0.00041	<0.00081	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041
2016	B-3253	CP	9/22/16	52	<0.001 D	<0.001 D	<0.001 D	<0.001 D	<0.001 D	<0.0013 D	<0.001 D	<0.0021 D	<0.001 D	<0.001 D	0.0028 D	<0.001 D	<0.001 D	<0.001 D
2016	B-3253	CP	9/22/16	62.5	<0.00037	<0.00037	<0.00037	<0.00037	<0.00037	<0.00047	<0.00037	<0.00074	<0.00037	<0.00037	0.00039	<0.00037	<0.00037	<0.00037
2016	B-3253	CP	9/22/16	80	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	0.00052 D	<0.001 D	<0.0005 D	0.001 D	0.052 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3253	CP	9/22/16	105.5	<0.0005	<0.0005	<0.0005	0.0042	<0.0005	<0.00064	0.002	<0.001	<0.0005	0.0028	0.059	<0.0005	<0.0005	<0.0005
2016	B-3253	CP	9/22/16 DUP	105.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.0072	<0.0005	<0.0005	<0.0005
2016	B-3253	CP	9/22/16	116	<0.0005	<0.0005	<0.0005	0.0065	<0.0005	<0.00064	0.004	<0.001	<0.0005	<0.0005	0.018	<0.0005	<0.0005	<0.0005
2016	B-3254	CP	9/19/16	12	<0.00077 D	<0.00077 D	<0.00077 D	<0.00077 D	<0.00077 D	<0.00098 D	<0.00077 D	<0.0015 D	<0.00077 D	<0.00077 D	<0.00077 D	<0.00077 D	<0.00077 D	<0.00077 D
2016	B-3254	CP	9/19/16	25.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3254	CP	9/19/16	40	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0009 D	<0.0007 D	<0.0014 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D	<0.0007 D
2016	B-3254	CP	9/19/16	52	<0.00061 D	<0.00061 D	<0.00061 D	<0.00061 D	<0.00061 D	<0.00077 D	<0.00061 D	<0.0012 D	<0.00061 D	<0.00061 D	0.00073 D	<0.00061 D	<0.00061 D	<0.00061 D
2016	B-3254	CP	9/19/16	57.5	<0.00075 D	<0.00075 D	<0.00075 D	<0.00075 D	<0.00075 D	<0.00096 D	<0.00075 D	<0.0015 D	<0.00075 D	<0.00075 D	0.0015 D	<0.00075 D	<0.00075 D	<0.00075 D
2016	B-3254	CP	9/19/16	78	<0.00066 D	<0.00066 D	<0.00066 D	<0.00066 D	<0.00066 D	<0.00085 D	<0.00066 D	<0.0013 D	<0.00066 D	<0.00066 D	0.011 DIJ	<0.00066 D	<0.00066 D	<0.00066 D
2016	B-3254	CP	9/19/16	106	<0.00056 D	<0.00056 D	0.003 D	0.081 D	0.0018 D	<0.00071 D	<0.00056 D	0.0026 D	<0.00056 D	0.022 D	0.35 D	0.0007 D	<0.00056 D	<0.00056 D
2016	B-3255	CP	9/26/16	15.5	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00052	<0.00041	<0.00082	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041	<0.00041
2016	B-3255	CP	9/26/16	23.5	<0.00071 D	<0.00071 D	<0.00071 D	<0.00071 D	<0.00071 D	<0.0009 D	<0.00071 D	<0.0014 D	<0.00071 D	<0.00071 D	<0.00071 D	<0.00071 D	<0.00071 D	<0.00071 D
2016	B-3255	CP	9/26/16	41.5	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00093 D	<0.00073 D	<0.0015 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D	<0.00073 D
2016	B-3255	CP	9/26/16	56	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00076 D	<0.00059 D	<0.0012 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D
2016	B-3255	CP	9/26/16	70	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005
2016	B-3255	CP	9/26/16	82	<0.0006 D	<0.0006 D	<0.0006 D	<0.0006 D	<0.0006 D	<0.00076 D	0.0067 D	<0.0012 D	<0.0006 D	0.003 D	0.036 D	<0.0006 D	<0.0006 D	<0.0006 D
2016	B-3255	CP	9/26/16	98	<0.00044	<0.00044	<0.00044	<0.00044	<0.00044	<0.00056	0.0018	<0.00088	<0.00044	<0.00044	0.0013	<0.00044	<0.00044	<0.00044
2016	B-3255	CP	9/26/16	112	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2016	B-3256	CP	9/28/16	23.5	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3256	CP	9/28/16	34	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00083 D	<0.00065 D	<0.0013 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D	<0.00065 D
2016	B-3256	CP	9/28/16	45.5	<0.00043	<0.00043	<0.00043	<0.00043	<0.00043	<0.00055	<0.00043	<0.00086	<0.00043	<0.00043	0.00053	<0.00043	<0.00043	<0.00043
2016	B-3256	CP	9/28/16	52.5	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3256	CP	9/28/16	58.5	<0.00077 D	<0.00077 D	<0.00077 D	<0.00077 D	<0.00077 D	<0.00099 D	<0.00077 D	<0.0015 D	<0.00077 D	0.00088 D	0.0032 D	<0.00077 D	<0.00077 D	<0.00077 D
2016	B-3256	CP	9/28/16	70	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00076 D	<0.00059 D	<0.0012 D	<0.00059 D	<0.00059 D	0.00084 D	<0.00059 D	<0.00059 D	<0.00059 D
2016	B-3256	CP	9/28/16	86.5	<0.00072 D	<0.00072 D	<0.00072 D	<0.00072 D	<0.00072 D	<0.00092 D	0.0014 D	<0.0014 D	<0.00072 D	0.0033 D	0.032 D	<0.00072 D	<0.00072 D	<0.00072 D
2016	B-3256	CP	9/28/16 DUP	86.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	0.0017	<0.001	<0.0005	0.0036	0.036	<0.0005	<0.0005	<0.0005
2016	B-3256	CP	9/28/16	110	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	0.0018	<0.001	<0.0005	0.00085	0.033	<0.0005	<0.0005	<0.0005
2016	B-3257	CP	9/28/16	22	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00074 D	<0.00094 D	<0.00074 D	<0.0015 D	<0.00074 D	<0.00074 D	0.00075 D	<0.00074 D	<0.00074 D	<0.00074 D
2016	B-3257	CP	9/28/16	36	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00087 D	<0.00068 D	<0.0014 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D	<0.00068 D
2016	B-3257	CP	9/28/16	46.5	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00079 D	<0.00062 D	<0.0012 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D	<0.00062 D
2016	B-3257	CP	9/28/16	56	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.00063 D	<0.0008 D	<0.00063 D	<0.0013 D	<0.00063 D	<0.00063 D	0.0035 D	<0.00063 D	<0.00063 D	<0.00063 D
2016	B-3257	CP	9/28/16	70.5	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00056 D	<0.00072 D	<0.00056 D	<0.0011 D	<0.00056 D	<0.00056 D	0.00098 D	<0.00056 D	<0.00056 D	<0.00056 D
2016	B-3257	CP	9/28/16	86	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	0.00059	0.07	<0.0005	<0.0005	<0.0005
2016	B-3257	CP	9/28/16 DUP	86	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00064	<0.0005	<0.001	<0.0005	0.00061	0.058 IJ	<0.0005	<0.0005	<0.0005
2016	B-3257	CP	9/28/16	111	<0.0005	<0.0005	<0.0005	0.017 IJ	<0.0005	<0.00064	0.0056 IJ	<0.001	<0.0005	<0.0005	0.062 IJ	<0.0005	<0.0005	<0.0005
2016	B-3258	CP	9/15/16	12	<0.00075 D	<0.00075 D	<0.00075 D	<0.00075 D	<0.00075 D	<0.00096 D	<0.00075 D	<0.0015 D	<0.00075 D	<0.00075 D	0.00092 D	<0.00075 D	<0.00075 D	<0.00075 D
2016	B-3258	CP	9/15/16	18	<0.00036	<0.00036	<0.00036	<0.00036	<0.00036	<0.00046	<0.00036	<0.00072	<0.00036	<0.00036	0.00059	<0.00036	<0.00036	<0.00036

Attachment B Table 2. 2016 direct-push drilling survey analytical results for VOCs in soil.

Year	Well Name	Type	Date	Depth (ft)	1,1,1-Trichloroethane (mg/kg)	1,1,2-Trichloroethane (mg/kg)	1,1-Dichloroethane (mg/kg)	1,1-Dichloroethene (mg/kg)	1,2-Dichloroethane (mg/kg)	1,2-Dichloroethene (total) (mg/kg)	Carbon tetrachloride (mg/kg)	Chloroform (mg/kg)	Freon 113 (mg/kg)	Tetrachloro ethene (mg/kg)	Trichloro ethene (mg/kg)	Trichloro fluoromethane (mg/kg)	cis-1,2-Dichloroethene (mg/kg)	trans-1,2-Dichloroethene (mg/kg)
2016	B-3258	CP	9/15/16	38	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.00064 D	<0.0005 D	<0.001 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D	<0.0005 D
2016	B-3258	CP	9/15/16	50	<0.00098 D	<0.00098 D	<0.00098 D	<0.00098 D	<0.00098 D	<0.0013 D	<0.00098 D	<0.002 D	<0.00098 D	0.0013 D	0.0057 D	<0.00098 D	<0.00098 D	<0.00098 D
2016	B-3258	CP	9/15/16	56.5	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00059 D	<0.00076 D	<0.00059 D	<0.0012 D	<0.00059 D	0.0014 D	0.0019 D	<0.00059 D	<0.00059 D	<0.00059 D
2016	B-3258	CP	9/15/16	75	<0.00036	<0.00036	<0.00036	<0.00036	0.0016	<0.00045	<0.00036	<0.00071	<0.00036	0.0011	0.011	<0.00036	<0.00036	<0.00036
2016	B-3258	CP	9/15/16	86	<0.00035	<0.00035	<0.00035	0.0011	0.0094	<0.00045	<0.00035	<0.00071	<0.00035	0.0024	0.064	<0.00035	<0.00035	<0.00035
2016	B-3258	CP	9/15/16 DUP	86	<0.00034	<0.00034	<0.00034	0.0011	0.01	<0.00043	<0.00034	<0.00067	<0.00034	0.0025	0.067	<0.00034	<0.00034	<0.00034
2016	B-3258	CP	9/15/16	104	<0.00041	<0.00041	<0.00041	0.0045	0.011	<0.00053	<0.00041	<0.00082	<0.00041	0.0043	0.15	<0.00041	<0.00041	<0.00041

Attachment B Table 3. 2016 direct-push drilling survey anlaytical results for VOCs in soil vapor.

Year	Well Name	Type	Date	Depth (ft)	req anal	1,1,1-Trichloroethane (PPM(V/V))	1,1,2-Trichloroethane (PPM(V/V))	1,1-Dichloroethane (PPM(V/V))	1,1-Dichloroethene (PPM(V/V))	1,2-Dichloroethane (PPM(V/V))	Dichloroethene (total) (PPM(V/V))	Carbon tetrachloride (PPM(V/V))	Chloroform (PPM(V/V))	Freon 113 (PPM(V/V))	Tetrachloro ethene (PPM(V/V))	Trichloro ethene (PPM(V/V))	Trichloro fluoromethane (PPM(V/V))	cis-1,2-Dichloroethene (PPM(V/V))	trans-1,2-Dichloroethene (PPM(V/V))
2016	B-3220	CP	5/4/16	9	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.11 D	0.084 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3220	CP	5/4/16	16	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3220	CP	5/4/16	34	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	1.3 D	1.5 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3220	CP	5/4/16	108	TO15DIT	<0.05 D	<0.05 D	<0.05 D	1.6 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.13 D	<0.25 D	0.21 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3221	CP	5/5/16	6	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3221	CP	5/5/16	32	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.31 D	1.9 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3221	CP	5/5/16	37.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.11 D	2.1 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3221	CP	5/9/16	56	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.11 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.28 DIJ	1.6 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3221	CP	5/9/16	74	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.079 D	0.092 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3222	CP	5/10/16	32.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.29 D	0.2 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3222	CP	5/10/16	38	TO15DIT	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	1.4 D	7.8 D	<0.5 D	<0.5 D	<0.5 D
2016	B-3222	CP	5/10/16	62	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.051 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.44 D	1 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3222	CP	5/10/16	102.5	TO15DIT	<0.25 D	<0.25 D	<0.25 D	8.6 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	2.4 D	1.2 D	<0.25 D	<0.25 D	<0.25 D
2016	B-3223	CP	5/11/16	7.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.98 D	0.59 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3223	CP	5/11/16	58.5	TO15DIT	<0.25 D	<0.25 D	<0.25 D	0.33 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	1.7 D	6.3 D	<0.25 D	<0.25 D	<0.25 D
2016	B-3223	CP	5/11/16	74	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.27 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.34 D	0.72 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3223	CP	5/11/16 DUP	74	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.26 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.36 D	0.65 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3224	CP	5/12/16	6	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.15 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	7.4 D	0.088 D	0.6 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3224	CP	5/12/16	58	TO15DIT	<0.05 D	<0.05 D	1.1 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	1.1 D	3 D	7.2 D	<0.05 D	48 D	<0.05 D
2016	B-3224	CP	5/12/16	60	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.16 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.25 D	0.66 D	2.4 D	<0.05 D	6.3 D	<0.05 D
2016	B-3225	CP	5/16/16	57	TO15DIT	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	4.7 D	<0.5 D	<0.5 D	<0.5 D
2016	B-3225	CP	5/16/16 DUP	57	TO15DIT	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	0.88 D	<0.5 D	<0.5 D	<0.5 D
2016	B-3226	CP	5/25/16	7	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.27 D	0.58 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3226	CP	5/25/16	24	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	1.2 D	1.4 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3226	CP	5/25/16	59	TO15DIT	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	<0.5 D	6.3 D	3.2 D	<0.5 D	<0.5 D	<0.5 D
2016	B-3226	CP	5/25/16	62	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.21 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3227	CP	5/26/16	9.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	1.5 D	0.9 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3227	CP	5/26/16	23.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.16 D	0.092 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3227	CP	5/26/16	34.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	1.7 D	1.4 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3228	CP	6/1/16	8	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3228	CP	6/1/16	27.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.06 D	0.31 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3228	CP	6/1/16	31	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.063 D	0.44 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3228	CP	6/1/16	36.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.21 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3228	CP	6/1/16	77	TO15DIT	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	0.46 D	<0.25 D	1.3 D	<0.25 D	<0.25 D	<0.25 D
2016	B-3229	CP	6/2/16	7	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3229	CP	6/2/16	15.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3229	CP	6/2/16	29	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.26 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3229	CP	6/2/16 DUP	29	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.29 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3229	CP	6/2/16	32	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.11 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3229	CP	6/2/16	44	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.71 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3229	CP	6/2/16	52	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.18 D	<0.05 D	<0.05 D	1.1 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3230	CP	6/6/16	10	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.051 D	0.3 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3230	CP	6/6/16	29.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.16 D	<0.05 D	0.077 D	0.61 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3230	CP	6/6/16	54	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.23 D	<0.05 D	<0.05 D	0.74 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3230	CP	6/6/16 DUP	54	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.52 D	<0.05 D	0.071 D	0.86 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3230	CP	6/6/16	69	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	1 D	0.15 D	0.076 D	1.8 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3230	CP	6/6/16	78.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<1 D	0.62 D	0.092 D	2.4 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3231	CP	6/7/16	20	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.48 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3231	CP	6/7/16	26.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.68 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3231	CP	6/7/16	74.5	TO15DIT	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	0.69 D	0.3 D	0.08 D	3.8 D	<0.25 D	<0.25 D	<0.25 D
2016	B-3231	CP	6/7/16	88	TO15DIT	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	0.62 D	0.88 D	0.25 D	5.1 D	<0.25 D	<0.25 D	<0.25 D
2016	B-3232	CP	6/8/16	7	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3232	CP	6/8/16	28	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.06 D	<0.05 D	<0.05 D	0.15 D	<0.05 D	<0.05 D	<0.05 D

Attachment B Table 3. 2016 direct-push drilling survey anlaytical results for VOCs in soil vapor.

Year	Well Name	Type	Date	Depth (ft)	req anal	1,1,1-Trichloroethane (PPM(V/V))	1,1,2-Trichloroethane (PPM(V/V))	1,1-Dichloroethane (PPM(V/V))	1,1-Dichloroethene (PPM(V/V))	1,2-Dichloroethane (PPM(V/V))	Dichloroethene (total) (PPM(V/V))	Carbon tetrachloride (PPM(V/V))	Chloroform (PPM(V/V))	Freon 113 (PPM(V/V))	Tetrachloro ethene (PPM(V/V))	Trichloro ethene (PPM(V/V))	Trichloro fluoromethane (PPM(V/V))	cis-1,2-Dichloroethene (PPM(V/V))	trans-1,2-Dichloroethene (PPM(V/V))
2016	B-3232	CP	6/8/16 DUP	28	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.059 D	<0.05 D	<0.05 D	0.15 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3232	CP	6/8/16	54	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.3 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3232	CP	6/8/16	68	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.3 D	0.11 D	<0.05 D	0.4 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3233	CP	6/13/16	26.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.067 D	<0.05 D	0.11 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3233	CP	6/13/16	28	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.086 D	<0.05 D	0.15 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3233	CP	6/13/16	37	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.098 D	0.081 D	0.47 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3233	CP	6/13/16 DUP	37	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.084 D	0.072 D	0.46 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3233	CP	6/13/16	50	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.063 D	<0.05 D	<0.05 D	<0.05 D	0.059 D	0.24 D	0.076 D	0.2 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3233	CP	6/13/16	57.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.082 D	<0.05 D	<0.05 D	<0.05 D	0.11 D	0.32 D	0.12 D	0.65 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3233	CP	6/14/16	63.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.11 D	0.32 D	0.11 D	0.51 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3234	CP	6/14/16	8.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3234	CP	6/14/16	26.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.088 D	0.13 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3234	CP	6/14/16	37	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.11 D	0.2 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3234	CP	6/14/16	58	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.086 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.17 D	0.13 D	0.42 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3234	CP	6/14/16	81.5	TO15DIT	<0.05 D	<0.05 D	0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.12 D	0.39 D	0.19 D	0.74 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3235	CP	6/15/16	7	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3235	CP	6/15/16	25.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.11 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3235	CP	6/15/16 DUP	25.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.099 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3235	CP	6/15/16	28	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.052 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3235	CP	6/15/16	67.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.15 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.11 D	0.16 D	0.6 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3235	CP	6/15/16	70	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.15 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.12 D	0.18 D	0.7 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3235	CP	6/15/16	97.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<1 D	<0.05 D	<0.05 D	<0.05 D	0.074 D	0.52 D	<1 D	1.7 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3236	CP	6/16/16	8	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3236	CP	6/16/16	27	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3236	CP	6/16/16	44	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.091 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3236	CP	6/16/16	75	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3237	CP	6/20/16	18	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.12 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 DJ
2016	B-3237	CP	6/20/16	25.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.19 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 DJ
2016	B-3237	CP	6/20/16	50	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.42 D	<0.05 D	0.051 D	<0.05 D	<0.05 D	<0.05 DJ
2016	B-3237	CP	6/20/16 DUP	50	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.38 D	<0.05 D	0.056 D	<0.05 D	<0.05 D	<0.05 DJ
2016	B-3237	CP	6/20/16 DUP2	50	TO15DIT	<0.042 D	<0.042 D	<0.042 D	0.055 D	<0.042 D	<0.042 D	<0.042 D	<0.042 D	0.82 D	<0.042 D	0.061 D	<0.042 D	<0.042 D	<0.042 D
2016	B-3237	CP	6/20/16	58.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.4 D	<0.05 D	0.054 D	<0.05 D	<0.05 D	<0.05 DJ
2016	B-3237	CP	6/20/16	73	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.44 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 DJ
2016	B-3237	CP	6/20/16	87.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.66 D	<0.05 D	0.052 D	<0.05 D	<0.05 D	<0.05 DJ
2016	B-3238	CP	6/21/16	7	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3238	CP	6/21/16	19.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3238	CP	6/21/16	26.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3238	CP	6/21/16	35	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3238	CP	6/21/16	45	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3238	CP	6/21/16	94	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.22 D	<0.05 D	<0.05 D	<0.05 D	0.16 D	3.1 D	0.26 D	1.7 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3238	CP	6/21/16 DUP	94	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.21 D	<0.05 D	<0.05 D	<0.05 D	0.15 D	3 D	0.27 D	1.7 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3238	CP	6/21/16 DUP2	94	TO15DIT	<0.34 D	<0.34 D	<0.34 D	0.34 D	<0.34 D	<0.34 D	<0.34 D	<0.34 D	6.6 D	0.35 D	3.5 D	<0.34 D	<0.34 D	<0.34 D
2016	B-3239	CP	6/23/16	6.5	TO15DIT	<0.05 D	<0.05 D	<0.05 DJ	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.059 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16 REA	6.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16	25	TO15DIT	<0.05 D	<0.05 D	<0.05 DJ	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.18 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16 REA	25	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.24 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16	45.5	TO15DIT	<0.05 D	<0.05 D	<0.05 DJ	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.058 D	0.066 D	<0.05 D	0.57 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16 REA	45.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.072 D	0.084 D	<0.05 D	0.66 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16	53	TO15DIT	<0.05 D	<0.05 D	<0.05 DJ	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.075 D	0.091 D	<0.05 D	0.65 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16 REA	53	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.11 D	0.14 D	0.058 D	1.1 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16	75	TO15DIT	<0.05 D	<0.05 D	<0.05 DJ	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.081 D	0.21 D	<0.05 D	1.6 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16 REA	75	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.069 D	<0.05 D	<0.05 D	<0.05 D	0.18 D	0.52 D	0.094 D	0.57 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16	89	TO15DIT	<0.05 D	<0.05 D	<0.05 DJ	0.15 D	<0.05 D	<0.05 D	<0.05 D	0.26 D	0.55 D	0.24 D	2.4 D	<0.05 D	<0.05 D	<0.05 D

Attachment B Table 3. 2016 direct-push drilling survey anlaytical results for VOCs in soil vapor.

Year	Well Name	Type	Date	Depth (ft)	req anal	1,1,1-Trichloroethane (PPM(V/V))	1,1,2-Trichloroethane (PPM(V/V))	1,1-Dichloroethane (PPM(V/V))	1,1-Dichloroethene (PPM(V/V))	1,2-Dichloroethane (PPM(V/V))	Dichloroethene (total) (PPM(V/V))	Carbon tetrachloride (PPM(V/V))	Chloroform (PPM(V/V))	Freon 113 (PPM(V/V))	Tetrachloro ethene (PPM(V/V))	Trichloro ethene (PPM(V/V))	Trichloro fluoromethane (PPM(V/V))	cis-1,2-Dichloroethene (PPM(V/V))	trans-1,2-Dichloroethene (PPM(V/V))
2016	B-3239	CP	6/23/16 REA	89	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.2 D	<0.05 D	<0.05 D	<0.05 D	0.35 D	0.19 D	0.32 D	0.93 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16 DUP	89	TO15DIT	<0.05 D	<0.05 D	<0.05 DJ	0.15 D	<0.05 D	<0.05 D	<0.05 D	0.25 D	0.72 D	0.24 D	3.1 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16 DUP2	89	TO15DIT	<0.55 D	<0.55 D	<0.55 D	<0.55 D	<0.55 D	<0.55 D	<0.55 D	<0.55 D	1.1 D	<0.55 D	4.1 D	<0.55 D	<0.55 D	<0.55 D
2016	B-3239	CP	6/23/16 REA2	89	TO15DIT	<0.05 D	<0.05 D	<0.05 D	0.21 D	<0.05 D	<0.05 D	<0.05 D	0.37 D	0.93 D	0.34 D	3.8 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16	104	TO15DIT	<0.05 D	<0.05 D	<0.05 DJ	0.17 D	<0.05 D	<0.05 D	<0.05 D	0.26 D	0.61 D	0.28 D	3.6 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3239	CP	6/23/16 REA	104	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.34 D	0.2 D	0.34 D	0.89 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3240A	CP	6/27/16	19	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.054 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3240A	CP	6/27/16	42	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.11 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3240A	CP	6/27/16	59	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.07 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3240A	CP	6/27/16	96.5	TO15DIT	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	0.56 D	<0.25 D	3.1 D	<0.25 D	<0.25 D	<0.25 D
2016	B-3240A	CP	6/27/16 DUP	96.5	TO15DIT	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	<0.25 D	0.6 D	0.27 D	3.5 D	<0.25 D	<0.25 D	<0.25 D
2016	B-3240A	CP	6/27/16 DUP2	96.5	TO15DIT	<0.43 D	<0.43 D	<0.43 D	<0.43 D	<0.43 D	<0.43 D	<0.43 D	<0.43 D	0.62 D	<0.43 D	3.2 D	<0.43 D	<0.43 D	<0.43 D
2016	B-3241	CP	8/22/16	7.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.051 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3241	CP	8/22/16	37	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.11 D	0.051 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3241	CP	8/22/16 DUP	37	TO15DIS	<0.098 D	<0.098 D	<0.098 D	<0.098 D	<0.098 D	<0.098 D	<0.098 D	<0.098 D	<0.098 D	<0.098 D	<0.098 D	<0.098 D	<0.098 D	<0.098 D
2016	B-3241	CP	8/22/16 DUP	37	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.088 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3241	CP	8/22/16	46.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	0.052 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3241	CP	8/22/16	55.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D
2016	B-3242	CP	8/23/16	6.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 DO	<0.05 D	<0.05 DO	<0.05 D	<0.05 D
2016	B-3242	CP	8/23/16 DUP	6.5	TO15DIS	<0.096 D	<0.096 D	<0.096 D	<0.096 D	<0.096 D	<0.096 D	<0.096 D	<0.096 D	<0.096 D	<0.096 DO	<0.096 D	<0.096 DO	<0.096 D	<0.096 D
2016	B-3242	CP	8/23/16 DUP	6.5	TO15DIT	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 D	<0.05 DO	<0.05 D	<0.05 DO	<0.05 D	<0.05 D
2016	B-3243	CP	8/29/16	14.5	TO15DIT	<0.005 D	<0.005 D	0.0097 D	0.15 D	<0.005 D	<0.01 D	<0.005 D	0.0071 D	20 D	0.68 D	1.7 D	0.021 D	0.6 D	<0.005 D
2016	B-3243	CP	8/29/16	33	TO15DIT	<0.005 D	<0.005 D	<0.005 D	0.13 D	<0.005 D	<0.01 D	<0.005 D	0.0062 D	19 D	0.7 D	1.6 D	0.015 D	0.63 D	<0.005 D
2016	B-3243	CP	8/29/16	50	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	0.0056 D	1.4 D	0.2 D	0.78 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3243	CP	8/29/16 DUP	50	TO15DIS	<0.007 D	<0.007 D	<0.007 D	<0.007 D	<0.007 D	<0.014 D	<0.007 D	<0.007 D	0.45 D	0.17 D	1.5 D	<0.007 D	<0.007 D	<0.007 D
2016	B-3243	CP	8/29/16 DUP	50	TO15DIT	<0.005 D	<0.005 D	0.022 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	0.012 D	<0.005 D	0.2 D	1.5 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3243	CP	8/29/16	59	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	0.0051 D	<0.005 D	0.082 D	0.64 D	<0.005 D	0.097 D	<0.005 D
2016	B-3244	CP	8/24/16	8.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 DO	<0.005 D	<0.005 D
2016	B-3244	CP	8/24/16	14	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	0.006 D	0.47 D	<0.005 DO	<0.005 D	<0.005 D
2016	B-3244	CP	8/24/16	39	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	0.28 D	<0.005 DO	<0.005 D	<0.005 D
2016	B-3244	CP	8/24/16 DUP	39	TO15DIS	<0.009 D	<0.009 D	<0.009 D	<0.009 D	<0.009 D	<0.009 D	<0.009 D	0.01 D	<0.009 D	<0.009 D	0.69 D	<0.009 DO	<0.009 D	<0.009 D
2016	B-3244	CP	8/24/16 DUP	39	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	0.012 D	<0.005 D	0.0083 D	0.77 D	<0.005 DO	<0.005 D	<0.005 D
2016	B-3244	CP	8/24/16	74	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	0.017 D	0.2 D	<0.005 DO	<0.005 D	<0.005 D
2016	B-3244	CP	8/24/16	115.6	TO15DIT	<0.005 D	<0.005 D	<0.005 D	0.037 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	0.0081 D	0.011 D	0.6 D	<0.005 DO	<0.005 D	<0.005 D
2016	B-3245	CP	8/25/16	7	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3245	CP	8/25/16	18.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3245	CP	8/25/16	38.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	0.0091 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3245	CP	8/25/16	53	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	0.0095 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3245	CP	8/25/16 DUP	53	TO15DIS	<0.007 D	<0.007 D	<0.007 D	<0.007 D	<0.007 D	<0.007 D	<0.007 D	<0.007 D	<0.007 D	<0.007 D	<0.007 D	<0.007 D	<0.007 D	<0.007 D
2016	B-3245	CP	8/25/16 DUP	53	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	0.012 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3245	CP	8/25/16	59	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	0.0081 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3246	CP	8/30/16	6.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.0081 D	0.028 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3246	CP	8/30/16	23.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.011 D	0.14 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3246	CP	8/30/16	43	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.04 D	0.24 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3246	CP	8/30/16 DUP	43	TO15DIS	<0.0084 D	<0.0084 D	<0.0084 D	<0.0084 D	<0.0084 D	<0.017 D	<0.0084 D	<0.0084 D	<0.0084 D	0.11 D	0.26 D	<0.0084 D	<0.0084 D	<0.0084 D
2016	B-3246	CP	8/30/16 DUP	43	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.071 D	0.26 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3246	CP	8/30/16	53.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.23 D	0.54 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3246	CP	8/30/16	65.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.24 D	0.58 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3247	CP	8/31/16	8	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.062 D	0.074 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3247	CP	8/31/16	19	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.11 D	0.21 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3247	CP	8/31/16	42	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.05 D	0.13 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3247	CP	8/31/16 DUP	42	TO15DIS	<0.0081 D	<0.0081 D	<0.0081 D	<0.0081 D	<0.0081 D	<0.016 D	<0.0081 D	<0.0081 D	<0.0081 D	0.25 D	0.57 D	<0.0081 D	<0.0081 D	<0.0081 D
2016	B-3247	CP	8/31/16 DUP	42	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.29 D	0.55 D	<0.005 D	<0.005 D	<0.005 D

Attachment B Table 3. 2016 direct-push drilling survey anlaytical results for VOCs in soil vapor.

Year	Well Name	Type	Date	Depth (ft)	req anal	1,1,1-Trichloroethane (PPM(V/V))	1,1,2-Trichloroethane (PPM(V/V))	1,1-Dichloroethane (PPM(V/V))	1,1-Dichloroethene (PPM(V/V))	1,2-Dichloroethane (PPM(V/V))	Dichloroethene (total) (PPM(V/V))	Carbon tetrachloride (PPM(V/V))	Chloroform (PPM(V/V))	Freon 113 (PPM(V/V))	Tetrachloro ethene (PPM(V/V))	Trichloro ethene (PPM(V/V))	Trichloro fluoromethane (PPM(V/V))	cis-1,2-Dichloroethene (PPM(V/V))	trans-1,2-Dichloroethene (PPM(V/V))
2016	B-3247	CP	8/31/16	54.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	0.0056 D	<0.005 D	0.32 D	0.67 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3247	CP	8/31/16	63	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.19 D	0.42 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3248	CP	9/1/16	9	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.0084 D	0.047 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3248	CP	9/1/16	18.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.011 D	0.035 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3248	CP	9/1/16 DUP	18.5	TO15DIS	<0.008 D	<0.008 D	<0.008 D	<0.008 D	<0.008 D	<0.016 D	<0.008 D	<0.008 D	<0.008 D	0.016 D	0.038 D	<0.008 D	<0.008 D	<0.008 D
2016	B-3248	CP	9/1/16 DUP	18.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.02 D	0.024 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3248	CP	9/1/16	40	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.015 D	0.019 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3249	CP	9/6/16	14.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.008 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3249	CP	9/6/16	21.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.025 D	0.0085 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3249	CP	9/6/16	43.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.22 D	0.31 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3249	CP	9/6/16	54.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.008 D	0.0054 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3249	CP	9/6/16 DUP	54.5	TO15DIS	<0.005 D	<0.005 D	<0.005 D	0.063 D	<0.005 D	<0.01 D	<0.005 D	0.0099 D	<0.005 D	1.2 D	1.5 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3249	CP	9/6/16 DUP	54.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	0.014 D	<0.005 D	1 D	1.4 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3251	CP	9/21/16	6	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.02 D	0.0053 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3251	CP	9/21/16	53.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.0072 D	0.028 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3251	CP	9/21/16 DUP	53.5	TO15DIS	<0.0083 D	<0.0083 D	<0.0083 D	<0.0083 D	<0.0083 D	<0.017 D	<0.0083 D	<0.0083 D	<0.0083 D	0.011 D	0.035 D	<0.0083 D	<0.0083 D	<0.0083 D
2016	B-3251	CP	9/21/16 DUP	53.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.02 D	0.06 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3251	CP	9/21/16	57	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.011 D	0.072 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3251	CP	9/21/16	68	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3252	CP	9/20/16	7	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	0.0067 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3252	CP	9/20/16	25	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.0069 D	0.024 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3252	CP	9/20/16 DUP	25	TO15DIS	<0.0081 D	<0.0081 D	<0.0081 D	<0.0081 D	<0.0081 D	<0.016 D	<0.0081 D	<0.0081 D	<0.0081 D	<0.0081 D	<0.0081 D	<0.0081 D	<0.0081 D	<0.0081 D
2016	B-3252	CP	9/20/16 DUP	25	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.016 D	0.03 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3252	CP	9/20/16	56.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.036 D	0.31 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3253	CP	9/22/16	23.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.0073 D	0.007 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3253	CP	9/22/16	28	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3253	CP	9/22/16 DUP	28	TO15DIS	<0.0078 D	<0.0078 D	<0.0078 D	<0.0078 D	<0.0078 D	<0.016 D	<0.0078 D	<0.0078 D	<0.0078 D	0.013 D	0.014 D	<0.0078 D	<0.0078 D	<0.0078 D
2016	B-3253	CP	9/22/16 DUP	28	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.022 D	0.021 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3253	CP	9/22/16	52	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.011 D	0.085 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3253	CP	9/22/16	62.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.013 D	0.031 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3254	CP	9/19/16	25.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.026 D	0.04 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3254	CP	9/19/16	52	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.076 D	0.25 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3254	CP	9/19/16 DUP	52	TO15DIS	<0.008 D	<0.008 D	<0.008 D	<0.008 D	<0.008 D	<0.016 D	<0.008 D	<0.008 D	<0.008 D	0.17 D	0.41 D	<0.008 D	<0.008 D	<0.008 D
2016	B-3254	CP	9/19/16 DUP	52	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.17 D	0.34 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3254	CP	9/19/16	57.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.11 D	0.8 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3255	CP	9/26/16	15.5	TO15DIT	<0.01 D	<0.01 D	<0.01 D	<0.01 D	<0.01 D	<0.02 D	<0.01 D	<0.01 D	<0.01 D	<0.01 D	<0.01 D	<0.01 D	<0.01 D	<0.01 D
2016	B-3255	CP	9/26/16	23.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.0053 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3255	CP	9/26/16	33.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.0087 D	0.0085 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3255	CP	9/26/16 DUP	33.5	TO15DIS	<0.0074 D	<0.0074 D	<0.0074 D	<0.0074 D	<0.0074 D	<0.015 D	<0.0074 D	<0.0074 D	<0.0074 D	0.014 D	0.014 D	<0.0074 D	<0.0074 D	<0.0074 D
2016	B-3255	CP	9/26/16 DUP	33.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.015 D	0.014 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3255	CP	9/26/16	41.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.011 D	0.019 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3255	CP	9/26/16	56	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.02 D	0.062 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3255	CP	9/26/16	60.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3256	CP	9/27/16	23.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.019 D	0.034 D	<0.005 DO	<0.005 D	<0.005 D
2016	B-3256	CP	9/27/16	45.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.037 D	0.13 D	<0.005 DO	<0.005 D	<0.005 D
2016	B-3256	CP	9/27/16 DUP	45.5	TO15DIS	<0.0078 D	<0.0078 D	<0.0078 D	<0.0078 D	<0.0078 D	<0.016 D	<0.0078 D	<0.0078 D	<0.0078 D	0.06 D	0.22 D	<0.0078 DO	<0.0078 D	<0.0078 D
2016	B-3256	CP	9/27/16 DUP	45.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	0.0067 D	<0.005 D	0.071 D	0.24 D	<0.005 DO	<0.005 D	<0.005 D
2016	B-3256	CP	9/27/16	52.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.041 D	0.19 D	<0.005 DO	<0.005 D	<0.005 D
2016	B-3256	CP	9/27/16	58.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	0.014 D	<0.005 D	0.045 D	0.22 D	<0.005 DO	<0.005 D	<0.005 D
2016	B-3257	CP	9/29/16	22	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.043 D	0.11 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3257	CP	9/29/16	46.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.065 D	0.28 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3257	CP	9/29/16 DUP	46.5	TO15DIS	<0.0091 D	<0.0091 D	<0.0091 D	<0.0091 D	<0.0091 D	<0.018 D	<0.0091 D	<0.0091 D	<0.0091 D	0.16 D	0.64 D	<0.0091 D	<0.0091 D	<0.0091 D
2016	B-3257	CP	9/29/16 DUP	46.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.13 D	0.58 D	<0.005 D	<0.005 D	<0.005 D

Attachment B Table 3. 2016 direct-push drilling survey anlaytical results for VOCs in soil vapor.

Year	Well Name	Type	Date	Depth (ft)	req anal	1,1,1-Trichloroethane (PPM(V/V))	1,1,2-Trichloroethane (PPM(V/V))	1,1-Dichloroethane (PPM(V/V))	1,1-Dichloroethene (PPM(V/V))	1,2-Dichloroethane (PPM(V/V))	Dichloroethene (total) (PPM(V/V))	Carbon tetrachloride (PPM(V/V))	Chloroform (PPM(V/V))	Freon 113 (PPM(V/V))	Tetrachloro ethene (PPM(V/V))	Trichloro ethene (PPM(V/V))	Trichloro fluoromethane (PPM(V/V))	cis-1,2-Dichloroethene (PPM(V/V))	trans-1,2-Dichloroethene (PPM(V/V))
2016	B-3257	CP	9/29/16	56	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.078 D	0.68 D	<0.005 D	<0.005 D	<0.005 D
2016	B-3258	CP	9/15/16	12	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.2 DIJ	0.4 DIJ	<0.005 D	<0.005 D	<0.005 D
2016	B-3258	CP	9/15/16	50	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.14 DIJ	0.62 DIJ	<0.005 D	<0.005 D	<0.005 D
2016	B-3258	CP	9/15/16 DUP	50	TO15DIS	<0.008 D	<0.008 D	<0.008 D	<0.008 D	<0.008 D	<0.016 D	<0.008 D	<0.008 D	<0.008 D	0.13 DIJ	0.91 DIJ	<0.008 D	<0.008 D	<0.008 D
2016	B-3258	CP	9/15/16 DUP	50	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.14 DIJ	0.74 DIJ	<0.005 D	<0.005 D	<0.005 D
2016	B-3258	CP	9/15/16	56.5	TO15DIT	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.005 D	<0.01 D	<0.005 D	<0.005 D	<0.005 D	0.15 DIJ	0.83 DIJ	<0.005 D	<0.005 D	<0.005 D

Attachment B Table 4. 2016 direct-push drilling survey analytical results for gross alpha, gross beta, and tritium in ground weater.

Year	Type	Well Name	Date	Depth (ft)	Gross Alpha (pCi/L)	Gross Beta (pCi/L)	Tritium (pCi/L)
2016	CP	B-3253	9/13/16	85.8	-	-	464
2016	CP	B-3253	9/27/16	85.3	-	-	1,990
2016	CP	B-3257	9/29/16	84.7	123	194	<100
2016	CP	B-3258	9/28/16	99	-	-	39,600

Attachment B Table 5. 2016 direct-pus drilling survey analytical results for tritium in soil moisture.

Year	Type	Well Name	Date	Depth (ft)	Moisture by weight (Percent)	Tritium (pCi/g)
2016	CP	B-3221	5/5/16	15	15.5	-
2016	CP	B-3221	5/5/16	32	5.31	-
2016	CP	B-3221	5/5/16	48	17.2	-
2016	CP	B-3221	5/5/16	56	16.2	-
2016	CP	B-3221	5/5/16	68	18.4	-
2016	CP	B-3221	5/5/16	74	17.2	-
2016	CP	B-3221	5/5/16	84	17.6	-
2016	CP	B-3221	5/5/16	89	15.2	-
2016	CP	B-3221	5/5/16	94	13.9	-
2016	CP	B-3226	5/25/16	7	5.71	<0.2
2016	CP	B-3226	5/25/16	14	13.3	<0.2
2016	CP	B-3226	5/25/16	24	7.93	<0.2
2016	CP	B-3226	5/25/16	40	14.1	<0.2
2016	CP	B-3226	5/25/16	59	4.05	<0.2
2016	CP	B-3226	5/25/16	62	5.09	<0.2
2016	CP	B-3226	5/25/16	68	11.1	<0.2
2016	CP	B-3226	5/25/16	88	14	<0.2
2016	CP	B-3227	5/31/16	9.5	6.95	<0.2
2016	CP	B-3227	5/31/16	23.5	3.61	<0.2
2016	CP	B-3227	5/31/16	34.5	5.63	<0.2
2016	CP	B-3227	5/31/16	44	11.4	<0.2
2016	CP	B-3227	5/31/16	60	8.2	<0.2
2016	CP	B-3227	5/31/16	79	12.4	<0.2
2016	CP	B-3227	5/31/16	96	16.9	<0.2
2016	CP	B-3227	5/31/16	111	15.6	<0.2
2016	CP	B-3227	5/31/16 DUP	111	16	<0.2
2016	CP	B-3228	6/1/16	8	5.51	<0.2
2016	CP	B-3228	6/1/16	20	14.1	<0.2
2016	CP	B-3228	6/1/16	27.5	3.81	<0.2
2016	CP	B-3228	6/1/16	42	13	<0.2
2016	CP	B-3228	6/1/16	53	8.77	<0.2
2016	CP	B-3228	6/1/16	64	5.78	<0.2
2016	CP	B-3228	6/1/16	77	3.99	<0.2
2016	CP	B-3228	6/1/16	90	18	<0.2
2016	CP	B-3228	6/1/16 DUP	90	16.8	<0.2
2016	CP	B-3229	6/2/16	15.5	4.96	4.63 B
2016	CP	B-3229	6/2/16	20	13.2	1.45 B
2016	CP	B-3229	6/2/16	29	4.18	<0.2
2016	CP	B-3229	6/2/16	38	14.9	<0.2
2016	CP	B-3229	6/2/16	44	8.19	<0.2
2016	CP	B-3229	6/2/16	52	13.2	<0.2
2016	CP	B-3229	6/2/16	68	16.8	<0.2
2016	CP	B-3229	6/2/16	92	15	<0.2
2016	CP	B-3229	6/2/16 DUP	92	14.7	<0.2
2016	CP	B-3230	6/6/16	22	12.1	<0.2
2016	CP	B-3230	6/6/16	29.5	2.57	<0.2
2016	CP	B-3230	6/6/16	44	11.7	<0.2

Attachment B Table 5. 2016 direct-pus drilling survey analytical results for tritium in soil moisture.

Year	Type	Well Name	Date	Depth (ft)	Moisture by weight (Percent)	Tritium (pCi/g)
2016	CP	B-3230	6/6/16	54	3.1	<0.2
2016	CP	B-3230	6/6/16	64	12.1	0.43
2016	CP	B-3230	6/6/16	69	10.4	0.231
2016	CP	B-3230	6/6/16	78.5	18.5	0.757
2016	CP	B-3230	6/6/16	96	14.8	<0.2
2016	CP	B-3231	6/7/16	26	2.72	<0.2
2016	CP	B-3231	6/7/16	32	12.8	<0.2
2016	CP	B-3231	6/7/16	52	8.96	<0.2
2016	CP	B-3231	6/7/16	61	9.77	<0.2
2016	CP	B-3231	6/7/16	70	14.9	<0.2
2016	CP	B-3231	6/7/16	74.5	13	<0.2
2016	CP	B-3231	6/7/16	94	14.1	<0.2
2016	CP	B-3231	6/7/16	102	13.6	<0.2
2016	CP	B-3231	6/7/16 DUP	102	11.8	<0.2
2016	CP	B-3232	6/13/16	20	6.59	<0.2
2016	CP	B-3232	6/13/16	28	1.93	<0.2
2016	CP	B-3232	6/13/16	44	10.6	<0.2
2016	CP	B-3232	6/13/16	54	3.67	<0.2
2016	CP	B-3232	6/13/16	68	3.52	<0.2
2016	CP	B-3232	6/13/16	74	10.5	<0.2
2016	CP	B-3232	6/13/16	96	15.5	<0.2
2016	CP	B-3232	6/13/16	101	14	<0.2
2016	CP	B-3232	6/13/16 DUP	101	9.96	0.244
2016	CP	B-3233	6/14/16	24	11.9	<0.2
2016	CP	B-3233	6/14/16	37	12.4	<0.2
2016	CP	B-3233	6/14/16	44	14	<0.2
2016	CP	B-3233	6/14/16	50	13.3	<0.2
2016	CP	B-3233	6/14/16	57.5	3.89	<0.2
2016	CP	B-3233	6/14/16	68	16.7	<0.2
2016	CP	B-3233	6/14/16	79.5	5.31	<0.2
2016	CP	B-3233	6/14/16	94	19.1	<0.2
2016	CP	B-3233	6/14/16 DUP	94	17.4	<0.2
2016	CP	B-3234	6/15/16	17.5	13	0.36
2016	CP	B-3234	6/15/16	26.5	4.3	<0.2
2016	CP	B-3234	6/15/16	37	4.81	<0.2
2016	CP	B-3234	6/15/16	44	12.7	<0.2
2016	CP	B-3234	6/15/16	58	4.65	<0.2
2016	CP	B-3234	6/15/16	70	14.3	<0.2
2016	CP	B-3234	6/15/16	81.5	7.06	<0.2
2016	CP	B-3234	6/15/16	90	16.6	<0.2
2016	CP	B-3234	6/15/16 DUP	90	12	<0.2
2016	CP	B-3235	6/16/16	20	9.58	<0.2
2016	CP	B-3235	6/16/16	25.5	2.94	<0.2
2016	CP	B-3235	6/16/16	28	3.41	<0.2
2016	CP	B-3235	6/16/16	36	12.2	<0.2
2016	CP	B-3235	6/16/16	58	13.3	<0.2
2016	CP	B-3235	6/16/16	67.5	5.73	<0.2

Attachment B Table 5. 2016 direct-pus drilling survey analytical results for tritium in soil moisture.

Year	Type	Well Name	Date	Depth (ft)	Moisture by weight (Percent)	Tritium (pCi/g)
2016	CP	B-3235	6/16/16	88	14.9	<0.2
2016	CP	B-3235	6/16/16	97.5	8.53	<0.2
2016	CP	B-3235	6/16/16 DUP	97.5	11.3	<0.2
2016	CP	B-3236	6/20/16	27	2.54	<0.2
2016	CP	B-3236	6/20/16	38	10.7	<0.2
2016	CP	B-3236	6/20/16	44	5.78	<0.2
2016	CP	B-3236	6/20/16	54	13.2	<0.2
2016	CP	B-3236	6/20/16	70	13.3	<0.2
2016	CP	B-3236	6/20/16	75	5.89	<0.2
2016	CP	B-3236	6/20/16	94.5	5.13	<0.2
2016	CP	B-3236	6/20/16	98	13.6	<0.2
2016	CP	B-3236	6/20/16 DUP	98	13.3	<0.2
2016	CP	B-3237	6/21/16	18	3.59	<0.2
2016	CP	B-3237	6/21/16	36	15.2	<0.2
2016	CP	B-3237	6/21/16	50	10.3	<0.2
2016	CP	B-3237	6/21/16	64	13.1	<0.2
2016	CP	B-3237	6/21/16	73	5.82	<0.2
2016	CP	B-3237	6/21/16	80	12.5	<0.2
2016	CP	B-3237	6/21/16	87.5	8.2	<0.2
2016	CP	B-3237	6/21/16	98	12.7	<0.2
2016	CP	B-3237	6/21/16 DUP	98	14.1	<0.2
2016	CP	B-3238	6/22/16	19.5	4.99	<0.2
2016	CP	B-3238	6/22/16	22.5	6.28	<0.2
2016	CP	B-3238	6/22/16	26.5	1.52	<0.2
2016	CP	B-3238	6/22/16	40	10.6	<0.2
2016	CP	B-3238	6/22/16	45	4.61	<0.2
2016	CP	B-3238	6/22/16	64	7.73	<0.2
2016	CP	B-3238	6/22/16	77.5	6.17	<0.2
2016	CP	B-3238	6/22/16	92	14.9	<0.2
2016	CP	B-3238	6/22/16 DUP	92	3.19	<0.2
2016	CP	B-3239	6/23/16	25	2.67	<0.2
2016	CP	B-3239	6/23/16	32	9.56	<0.2
2016	CP	B-3239	6/23/16	56	5.9	<0.2
2016	CP	B-3239	6/23/16	57.5	7.92	<0.2
2016	CP	B-3239	6/23/16	75	4.27	<0.2
2016	CP	B-3239	6/23/16	83	14	<0.2
2016	CP	B-3240A	6/27/16	19	2.03	<0.2
2016	CP	B-3240A	6/27/16	27	17.2	<0.2
2016	CP	B-3240A	6/27/16	46	11.7	<0.2
2016	CP	B-3240A	6/27/16	59	3.69	<0.2
2016	CP	B-3240A	6/27/16	62	8.08	<0.2
2016	CP	B-3240A	6/27/16	73	5.41	<0.2
2016	CP	B-3240A	6/27/16	81.5	8.27	<0.2
2016	CP	B-3240A	6/27/16	96.5	11.6	0.234
2016	CP	B-3240A	6/27/16 DUP	62	11.2	<0.2
2016	CP	B-3251	9/21/16	6	5.53	<0.2
2016	CP	B-3251	9/21/16	20	11.2	0.22

Attachment B Table 5. 2016 direct-pus drilling survey analytical results for tritium in soil moisture.

Year	Type	Well Name	Date	Depth (ft)	Moisture by weight (Percent)	Tritium (pCi/g)
2016	CP	B-3251	9/21/16	36	14.7	0.613
2016	CP	B-3251	9/21/16	53.5	3.45	0.204
2016	CP	B-3251	9/21/16	57	6.06	0.338
2016	CP	B-3251	9/21/16	68	6.79	<0.2
2016	CP	B-3251	9/21/16	82	11.6	<0.2
2016	CP	B-3251	9/21/16	108	20.1	<0.2
2016	CP	B-3251	9/21/16 DUP	108	12.4	0.316
2016	CP	B-3252	9/20/16	7	5.13	<0.2
2016	CP	B-3252	9/20/16	18	12.4	<0.2
2016	CP	B-3252	9/20/16	25	9.51	<0.2
2016	CP	B-3252	9/20/16	42	16.2	<0.2
2016	CP	B-3252	9/20/16	56.5	3.7	<0.2
2016	CP	B-3252	9/20/16	65	16.5	<0.2
2016	CP	B-3252	9/20/16	88	12.9	<0.2
2016	CP	B-3252	9/20/16	114	20	<0.2
2016	CP	B-3252	9/20/16 DUP	114	13.4	<0.2
2016	CP	B-3253	9/22/16	14	10.7	<0.2
2016	CP	B-3253	9/22/16	23.5	3.13	<0.2
2016	CP	B-3253	9/22/16	40	12.4	<0.2
2016	CP	B-3253	9/22/16	52	5.81	<0.2
2016	CP	B-3253	9/22/16	62.5	17	0.207
2016	CP	B-3253	9/22/16	80	13.5	<0.2
2016	CP	B-3253	9/22/16	105.5	14.6	<0.2
2016	CP	B-3253	9/22/16	116	15.7	<0.2
2016	CP	B-3253	9/22/16 DUP	116	17.2	<0.2
2016	CP	B-3254	9/19/16	12	11.9	<0.2
2016	CP	B-3254	9/19/16	25.5	2.03	<0.2
2016	CP	B-3254	9/19/16	40	14.8	<0.2
2016	CP	B-3254	9/19/16	52	6.55	<0.2
2016	CP	B-3254	9/19/16	57.5	4.28	<0.2
2016	CP	B-3254	9/19/16	78	15.5	<0.2
2016	CP	B-3254	9/19/16	106	16	<0.2
2016	CP	B-3255	9/26/16	15.5	12.2	<0.2
2016	CP	B-3255	9/26/16	23.5	2.69	<0.2
2016	CP	B-3255	9/26/16	41.5	5.13	<0.2
2016	CP	B-3255	9/26/16	56	4.6	<0.2
2016	CP	B-3255	9/26/16	70	8.95	<0.2
2016	CP	B-3255	9/26/16	82	15.7	<0.2
2016	CP	B-3255	9/26/16	98	12.6	<0.2
2016	CP	B-3255	9/26/16	112	15.9	<0.2
2016	CP	B-3255	9/26/16 DUP	112	14.8	<0.2
2016	CP	B-3256	9/28/16	23.5	2.53	0.594
2016	CP	B-3256	9/28/16	34	14.7	16.3
2016	CP	B-3256	9/28/16	45.5	6.09	4.11
2016	CP	B-3256	9/28/16	52.5	6.79	10.5
2016	CP	B-3256	9/28/16	58.5	4.54	5.31
2016	CP	B-3256	9/28/16	70	6.25	0.641

Attachment B Table 5. 2016 direct-pus drilling survey analytical results for tritium in soil moisture.

Year	Type	Well Name	Date	Depth (ft)	Moisture by weight (Percent)	Tritium (pCi/g)
2016	CP	B-3256	9/28/16	86.5	10.9	<0.2
2016	CP	B-3256	9/28/16	110	12.5	<0.2
2016	CP	B-3256	9/28/16 DUP	110	19.4	<0.2
2016	CP	B-3257	9/28/16	22	6.31	<0.2
2016	CP	B-3257	9/28/16	36	13	<0.2
2016	CP	B-3257	9/28/16	46.5	5.29	<0.2
2016	CP	B-3257	9/28/16	56	3.99	<0.2
2016	CP	B-3257	9/28/16	70.5	7.14	<0.2
2016	CP	B-3257	9/28/16	86	12.9	<0.2
2016	CP	B-3257	9/28/16	111	14.7	<0.2
2016	CP	B-3257	9/28/16 DUP	111	13.8	<0.2
2016	CP	B-3258	9/15/16	12	3.47	<0.2
2016	CP	B-3258	9/15/16	18	12.8	7.67
2016	CP	B-3258	9/15/16	38	14.1	9.86
2016	CP	B-3258	9/15/16	50	5.17	2.62
2016	CP	B-3258	9/15/16	56.5	10.4	7.58
2016	CP	B-3258	9/15/16	75	16	7.06
2016	CP	B-3258	9/15/16	86	16.1	5.37
2016	CP	B-3258	9/15/16	104	22.9	3.73
2016	CP	B-3258	9/15/16 DUP	104	24.7	4.54

Attachment C

Direct-push soil and soil vapor sampling analytical results

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-001	MW	1/21/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	4.2	1	<0.5	<0.5	<0.5
2016	W-001A	MW	1/21/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	2	2.4	<0.5	1.4	7	<0.5	<0.5	<0.5
2016	W-002	MW	3/31/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.63	<0.5	<0.5	<0.5	4.2	<0.5	<0.5
2016	W-002	MW	9/14/16	<0.5	<0.5	<0.5	3.4	<0.5	<1	0.79	9.2	0.7	5.9	7.4	0.57	<0.5	<0.5
2016	W-002A	MW	5/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.8	<0.5	<0.5	<0.5	3.9	<0.5	<0.5
2016	W-004	MW	9/1/16	<0.5	<0.5	<0.5	0.98	<0.5	<1	<0.5	1.2	14	0.53	13	<0.5	<0.5	<0.5
2016	W-005	MW	9/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-005A	MW	11/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-008	MW	8/22/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	3.5	<0.5	<0.5	<0.5	<0.5
2016	W-012	MW	3/7/16	<0.5	<0.5	<0.5	1.1	<0.5	<1	<0.5	<0.5	2.6	4.8	17	<0.5	<0.5	<0.5
2016	W-012	MW	3/7/16 DUP	<0.5	<0.5	<0.5	0.91	<0.5	<1	<0.5	<0.5	2.5	4.3	14	<0.5	<0.5	<0.5
2016	W-017	MW	1/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-104	MW	2/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 L	<0.5
2016	W-104	MW	4/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-104	MW	8/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5 L	<0.5	<0.5	<0.5 L	<0.5
2016	W-104	MW	10/27/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-105	MW	2/22/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.69	3.6	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-105	MW	7/22/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.77	4.8	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-108	MW	9/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.2	0.61	2.8	<0.5	<0.5	<0.5
2016	W-109	MW	2/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.53	0.88	<0.5	<0.5	<0.5	<0.5
2016	W-109	MW	4/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.52	0.91	<0.5	<0.5	<0.5	<0.5
2016	W-109	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.56	0.72	<0.5	<0.5	<0.5	<0.5
2016	W-109	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.52	0.84	<0.5	<0.5	<0.5	<0.5
2016	W-110	MW	1/20/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-110	MW	4/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-110	MW	8/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-110	MW	10/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-111	MW	6/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	6.7	0.5	<0.5	3.1	<0.5	<0.5	<0.5
2016	W-112	MW	3/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.95	5.3	<0.5	<0.5	<0.5
2016	W-115	MW	11/30/16	<0.5	<0.5	<0.5	0.93	<0.5	<1	0.56	4.7	<0.5	<0.5	0.6	<0.5	<0.5	<0.5
2016	W-116	MW	8/15/16	<0.5	<0.5	1.7	0.59	<0.5	74	<0.5	<0.5	<0.5	210 D	24	<0.5	72	1.8
2016	W-118	MW	4/20/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	9.3	<0.5	<0.5	<0.5	<0.5
2016	W-119	MW	1/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-120	MW	2/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.76	<0.5	<0.5	<0.5	<0.5
2016	W-120	MW	8/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.82	<0.5	<0.5	<0.5	<0.5
2016	W-121	MW	1/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-121	MW	4/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-121	MW	8/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-121	MW	10/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-122	MW	2/2/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-123	MW	2/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-143	MW	2/2/16	<0.5	<0.5	11	8.1	<0.5	<1	<0.5	<0.5	<0.5	5.1 L	2.9 LO	<0.5	0.69 L	<0.5
2016	W-146	MW	2/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.8	2.8	<0.5	<0.5	<0.5
2016	W-146	MW	5/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.5	2.7 IJ	<0.5	<0.5	<0.5
2016	W-146	MW	5/18/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.5	2.4	<0.5	<0.5	<0.5
2016	W-146	MW	10/26/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.4	2.6	<0.5	<0.5	<0.5
2016	W-148	MW	2/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-151	MW	1/12/16	<0.5	<0.5	0.94	1.2	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-151	MW	2/1/16	<0.5	<0.5	0.9	1.2	<0.5	<1	<0.5	<0.5	<0.5	0.52	<0.5	<0.5	<0.5	<0.5
2016	W-151	MW	3/22/16	<0.5	<0.5	0.99	1.3	<0.5	<1	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5
2016	W-151	MW	5/17/16	<0.5	<0.5	0.88	1.1	<0.5	<1	<0.5	<0.5	<0.5	0.52	<0.5	<0.5	<0.5	<0.5
2016	W-151	MW	5/31/16	<0.5	<0.5	0.91	1.1	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-151	MW	6/28/16	<0.5	<0.5	0.97	1.3	<0.5	<1	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5
2016	W-151	MW	7/29/16	<0.5	<0.5	0.96	1.2	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-151	MW	8/29/16	<0.5	<0.5	0.96	1.2	<0.5	<1	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5
2016	W-151	MW	9/21/16	<0.5	<0.5	0.88	1.2	<0.5	<1	<0.5	<0.5	<0.5	0.51	<0.5	<0.5	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-151	MW	10/17/16	<0.5	<0.5	0.84	1.1	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-151	MW	11/3/16	<0.5	<0.5	0.84	1.1	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-151	MW	12/6/16	<0.5	<0.5	0.87	1.1	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-201	MW	4/20/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-204	MW	1/6/16	<0.5	<0.5	<0.5	1.5	<0.5	<1	0.77	3.7	10	1.2	14	<0.5	<0.5	<0.5
2016	W-205	MW	3/1/16	<0.5	<0.5	<0.5	2.1	<0.5	1.5	0.53	1	1	<0.5	470 D	<0.5	1.5	<0.5
2016	W-205	MW	3/1/16 DUP	<0.5	<0.5	<0.5	1.8	<0.5	1.4	<0.5	0.89	1.1	<0.5	450 D	<0.5	1.4	<0.5
2016	W-205	MW	5/19/16	<0.5	<0.5	<0.5	1.9	<0.5	1.3	0.61	0.94	1	<0.5	420 D	<0.5	1.3	<0.5
2016	W-205	MW	8/22/16 DUP	<0.5 H	<0.5 H	<0.5 H	2.1 H	<0.5 H	1.4 H	<0.5 H	1 H	1.1 H	<0.5 H	430 DH	<0.5 H	1.4 H	<0.5 H
2016	W-205	MW	8/22/16	<0.5	<0.5	<0.5	2.7	<0.5	1.8	0.56	1.1	1.1	<0.5	550 D	<0.5	1.8	<0.5
2016	W-206	MW	8/2/16	<0.5	<0.5	0.89	12	4.8	<1	1.9	24	3.1	34	280 D	<0.5	<0.5	<0.5
2016	W-213	MW	9/14/16	<0.5	<0.5	<0.5	0.6	<0.5	<1	<0.5	4.7	<0.5	<0.5	0.59	<0.5	<0.5	<0.5
2016	W-214	MW	2/2/16	<0.5	<0.5	0.95	3.3	<0.5	<1	0.66	3.3	<0.5	5.8 L	2.7 LO	<0.5	<0.5 L	<0.5
2016	W-220	MW	5/11/16	<0.5	<0.5	<0.5	2.7	2.1	<1	<0.5	<0.5	<0.5	4.2	19	<0.5	<0.5	<0.5
2016	W-221	MW	1/13/16	<0.5	<0.5	0.55	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-222	MW	9/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.6	<0.5	0.94	31	<0.5	<0.5	<0.5
2016	W-222	MW	9/1/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.5	2.7	<0.5	0.96	31	<0.5	<0.5	<0.5
2016	W-224	MW	9/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-225	MW	6/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-251	MW	2/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-251	MW	4/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-251	MW	11/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-252	MW	9/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	15	<0.5	0.51	1.4	<0.5	<0.5	<0.5
2016	W-254	MW	1/14/16	<0.5	<0.5	0.65	0.58	<0.5	2	<0.5	<0.5	<0.5	63	2.1	<0.5	2	<0.5
2016	W-254	MW	7/12/16	<0.5	<0.5	0.93	0.86	<0.5	1.4	<0.5	<0.5	<0.5	90	2.4	<0.5	1.4	<0.5
2016	W-254	MW	10/5/16	<0.5	<0.5	0.89	0.82	<0.5	1.9	<0.5	<0.5	<0.5	78	3.7	<0.5	1.9	<0.5
2016	W-258	MW	5/23/16	<0.5	<0.5	<0.5	14	0.51	<1	1.4	1.3	<0.5	7.4	110 D	<0.5	<0.5	<0.5
2016	W-258	MW	5/23/16 DUP	<0.5	<0.5	<0.5	16	0.5	<0.5	1.6	1.4	<0.5	7.5	120 D	<0.5	<0.5	<0.5
2016	W-260	MW	11/8/16	<0.5	<0.5	29	8.2	<0.5	<1	<0.5	<0.5	<0.5	3.3	0.84	<0.5	0.62	<0.5
2016	W-260	MW	11/8/16 DUP	<0.5 H	<0.5 H	31 H	9.7 H	<0.5 H	0.7 H	<0.5 H	<0.5 H	<0.5 H	3.6 H	0.9 H	<0.5 H	0.7 H	<0.5 H
2016	W-261	MW	3/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-261	MW	5/19/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-261	MW	9/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-262	MW	2/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-262	MW	4/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-262	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-262	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-263	MW	1/21/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	1.5	<0.5	14	1.5	<0.5	<0.5	<0.5
2016	W-263	MW	4/19/16	<0.5	<0.5	<0.5	0.77	<0.5	2.2	<0.5	0.92	<0.5	8.2	1.2	<0.5	2.2	<0.5
2016	W-263	MW	7/22/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	1.6	<0.5	14	1.6	<0.5	<0.5	<0.5
2016	W-263	MW	10/5/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	1.5	<0.5	13	1.5	<0.5	<0.5	<0.5
2016	W-264	MW	2/2/16	<0.5	<0.5	0.7	1.6	<0.5	<1	<0.5	1.8	<0.5	21 L	2.5 LO	<0.5	<0.5 L	<0.5
2016	W-264	MW	2/2/16 DUP	<0.5	<0.5	0.69	1.7	<0.5	<1	<0.5	1.9	<0.5	22	1.7	<0.5	<0.5	<0.5
2016	W-264	MW	4/20/16	<0.5	<0.5	1	2.9	<0.5	<1	<0.5	3.3	0.54	29	1.5	<0.5	<0.5	<0.5
2016	W-264	MW	7/22/16	<0.5	<0.5	0.96	2.8	<0.5	<1	<0.5	3.2	<0.5	27	1.6	<0.5	<0.5	<0.5
2016	W-264	MW	7/22/16 DUP	<0.5	<0.5	1.4	4.1	<0.5	0.5	1.1	4	1.1	30	2	<0.5	0.5	<0.5
2016	W-268	MW	3/1/16	<0.5	<0.5	<0.5	2.6	<0.5	<1	<0.5	1.2	2.8	0.63	7.8	<0.5	<0.5	<0.5
2016	W-268	MW	5/19/16	<0.5	<0.5	<0.5	2.3	<0.5	<1	<0.5	1.2	2.4	0.6	9.8	<0.5	<0.5	<0.5
2016	W-268	MW	5/19/16 DUP	<0.5	<0.5	<0.5	2.2	<0.5	<1	<0.5	1.1	2.3	0.67	9.4	<0.5	<0.5	<0.5
2016	W-269	MW	12/5/16 DUP	<0.5	<0.5	<0.5	6.3	<0.5	<1	<0.5	1	1.5	0.89	2.7	<0.5	<0.5	<0.5
2016	W-269	MW	12/5/16	<0.5	<0.5	<0.5	6.1	<0.5	<1	<0.5	0.99	1.4	0.92	2.6	<0.5	<0.5	<0.5
2016	W-271	MW	3/7/16	<0.5	<0.5	<0.5	2.2	<0.5	<1	<0.5	<0.5	0.67	1.1	5.3	<0.5	<0.5	<0.5
2016	W-272	MW	8/15/16	<0.5	<0.5	<0.5	0.97	<0.5	<1	<0.5	<0.5	<0.5	<0.5	4.8	<0.5	<0.5	<0.5
2016	W-273	MW	2/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-274	MW	8/22/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	12 HL	<0.5	<0.5	<0.5
2016	W-274	MW	8/22/16	<0.5	<0.5	<0.5 O	<0.5	<0.5	<1 O	<0.5	<0.5 O	<0.5 O	<0.5	26	<0.5	<0.5 O	<0.5 O

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-274	MW	11/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.51	<0.5	<0.5	68 L	<0.5	<0.5	<0.5
2016	W-275	MW	12/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.54	<0.5	5.4	<0.5	<0.5	<0.5
2016	W-276	MW	3/7/16	<0.5	<0.5	<0.5	7.5	<0.5	1.6	<0.5	<0.5	13	14	54	0.76	1.6	<0.5
2016	W-276	MW	3/7/16 DUP	<0.5	<0.5	<0.5	6.8	<0.5	1.4	<0.5	<0.5	11	12	50	0.67	1.4	<0.5
2016	W-276	MW	6/1/16	<0.5	<0.5	<0.5	7.5	<0.5	1.4	<0.5	<0.5	13	13	56	0.74	1.4	<0.5
2016	W-277	MW	6/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.4	<0.5	<0.5	2.8	1.1	<0.5	<0.5
2016	W-292	MW	1/6/16	<0.5	<0.5	<0.5	1	<0.5	2.1	<0.5	0.86	1.2	1.2	18	<0.5	2.1	<0.5
2016	W-292	MW	4/5/16	<0.5	<0.5	<0.5	0.91	<0.5	1.7	<0.5	0.77	1.1	1.2	15	<0.5	1.7	<0.5
2016	W-292	MW	7/7/16	<0.5	<0.5	<0.5	1.1	<0.5	2.1	<0.5	0.86	1.2	1.2	17	<0.5	2.1	<0.5
2016	W-292	MW	10/6/16	<0.5	<0.5	<0.5	0.91	<0.5	1.8	<0.5	0.88	1.1	1.3	17	<0.5	1.8	<0.5
2016	W-301	MW	10/26/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.61	2.9	2.7	2.8	<0.5	<0.5	<0.5
2016	W-303	MW	9/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.1	4.4	<0.5	<0.5	<0.5	1.6	<0.5	<0.5
2016	W-304	MW	6/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.6	1.2	<0.5	13	<0.5	<0.5	<0.5
2016	W-305	MW	1/6/16	<0.5	<0.5	<0.5	1.6	<0.5	<1	<0.5	0.89	9.8	7.5	26	<0.5	<0.5	<0.5
2016	W-305	MW	4/5/16	<0.5	<0.5	<0.5	1.5	<0.5	<1	<0.5	0.87	8.8	7	22	<0.5	<0.5	<0.5
2016	W-305	MW	7/7/16	<0.5	<0.5	<0.5	1.7	<0.5	<1	<0.5	0.94	9	7.5	25	<0.5	<0.5	<0.5
2016	W-305	MW	10/6/16	<0.5	<0.5	<0.5	1.5	<0.5	<1	<0.5	0.9	7.7	6.9	22	<0.5	<0.5	<0.5
2016	W-306	MW	4/7/16	<0.5	<0.5	<0.5	1.1	<0.5	<1	1.8	17	<0.5	<0.5	3.1	7.8	<0.5	<0.5
2016	W-307	MW	2/17/16	<0.5	<0.5	<0.5	0.57	<0.5	<1	<0.5	2.1	<0.5	22	28	<0.5	<0.5	<0.5
2016	W-307	MW	2/17/16 DUP	<0.5	<0.5	<0.5	0.72	<0.5	<1	<0.5	2.3	0.53	26	32	<0.5	<0.5	<0.5
2016	W-307	MW	9/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.3	<0.5	23	29	<0.5	<0.5	<0.5
2016	W-307	MW	9/14/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.9	<0.5	25	35	<0.5	<0.5	<0.5
2016	W-308	MW	8/22/16	<0.5	<0.5	<0.5	1.1	<0.5	<1	1.2	2.4	0.61	1.8	9.2	<0.5	<0.5	<0.5
2016	W-310	MW	2/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.1	4.2	5.7	3.9	<0.5	<0.5	<0.5
2016	W-310	MW	2/18/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1	3.9	5.3	3.6	<0.5	<0.5	<0.5
2016	W-310	MW	4/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.96	3.4	4.8	3.2	<0.5	<0.5	<0.5
2016	W-310	MW	10/27/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1	3.5	5	3.3	<0.5	<0.5	<0.5
2016	W-311	MW	2/24/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	5.2	<0.5	<0.5	7.9	22	<0.5	<0.5
2016	W-314	MW	1/13/16	<0.5	<0.5	<0.5	0.7	<0.5	<1	<0.5	<0.5	<0.5	1.2	5	<0.5	<0.5	<0.5
2016	W-314	MW	4/18/16	<0.5	<0.5	<0.5	0.62	<0.5	<1	<0.5	<0.5	<0.5	1	3.7	<0.5	<0.5	<0.5
2016	W-314	MW	7/11/16	<0.5	<0.5	0.52	0.66	<0.5	<1	<0.5	<0.5	<0.5	0.96 O	3.4	<0.5	<0.5	<0.5
2016	W-314	MW	10/3/16	<0.5	<0.5	<0.5	0.61	<0.5	<1	<0.5	<0.5	<0.5	0.94	3.3	<0.5	<0.5	<0.5
2016	W-315	MW	2/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.2	0.51	<0.5	9	24	<0.5	<0.5
2016	W-315	MW	4/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.8	<0.5	<0.5	7.6	20	<0.5	<0.5
2016	W-315	MW	8/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.8	0.56	<0.5	8.8	20	<0.5	<0.5
2016	W-315	MW	11/28/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.1	<0.5	<0.5	8	20	<0.5	<0.5
2016	W-315	MW	11/28/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3	<0.5	<0.5	8	21	<0.5	<0.5
2016	W-316	MW	12/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.1	<0.5	<0.5	<0.5	27	<0.5	<0.5
2016	W-317	MW	11/7/16	<0.5	<0.5	<0.5	0.87	<0.5	<1	<0.5	16	2	<0.5	12	20	<0.5	<0.5
2016	W-319	MW	9/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.4	<0.5	<0.5	1.1	<0.5	<0.5
2016	W-321	MW	3/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-322	MW	1/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-322	MW	4/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-322	MW	8/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-322	MW	10/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-323	MW	2/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.89	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-323	MW	4/19/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.82	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-323	MW	8/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.84	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-323	MW	10/19/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.84	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-324	MW	12/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-325	MW	2/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-351	MW	2/4/16	<0.5	<0.5	<0.5	1.2	<0.5	1.8	4	0.88	0.73	1.4	83	2	1.8	<0.5
2016	W-351	MW	4/5/16	<0.5	<0.5	<0.5	3.5	0.64	<1	10	1.9	1.8	4.1	190 D	2.4	<0.5	<0.5
2016	W-351	MW	7/7/16	<0.5	<0.5	<0.5	6	0.77	<1	23	4.3	4	5.4	480 D	2.5	<0.5	<0.5
2016	W-351	MW	10/3/16	<0.5	<0.5	<0.5	6.9	0.93	<1	27	4.8	4.1	5.8	530 D	1.9	<0.5	<0.5
2016	W-353	MW	8/15/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	5.1	<0.5	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-353	MW	8/15/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	5.2	<0.5	<0.5	<0.5
2016	W-354	MW	3/14/16	<0.5	<0.5	<0.5	0.52	<0.5	<1	1.2	1	<0.5	1.7	34	<0.5	0.59	<0.5
2016	W-354	MW	3/14/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.73	0.69	<0.5	1	23	<0.5	<0.5	<0.5
2016	W-354	MW	6/2/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.6	14	<0.5	<0.5	<0.5
2016	W-354	MW	8/2/16	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<1 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H	9.5 H	<0.5 H	<0.5 H	<0.5 H
2016	W-354	MW	8/2/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	11	<0.5	<0.5	<0.5
2016	W-354	MW	12/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	11 L	<0.5	<0.5	<0.5
2016	W-355	MW	2/24/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.53	<0.5	<0.5	2.7	0.61	<0.5	<0.5
2016	W-355	MW	8/22/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.54	<0.5	<0.5	12	2.3	<0.5	<0.5
2016	W-355	MW	11/2/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.56	<0.5	<0.5	5.6	1.3	<0.5	<0.5
2016	W-356	MW	6/2/16	<0.5	<0.5	<0.5	13	<0.5	1.5	<0.5	0.65	2.6	8.1	64	<0.5	1.5	<0.5
2016	W-356	MW	12/8/16	<0.5	<0.5	<0.5	12	<0.5	1.4	<0.5	0.64	2.3	6.8	62	<0.5	1.4	<0.5
2016	W-356	MW	12/8/16 DUP	<0.5	<0.5	<0.5	12	<0.5	1.6	<0.5	0.58	2.3	7	62	<0.5	1.6	<0.5
2016	W-357	MW	1/4/16	<0.5	<0.5	<0.5	1	<0.5	<1	1.4	3.2	3	1.1	30	<0.5	<0.5	<0.5
2016	W-357	MW	4/4/16	<0.5	<0.5	<0.5	1	<0.5	<1	1.4	3	2.6	0.97	25	<0.5	<0.5	<0.5
2016	W-357	MW	7/5/16	<0.5	<0.5	<0.5	1.3	<0.5	<1	1.5	3.5	2.8	1.1	28	<0.5	<0.5	<0.5
2016	W-357	MW	10/5/16	<0.5	<0.5	<0.5	1	<0.5	<1	1.4	3.2	2.3	1	25	<0.5	<0.5	<0.5
2016	W-359	MW	1/7/16	<0.5	<0.5	<0.5	10	<0.5	<1	2.3	3.3	4.5	7.3	160 D	<0.5	<0.5	<0.5
2016	W-359	MW	4/5/16	<0.5	<0.5	<0.5	8.9	<0.5	<1	1.9	3.2	5	7.6	140 D	<0.5	<0.5	<0.5
2016	W-359	MW	7/7/16	<0.5	<0.5	<0.5	10	0.52	<1	2	3.4	4.6	7.7	140 D	<0.5	<0.5	<0.5
2016	W-359	MW	10/6/16	<0.5	<0.5	<0.5	8.1	<0.5	<1	1.6	3	3.8	6.3	120 D	<0.5	<0.5	<0.5
2016	W-362	MW	5/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	<0.5
2016	W-363	MW	1/6/16	<0.5	<0.5	0.51	7	2.1	<1	1.6	13	15	13	120 D	<0.5	<0.5	<0.5
2016	W-363	MW	1/6/16 DUP	<0.5	<0.5	0.5	7	2.2	<1	1.6	14	15	13	120 D	<0.5	<0.5	<0.5
2016	W-363	MW	5/25/16	<0.5	<0.5	0.76	11	2.9	<1	2	19	17	22	180 D	<0.5	<0.5	<0.5
2016	W-363	MW	8/2/16	<0.5	<0.5	0.67	9.5	2.5	<1	2	16	18	18	150 D	<0.5	<0.5	<0.5
2016	W-363	MW	8/2/16 DUP	<0.5	<0.5	0.65	9.3	2.7	<1	1.9	16	17	17	140 D	<0.5	<0.5	<0.5
2016	W-364	MW	8/23/16	<0.5	<0.5	<0.5 O	7	<0.5	2.6	<0.5	0.69 O	1.8 O	3.3	51	<0.5	2.6 O	<0.5 O
2016	W-364	MW	8/23/16 DUP	<0.5	<0.5	<0.5 O	5.7	<0.5	2.4	<0.5	0.62 O	1.4 O	2.6	43	<0.5	2.4 O	<0.5 O
2016	W-365	MW	8/23/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.6	2.3	0.51	<0.5	13	<0.5	<0.5	<0.5
2016	W-366	MW	5/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-368	MW	1/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.7	15	2.5	11	2.2	<0.5	<0.5
2016	W-368	MW	4/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	4.3	13	2.2	9.8	2.6	<0.5	<0.5
2016	W-368	MW	7/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	5.3	12	2.2	10	2.7	<0.5	<0.5
2016	W-368	MW	10/20/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	4	14	2.1	10	2.1	<0.5	<0.5
2016	W-369	MW	8/24/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	7.6	<0.5	<0.5	5.4	14	<0.5	<0.5
2016	W-371	MW	2/24/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-371	MW	2/24/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.55	<0.5	<0.5	2.4	0.62	<0.5	<0.5
2016	W-373	MW	3/29/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	12	<0.5	<0.5	<0.5
2016	W-375	MW	2/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-378	MW	2/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	<0.5	<0.5
2016	W-379	MW	8/15/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.61	<0.5	0.51	<0.5	<0.5	<0.5	<0.5
2016	W-401	MW	11/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-404	MW	2/17/16	<0.5	<0.5	0.57	0.81	<0.5	<1	<0.5	<0.5	<0.5	3.5	<0.5	<0.5	<0.5	<0.5
2016	W-404	MW	4/7/16	<0.5	<0.5	0.58	0.73	<0.5	<1	<0.5	<0.5	<0.5	3.2	<0.5	<0.5	<0.5	<0.5
2016	W-404	MW	7/12/16	<0.5	<0.5	0.55	0.84	<0.5	<1	<0.5	<0.5	<0.5	3.2	<0.5	<0.5	<0.5	<0.5
2016	W-404	MW	10/5/16	<0.5	<0.5	0.52	0.74	<0.5	<1	<0.5	<0.5	<0.5	3.1	<0.5	<0.5	<0.5	<0.5
2016	W-405	MW	1/20/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-405	MW	4/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-405	MW	7/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-405	MW	10/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-406	MW	3/16/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.94	<0.5	<0.5	<0.5	<0.5
2016	W-406	MW	3/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.93	<0.5	<0.5	<0.5	<0.5
2016	W-407	MW	10/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-408	MW	2/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.54	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-408	MW	4/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.59	<0.5	<0.5	<0.5	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-408	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.57	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-408	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.56	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-409	MW	11/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	16	<0.5	<0.5	<0.5
2016	W-410	MW	1/21/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-410	MW	4/20/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-410	MW	8/2/16	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<1 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H
2016	W-410	MW	11/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-412	MW	12/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	23	<0.5	<0.5	8.1 L	1.5	0.91	<0.5
2016	W-413	MW	1/13/16	<0.5	<0.5	<0.5	0.73	<0.5	<1	<0.5	9.8	12	<0.5	6.8	2.8	<0.5	<0.5
2016	W-413	MW	4/7/16	<0.5	<0.5	<0.5	0.76	<0.5	<1	<0.5	11	11	<0.5	6.7	3.7	<0.5	<0.5
2016	W-413	MW	7/14/16	<0.5	<0.5	<0.5	0.87	<0.5	<1	<0.5	13	10	<0.5	7.8	3.9	<0.5	<0.5
2016	W-413	MW	10/5/16	<0.5	<0.5	<0.5	0.88	<0.5	<1	<0.5	13	11	<0.5	7.5	3.9	<0.5	<0.5
2016	W-415	MW	2/17/16	<0.5	<0.5	0.56	1.2	<0.5	<1	<0.5	2	<0.5	8.8	1	<0.5	<0.5	<0.5
2016	W-415	MW	4/7/16	<0.5	<0.5	0.65	1.3	<0.5	<1	<0.5	1.7	<0.5	7.9	1	<0.5	<0.5	<0.5
2016	W-415	MW	7/12/16	<0.5	<0.5	0.64	1.4	<0.5	<1	<0.5	2	<0.5	8.2	1	<0.5	<0.5	<0.5
2016	W-415	MW	10/5/16	<0.5	<0.5	0.55	1.2	<0.5	<1	<0.5	2	<0.5	7.8	0.91	<0.5	<0.5	<0.5
2016	W-416	MW	11/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	3.5	<0.5	<0.5	<0.5
2016	W-418	MW	10/27/16	<0.5	<0.5	<0.5	0.66	<0.5	<1	1.4	4	3.2	0.99	7.8	<0.5	<0.5	<0.5
2016	W-419	MW	4/20/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	5	2.5	1.4	4	<0.5	<0.5	<0.5
2016	W-420	MW	11/30/16	<0.5	<0.5	<0.5	4.3	<0.5	<1	<0.5	2.8	1.2	1.8	4.9	<0.5	<0.5	<0.5
2016	W-421	MW	3/29/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-421	MW	4/19/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-421	MW	8/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5 L	<0.5	<0.5	<0.5 L	<0.5
2016	W-421	MW	10/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-422	MW	8/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	4.1	<0.5	<0.5	<0.5
2016	W-423	MW	12/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.83	<0.5	<0.5	<0.5 L	18	<0.5	<0.5
2016	W-424	MW	8/15/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.2	<0.5	<0.5	<0.5	32	<0.5	<0.5
2016	W-447	MW	4/21/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-448	MW	2/10/16	<0.5	<0.5	2.3	4.6	<0.5	<1	<0.5	1.2	0.75	5.1	3.2	<0.5	<0.5	<0.5
2016	W-449	MW	2/10/16	<0.5	<0.5	7.6	5.3	<0.5	<1	<0.5	0.5	<0.5	0.78	0.94	<0.5	0.54	<0.5
2016	W-450	MW	5/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	2.1	4.2	<0.5	<0.5
2016	W-452	MW	2/23/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.54	<0.5	<0.5	<0.5
2016	W-453	MW	11/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.61	0.52	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-454	MW	2/22/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.57	1.5	3.9	<0.5	<0.5	<0.5
2016	W-454	MW	4/26/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.71	1.6	3.9	<0.5	<0.5	<0.5
2016	W-454	MW	4/26/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.66	1.6	3.8	<0.5	<0.5	<0.5
2016	W-454	MW	11/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.64	1.4	4.1	<0.5	<0.5	<0.5
2016	W-457	MW	2/17/16	<0.5	<0.5	<0.5	0.53	<0.5	<1	<0.5	<0.5	<0.5	4.4	<0.5	<0.5	<0.5	<0.5
2016	W-457	MW	4/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	4.1	<0.5	<0.5	<0.5	<0.5
2016	W-457	MW	7/12/16	<0.5	<0.5	<0.5	0.55	<0.5	<1	<0.5	<0.5	<0.5	4.3	<0.5	<0.5	<0.5	<0.5
2016	W-457	MW	10/5/16	<0.5	<0.5	<0.5	0.55	<0.5	<1	<0.5	<0.5	<0.5	4.2	<0.5	<0.5	<0.5	<0.5
2016	W-458	MW	4/26/16	<0.5	<0.5	<0.5	0.52	<0.5	<1	1.2	4.4	2.8	<0.5	2.1	<0.5	<0.5	<0.5
2016	W-459	MW	2/22/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	4.8	2.1	<0.5	2.7	<0.5	<0.5	<0.5
2016	W-462	MW	3/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.4	<0.5	<0.5	<0.5	<0.5
2016	W-464	MW	2/17/16	<0.5	<0.5	<0.5	1.5	<0.5	<1	<0.5	7.7	<0.5	0.69	3.9	<0.5	<0.5	<0.5
2016	W-464	MW	12/12/16	<0.5	<0.5	<0.5	1.7	<0.5	<1	<0.5	7.5	<0.5	0.6	4.2	<0.5	<0.5	<0.5
2016	W-481	MW	1/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-481	MW	4/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	5.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-481	MW	7/29/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	5.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-481	MW	10/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	5.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-482	MW	8/23/16	<0.5	<0.5	8.5 O	7.4	<0.5	1.2	<0.5	0.83 O	<0.5 O	2.6	2.6	<0.5	1.2 O	<0.5 O
2016	W-483	MW	11/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	<0.5	<0.5
2016	W-486	MW	5/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-501	MW	2/22/16	<0.5	<0.5	<0.5	0.64	<0.5	<1	<0.5	4.2	22	<0.5	0.98	<0.5	<0.5	<0.5
2016	W-503	MW	4/26/16	<0.5	<0.5	<0.5	3.2	<0.5	<1	<0.5	0.54	21	<0.5	1.4	<0.5	<0.5	<0.5
2016	W-503	MW	12/6/16	<0.5	<0.5	<0.5	2.9	<0.5	<1	<0.5	0.51	19	<0.5	1.3	<0.5	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-504	MW	3/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-505	MW	8/23/16	<0.5	<0.5	2.5	3	<0.5	<1	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	<0.5	<0.5
2016	W-506	MW	8/2/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	2.2	<0.5	<0.5	<0.5	<0.5
2016	W-509	MW	3/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	7	<0.5	<0.5	<0.5
2016	W-509	MW	8/24/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	6.6	<0.5	<0.5	<0.5
2016	W-509	MW	10/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	5.8	<0.5	<0.5	<0.5
2016	W-511	MW	3/31/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-514	MW	3/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-515	MW	2/23/16	<0.5	<0.5	<0.5	0.91	<0.5	1.4	<0.5	<0.5	<0.5	1.2	69 D	<0.5	1.4	<0.5
2016	W-515	MW	5/12/16	<0.5	<0.5	<0.5	1.4	<0.5	3	<0.5	0.55	<0.5	1.6	100 D	<0.5	3	<0.5
2016	W-515	MW	5/12/16 DUP	<0.5	<0.5	<0.5	1.2	<0.5	4	<0.5	<0.5	<0.5	1.3	110 D	<0.5	4	<0.5
2016	W-516	MW	5/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	3.9	<0.5	<0.5	<0.5
2016	W-516	MW	9/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	3	<0.5	<0.5	<0.5
2016	W-516	MW	11/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	4.2	<0.5	<0.5	<0.5
2016	W-517	MW	1/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.3	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-517	MW	4/19/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-517	MW	7/22/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-517	MW	10/19/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-518	MW	2/17/16	<0.5	<0.5	5.7	3	<0.5	<1	<0.5	<0.5	<0.5	4.1	<0.5	<0.5	<0.5	<0.5
2016	W-518	MW	4/7/16	<0.5	<0.5	5.3	2.4	<0.5	<1	<0.5	<0.5	<0.5	4	<0.5	<0.5	<0.5	<0.5
2016	W-518	MW	7/12/16	<0.5	<0.5	5.9	3	<0.5	<1	<0.5	<0.5	<0.5	4.3	<0.5	<0.5	<0.5	<0.5
2016	W-518	MW	10/5/16	<0.5	<0.5	3.1	1.7	<0.5	<1	<0.5	<0.5	<0.5	2.6	<0.5	<0.5	<0.5	<0.5
2016	W-519	MW	11/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	1.3	<0.5	<0.5	<0.5
2016	W-520	MW	2/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-522	MW	2/17/16	<0.5	<0.5	1.3	0.86	<0.5	<1	<0.5	<0.5	<0.5	2.5	<0.5	<0.5	<0.5	<0.5
2016	W-522	MW	4/7/16	<0.5	<0.5	1.2	0.78	<0.5	<1	<0.5	<0.5	<0.5	2.4	<0.5	<0.5	<0.5	<0.5
2016	W-522	MW	7/12/16	<0.5	<0.5	1.3	0.86	<0.5	<1	<0.5	<0.5	<0.5	2.5	<0.5	<0.5	<0.5	<0.5
2016	W-551	MW	5/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.4	1.6	11	5.4	<0.5	<0.5	<0.5
2016	W-551	MW	5/18/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.7	1.9	12	6	<0.5	<0.5	<0.5
2016	W-551	MW	10/26/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.5	1.7	9.5	5.4	<0.5	<0.5	<0.5
2016	W-551	MW	10/26/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.8	2.5	10	6.4	<0.5	<0.5	<0.5
2016	W-552	MW	8/23/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-554	MW	11/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-556	MW	5/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.83	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-558	MW	2/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-558	MW	4/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-558	MW	7/29/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.65	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-558	MW	10/19/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.65	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-561	MW	11/30/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-563	MW	11/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	3.1	<0.5	<0.5	<0.5
2016	W-564	MW	5/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.5	<0.5	<0.5	15	<0.5	<0.5	<0.5
2016	W-566	MW	1/7/16	<0.5	<0.5	<0.5	7.1	0.83	<1	0.83	6.3	6.6	9.8	100	<0.5	<0.5	<0.5
2016	W-566	MW	4/5/16	<0.5	<0.5	<0.5	5.6	0.67	<1	0.71	5.3	5.6	8.5	87	<0.5	<0.5	<0.5
2016	W-566	MW	7/7/16	<0.5	<0.5	<0.5	6.8	0.86	<1	0.84	6.3	6.4	9.4	100	<0.5	<0.5	<0.5
2016	W-566	MW	10/4/16	<0.5	<0.5	<0.5	5.8	0.69	<1	0.73	5.6	5.6	8.1	90	<0.5	<0.5	<0.5
2016	W-568	MW	2/25/16	<0.5	<0.5	<0.5	4.1	<0.5	<1	<0.5	53	0.72	<0.5	34	15	<0.5	<0.5
2016	W-568	MW	5/16/16	<0.5	<0.5	<0.5	3.9	<0.5	<1	<0.5	52	0.72	<0.5	32	17	<0.5	<0.5
2016	W-568	MW	8/3/16	<0.5	<0.5	<0.5	2.2	<0.5	<1	<0.5	35	<0.5	<0.5	20	9.9	<0.5	<0.5
2016	W-568	MW	8/3/16 DUP	<0.5	<0.5	<0.5	4	<0.5	<0.5	<0.5	50	0.8	<0.5	30	20	<0.5	<0.5
2016	W-568	MW	12/5/16	<0.5	<0.5	<0.5	5.2	<0.5	<1	<0.5	63	0.74	<0.5	54	16	<0.5	<0.5
2016	W-569	MW	2/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	7.5	<0.5	<0.5	6.9	24	<0.5	<0.5
2016	W-569	MW	11/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.2	<0.5	<0.5	2.9	11	<0.5	<0.5
2016	W-569	MW	11/7/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.71	<0.5	<0.5	0.83	4	<0.5	<0.5
2016	W-571	MW	1/13/16	<0.5	<0.5	<0.5	0.52	<0.5	<1	<0.5	<0.5	0.52	1.1	1.6	<0.5	<0.5	<0.5
2016	W-592	MW	3/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-594	MW	2/25/16	<0.5	<0.5	<0.5	<0.5 J	<0.5	<1	<0.5	2.2	<0.5	<0.5	<0.5 J	<0.5	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-601	MW	2/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-602	MW	2/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.89	<0.5	<0.5	<0.5	<0.5
2016	W-604	MW	2/2/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	2.6 L	0.65 LO	<0.5	<0.5 L	<0.5
2016	W-605	MW	2/17/16	<0.5	<0.5	0.64	0.8	<0.5	<1	<0.5	<0.5	<0.5	9.9	0.54	<0.5	<0.5	<0.5
2016	W-605	MW	4/7/16	<0.5	<0.5	0.65	0.73	<0.5	<1	<0.5	<0.5	<0.5	9.1	<0.5	<0.5	<0.5	<0.5
2016	W-605	MW	7/12/16	<0.5	<0.5	0.71	0.77	<0.5	<1	<0.5	<0.5	<0.5	8.9	<0.5	<0.5	<0.5	<0.5
2016	W-605	MW	10/5/16	<0.5	<0.5	0.76	0.78	<0.5	<1	<0.5	<0.5	<0.5	9.1	0.51	<0.5	<0.5	<0.5
2016	W-606	MW	2/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1	<0.5	<0.5	<0.5	<0.5
2016	W-609	MW	2/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.55	<0.5	<0.5	<0.5	<0.5
2016	W-610	MW	1/4/16	<0.5	<0.5	<0.5	0.68	<0.5	<1	<0.5	<0.5	0.86	<0.5	1.1	<0.5	<0.5	<0.5
2016	W-610	MW	4/4/16	<0.5	<0.5	<0.5	0.51	<0.5	<1	<0.5	<0.5	0.69	<0.5	0.91	<0.5	<0.5	<0.5
2016	W-610	MW	7/5/16	<0.5	<0.5	<0.5	0.6	<0.5	<1	<0.5	<0.5	0.7	<0.5	1	<0.5	<0.5	<0.5
2016	W-610	MW	10/5/16	<0.5	<0.5	<0.5	0.71	<0.5	<1	<0.5	<0.5	0.75	0.55	1.1	<0.5	<0.5	<0.5
2016	W-611	MW	2/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.5	3.3	1.8	3.8	<0.5	<0.5	<0.5
2016	W-612	MW	8/23/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	1.9	<0.5	2.7	<0.5	<0.5	<0.5	<0.5
2016	W-613	MW	11/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.98	<0.5	<0.5	<0.5	<0.5
2016	W-614	MW	2/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	3.9	<0.5	<0.5	<0.5	<0.5
2016	W-614	MW	4/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	3.5	<0.5	<0.5	<0.5	<0.5
2016	W-614	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	3.6	<0.5	<0.5	<0.5	<0.5
2016	W-614	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	3.4	<0.5	<0.5	<0.5	<0.5
2016	W-615	MW	2/18/16	<0.5	<0.5	<0.5	3.4	<0.5	<1	<0.5	3.6	0.74	1.1	8.8	<0.5	<0.5	<0.5
2016	W-616	MW	2/22/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.83	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-617	MW	10/19/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	4.5	<0.5	1.1	<0.5	<0.5	<0.5
2016	W-618	MW	2/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.1	1.9	<0.5	<0.5	<0.5	<0.5
2016	W-618	MW	5/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1	1.9	<0.5	<0.5	<0.5	<0.5
2016	W-618	MW	8/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.1	2	0.81	<0.5	<0.5	<0.5
2016	W-618	MW	10/26/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.1	1.6	<0.5	<0.5	<0.5	<0.5
2016	W-620	MW	1/4/16	<0.5	<0.5	<0.5	0.73	<0.5	<1	<0.5	0.66	1.2	0.8	2.6	<0.5	<0.5	<0.5
2016	W-620	MW	4/4/16	<0.5	<0.5	<0.5	0.65	<0.5	<1	<0.5	0.7	0.94	0.72	2.3	<0.5	<0.5	<0.5
2016	W-620	MW	7/5/16	<0.5	<0.5	<0.5	0.64	<0.5	<1	<0.5	0.73	0.91	0.72	2.4	<0.5	<0.5	<0.5
2016	W-620	MW	10/5/16	<0.5	<0.5	<0.5	0.75	<0.5	<1	<0.5	0.79	0.85	0.71	2.3	<0.5	<0.5	<0.5
2016	W-621	MW	1/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5
2016	W-621	MW	4/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.97	<0.5	<0.5	<0.5
2016	W-621	MW	7/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	<0.5	<0.5
2016	W-621	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.98	<0.5	<0.5	<0.5
2016	W-651	MW	1/21/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.82	<0.5	<0.5	<0.5	<0.5
2016	W-651	MW	4/19/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.72	<0.5	<0.5	<0.5	<0.5
2016	W-651	MW	7/22/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5
2016	W-651	MW	10/24/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.74	<0.5	<0.5	<0.5	<0.5
2016	W-653	MW	2/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	12	4.6	1.9	<0.5	350 D	<0.5	<0.5	<0.5
2016	W-653	MW	4/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	13	4.1	1.8	0.52	380 D	<0.5	<0.5	<0.5
2016	W-653	MW	7/7/16	<0.5	<0.5	<0.5	0.55	<0.5	<1	14	4.6	1.9	0.56	430 D	<0.5	<0.5	<0.5
2016	W-653	MW	10/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	13	3.9	1.6	0.54	370 D	<0.5	<0.5	<0.5
2016	W-654	MW	4/21/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	<0.5
2016	W-654	MW	4/21/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.1	<0.5	<0.5	<0.5	<0.5
2016	W-654	MW	8/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	<0.5	<0.5
2016	W-654	MW	11/9/16 DUP	<0.5 H	<0.5 H	0.5 H	1.5 H	<0.5 H	<0.5 H	<0.5 H	0.6 H	<0.5 H	6.4 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H
2016	W-654	MW	11/9/16	<0.5	<0.5	<0.5	0.79	<0.5	<1	<0.5	<0.5	<0.5	4	<0.5	<0.5	<0.5	<0.5
2016	W-655	MW	1/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	5.9	<0.5	0.58	<0.5	<0.5	<0.5
2016	W-655	MW	4/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	5.6	<0.5	0.56	<0.5	<0.5	<0.5
2016	W-655	MW	7/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	4.9	<0.5	0.57	<0.5	<0.5	<0.5
2016	W-655	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	5.6	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-701	MW	1/14/16	<0.5	<0.5	<0.5	1.1	<0.5	<1	<0.5	1.5	18	2.2	19	<0.5	<0.5	<0.5
2016	W-701	MW	4/4/16	<0.5	<0.5	<0.5	1.1	<0.5	<1	<0.5	1.5	16	2.6	19	<0.5	<0.5	<0.5
2016	W-701	MW	7/5/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	1.6	16	2.8	21	<0.5	<0.5	<0.5
2016	W-701	MW	10/5/16	<0.5	<0.5	<0.5	1.1	<0.5	<1	<0.5	1.6	14	2.2	18	<0.5	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-702	MW	5/12/16	<0.5	<0.5	<0.5	0.71	<0.5	<1	<0.5	0.97	2.5	6	4.1	<0.5	<0.5	<0.5
2016	W-702	MW	12/5/16	<0.5	<0.5	<0.5	0.82	<0.5	<1	<0.5	1	3.1	6.5	4.6	<0.5	<0.5	<0.5
2016	W-703	MW	8/23/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-704	MW	1/4/16	<0.5	<0.5	<0.5	2	<0.5	<1	0.56	3.7	5.5	2.2	17	<0.5	<0.5	<0.5
2016	W-704	MW	4/4/16	<0.5	<0.5	<0.5	2	<0.5	<1	0.58	3.7	5.4	2	15	<0.5	<0.5	<0.5
2016	W-704	MW	7/5/16	<0.5	<0.5	<0.5	2.2	<0.5	<1	0.68	4.3	5.2	2.1	16	<0.5	<0.5	<0.5
2016	W-704	MW	10/5/16	<0.5	<0.5	<0.5	2	<0.5	<1	0.59	4	5	1.9	15	<0.5	<0.5	<0.5
2016	W-705	MW	2/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-705	MW	11/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-706	MW	2/23/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	16	<0.5	0.58	<0.5	<0.5	<0.5
2016	W-712	MW	2/17/16	<0.5	<0.5	1	3.5	<0.5	<1	2.8	3.1	<0.5	2	3.2	<0.5	<0.5	<0.5
2016	W-712	MW	4/7/16	<0.5	<0.5	1	2.9	<0.5	<1	2.6	2.7	<0.5	1.9	2.8	<0.5	<0.5	<0.5
2016	W-712	MW	7/12/16	<0.5	<0.5	1.2	3.5	<0.5	<1	2.9	3.1	<0.5	1.9	3.1	<0.5	<0.5	<0.5
2016	W-712	MW	10/5/16	<0.5	<0.5	1	3.2	<0.5	<1	2.6	3	<0.5	1.8	2.9	<0.5	<0.5	<0.5
2016	W-714	MW	2/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	5	<0.5	<0.5	<0.5	<0.5
2016	W-714	MW	4/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	4.7	<0.5	<0.5	<0.5	<0.5
2016	W-714	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	4.7	<0.5	<0.5	<0.5	<0.5
2016	W-714	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	4.7	<0.5	<0.5	<0.5	<0.5
2016	W-750	MW	8/23/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	<0.5
2016	W-902	MW	4/26/16	<0.5	<0.5	<0.5	0.59	<0.5	<1	<0.5	1.4	19	<0.5	8.9	<0.5	<0.5	<0.5
2016	W-903	MW	2/17/16	<0.5	<0.5	0.66	0.57	<0.5	<1	<0.5	<0.5	<0.5	3.8	<0.5	<0.5	<0.5	<0.5
2016	W-903	MW	4/7/16	<0.5	<0.5	0.62	0.53	<0.5	<1	<0.5	<0.5	<0.5	3.5	<0.5	<0.5	<0.5	<0.5
2016	W-903	MW	7/12/16	<0.5	<0.5	0.66	0.57	<0.5	<1	<0.5	<0.5	<0.5	3.6	<0.5	<0.5	<0.5	<0.5
2016	W-903	MW	10/5/16	<0.5	<0.5	0.62	0.5	<0.5	<1	<0.5	<0.5	<0.5	3.5	<0.5	<0.5	<0.5	<0.5
2016	W-904	MW	2/17/16	<0.5	<0.5	<0.5	0.59	<0.5	<1	<0.5	<0.5	<0.5	3.9	<0.5	<0.5	<0.5	<0.5
2016	W-904	MW	4/7/16	<0.5	<0.5	<0.5	0.58	<0.5	<1	<0.5	<0.5	<0.5	3.6	<0.5	<0.5	<0.5	<0.5
2016	W-904	MW	7/12/16	<0.5	<0.5	<0.5	0.66	<0.5	<1	<0.5	<0.5	<0.5	3.7	<0.5	<0.5	<0.5	<0.5
2016	W-904	MW	10/5/16	<0.5	<0.5	<0.5	0.61	<0.5	<1	<0.5	<0.5	<0.5	3.6	<0.5	<0.5	<0.5	<0.5
2016	W-909	MW	6/1/16	<0.5	<0.5	<0.5	7.3	<0.5	<1	<0.5	<0.5	1.5	7.9	32	<0.5	<0.5	<0.5
2016	W-909	MW	12/8/16	<0.5	<0.5	<0.5	5.2	<0.5	<1	<0.5	<0.5	1.3	6.1	38	<0.5	<0.5	<0.5
2016	W-909	MW	12/8/16 DUP	<0.5	<0.5	<0.5	8.4	<0.5	<1	<0.5	<0.5	2.3	8.8	41	<0.5	<0.5	<0.5
2016	W-911	MW	3/15/16	<0.5	<0.5	<0.5	8.7	<0.5	<1	<0.5	<0.5	3.3	10	24	<0.5	<0.5	<0.5
2016	W-911	MW	6/1/16 DUP	<0.5	<0.5	<0.5	15	<0.5	<1	<0.5	<0.5	6.3	19	42	<0.5	<0.5	<0.5
2016	W-911	MW	6/1/16	<0.5	<0.5	<0.5	15	<0.5	<1	<0.5	<0.5	6.2	19	43	<0.5	<0.5	<0.5
2016	W-911	MW	8/3/16	<0.5	<0.5	<0.5	16	<0.5	<1	<0.5	<0.5	6	18	43	<0.5	<0.5	<0.5
2016	W-912	MW	5/25/16	<0.5	<0.5	<0.5	2.9	<0.5	<1	0.68	2.5	1.6	4.2	66	<0.5	<0.5	<0.5
2016	W-912	MW	5/25/16 DUP	<0.5	<0.5	<0.5	3.4	<0.5	<0.5	0.8	2.9	2.1	4.4	58 DHL	<0.5	<0.5	<0.5
2016	W-912	MW	12/8/16	<0.5	<0.5	<0.5	2.3	<0.5	<1	0.69	1.8	1	2.9	54	<0.5	<0.5	<0.5
2016	W-913	MW	2/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-913	MW	4/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-913	MW	8/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-913	MW	11/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1001	MW	2/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1001	MW	4/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1001	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1001	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1004	MW	2/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	<0.5	<0.5
2016	W-1004	MW	4/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	<0.5	<0.5
2016	W-1004	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	<0.5	<0.5
2016	W-1004	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	<0.5	<0.5
2016	W-1009	MW	2/17/16	<0.5	<0.5	0.57	2.5	<0.5	<1	0.96	4.2	<0.5	8.7	1.7	<0.5	<0.5	<0.5
2016	W-1009	MW	4/7/16	<0.5	<0.5	0.57	2.2	<0.5	<1	0.89	3.8	<0.5	8.3	1.5	<0.5	<0.5	<0.5
2016	W-1009	MW	7/12/16	<0.5	<0.5	0.66	2.7	<0.5	<1	0.9	4.3	<0.5	8.4	1.7	<0.5	<0.5	<0.5
2016	W-1009	MW	10/5/16	<0.5	<0.5	0.61	2.2	<0.5	<1	0.88	4	<0.5	7.9	1.5	<0.5	<0.5	<0.5
2016	W-1010	MW	2/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1011	MW	4/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.5	<0.5	<0.5	0.63	<0.5	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-1012	MW	1/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1013	MW	2/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1014	MW	8/23/16	<0.5	<0.5	<0.5 O	<0.5	<0.5	<1	<0.5	1.5 O	2 O	3.2	7	<0.5	<0.5 O	<0.5 O
2016	W-1015	MW	2/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.99	0.82	4.6	<0.5	<0.5	<0.5
2016	W-1015	MW	5/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.88	0.77	3.8	<0.5	<0.5	<0.5
2016	W-1015	MW	10/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.93	0.8	4.3	<0.5	<0.5	<0.5
2016	W-1101	MW	4/26/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.86	<0.5	1.5	<0.5	<0.5	<0.5
2016	W-1101	MW	11/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.81	<0.5	1.7	<0.5	<0.5	<0.5
2016	W-1102	MW	2/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.9	<0.5	1.3	<0.5	<0.5	<0.5
2016	W-1102	MW	5/26/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.8	<0.5	1.3	<0.5	<0.5	<0.5
2016	W-1102	MW	10/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.6	<0.5	1.2	<0.5	<0.5	<0.5
2016	W-1103	MW	2/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.71	<0.5	<0.5	<0.5
2016	W-1103	MW	5/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.67	<0.5	<0.5	<0.5
2016	W-1103	MW	10/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.64	<0.5	<0.5	<0.5
2016	W-1104	MW	1/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.54	1.9	3.8	7.1	<0.5	<0.5	<0.5
2016	W-1104	MW	4/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.5	3.3	5.8	<0.5	<0.5	<0.5
2016	W-1104	MW	7/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.57	1.6	3.2	5.8	<0.5	<0.5	<0.5
2016	W-1104	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.51	1.5	3	5.4	<0.5	<0.5	<0.5
2016	W-1106	MW	4/26/16	<0.5	<0.5	<0.5	0.72	<0.5	<1	<0.5	<0.5	2.5	3.4	6.2	<0.5	<0.5	<0.5
2016	W-1108	MW	1/12/16	<0.5	<0.5	0.51	13	2.3	<1	1.5	15	3.5	27	220 D	<0.5	<0.5	<0.5
2016	W-1108	MW	4/18/16	<0.5	<0.5	<0.5	10	1.9	<1	1.3	11	2.6	21	170 D	<0.5	<0.5	<0.5
2016	W-1108	MW	7/11/16	<0.5	<0.5	<0.5	12	2.1	<1	1.4	12	2.5	21 O	180 D	<0.5	<0.5	<0.5
2016	W-1108	MW	10/5/16	<0.5	<0.5	<0.5	10	2.1	<1	1.3	12	2.2	20	170 D	<0.5	<0.5	<0.5
2016	W-1109	MW	1/7/16	<0.5	<0.5	<0.5	14	<0.5	<1	<0.5	<0.5	2.5	23	100 D	<0.5	<0.5	<0.5
2016	W-1109	MW	4/5/16	<0.5	<0.5	<0.5	12	<0.5	<1	<0.5	<0.5	2.3	21	95 D	<0.5	<0.5	<0.5
2016	W-1109	MW	7/7/16	<0.5	<0.5	<0.5	15	<0.5	<1	<0.5	<0.5	2.4	23	110 D	<0.5	<0.5	<0.5
2016	W-1109	MW	10/4/16	<0.5	<0.5	<0.5	12	<0.5	<1	<0.5	<0.5	2	21	96 D	<0.5	<0.5	<0.5
2016	W-1110	MW	2/23/16	<0.5	<0.5	<0.5	0.97	<0.5	<1	<0.5	3.2	8	0.68	8.4	<0.5	<0.5	<0.5
2016	W-1111	MW	1/20/16	<0.5	<0.5	<0.5	0.74	<0.5	<1	4.5	7.9	<0.5	1	4.4	<0.5	<0.5	<0.5
2016	W-1111	MW	4/5/16	<0.5	<0.5	<0.5	0.75	<0.5	<1	4.1	7.9	0.5	0.96	4	<0.5	<0.5	<0.5
2016	W-1111	MW	7/12/16	<0.5	<0.5	<0.5	0.91	<0.5	<1	5	9.1	0.5	1	4.6	<0.5	<0.5	<0.5
2016	W-1111	MW	10/5/16	<0.5	<0.5	<0.5	0.75	<0.5	<1	4.4	8.1	<0.5	1	4.4	<0.5	<0.5	<0.5
2016	W-1112	MW	8/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.62	<0.5	<0.5	1.7	<0.5	<0.5	<0.5
2016	W-1113	MW	3/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	<0.5
2016	W-1115	MW	9/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1116	MW	1/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.87	4.1	3.7	8.4	<0.5	<0.5	<0.5
2016	W-1116	MW	4/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.82	4.1	3.6	8.1	<0.5	<0.5	<0.5
2016	W-1116	MW	7/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.91	3.9	3.5	8	<0.5	<0.5	<0.5
2016	W-1116	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.81	3.8	3.4	8	<0.5	<0.5	<0.5
2016	W-1117	MW	3/15/16 DUP	<0.5	<0.5	1.2	31	7.5	<1	3	40	8.8	65	510 D	<0.5	<0.5	<0.5
2016	W-1117	MW	3/15/16	<0.5	<0.5	1.3	33	7.8	<1	3.3	41	9.4	69	520 D	<0.5	<0.5	<0.5
2016	W-1117	MW	8/16/16	<0.5	<0.5	1.3	31	7.7	<1	3.2	41	9.2	65	480 D	<0.5	<0.5	<0.5
2016	W-1117	MW	8/16/16 DUP	<0.5	<0.5	1.4	33	7.8	<1	3.4	43	9.9	68	530 D	<0.5	<0.5	<0.5
2016	W-1117	MW	12/8/16	<0.5	<0.5	1.2	31	7.5	<1	3.1	39	9.9	70	490 D	<0.5	<0.5	<0.5
2016	W-1118	MW	12/12/16	<0.5	<0.5	<0.5	5.1	<0.5	<1	<0.5	<0.5	6	1.6	6.1	<0.5	<0.5	<0.5
2016	W-1201	MW	3/1/16	<0.5	<0.5	<0.5	4.8	<0.5	7.8	2.1	3.6	7.4	14	240 D	<0.5	7.8	<0.5
2016	W-1201	MW	8/3/16	<0.5	<0.5	<0.5	5.2	<0.5	1.4	2.3	4	6.7	14	240 D	<0.5	1.4	<0.5
2016	W-1201	MW	8/3/16 DUP	<0.5	<0.5	<0.5	5.8	<0.5	1.4	2.4	4.3	8.1	14	260 DH	<0.5	1.4	<0.5
2016	W-1201	MW	10/6/16	<0.5	<0.5	<0.5	2.1	<0.5	1.4	0.51	2.8	8.7	20	170 D	<0.5	1.4	<0.5
2016	W-1202	MW	3/10/16	<0.5	<0.5	<0.5	3	<0.5	<1	<0.5	<0.5	0.62	7.6	57	<0.5	<0.5	<0.5
2016	W-1202	MW	3/10/16 DUP	<0.5	<0.5	<0.5	2.6	<0.5	<1	<0.5	<0.5	0.64	8.4	61 L	<0.5	<0.5	<0.5
2016	W-1202	MW	8/16/16	<0.5	<0.5	<0.5	3.5	<0.5	<1	<0.5	0.53	0.81	9.4	70	<0.5	<0.5	<0.5
2016	W-1202	MW	8/16/16 DUP	<0.5	<0.5	<0.5	3.4	<0.5	<1	<0.5	0.53	0.72	9.1	70	<0.5	<0.5	<0.5
2016	W-1203	MW	6/2/16	<0.5	<0.5	<0.5	0.76	<0.5	<1	1.4	0.5	4.7	0.58	110 D	<0.5	<0.5	<0.5
2016	W-1204	MW	8/25/16	<0.5 H	<0.5 H	<0.5 H	8.1 H	<0.5 H	<1 H	<0.5 H	<0.5 H	2.8 H	8.6 HL	28 HF	<0.5 H	<0.5 H	<0.5 H
2016	W-1206	MW	2/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.84	<0.5	<0.5	5.2	2.4	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-1206	MW	4/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.6	2.4	<0.5	<0.5	10	<0.5	<0.5	<0.5
2016	W-1206	MW	7/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.67	2.7	<0.5	<0.5	11	<0.5	<0.5	<0.5
2016	W-1206	MW	10/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.63	3.2	<0.5	<0.5	10	<0.5	<0.5	<0.5
2016	W-1207	MW	11/2/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	4.7	<0.5	<0.5	<0.5
2016	W-1208	MW	2/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1	1.4	<0.5	<0.5	14	31	<0.5	<0.5
2016	W-1208	MW	4/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.6	1.6	<0.5	<0.5	35	20	<0.5	<0.5
2016	W-1208	MW	7/7/16	<0.5	<0.5	<0.5	0.64	<0.5	<1	1.8	1.8	<0.5	0.73	38	19	<0.5	<0.5
2016	W-1208	MW	10/3/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	1.6	1.7	<0.5	1.2	41	18	<0.5	<0.5
2016	W-1209	MW	3/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.52	<0.5	<0.5	<0.5	<0.5
2016	W-1210	MW	6/2/16	<0.5	<0.5	<0.5	3.9	<0.5	<1	<0.5	0.53	0.95	2.7	15	<0.5	<0.5	<0.5
2016	W-1210	MW	6/2/16 DUP	<0.5	<0.5	<0.5	3.2	<0.5	<1	<0.5	<0.5	0.77	2.3	13	<0.5	<0.5	<0.5
2016	W-1211	MW	1/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.1	1.1	<0.5	7.3	<0.5	<0.5	<0.5
2016	W-1211	MW	4/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.2	1.1	<0.5	6.5	<0.5	<0.5	<0.5
2016	W-1211	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.4	1.1	<0.5	7.2	<0.5	<0.5	<0.5
2016	W-1211	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.3	1.1	<0.5	6.8	<0.5	<0.5	<0.5
2016	W-1212	MW	1/28/16	<0.5	<0.5	<0.5	10	2	<1	<0.5	3.1	11	<0.5	140 D	<0.5	<0.5	<0.5
2016	W-1212	MW	4/28/16	<0.5	<0.5	<0.5	6.5	1.8	<1	<0.5	2.6	5.7	<0.5	110 D	<0.5	<0.5	<0.5
2016	W-1212	MW	6/29/16	<0.5	<0.5	<0.5	8.4	1.9	<1	<0.5	3.4	7.6	<0.5	130 D	<0.5	<0.5	<0.5
2016	W-1212	MW	8/4/16	<0.5	<0.5	<0.5	7.6	1.8	<1	<0.5	3.3	7.4	0.59	120 D	<0.5	<0.5	<0.5
2016	W-1212	MW	8/31/16	<0.5	<0.5	<0.5	6.8	1.6	<1	<0.5	3.1	5.8	<0.5	120 D	<0.5	<0.5	<0.5
2016	W-1212	MW	10/20/16	<0.5	<0.5	<0.5	6.6	1.7	<1	<0.5	3.5	6.5	<0.5	110 D	<0.5	<0.5	<0.5
2016	W-1212	MW	11/16/16	<0.5	<0.5	<0.5	5.4	1.3	<1	<0.5	3.2	5.2	<0.5	72 D	<0.5	<0.5	<0.5
2016	W-1212	MW	12/13/16	<0.5	<0.5	<0.5	4.4	0.83	<1	<0.5	3.2	6	<0.5	98	<0.5	<0.5	<0.5
2016	W-1213	MW	1/5/16	<0.5	<0.5	<0.5	3.1	<0.5	<1	<0.5	4.3	9.2	<0.5	16	<0.5	<0.5	<0.5
2016	W-1213	MW	1/28/16	<0.5	<0.5	<0.5	2.8	<0.5	<1	<0.5	4.7	11	<0.5	15	<0.5	<0.5	<0.5
2016	W-1213	MW	4/5/16	<0.5	<0.5	<0.5	1.8	<0.5	<1	<0.5	4.4	9.6	<0.5	10	<0.5	<0.5	<0.5
2016	W-1213	MW	4/28/16	<0.5	<0.5	<0.5	1.1	<0.5	<1	<0.5	3.8	5.2	<0.5	7.7	<0.5	<0.5	<0.5
2016	W-1213	MW	6/29/16	<0.5	<0.5	<0.5	1.6	<0.5	<1	<0.5	5.4	8.5	<0.5	9.8	0.61	<0.5	<0.5
2016	W-1213	MW	7/11/16	<0.5	<0.5	<0.5	1.6	<0.5	<1	<0.5	5.9	9.2	<0.5	10	0.73	<0.5	<0.5
2016	W-1213	MW	8/31/16	<0.5	<0.5	<0.5	1.4	<0.5	<1	<0.5	5.4	8	<0.5	9.4	0.62	<0.5	<0.5
2016	W-1213	MW	10/5/16	<0.5	<0.5	<0.5	1.5	<0.5	<1	<0.5	5.9	8	<0.5	9.7	0.74	<0.5	<0.5
2016	W-1213	MW	10/20/16	<0.5	<0.5	<0.5	1.7	<0.5	<1	<0.5	5.3	7.6	<0.5	11	0.65	<0.5	<0.5
2016	W-1213	MW	11/16/16	<0.5	<0.5	<0.5	1.5	<0.5	<1	<0.5	5.8	7.7	<0.5	9.7	0.73	<0.5	<0.5
2016	W-1214	MW	2/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	5.8	1.8	<0.5	<0.5	<0.5
2016	W-1214	MW	8/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	42	1.7 IJ	<0.5	<0.5	<0.5
2016	W-1215	MW	1/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	7.6	<0.5	<0.5	4.3	15	<0.5	<0.5
2016	W-1215	MW	4/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	7.7	<0.5	<0.5	3.6	15	<0.5	<0.5
2016	W-1215	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	8.8	<0.5	<0.5	4	15	<0.5	<0.5
2016	W-1215	MW	10/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	8.4	<0.5	<0.5	3.7	14	<0.5	<0.5
2016	W-1216	MW	1/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	4.1	<0.5	<0.5	2.1	18	<0.5	<0.5
2016	W-1216	MW	4/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	4.1	<0.5	<0.5	1.8	19	<0.5	<0.5
2016	W-1216	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	4.7	<0.5	<0.5	1.8	18	<0.5	<0.5
2016	W-1216	MW	10/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	4.4	<0.5	<0.5	1.7	17	<0.5	<0.5
2016	W-1217	MW	1/21/16	<0.5	<0.5	<0.5	0.6	<0.5	<1	<0.5	0.53	<0.5	130 D	2.5	<0.5	<0.5	<0.5
2016	W-1217	MW	1/21/16 DUP	<0.5	<0.5	<0.5	0.6	<0.5	<1	<0.5	0.52	<0.5	130 D	2.6	<0.5	0.51	<0.5
2016	W-1217	MW	4/20/16	<0.5	<0.5	<0.5	0.69	<0.5	<1	<0.5	0.51	<0.5	150 D	2.7	<0.5	<0.5	<0.5
2016	W-1217	MW	8/4/16	<0.5	<0.5	<0.5	0.73	<0.5	<1	<0.5	0.59	<0.5	150 D	2.8	<0.5	<0.5	<0.5
2016	W-1217	MW	8/4/16 DUP	<0.5	<0.5	<0.5	0.72	<0.5	<1	<0.5	0.6	<0.5	150 D	2.8	<0.5	<0.5	<0.5
2016	W-1219	MW	3/10/16	<0.5	<0.5	<0.5	0.89	<0.5	2.6	<0.5	<0.5	<0.5	<0.5	5.6	<0.5	2.6	<0.5
2016	W-1219	MW	8/25/16	<0.5	<0.5	<0.5	1.1	<0.5	3.3	<0.5	<0.5	<0.5	<0.5	6.3	<0.5	3.3	<0.5
2016	W-1222	MW	8/25/16	<0.5	<0.5	<0.5	38	<0.5	<1	0.83	5.2	11	44	150 D	<0.5	<0.5	<0.5
2016	W-1222	MW	8/25/16 DUP	<0.5	<0.5	0.52	38	0.51	<1	0.8	5.2	11	43	150 D	<0.5	<0.5	<0.5
2016	W-1223	MW	2/25/16	<0.5	<0.5	<0.5	6.4	1.7	<1	1.7	2	<0.5	7.6	86	1.1	<0.5	<0.5
2016	W-1223	MW	2/25/16 DUP	<0.5	<0.5	<0.5	6.9	1.8	<1	2	2	<0.5	7.6	92	1.2	<0.5	<0.5
2016	W-1224	MW	5/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.73 L	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1225	MW	3/15/16	<0.5	<0.5	<0.5	42	<0.5	<1	<0.5	1.5	2.4	60	510 D	<0.5	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-1225	MW	5/25/16	<0.5	<0.5	0.71	51	<0.5	<1	<0.5	1.6	2.7	86	720 D	<0.5	0.64	<0.5
2016	W-1225	MW	5/25/16 DUP	<0.5	<0.5	0.73	53	<0.5	<1	<0.5	1.6	2.9	91	790 D	<0.5	0.62	<0.5
2016	W-1225	MW	8/3/16	<0.5	<0.5	0.92	70	<0.5	<1	<0.5	1.7	3.3	91 D	960 D	<0.5	0.87	<0.5
2016	W-1225	MW	12/8/16	<0.5	<0.5	0.75	65	<0.5	<1	<0.5	1.3	3.3	100	880 D	<0.5	0.61	<0.5
2016	W-1225	MW	12/8/16 DUP	<0.5	<0.5	0.78	66	<0.5	<1	<0.5	1.3	3.4	100	890 D	<0.5	0.71	<0.5
2016	W-1226	MW	4/20/16	<0.5	<0.5	<0.5	1.3	<0.5	9.2	<0.5	<0.5	<0.5	<0.5	0.64	<0.5	9.2	<0.5
2016	W-1226	MW	11/7/16	<0.5	<0.5	<0.5	1.9	<0.5	3.2	0.66	3.9	1.2	<0.5	3.6	<0.5	3.2	<0.5
2016	W-1227	MW	8/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.6	<0.5	<0.5	<0.5	<0.5
2016	W-1250	MW	2/25/16	<2.5 D	<2.5 D	<2.5 D	<2.5 D	<2.5 D	<5 D	61 D	27 D	9.6 D	<2.5 D	3,200 D	<2.5 D	<2.5 D	<2.5 D
2016	W-1250	MW	5/17/16	<5 D	<5 D	<5 D	<5 D	<5 D	<10 D	51 D	25 D	7.9 D	<5 D	2,700 D	<5 D	<5 D	<5 D
2016	W-1250	MW	5/17/16 DUP	<25 D	<25 D	<25 D	<25 D	<25 D	<25 D	64 D	30 D	<25 D	<25 D	3,200 DH	<25 D	<25 D	<25 D
2016	W-1250	MW	9/14/16	<2.5 D	<2.5 D	<2.5 D	<2.5 D	<2.5 D	<5 D	61 D	27 D	8.8 D	<2.5 D	3,000 D	<2.5 D	<2.5 D	<2.5 D
2016	W-1251	MW	2/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.65	<0.5	<0.5	68	<0.5	<0.5	<0.5
2016	W-1251	MW	8/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.65	<0.5	<0.5	36	<0.5	<0.5	<0.5
2016	W-1252	MW	5/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	11	3.7	4.8	<0.5	410 D	<0.5	<0.5	<0.5
2016	W-1253	MW	2/29/16	<2.5 D	<2.5 D	<2.5 D	5.4 D	<2.5 D	<5 D	3.4 D	3.8 D	3.5 D	5.3 D	970 D	<2.5 D	<2.5 D	<2.5 D
2016	W-1253	MW	5/17/16	<2.5 D	<2.5 D	<2.5 D	13 D	<2.5 D	<5 D	<2.5 D	3 D	10 D	11 D	1,800 D	<2.5 D	<2.5 D	<2.5 D
2016	W-1253	MW	5/17/16 DUP	<0.5	<0.5	1.6	14	1.6	3.1	0.59	2.8	11	12	1,700 D	<0.5	2.4	0.72
2016	W-1253	MW	8/17/16	<2.5 D	<2.5 D	<2.5 D	15 D	<2.5 D	<5 D	<2.5 D	2.8 D	11 D	11 D	1,800 D	<2.5 D	2.6 D	<2.5 D
2016	W-1253	MW	11/29/16	<0.5	<0.5	1.3	14	1.4	3.2	0.62	4.8	11	11	1,500 D	<0.5	2.4	0.75
2016	W-1254	MW	1/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.4	0.5	<0.5	<0.5	32	<0.5	<0.5	<0.5
2016	W-1254	MW	4/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.4	<0.5	<0.5	<0.5	30	<0.5	<0.5	<0.5
2016	W-1254	MW	7/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.4	<0.5	0.78	<0.5	31	<0.5	<0.5	<0.5
2016	W-1254	MW	10/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.4	<0.5	<0.5	<0.5	33	<0.5	<0.5	<0.5
2016	W-1255	MW	2/29/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.8	<0.5	<0.5	30	<0.5	<0.5	<0.5
2016	W-1255	MW	6/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.5	<0.5	<0.5	13	<0.5	<0.5	<0.5
2016	W-1301	MW	1/20/16	<0.5	<0.5	1.7	47	5.3	<1	6.8	2.6	0.66	36	260 D	<0.5	0.6	<0.5
2016	W-1301	MW	4/11/16	<0.5	<0.5	1.8	45	5.3	<1	6.1	2.5	0.62	48	250 D	<0.5	0.63	<0.5
2016	W-1301	MW	7/13/16	<0.5	<0.5	1.8	52	6	<1	6.6	2.8	0.62	51	270 D	<0.5	0.64	<0.5
2016	W-1301	MW	10/12/16	<0.5	<0.5	1.6	45	5.2	<1	6.9	2.8	0.71	33	180 D	<0.5	0.53	<0.5
2016	W-1302-2	MW	1/21/16	<0.5	<0.5	1.4	27	4.8	2	2.3	35	8.9	56	420 D	<0.5	2	<0.5
2016	W-1302-2	MW	4/13/16	<0.5	<0.5	1.4	26	4.7	2.6	2.4	35	8.6	58	380 D	<0.5	2.6	<0.5
2016	W-1302-2	MW	7/21/16	<0.5	<0.5	1.5	29	5	3	2.4	38	9	60 L	420 D	<0.5	3	<0.5
2016	W-1302-2	MW	10/20/16	<0.5	<0.5	1.4	28	4.7	2.6	2.1	34	7.8	53	390 D	<0.5	2.6	<0.5
2016	W-1303	MW	1/20/16	<0.5	<0.5	<0.5	3.2	0.88	<1	2.5	1.7	<0.5	3.5	100	4	<0.5	<0.5
2016	W-1303	MW	4/11/16	<0.5	<0.5	<0.5	2.5	0.7	<1	2.4	1.5	<0.5	3.1	94	3.4	<0.5	<0.5
2016	W-1303	MW	7/13/16	<0.5	<0.5	<0.5	3.2	0.91	<1	2.8	<0.5	<0.5	3.5	97 D	2.5	<0.5	<0.5
2016	W-1303	MW	10/12/16	<0.5	<0.5	<0.5	2.9	0.79	<1	2.5	1.7	<0.5	3.4	75 D	2.3	<0.5	<0.5
2016	W-1304	MW	3/1/16	<0.5	<0.5	3.1	100 D	14	1.7	1.7	2.5	<0.5	30	1,200 D	<0.5	1.7	<0.5
2016	W-1306	MW	1/20/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.8	1.4	<0.5	1.6	51	<0.5	<0.5	<0.5
2016	W-1306	MW	4/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.5	1.4	<0.5	2	49	<0.5	<0.5	<0.5
2016	W-1306	MW	7/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.4	1.5	<0.5	2.3	49	<0.5	<0.5	<0.5
2016	W-1306	MW	10/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.3	1.4	<0.5	2.3	47	<0.5	<0.5	<0.5
2016	W-1307	MW	1/20/16	<0.5	<0.5	<0.5	0.54	<0.5	<1	3.3	0.78	<0.5	0.74	45	<0.5	<0.5	<0.5
2016	W-1307	MW	4/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	2.5	0.54	<0.5	0.67	30	<0.5	<0.5	<0.5
2016	W-1307	MW	7/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	2.5	0.58	<0.5	0.63	28	<0.5	<0.5	<0.5
2016	W-1307	MW	10/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	2.5	0.59	<0.5	0.64	29	<0.5	<0.5	<0.5
2016	W-1308	MW	1/13/16	<0.5	<0.5	0.92	15	3.1	<1	0.62	1.4	<0.5	52	100	<0.5	<0.5	<0.5
2016	W-1308	MW	4/18/16	<0.5	<0.5	1	16	2.7	<1	0.58	1	<0.5	56	99	<0.5	<0.5	<0.5
2016	W-1308	MW	7/11/16	<0.5	<0.5	0.8	16	2	<1	<0.5	0.81	<0.5	63 O	82	<0.5	<0.5	<0.5
2016	W-1308	MW	10/3/16	<0.5	<0.5	0.64	13	1.4	<1	<0.5	0.69	<0.5	60	68	<0.5	<0.5	<0.5
2016	W-1309	MW	1/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.64	<0.5	<0.5	<0.5	3.1	<0.5	<0.5	<0.5
2016	W-1309	MW	4/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.61	<0.5	<0.5	<0.5	2.8	<0.5	<0.5	<0.5
2016	W-1309	MW	7/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.62	<0.5	<0.5	0.5 O	3.2	<0.5	<0.5	<0.5
2016	W-1309	MW	10/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.57	<0.5	<0.5	<0.5	2.7	<0.5	<0.5	<0.5
2016	W-1310	MW	1/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	3.5	<0.5	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-1310	MW	4/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	3.1	<0.5	<0.5	<0.5
2016	W-1310	MW	7/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5 O	3	<0.5	<0.5	<0.5
2016	W-1310	MW	10/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	3.1	<0.5	<0.5	<0.5
2016	W-1311	MW	2/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	6	<0.5	<0.5	<0.5	9.5	<0.5	<0.5
2016	W-1401	MW	5/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.75	1.1	<0.5	<0.5	2.1	9.2	<0.5	<0.5
2016	W-1402	MW	8/24/16	<0.5	<0.5 IJ	<0.5	5.1	0.83	<1	<0.5	<0.5	<0.5	5.7 IJ	21 L	<0.5	<0.5	<0.5
2016	W-1403	MW	1/13/16	<0.5	<0.5	1.1	32	4.2	<1	1.8	14	3.3	73	290 D	<0.5	<0.5	<0.5
2016	W-1403	MW	4/18/16	<0.5	<0.5	1.2	29	3.8	<1	1.7	13	3.3	80	270 D	<0.5	<0.5	<0.5
2016	W-1403	MW	7/11/16	<0.5	<0.5	1.2	33	3.9	<1	1.8	13	3.2	76 O	290 D	<0.5	<0.5	<0.5
2016	W-1403	MW	10/3/16	<0.5	<0.5	1.2	30	<0.5	<1	1.7	12	3	71	280 D	<0.5	<0.5	<0.5
2016	W-1405	MW	9/6/16	<2.5 D	<2.5 D	<2.5 D	<2.5 D	<2.5 D	<5 D	<2.5 D	<2.5 D	<2.5 D	<2.5 D	<2.5 D	<2.5 D	<2.5 D	<2.5 D
2016	W-1406	MW	12/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.62	1.5 L	<0.5	<0.5	<0.5
2016	W-1407	MW	2/29/16	<0.5	<0.5	<0.5	0.55	<0.5	<1	<0.5	<0.5	<0.5	2.2	8.4	<0.5	<0.5	<0.5
2016	W-1408	MW	3/28/16	<0.5	<0.5	<0.5	11	0.55	<1	1.4	0.98	<0.5	22	65	<0.5	<0.5	<0.5
2016	W-1408	MW	3/28/16 DUP	<0.5	<0.5	<0.5	11	0.55	<1	1.4	0.97	<0.5	21	65	<0.5	<0.5	<0.5
2016	W-1408	MW	8/12/16	<0.5	<0.5	<0.5	10	<0.5	<1	1.5	0.99	<0.5	20	61 J	<0.5	<0.5	<0.5
2016	W-1408	MW	8/12/16 DUP	<0.5	<0.5	<0.5	9.9	0.57 IJ	<1	1.5 IJ	1	<0.5	19	62 IJ	<0.5	<0.5	<0.5
2016	W-1408	MW	12/6/16	<0.5	<0.5	<0.5	11	0.63	<1	1.7	1.1	<0.5	20	69 L	<0.5	<0.5	<0.5
2016	W-1409	MW	1/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.91	19	<0.5	<0.5	<0.5
2016	W-1409	MW	4/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.93	18	<0.5	<0.5	<0.5
2016	W-1409	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.1	24	<0.5	<0.5	<0.5
2016	W-1409	MW	10/5/16	<0.5	<0.5	<0.5	0.52	<0.5	<1	<0.5	<0.5	<0.5	1.3	33	<0.5	<0.5	<0.5
2016	W-1410	MW	1/21/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.3	1.8	<0.5	<0.5	9.9	<0.5	<0.5	<0.5
2016	W-1410	MW	4/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.5	1.9	<0.5	<0.5	10	<0.5	<0.5	<0.5
2016	W-1410	MW	7/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.6	2	<0.5	<0.5	10	<0.5	<0.5	<0.5
2016	W-1410	MW	10/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.6	2.4	<0.5	<0.5	12	<0.5	<0.5	<0.5
2016	W-1411	MW	9/21/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1411	MW	12/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5 L	<0.5	<0.5	<0.5
2016	W-1414	MW	3/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.9	8	<0.5	<0.5	<0.5
2016	W-1414	MW	3/14/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.8	8.6	<0.5	<0.5	<0.5
2016	W-1414	MW	6/8/16	<0.5	<0.5	1.2	0.99	72 L	<1	17	5.5	<0.5	130 D	1,500 DL	<0.5	<0.5	<0.5
2016	W-1414	MW	8/17/16	<0.5	<0.5	1.6	1.7	99 D	<1	26	7.2	<0.5	150 D	1,900 D	<0.5	<0.5	0.53
2016	W-1414	MW	12/5/16 DUP	<5 DH	<5 DH	<5 DH	<5 DH	89 DH	<10 DH	22 DH	6.5 DH	<5 DH	150 DH	1,800 DL	<5 DH	<5 DH	<5 DH
2016	W-1414	MW	12/5/16	<5 DH	<5 DH	<5 DH	<5 DH	78 DH	<10 DH	20 DH	6.3 DH	<5 DH	130 DH	1,900 DL	<5 DH	<5 DH	<5 DH
2016	W-1416	MW	8/25/16	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<1 H	<0.5 H	<0.5 H	<0.5 H	<0.5 HL	4 HF	<0.5 H	<0.5 H	<0.5 H
2016	W-1417	MW	8/25/16	<0.5 H	<0.5 H	<0.5 H	0.83 H	<0.5 H	<1 H	<0.5 H	4.6 H	<0.5 H	<0.5 HL	9.9 HF	1.5 H	<0.5 H	<0.5 H
2016	W-1418	MW	3/10/16	<0.5	<0.5	<0.5	2.1	<0.5	1.2	<0.5	0.84	<0.5	3	38 L	<0.5	1.2	<0.5
2016	W-1418	MW	3/10/16 DUP	<0.5	<0.5	<0.5	2.5	<0.5	1.3	<0.5	0.87	<0.5	2.8	38	<0.5	1.3	<0.5
2016	W-1419	MW	8/25/16	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<1 H	<0.5 H	3.4 H	<0.5 H	<0.5 HL	1.9 HF	1.5 H	<0.5 H	<0.5 H
2016	W-1420	MW	2/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.1	3.8	<0.5	<0.5	<0.5
2016	W-1420	MW	5/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.1	3.4	<0.5	<0.5	<0.5
2016	W-1420	MW	5/9/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.58	1.1	3.4	<0.5	<0.5	<0.5
2016	W-1421	MW	2/29/16	<0.5	<0.5	<0.5	1.7	<0.5	<1	<0.5	1.7	<0.5	1.6	27	0.65	<0.5	<0.5
2016	W-1422	MW	3/10/16	<0.5	<0.5	<0.5	11	<0.5	<1	<0.5	<0.5	2.7	10	64 L	<0.5	<0.5	<0.5
2016	W-1422	MW	8/17/16	<0.5	<0.5	<0.5	9	<0.5	1.9	<0.5	<0.5	2.5	8.3	52 J	<0.5	1.9	<0.5
2016	W-1422	MW	8/17/16 DUP	<0.5	<0.5	<0.5	5.7	<0.5	4.2	<0.5	<0.5	1.5	4.3	33	<0.5	4.2	<0.5
2016	W-1422	MW	12/8/16	<0.5	<0.5	<0.5	11	<0.5	1.2	<0.5	<0.5	3	8.8	59 L	<0.5	1.2	<0.5
2016	W-1423	MW	1/4/16	<0.5	<0.5	<0.5	3	<0.5	<1	0.74	4.4	2.9	1.6	8.6	<0.5	<0.5	<0.5
2016	W-1423	MW	4/4/16	<0.5	<0.5	<0.5	2.7	<0.5	<1	0.78	4.5	2.8	1.6	7.8	<0.5	<0.5	<0.5
2016	W-1423	MW	7/5/16	<0.5	<0.5	<0.5	3.1	<0.5	<1	0.85	4.9	2.9	1.7	8.6	<0.5	<0.5	<0.5
2016	W-1423	MW	10/5/16	<0.5	<0.5	<0.5	2.7	<0.5	<1	0.69	4.4	2.8	1.6	8.1	<0.5	<0.5	<0.5
2016	W-1424	MW	2/11/16	<0.5	<0.5	<0.5	0.63	<0.5	<1	<0.5	<0.5	<0.5	5.7	<0.5	<0.5	<0.5	<0.5
2016	W-1424	MW	4/21/16	<0.5	<0.5	<0.5	0.63	<0.5	<1	<0.5	<0.5	<0.5	6	<0.5	<0.5	<0.5	<0.5
2016	W-1424	MW	8/3/16	<0.5	<0.5	<0.5	0.63	<0.5	<1	<0.5	<0.5	<0.5	5	<0.5	<0.5	<0.5	<0.5
2016	W-1424	MW	11/8/16	<0.5	<0.5	<0.5	0.65	<0.5	<1	<0.5	<0.5	<0.5	6.3	<0.5	<0.5	<0.5	<0.5
2016	W-1425	MW	4/21/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-1425	MW	4/21/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1425	MW	8/3/16	<0.5	<0.5	<0.5	0.61	<0.5	<1	<0.5	<0.5	<0.5	4.1	<0.5	<0.5	<0.5	<0.5
2016	W-1425	MW	9/21/16	<0.5	<0.5	<0.5	0.51	<0.5	<1	<0.5	<0.5	<0.5	4.1	<0.5	<0.5	<0.5	<0.5
2016	W-1425	MW	11/9/16	<0.5	<0.5	0.51	0.73	<0.5	<1	<0.5	<0.5	<0.5	5.4	<0.5	<0.5	<0.5	<0.5
2016	W-1426	MW	2/22/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.54	<0.5	<0.5	<0.5
2016	W-1427	MW	8/10/16	<0.5	<0.5	<0.5	0.61	<0.5	<1	<0.5	0.51	1.4	2.1	3.9	<0.5	<0.5	<0.5
2016	W-1427	MW	8/10/16 DUP	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	0.6	1.6	2.3	4	<0.5	<0.5	<0.5
2016	W-1428	MW	5/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5 L	<0.5	2.3	<0.5	<0.5	<0.5
2016	W-1428	MW	11/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5
2016	W-1501	MW	8/24/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1503	MW	1/5/16	<0.5	<0.5	<0.5	1.1	<0.5	<1	1	1.4	0.56	1.7	33	<0.5	<0.5	<0.5
2016	W-1503	MW	4/7/16	<0.5	<0.5	<0.5	0.8	<0.5	<1	0.89	1.3	0.51	1.4	27	<0.5	<0.5	<0.5
2016	W-1503	MW	7/7/16	<0.5	<0.5	<0.5	0.78	<0.5	<1	0.91	1.4	<0.5	1.2	27	<0.5	<0.5	<0.5
2016	W-1503	MW	10/13/16	<0.5	<0.5	<0.5	0.67	<0.5	<1	0.83	1.2	<0.5	1.2	25	<0.5	<0.5	<0.5
2016	W-1504	MW	1/5/16	<0.5	<0.5	<0.5	6.9	<0.5	<1	<0.5	1.1	1.7	10	56	<0.5	0.64	<0.5
2016	W-1504	MW	4/7/16	<0.5	<0.5	<0.5	5.8	<0.5	<1	<0.5	1.1	1.5	9.7	50	<0.5	0.58	<0.5
2016	W-1504	MW	7/7/16	<0.5	<0.5	<0.5	7	<0.5	<1	<0.5	1.2	1.6	10	55	<0.5	0.58	<0.5
2016	W-1504	MW	10/13/16	<0.5	<0.5	<0.5	6.5	<0.5	<1	<0.5	1.2	1.6	9.7	53	<0.5	0.5	<0.5
2016	W-1505	MW	2/18/16	<0.5	<0.5	<0.5	1.7	0.58	<1	3.2	1.9	<0.5	2.8	90	<0.5	0.91	<0.5
2016	W-1505	MW	5/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	11	<0.5	<0.5	<0.5
2016	W-1505	MW	5/10/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	13	<0.5	<0.5	<0.5
2016	W-1505	MW	8/17/16	<0.5	<0.5	<0.5	0.89	<0.5	<1	1.5	1.2	<0.5	1.2	48	<0.5	<0.5	<0.5
2016	W-1506	MW	12/12/16	<0.5	<0.5	<0.5	3.9	<0.5	<1	0.82	<0.5	2.6	2.6	8.9	<0.5	<0.5	<0.5
2016	W-1507	MW	3/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	11	<0.5	<0.5	<0.5
2016	W-1507	MW	6/7/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.2	<0.5	<0.5	24	<0.5	<0.5	<0.5
2016	W-1507	MW	6/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.2	<0.5	<0.5	24	<0.5	<0.5	<0.5
2016	W-1507	MW	8/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.51	<0.5	7.5	<0.5	<0.5	<0.5
2016	W-1508	MW	8/25/16	<0.5	<0.5	<0.5	0.89	<0.5	<1	<0.5	<0.5	<0.5	0.73	5	<0.5	<0.5	<0.5
2016	W-1509	MW	2/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.6	<0.5	<0.5	<0.5	<0.5
2016	W-1510	MW	1/5/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	1.5	<0.5	2.5	18	<0.5	<0.5	<0.5
2016	W-1510	MW	4/7/16	<0.5	<0.5	<0.5	0.85	<0.5	<1	<0.5	1.5	<0.5	2	13	<0.5	<0.5	<0.5
2016	W-1510	MW	7/7/16	<0.5	<0.5	<0.5	0.79	<0.5	<1	<0.5	1.7	<0.5	1.8	13	<0.5	<0.5	<0.5
2016	W-1510	MW	10/13/16	<0.5	<0.5	<0.5	0.82	<0.5	<1	<0.5	1.2	<0.5	1.9	14	<0.5	<0.5	<0.5
2016	W-1511	MW	6/1/16 DUP	<0.5	<0.5	<0.5	21	2	<0.5	1.1	11	7.4	30	200 DL	<0.5	<0.5	<0.5
2016	W-1511	MW	6/1/16	<0.5	<0.5	<0.5	18	1.7	<1	0.94	9.7	5.9	30	180 D	<0.5	<0.5	<0.5
2016	W-1512	MW	12/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-1516	MW	1/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	6.9	<0.5	<0.5	<0.5
2016	W-1516	MW	4/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.4	0.57	<0.5	6.5	<0.5	<0.5	<0.5
2016	W-1516	MW	7/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.5	0.56	<0.5	7.4	<0.5	<0.5	<0.5
2016	W-1516	MW	10/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.1	0.51	<0.5	6.1	<0.5	<0.5	<0.5
2016	W-1517	MW	3/15/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	13	<0.5	<0.5	<0.5
2016	W-1518	MW	1/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.5	0.55	<0.5	7.1	<0.5	<0.5	<0.5
2016	W-1518	MW	4/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	5.2	<0.5	<0.5	<0.5
2016	W-1518	MW	7/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	5.6	<0.5	<0.5	<0.5
2016	W-1518	MW	10/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	5.1	<0.5	<0.5	<0.5
2016	W-1519	MW	3/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	6.5	<0.5	<0.5	<0.5
2016	W-1519	MW	6/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	3.8	<0.5	<0.5	<0.5
2016	W-1519	MW	8/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.76	<0.5	<0.5	<0.5	10	<0.5	<0.5	<0.5
2016	W-1519	MW	8/9/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	6.9	<0.5	<0.5	<0.5
2016	W-1519	MW	12/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.64	<0.5	<0.5	<0.5	9.1	<0.5	<0.5	<0.5
2016	W-1520	MW	1/12/16	<0.5	<0.5	<0.5	0.71	0.89	<1	3.8	2.5	<0.5	3.7	81	<0.5	0.76	<0.5
2016	W-1520	MW	4/12/16	<0.5	<0.5	<0.5	0.83	1	<1	4.6	3	<0.5	4.3	99	<0.5	0.92	<0.5
2016	W-1520	MW	7/7/16	<0.5	<0.5	<0.5	1	1.4	<1	5.1	3.6	<0.5	4.8	100 D	<0.5	0.98	<0.5
2016	W-1520	MW	10/11/16	<0.5	<0.5	<0.5	1.1	1.5	1.1	5.5	3.8	<0.5	5.4	110 D	<0.5	1.1	<0.5
2016	W-1522	MW	1/12/16	<0.5	<0.5	<0.5	5.1	1.8	4.5	7.7	4.6	0.6	8.1	190 D	<0.5	4.5	<0.5
2016	W-1522	MW	4/12/16	<0.5	<0.5	<0.5	4.4	1.6	4.4	8.1	4.5	0.57	7.5	180 D	<0.5	4.4	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-1522	MW	7/7/16	<0.5	<0.5	<0.5	5.5	1.7	5.5	8.3	5.2	0.63	7	200 D	<0.5	5.5	<0.5
2016	W-1522	MW	10/11/16	<0.5	<0.5	<0.5	4.9	1.4	5.8	8.2	5	0.71	6.4	180 D	<0.5	5.8	<0.5
2016	W-1523	MW	1/14/16	<0.5	<0.5	<0.5	14	1.8	<1	7.1	3.6	1.9	17	200 D	<0.5	<0.5	<0.5
2016	W-1523	MW	4/7/16	<0.5	<0.5	<0.5	11	1.5	<1	6.1	3.5	1.8	16	180 D	<0.5	<0.5	<0.5
2016	W-1523	MW	7/12/16	<0.5	<0.5	<0.5	9.7	1.3	<1	3.9	3.6	1.4	16	130 D	<0.5	<0.5	<0.5
2016	W-1523	MW	10/5/16	<0.5	<0.5	<0.5	8.7	1.2	<1	3.2	3.3	1.1	14	110 D	<0.5	<0.5	<0.5
2016	W-1550	MW	1/20/16	<0.5	<0.5	<0.5	0.72	<0.5	<1	5.2	3.5	<0.5	1.8	130 D	<0.5	<0.5	<0.5
2016	W-1550	MW	4/11/16	<0.5	<0.5	<0.5	0.75	<0.5	<1	5.8	3.7	<0.5	1.9	120 D	<0.5	<0.5	<0.5
2016	W-1550	MW	7/13/16	<0.5	<0.5	<0.5	0.99	<0.5	<1	6.6	4.2	0.5	2.1	130 D	<0.5	<0.5	<0.5
2016	W-1550	MW	10/12/16	<0.5	<0.5	<0.5	0.88	<0.5	<1	6.2	4.2	<0.5	2	90 D	<0.5	<0.5	<0.5
2016	W-1551	MW	3/31/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.2	<0.5	<0.5	66	<0.5	<0.5	<0.5
2016	W-1551	MW	5/26/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.1	<0.5	0.66	39	<0.5	0.65	<0.5
2016	W-1551	MW	12/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.83	2.2	<0.5	2.4	79	<0.5	<0.5	<0.5
2016	W-1552	MW	1/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	12	<0.5	1	<0.5	<0.5	61	<0.5	12	<0.5
2016	W-1552	MW	4/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	11	<0.5	0.98	<0.5	<0.5	64	<0.5	11	<0.5
2016	W-1552	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	12	<0.5	0.87	<0.5	<0.5	56	<0.5	12	<0.5
2016	W-1552	MW	10/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	38	<0.5	<0.5	<0.5	<0.5	16	<0.5	38	<0.5
2016	W-1553	MW	2/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	13	2.2	5.5	<0.5	330 D	<0.5	<0.5	<0.5
2016	W-1553	MW	5/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	11	2	4.6	<0.5	280 D	<0.5	<0.5	<0.5
2016	W-1553	MW	5/17/16 DUP	<1 D	<1 D	<1 D	<1 D	<1 D	<2 D	9.2 D	1.7 D	3.7 D	<1 D	410 D	<1 D	<1 D	<1 D
2016	W-1553	MW	8/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	9.1	1.8	3.4	<0.5	240 D	<0.5	<0.5	<0.5
2016	W-1553	MW	12/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	10	1.7	3.9	<0.5	270 D	<0.5	<0.5	<0.5
2016	W-1601	MW	1/14/16	<0.5	<0.5	1.2	19	4.4	<1	3.3	3.2	1.1	71	200 D	<0.5	0.84	<0.5
2016	W-1601	MW	4/7/16	<0.5	<0.5	1.1	16	3.9	<1	2.8	2.9	0.91	68	170 D	<0.5	0.8	<0.5
2016	W-1601	MW	7/12/16	<0.5	<0.5	1.2	20	4.6	<1	3	3.2	0.99	74	210 D	<0.5	0.88	<0.5
2016	W-1601	MW	10/5/16	<0.5	<0.5	1.3	22	5.5	<1	3	3.2	0.92	77	220 D	<0.5	0.84	<0.5
2016	W-1602	MW	1/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.6	<0.5	0.86	7.9	2.5	<0.5	<0.5
2016	W-1602	MW	4/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.5	<0.5	0.88	8.1	1.6	<0.5	<0.5
2016	W-1602	MW	7/12/16	<0.5	<0.5	<0.5	0.51	<0.5	<1	<0.5	1.7	<0.5	1	9.4	1.4	<0.5	<0.5
2016	W-1602	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.5	<0.5	1.1	9.4	1.3	<0.5	<0.5
2016	W-1603	MW	1/14/16	<0.5	<0.5	<0.5	4.3	0.98	<1	1.4	1.9	<0.5	6.7	72	13	<0.5	<0.5
2016	W-1603	MW	4/7/16	<0.5	<0.5	0.87	11	2.3	<1	1	2.1	<0.5	17	120 D	6	0.79	<0.5
2016	W-1603	MW	7/12/16	<0.5	<0.5	0.99	12	2.7	<1	0.91	2.2	<0.5	19	140 D	4.7	0.96	<0.5
2016	W-1603	MW	10/5/16	<0.5	<0.5	0.93	12	2.9	<1	0.81	2.3	<0.5	19	140 D	4.5	0.98	<0.5
2016	W-1604	MW	5/24/16 DUP	<0.5	<0.5	2.6	56	17	11	6.4	67 D	16	120 D	980 D	<0.5	11	<0.5
2016	W-1604	MW	5/24/16	<0.5	<0.5	2.6	58	16	11	6.4	69 D	17	120 D	980 D	<0.5	11	<0.5
2016	W-1604	MW	8/12/16	<0.5	<0.5	1.5	30	10 IJ	5.3	3.2 IJ	47	8.4	69 DH	610 DH	<0.5	5.3	<0.5
2016	W-1604	MW	11/30/16	<1 DH	<1 DH	1.3 DH	23 DH	11 DH	3.7 DH	2.8 DH	43 DH	6.9 DH	58 DH	540 D	<1 DH	3.7 DH	<1 DH
2016	W-1604	MW	11/30/16 DUP	<1 DH	<1 DH	1.3 DH	24 DH	11 DH	4 DH	3.1 DH	43 DH	7 DH	58 DH	560 D	<1 DH	4 DH	<1 DH
2016	W-1605	MW	2/16/16	<0.5	<0.5	<0.5	0.93	2.1	<1	<0.5	23	<0.5	3	39	<0.5	0.84	<0.5
2016	W-1605	MW	2/16/16 DUP	<0.5	<0.5	<0.5	0.99	2.1	<1	<0.5	24	<0.5	3.2	41	<0.5	0.98	<0.5
2016	W-1605	MW	5/10/16	<0.5	<0.5	<0.5	1	1.9	<1	<0.5	22	<0.5	3.2	42	<0.5	<0.5	<0.5
2016	W-1605	MW	9/12/16	<0.5	<0.5	<0.5	1.4	2.1	<1	<0.5	29	<0.5	3.9	55	<0.5	<0.5	<0.5
2016	W-1606	MW	5/10/16	<0.5	<0.5	<0.5	<0.5	3.6	<1	<0.5	24	<0.5	3	38	<0.5	<0.5	<0.5
2016	W-1606	MW	8/25/16	<0.5	<0.5	<0.5	0.57	3.9	<1	<0.5	28	<0.5	3.2	43	<0.5	<0.5	<0.5
2016	W-1606	MW	12/13/16	<0.5	<0.5	<0.5	0.55	3.7	<1	<0.5	28	<0.5	3.5	46	<0.5	<0.5	<0.5
2016	W-1607	MW	2/16/16	<0.5	<0.5	<0.5	<0.5	0.51	<1	<0.5	15	<0.5	2.8	28	<0.5	<0.5	<0.5
2016	W-1608	MW	9/12/16	<0.5	<0.5	<0.5	1.2	2	<1	<0.5	21	<0.5	3.4	19	<0.5	0.62	<0.5
2016	W-1609	MW	2/16/16	<0.5	<0.5	<0.5	4.6	2.1	<1	<0.5	31	0.76	15	100 D	<0.5	<0.5	<0.5
2016	W-1609	MW	5/10/16	<0.5	<0.5	<0.5	1.8	2	<1	<0.5	26	<0.5	5.4	36	<0.5	<0.5	<0.5
2016	W-1609	MW	9/12/16	<0.5	<0.5	<0.5	5.1	2.3	<1	0.73	30	1	14	110 D	<0.5	<0.5	<0.5
2016	W-1609	MW	11/22/16	<0.5	<0.5	<0.5	3.8	2	<1	<0.5	26	0.76	8.2	84	<0.5	<0.5	<0.5
2016	W-1610	MW	9/12/16	<0.5	<0.5	<0.5	3.3	2.4	<1	<0.5	38	<0.5	11	92 D	<0.5	<0.5	<0.5
2016	W-1610	MW	11/7/16	<0.5	<0.5	0.52	3.4	1.8	<1	<0.5	37	<0.5	13	95 D	<0.5	<0.5	<0.5
2016	W-1614	MW	2/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.81	<0.5	<0.5	<0.5	<0.5
2016	W-1615	MW	2/11/16	<0.5	<0.5	<0.5	2.8	<0.5	<1	<0.5	<0.5	<0.5	30	150 D	<0.5	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-1615	MW	4/20/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	4.6	28	<0.5	<0.5	<0.5
2016	W-1615	MW	7/27/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	4	30	<0.5	<0.5	<0.5
2016	W-1615	MW	11/3/16	<0.5	<0.5	<0.5	0.59	<0.5	<1	<0.5	<0.5	<0.5	10	59	<0.5	<0.5	<0.5
2016	W-1650	MW	1/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	2	1.2	0.54	<0.5	130 D	<0.5	<0.5	<0.5
2016	W-1650	MW	4/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	2	1.1	<0.5	<0.5	110 D	<0.5	<0.5	<0.5
2016	W-1650	MW	6/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.5	1.2	1.1	<0.5	92 D	<0.5	0.78	<0.5
2016	W-1650	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.8	1.1	<0.5	<0.5	110 D	<0.5	<0.5	<0.5
2016	W-1650	MW	8/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	2.1	1.2	<0.5	<0.5	120 D	<0.5	<0.5	<0.5
2016	W-1650	MW	8/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	2.3	1.2	0.87	<0.5	100 D	<0.5	0.83	<0.5
2016	W-1650	MW	10/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	1	1.8	1.3	1.1	<0.5	100 D	<0.5	1	<0.5
2016	W-1650	MW	12/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.3	1	<0.5	<0.5	84 D	<0.5	<0.5	<0.5
2016	W-1651	MW	1/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	4	0.85	0.77	<0.5	<0.5	39	<0.5	4	<0.5
2016	W-1651	MW	4/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	4.9	0.8	0.74	<0.5	<0.5	33	<0.5	4.9	<0.5
2016	W-1651	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	5.6	1	0.95	<0.5	<0.5	44	<0.5	5.6	<0.5
2016	W-1651	MW	10/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	6.4	0.6	0.96	<0.5	<0.5	42	<0.5	6.4	<0.5
2016	W-1652	MW	1/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	9.1	<0.5	<0.5	<0.5	<0.5	21	<0.5	9.1	<0.5
2016	W-1652	MW	4/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	8.7	<0.5	<0.5	<0.5	<0.5	17	<0.5	8.7	<0.5
2016	W-1652	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	8.8	<0.5	<0.5	<0.5	<0.5	23	<0.5	8.8	<0.5
2016	W-1652	MW	8/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	8.8	<0.5	<0.5	<0.5	<0.5	12	<0.5	8.8	<0.5
2016	W-1652	MW	10/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	12	<0.5	<0.5	<0.5	<0.5	12	<0.5	12	<0.5
2016	W-1653	MW	1/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	7	<0.5	0.9	<0.5	<0.5	47	<0.5	7	<0.5
2016	W-1653	MW	4/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	8.9	<0.5	0.59	<0.5	<0.5	39	<0.5	8.9	<0.5
2016	W-1653	MW	6/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	38	<0.5	<0.5	<0.5	<0.5	15	<0.5	38	<0.5
2016	W-1653	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	10	<0.5	0.58	<0.5	<0.5	38	<0.5	10	<0.5
2016	W-1653	MW	8/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	12	<0.5	<0.5	<0.5	<0.5	42	<0.5	12	<0.5
2016	W-1653	MW	8/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	24	<0.5	<0.5	<0.5	<0.5	35	<0.5	24	<0.5
2016	W-1653	MW	10/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	44	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	44	<0.5
2016	W-1653	MW	12/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	13	<0.5	<0.5	<0.5	<0.5	30	<0.5	13	<0.5
2016	W-1654	MW	1/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	24	<0.5	<0.5	<0.5	<0.5	17	<0.5	24	<0.5
2016	W-1654	MW	4/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	22	<0.5	<0.5	<0.5	<0.5	19	<0.5	22	<0.5
2016	W-1654	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	22	<0.5	<0.5	<0.5	<0.5	20	<0.5	22	<0.5
2016	W-1654	MW	8/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	22	<0.5	<0.5	<0.5	<0.5	21	<0.5	22	<0.5
2016	W-1654	MW	8/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	22	<0.5	<0.5	<0.5	<0.5	22	<0.5	22	<0.5
2016	W-1654	MW	10/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	20	<0.5	<0.5	<0.5	<0.5	21	<0.5	20	<0.5
2016	W-1654	MW	12/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	17	<0.5	<0.5	<0.5	<0.5	19	<0.5	17	<0.5
2016	W-1655	MW	1/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.4	<0.5	2.5	40	<0.5	<0.5	<0.5
2016	W-1655	MW	4/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.2	<0.5	2	37	<0.5	0.8	<0.5
2016	W-1655	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.9	35	<0.5	0.77	<0.5
2016	W-1655	MW	10/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	2.1	<0.5	<0.5	<0.5	1.3	28	<0.5	2.1	<0.5
2016	W-1656	MW	1/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	2.9	<0.5	0.73	<0.5	<0.5	40	<0.5	2.9	<0.5
2016	W-1656	MW	4/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	3	<0.5	0.71	<0.5	<0.5	33	<0.5	3	<0.5
2016	W-1656	MW	6/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	2.9	<0.5	0.69	<0.5	<0.5	32	<0.5	2.9	<0.5
2016	W-1656	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	3.2	<0.5	0.76	<0.5	<0.5	32	<0.5	3.2	<0.5
2016	W-1656	MW	10/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	3.1	<0.5	<0.5	<0.5	<0.5	27	<0.5	3.1	<0.5
2016	W-1656	MW	12/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	2.7	<0.5	<0.5	<0.5	<0.5	28	<0.5	2.7	<0.5
2016	W-1657	MW	1/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	9	4.5	2.7	<0.5	1,100 D	<0.5	<0.5	<0.5
2016	W-1657	MW	4/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	1.4	8.5	4.3	2.4	<0.5	1,100 D	<0.5	1.4	<0.5
2016	W-1657	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	1.7	7.8	4.6	1.6	<0.5	1,000 D	<0.5	1.7	<0.5
2016	W-1657	MW	10/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	16	6	3.8	1.5	<0.5	790 D	<0.5	16	<0.5
2016	W-1701	MW	2/2/16	<0.5	<0.5	2.4	3	<0.5	<1	<0.5	0.65	<0.5	4.9	<0.5	<0.5	<0.5	<0.5
2016	W-1701	MW	2/2/16 DUP	<0.5	<0.5	2.3	2.9	<0.5	<1	<0.5	0.62	<0.5	4.7	<0.5	<0.5	<0.5	<0.5
2016	W-1701	MW	4/21/16	<0.5	<0.5	2.1	2.6	<0.5	<1	<0.5	0.64	<0.5	4.3	<0.5	<0.5	<0.5	<0.5
2016	W-1701	MW	8/11/16	<0.5	<0.5	2.8	3.5	<0.5	<1	<0.5	0.76	<0.5	4.7	<0.5	<0.5	<0.5	<0.5
2016	W-1701	MW	8/11/16 DUP	<0.5	<0.5	2.7	4.4	<0.5	<0.5	<0.5	0.8	<0.5	5.3	<0.5	<0.5	<0.5	<0.5
2016	W-1701	MW	11/9/16	<0.5	<0.5	2.5	3	<0.5	<1	<0.5	0.61	<0.5	4.9	<0.5	<0.5	<0.5	<0.5
2016	W-1704	MW	9/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	8	<0.5	<0.5	3.2	2.7	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-1705-2	MW	3/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	45	<0.5	6.2	3.8	1	70	<0.5	45	<0.5
2016	W-1705-2	MW	6/27/16	<0.5	<0.5	<0.5	<0.5	<0.5	11	<0.5	2.1	2.5	0.71	55	<0.5	11	<0.5
2016	W-1705-2	MW	8/30/16	<0.5	<0.5	<0.5	<0.5	<0.5	5.5	<0.5	2.1	6.4	1.6	110 D	<0.5	5.5	<0.5
2016	W-1705-2	MW	8/30/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	7	<0.5	2.2	7.4	1.4	97 DH	<0.5	7	<0.5
2016	W-1705-2	MW	11/21/16	<0.5	<0.5	<0.5	<0.5	<0.5	4.4	<0.5	2	4	1.2	93 D	<0.5	4.4	<0.5
2016	W-1705-3	MW	3/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	130 D	<0.5	5.3	<0.5	<0.5	4.3	<0.5	130 D	<2.5 D
2016	W-1705-3	MW	5/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	36	<0.5	3.9	5.3	1.2	87	<0.5	36	<0.5
2016	W-1705-3	MW	8/30/16	<0.5	<0.5	<0.5	<0.5	<0.5	37	<0.5	1.6	<0.5	<0.5	9.6	<0.5	37	<0.5
2016	W-1705-3	MW	11/21/16	<0.5	<0.5	<0.5	<0.5	<0.5	26	<0.5	1.9	<0.5	<0.5	12	<0.5	26	<0.5
2016	W-1705-3	MW	11/21/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	56	<0.5	5.9	<0.5	<0.5	5.8	<0.5	56	<0.5
2016	W-1801	MW	1/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.6	2.6	0.86	18	<0.5	<0.5	<0.5
2016	W-1801	MW	4/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.5	2.5	0.81	16	<0.5	<0.5	<0.5
2016	W-1801	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.7	3	0.95	19	<0.5	<0.5	<0.5
2016	W-1801	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.5	3.1	1	19	<0.5	<0.5	<0.5
2016	W-1802	MW	12/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.1	1.7	<0.5	<0.5	16	66	<0.5	<0.5
2016	W-1803-1	MW	5/17/16	<0.5	<0.5	0.56	9.6	3.4	<1	2.4	3.3	1.7	14	140 D	<0.5	<0.5	<0.5
2016	W-1803-1	MW	5/17/16 DUP	<5 D	<5 D	<5 D	8.8 D	<5 D	<5 D	<5 D	<5 D	<5 D	14 D	140 D	<5 D	<5 D	<5 D
2016	W-1803-1	MW	12/7/16	<1 D	<1 D	<1 D	9 D	3.5 D	<2 D	2.4 D	3.3 D	1.8 D	15 D	150 D	<1 D	<1 D	<1 D
2016	W-1803-1	MW	12/7/16 DUP	<1 D	<1 D	<1 D	8.4 D	3.1 D	<2 D	2.4 D	3.2 D	1.4 D	14 D	140 D	<1 D	<1 D	<1 D
2016	W-1803-2	MW	5/17/16	<0.5	<0.5	<0.5	0.66	<0.5	<1	<0.5	1	<0.5	0.84	12	<0.5	<0.5	<0.5
2016	W-1803-2	MW	12/7/16	<0.5	<0.5	<0.5	0.69	<0.5	<1	<0.5	1.1	<0.5	0.71	12 L	<0.5	<0.5	<0.5
2016	W-1804-1	MW	5/11/16	<0.5	<0.5	0.76	<0.5	<0.5	<1	<0.5	<0.5	<0.5	6.5	32	<0.5	<0.5	<0.5
2016	W-1804-1	MW	8/18/16	<0.5	<0.5	0.65	0.72	<0.5	<1	<0.5	<0.5	<0.5	5.7	32 IJ	<0.5	<0.5	<0.5
2016	W-1804-1	MW	8/18/16 DUP	<0.5	<0.5	0.57	0.6	<0.5	<1	<0.5	<0.5	<0.5	4.8	27	<0.5	<0.5	<0.5
2016	W-1804-2	MW	2/25/16	<0.5	<0.5	3.4	190	1.1	<1	<0.5	0.93	<0.5	66	320	<0.5	0.55	<0.5
2016	W-1804-2	MW	2/25/16 DUP	<0.5	<0.5	3.1	160 D	0.97	<1	<0.5	0.87	<0.5	69	280 D	<0.5	<0.5	<0.5
2016	W-1804-2	MW	5/11/16	<0.5	<0.5	2.5	170 D	0.9	<1	<0.5	0.78	<0.5	73	270 D	<0.5	<0.5	<0.5
2016	W-1804-2	MW	9/19/16	<2.5 D	<2.5 D	3 D	170 D	<2.5 D	<5 D	<2.5 D	<2.5 D	<2.5 D	59 D	300 DL	<2.5 D	<2.5 D	<2.5 D
2016	W-1804-2	MW	9/19/16 REA	<1 DH	<1 DH	3.1 DH	170 DH	1.1 DH	<2 DH	<1 DH	<1 DH	<1 DH	52 DH	310 DH	<1 DH	<1 DH	<1 DH
2016	W-1805	MW	11/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.81	<0.5	<0.5	<0.5	<0.5
2016	W-1806	MW	1/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1	<0.5	9.3	3.2	<0.5	<0.5	<0.5
2016	W-1806	MW	8/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	5.5	1.6	<0.5	<0.5	<0.5
2016	W-1806	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	6.6	1.6	<0.5	<0.5	<0.5
2016	W-1807	MW	1/13/16	<0.5	<0.5	<0.5	1.4	<0.5	<1	<0.5	1.4	1.4	18	5	<0.5	<0.5	<0.5
2016	W-1807	MW	4/5/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	1.2	1.1	16	4.4	<0.5	<0.5	<0.5
2016	W-1807	MW	8/11/16	<0.5	<0.5	<0.5	1.4	<0.5	<1	<0.5	1.5	1.4	18	5.6	<0.5	<0.5	<0.5
2016	W-1807	MW	10/5/16	<0.5	<0.5	<0.5	1.4	<0.5	<1	<0.5	1.5	1.4	19	5.3	<0.5	<0.5	<0.5
2016	W-1901-1	MW	5/18/16	<0.5	<0.5	<0.5	0.77	<0.5	<1	<0.5	1.6	<0.5	3.2	6.9	<0.5	<0.5	<0.5
2016	W-1901-1	MW	10/26/16	<0.5	<0.5	<0.5	0.71	<0.5	<1	<0.5	1.9	<0.5	2.7	6.5	<0.5	<0.5	<0.5
2016	W-1901-2	MW	2/17/16	<0.5	<0.5	<0.5	5.2	<0.5	<1	<0.5	1	<0.5	7.4	4.5	<0.5	<0.5	<0.5
2016	W-1901-2	MW	5/18/16	<0.5	<0.5	<0.5	17	<0.5	<1	<0.5	0.9	<0.5	4.1	7.3	<0.5	<0.5	<0.5
2016	W-1901-2	MW	9/14/16	<0.5	<0.5	<0.5	7.5	<0.5	<1	<0.5	1.1	<0.5	7.7	5.6	<0.5	<0.5	<0.5
2016	W-1901-2	MW	9/14/16 DUP	<0.5	<0.5	<0.5	7.9	<0.5	<0.5	<0.5	1.2	0.5	7.3	5.8	<0.5	<0.5	<0.5
2016	W-1901-2	MW	10/26/16	<0.5	<0.5	<0.5	5.7	<0.5	<1	<0.5	1.1	<0.5	7.7	5.1	<0.5	<0.5	<0.5
2016	W-1902	MW	1/6/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.3	<0.5	<0.5	3.7	39	<0.5	<0.5
2016	W-1902	MW	4/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.2	<0.5	<0.5	3.3	41	<0.5	<0.5
2016	W-1902	MW	7/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.4	<0.5	<0.5	1.2	17	<0.5	<0.5
2016	W-1902	MW	10/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.5	<0.5	<0.5	3.1	41	<0.5	<0.5
2016	W-1903	MW	1/7/16	<0.5	<0.5	<0.5	15	<0.5	<1	<0.5	<0.5	3.9	13	29	<0.5	<0.5	<0.5
2016	W-1903	MW	4/5/16	<0.5	<0.5	<0.5	8.3	<0.5	<1	<0.5	<0.5	2.4	8.2	17	<0.5	<0.5	<0.5
2016	W-1903	MW	7/7/16	<0.5	<0.5	<0.5	10	<0.5	<1	<0.5	<0.5	2.8	9.7	24	<0.5	<0.5	<0.5
2016	W-1903	MW	10/4/16	<0.5	<0.5	<0.5	12	<0.5	<1	<0.5	<0.5	3	12	27	<0.5	<0.5	<0.5
2016	W-1905-1	MW	6/7/16	<0.5	<0.5	2.1	34	5	1.9	<0.5	1.3	<0.5	22	260 D	<0.5	1.9	<0.5
2016	W-1905-1	MW	8/29/16	<0.5	<0.5	2.9	55	5.8	3	<0.5	1.7	<0.5	33	460 D	<0.5	3	<0.5
2016	W-1905-1	MW	8/29/16 DUP	<0.5	<0.5	2.8	53	5.9	2.8	<0.5	1.6	<0.5	32	360 D	<0.5	2.8	<0.5
2016	W-1905-1	MW	12/5/16	<0.5	<0.5	3.1	59	6.2	3.4	<0.5	1.8	<0.5	38	520 D	<0.5	3.4	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-1905-2	MW	2/29/16	<0.5	<0.5	<0.5	3.4	0.6	<1	<0.5	<0.5	<0.5	7.4	39	<0.5	<0.5	<0.5
2016	W-1905-2	MW	2/29/16 DUP	<0.5	<0.5	<0.5	3.5	0.63	<1	<0.5	<0.5	<0.5	7.4	40	<0.5	<0.5	<0.5
2016	W-1905-2	MW	6/7/16	<0.5	<0.5	<0.5	3.2	<0.5	<1	<0.5	<0.5	<0.5	8.3	37	<0.5	<0.5	<0.5
2016	W-1905-2	MW	8/18/16	<0.5	<0.5	<0.5	5.4	0.53	<1	<0.5	<0.5	<0.5	11	55	<0.5	<0.5	<0.5
2016	W-2005	MW	1/13/16	<0.5	<0.5	<0.5	8	0.53	<1	<0.5	1	<0.5	19	39	<0.5	<0.5	<0.5
2016	W-2005	MW	4/18/16	<0.5	<0.5	<0.5	4.4	<0.5	<1	<0.5	0.9	<0.5	11	20	<0.5	<0.5	<0.5
2016	W-2005	MW	7/11/16	<0.5	<0.5	<0.5	5.7	<0.5	<1	<0.5	0.95	<0.5	14 O	24	<0.5	<0.5	<0.5
2016	W-2005	MW	10/3/16	<0.5	<0.5	<0.5	14	1.1	<1	0.56	0.97	<0.5	32	71	<0.5	<0.5	<0.5
2016	W-2006	MW	1/20/16	<0.5	<0.5	3.5	98 D	10	1.5	1.1	2	<0.5	86 D	560 D	<0.5	1.5	<0.5
2016	W-2006	MW	4/11/16	<0.5	<0.5	3.6	82 D	10	1.5	1.1	2	<0.5	90 D	530 D	<0.5	1.5	<0.5
2016	W-2006	MW	7/13/16	<0.5	<0.5	4	97 D	11	1.6	1.2	2.2	<0.5	98 D	600 D	<0.5	1.6	<0.5
2016	W-2006	MW	10/12/16	<0.5	<0.5	4	64 D	11	1.6	1.1	2	<0.5	72 D	410 D	<0.5	1.6	<0.5
2016	W-2011	MW	2/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.55	<0.5	<0.5	4.7	<0.5	<0.5	<0.5
2016	W-2011	MW	4/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.56	<0.5	<0.5	7.4	<0.5	<0.5	<0.5
2016	W-2011	MW	7/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.62	0.62	<0.5	<0.5	14	<0.5	<0.5	<0.5
2016	W-2011	MW	10/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.62	0.6	<0.5	<0.5	14	<0.5	<0.5	<0.5
2016	W-2101	MW	2/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	9.4	<0.5	<0.5	<0.5
2016	W-2101	MW	4/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	3.8	1.4	0.65	<0.5	110 D	<0.5	<0.5	<0.5
2016	W-2101	MW	7/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	4	1.5	0.62	<0.5	120 D	<0.5	<0.5	<0.5
2016	W-2101	MW	10/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	3.9	1.4	0.53	<0.5	120 D	<0.5	<0.5	<0.5
2016	W-2102	MW	2/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	5.9	2.8	0.83	<0.5	190 D	<0.5	<0.5	<0.5
2016	W-2102	MW	4/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	9.5	3.4	1.2	<0.5	300 D	<0.5	<0.5	<0.5
2016	W-2102	MW	7/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	11	3.6	1.2	<0.5	330 D	0.65	<0.5	<0.5
2016	W-2102	MW	10/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	10	3.2	1.1	<0.5	290 D	0.62	<0.5	<0.5
2016	W-2103	MW	2/25/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	11	3.2	2.9	<0.5	400 D	<0.5	<0.5	<0.5
2016	W-2103	MW	5/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	9.3	2.5	2.5	<0.5	260 D	<0.5	<0.5	<0.5
2016	W-2103	MW	8/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	12	3.1	2.8	<0.5	330 D	<0.5	<0.5	<0.5
2016	W-2103	MW	8/16/16 DUP	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	12	3	3.6	<0.5	310 D	<0.5	<0.5	<0.5
2016	W-2103	MW	12/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	12	3	2.9	<0.5	330 D	<0.5	<0.5	<0.5
2016	W-2103	MW	12/7/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	8.7	2.2	2.4	<0.5	290 D	<0.5	<0.5	<0.5
2016	W-2105	MW	1/13/16	<0.5	<0.5	<0.5	4	<0.5	1.8	2.3	1.5	1.6	4.9	100 D	<0.5	1.8	<0.5
2016	W-2105	MW	4/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.94	4.6	57	<0.5	<0.5	<0.5
2016	W-2105	MW	7/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.1	5.8	76	<0.5	<0.5	<0.5
2016	W-2105	MW	10/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.79	4.1	53	<0.5	<0.5	<0.5
2016	W-2201	MW	1/5/16	<0.5	<0.5	<0.5	1.7	<0.5	<1	<0.5	5.3	17	0.84	14	0.95	<0.5	<0.5
2016	W-2201	MW	1/28/16	<0.5	<0.5	<0.5	1.5	<0.5	<1	<0.5	5.4	18	0.94	15	1.1	<0.5	<0.5
2016	W-2201	MW	4/5/16	<0.5	<0.5	<0.5	1.3	<0.5	<1	<0.5	5	14	0.81	13	0.94	<0.5	<0.5
2016	W-2201	MW	4/28/16	<0.5	<0.5	<0.5	1.4	<0.5	<1	<0.5	5	15	0.86	13	1	<0.5	<0.5
2016	W-2201	MW	6/29/16	<0.5	<0.5	<0.5	1.4	<0.5	<1	<0.5	5.7	15	0.83	14	0.99	<0.5	<0.5
2016	W-2201	MW	7/11/16	<0.5	<0.5	<0.5	1.5	<0.5	<1	<0.5	5.8	15	0.89	14	0.98	<0.5	<0.5
2016	W-2201	MW	8/31/16	<0.5	<0.5	<0.5	1.5	<0.5	<1	<0.5	5.9	15	0.9	14	1.1	<0.5	<0.5
2016	W-2201	MW	10/5/16	<0.5	<0.5	<0.5	1	<0.5	<1	<0.5	5.2	14	0.87	12	0.95	<0.5	<0.5
2016	W-2201	MW	10/20/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	5.2	14	0.94	13	1	<0.5	<0.5
2016	W-2201	MW	11/16/16	<0.5	<0.5	<0.5	1.1	<0.5	<1	<0.5	5	14	0.88	13	0.96	<0.5	<0.5
2016	W-2202	MW	2/29/16	<0.5	<0.5	<0.5	9.3	0.54	<1	11	3	1.6	12	100 D	<0.5	<0.5	<0.5
2016	W-2202	MW	5/31/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.73	<0.5	<0.5	<0.5
2016	W-2202	MW	5/31/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.75	<0.5	<0.5	<0.5
2016	W-2202	MW	8/10/16	<0.5	<0.5	<0.5	3.1	<0.5	<1	1.8	2	0.54	2.8	57	<0.5	<0.5	<0.5
2016	W-2202	MW	11/28/16	<0.5	<0.5	<0.5	1.6	<0.5	<1	1.4	0.64	<0.5	1.6	30	<0.5	<0.5	<0.5
2016	W-2202	MW	11/28/16 DUP	<0.5	<0.5	<0.5	1.8	<0.5	<1	1.4	0.66	<0.5	1.6	30	<0.5	<0.5	<0.5
2016	W-2203	MW	1/20/16	<0.5	<0.5	<0.5	1.6	<0.5	<1	7.2	2.2	1.5	4.8	83	<0.5	<0.5	<0.5
2016	W-2203	MW	4/11/16	<0.5	<0.5	<0.5	1.5	<0.5	<1	8.1	2.2	1.6	5.1	84	<0.5	<0.5	<0.5
2016	W-2203	MW	7/13/16	<0.5	<0.5	<0.5	2	<0.5	<1	8.8	2.4	1.7	5.4	90	<0.5	<0.5	<0.5
2016	W-2203	MW	10/12/16	<0.5	<0.5	<0.5	2	<0.5	<1	9.1	2.4	1.8	5.6	91	<0.5	<0.5	<0.5
2016	W-2204	MW	3/2/16	<5 D	<5 D	<5 D	9.2 D	110 D	<10 D	26 D	8.4 D	<5 D	180 D	2,100 D	<5 D	<5 D	<5 D
2016	W-2204	MW	4/20/16	<5 D	<5 D	<5 D	7.1 D	100 D	<10 D	20 D	6.9 D	<5 D	130 D	1,700 D	<5 D	<5 D	<5 D

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-2204	MW	8/2/16	<0.5	<0.5	1.6	3.1	52	<1	23	5.7	<0.5	140 D	2,000 D	<0.5	<0.5	<0.5
2016	W-2204	MW	10/6/16	<0.5	<0.5	1.8	15	90	<1	36	8.2	0.53	130 D	1,800 D	<0.5	<0.5	<0.5
2016	W-2205	MW	3/2/16	<1 D	<1 D	<1 D	5.6 D	7.2 D	<2 D	18 D	5.4 D	<1 D	22 D	840 D	<1 D	<1 D	<1 D
2016	W-2205	MW	4/20/16	<0.5	<0.5	<0.5	5.5	9.3	<1	19	5.6	<0.5	22	710 D	<0.5	<0.5	<0.5
2016	W-2205	MW	8/2/16	<0.5	<0.5	<0.5	4.8	11	<1	22	5.3	<0.5	28	790 D	<0.5	<0.5	<0.5
2016	W-2205	MW	10/6/16	<0.5	<0.5	0.53	4.7	11	<1	20	5.8	<0.5	27	790 D	<0.5	<0.5	<0.5
2016	W-2207B	MW	3/2/16	<5 D	<5 D	<5 D	13 D	<5 D	<10 D	7 D	6.9 D	<5 D	<5 D	3,800 D	<5 D	<5 D	<5 D
2016	W-2207B	MW	4/20/16	<5 D	<5 D	<5 D	<5 D	<5 D	<10 D	<5 D	7 D	<5 D	<5 D	2,200 D	<5 D	<5 D	<5 D
2016	W-2207B	MW	8/2/16	<5 D	<5 D	<5 D	5.9 D	<5 D	<10 D	<5 D	7.2 D	<5 D	<5 D	2,500 D	<5 D	<5 D	<5 D
2016	W-2207B	MW	10/6/16	<0.5	0.82	<0.5	5.6	<0.5	<1	2.6	7.9	<0.5	2.8	2,100 D	<0.5	<0.5	<0.5
2016	W-2208B	MW	4/20/16	<0.5	6.8	1	4.2	4.1	3.4	1.1	2.6	<0.5	7.3	150 D	<0.5	3.4	<0.5
2016	W-2208B	MW	8/2/16	<0.5	5	1.1	10	4.2	1.6	2.7	2.5	<0.5	7.9	190 D	<0.5	1.6	<0.5
2016	W-2211	MW	3/24/16	<0.5	<0.5	<0.5	0.57	2.5	<1	<0.5	14	<0.5	1.6	16	<0.5	<0.5	<0.5
2016	W-2212	MW	3/24/16	<0.5	<0.5	0.64	10	2	<1	0.92	20	<0.5	16	110 D	<0.5	<0.5	<0.5
2016	W-2212	MW	3/24/16 DUP	<0.5	<0.5	0.59	9.2	2	<1	0.83	19	<0.5	14	130 D	<0.5	<0.5	<0.5
2016	W-2212	MW	5/25/16	<0.5	<0.5	0.55	6.7	2.1	<1	0.67	19	<0.5	12	100 D	<0.5	<0.5	<0.5
2016	W-2212	MW	8/18/16	<0.5	<0.5	0.57	7.4	2.3	<1	0.77	19	<0.5	12	110 D	<0.5	<0.5	<0.5
2016	W-2212	MW	11/22/16	<0.5	<0.5	0.66	9.6	2.4	<1	1	21	<0.5	18	160 D	<0.5	<0.5	<0.5
2016	W-2212	MW	11/22/16 DUP	<0.5	<0.5	0.71	9.8	2.1	<1	0.97	21	<0.5	17	160 D	<0.5	<0.5	<0.5
2016	W-2215A	MW	2/9/16	<0.5	<0.5	<0.5	2.7	<0.5	<1	<0.5	1.1	<0.5	1.5	280 D	<0.5	<0.5	<0.5
2016	W-2216B	MW	3/1/16	<0.5	<0.5	<0.5	5.4	4.2	5.7	0.93	18	2.3	32	220 D	<0.5	5.7	<0.5
2016	W-2216B	MW	5/23/16	<0.5	<0.5	0.59	6.8	4.8	34	1.3	22	3.2	35	250 D	<0.5	34	<0.5
2016	W-2216B	MW	5/23/16 DUP	<0.5	<0.5	0.7	8.9	5.2	45	1.6	24	4.7	41	310 D	<0.5	45	<0.5
2016	W-2216B	MW	8/10/16	<0.5	<0.5	<0.5	3.3	4.2	20	0.76	16	1.6	25	140 D	<0.5	20	<0.5
2016	W-2302	MW	5/26/16	<0.5	<0.5	1.4	26	4.2	<1	2.2	56	1.4	78	880 D	<0.5	<0.5	<0.5
2016	W-2302	MW	8/18/16	<0.5	<0.5	1.8	30	6.7	<1	2.6	69	1.4	86	1,000 D	<0.5	<0.5	<0.5
2016	W-2302	MW	11/30/16	<0.5	<0.5	0.87	22	2.7	<1	2	26	1.8	45	450 D	<0.5	<0.5	<0.5
2016	W-2302	MW	11/30/16 DUP	<0.5	<0.5	1	29	2.9	<0.5	2.3	30	2.5	52	540 D	<0.5	<0.5	<0.5
2016	W-2304	MW	2/29/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	21	<0.5	0.76	<0.5
2016	W-2304	MW	2/29/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	24	<0.5	0.79	<0.5
2016	W-2304	MW	5/31/16	<0.5	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	<0.5	<0.5	24	<0.5	1.8	<0.5
2016	W-2304	MW	6/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	9.3	<0.5	<0.5	<0.5
2016	W-2304	MW	9/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	2	<0.5	<0.5	<0.5	<0.5	30	<0.5	2	<0.5
2016	W-2305	MW	1/7/16	<0.5	<0.5	<0.5	2.6	<0.5	<1	<0.5	<0.5	0.6	3	4.8	<0.5	<0.5	<0.5
2016	W-2305	MW	4/19/16	<0.5	<0.5	<0.5	1.5	<0.5	<1	<0.5	<0.5	<0.5	1.9	3.2	<0.5	<0.5	<0.5
2016	W-2305	MW	7/5/16	<0.5	<0.5	<0.5	3.6	<0.5	<1	<0.5	<0.5	<0.5	7.9	23	<0.5	<0.5	<0.5
2016	W-2501	MW	1/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1.1	<0.5	3.5	<0.5	<0.5	<0.5
2016	W-2501	MW	4/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	1	<0.5	3.1	<0.5	<0.5	<0.5
2016	W-2501	MW	7/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.95	<0.5	3.1	<0.5	<0.5	<0.5
2016	W-2501	MW	10/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	0.92	<0.5	3	<0.5	<0.5	<0.5
2016	W-2502	MW	1/4/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	2.1	<0.5	<0.5	2.1	<0.5	<0.5	<0.5
2016	W-2502	MW	4/4/16	<0.5	<0.5	<0.5	1.1	<0.5	<1	<0.5	2.1	<0.5	<0.5	2	<0.5	<0.5	<0.5
2016	W-2502	MW	7/5/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	2	<0.5	<0.5	2.2	<0.5	<0.5	<0.5
2016	W-2502	MW	10/5/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	1.9	<0.5	<0.5	2.1	<0.5	<0.5	<0.5
2016	W-2601	MW	1/5/16	<0.5	<0.5	<0.5	2.4	<0.5	<1	<0.5	5	1.4	4.5	51	<0.5	<0.5	<0.5
2016	W-2601	MW	4/7/16	<0.5	<0.5	<0.5	1.7	<0.5	<1	<0.5	4.5	1	3.6	38	<0.5	<0.5	<0.5
2016	W-2601	MW	7/7/16	<0.5	<0.5	<0.5	1.7	<0.5	<1	<0.5	5.6	0.95	3.4	38	<0.5	<0.5	<0.5
2016	W-2602	MW	6/2/16	<0.5	<0.5	<0.5	2.9	<0.5	<1	1	1.7	0.5	2.3	150 D	<0.5	0.96	<0.5
2016	W-2602	MW	12/12/16	<0.5	<0.5	<0.5	3.9	<0.5	1.2	1	1.8	0.86	2.7	170 D	<0.5	1.2	<0.5
2016	W-2602	MW	12/12/16 DUP	<0.5	<0.5	<0.5	4.2	<0.5	1.4	1.2	1.9	0.91	3	180 D	<0.5	1.4	<0.5
2016	W-2603	MW	2/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.2	1.7	<0.5	2	<0.5	<0.5	<0.5
2016	W-2604A	MW	5/19/16	<0.5	<0.5	<0.5	<0.5	<0.5	2.2	<0.5	2.4	<0.5	56	79	<0.5	2.2	<0.5
2016	W-2604A	MW	8/29/16	<0.5	<0.5	<0.5	<0.5	<0.5	3	0.58	4.8	<0.5	41 L	100 DL	<0.5	3	<0.5
2016	W-2604A	MW	11/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.1	<0.5	8.3	19 L	<0.5	0.67	<0.5
2016	W-2604A	MW	11/17/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1	<0.5	6.7	18	<0.5	0.6	<0.5
2016	W-2604B	MW	5/19/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.61	2.3	<0.5	<0.5	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-2605A	MW	3/1/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.8	<0.5	8.3	20	<0.5	<0.5	<0.5
2016	W-2605A	MW	8/29/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.8	<0.5	15	35	<0.5	<0.5	<0.5
2016	W-2605B	MW	11/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	W-2606	MW	5/19/16	<0.5	11	9	170 D	21	41	57	8.1	1.5	78	170 D	<0.5	41	<0.5
2016	W-2606	MW	5/19/16 DUP	<0.5	13	11	170 D	23	46	55 D	9.4	<0.5	70 D	190 D	<0.5	46	<0.5
2016	W-2606	MW	8/10/16	<0.5	14	6	52	24	49	9.5	7.3	<0.5	38	120 D	<0.5	49	<0.5
2016	W-2606	MW	11/17/16	<0.5	13	5	22	20	51	5.3	6.3	<0.5	29	110 D	<0.5	51	<0.5
2016	W-2606	MW	11/17/16 DUP	<0.5	14	4.9	23	19	50	5.5	6.3	<0.5	29	130 D	<0.5	50	<0.5
2016	W-2607	MW	10/6/16	<0.5	<0.5	6.5	47	7.4	97	20	16	3.2	110 D	140 D	<0.5	96	0.62
2016	W-2611	MW	1/28/16	<0.5	<0.5	<0.5	8.6	<0.5	<1	<0.5	2.9	8.8	0.55	160 D	<0.5	<0.5	<0.5
2016	W-2611	MW	4/28/16	<0.5	<0.5	<0.5	6.7	<0.5	<1	<0.5	2.9	9	<0.5	130 D	<0.5	<0.5	<0.5
2016	W-2611	MW	6/29/16	<0.5	<0.5	<0.5	6.4	<0.5	<1	<0.5	2.9	8	<0.5	130 D	<0.5	<0.5	<0.5
2016	W-2611	MW	8/31/16	<0.5	<0.5	<0.5	5.7	<0.5	<1	<0.5	2.9	6.3	<0.5	130 D	<0.5	<0.5	<0.5
2016	W-2611	MW	9/7/16	<0.5	<0.5	<0.5	5.8	<0.5	<1	<0.5	3.3	10	<0.5	96 D	<0.5	<0.5	<0.5
2016	W-2611	MW	10/20/16	<0.5	<0.5	<0.5	5.5	<0.5	<1	<0.5	3	7.5	<0.5	110 D	<0.5	<0.5	<0.5
2016	W-2611	MW	11/16/16	<0.5	<0.5	<0.5	5.4	<0.5	<1	<0.5	2.7	8.4	<0.5	90 D	<0.5	<0.5	<0.5
2016	W-2611	MW	12/13/16	<0.5	<0.5	<0.5	5.9	<0.5	<1	<0.5	2.8	8.3	<0.5	110 D	<0.5	<0.5	<0.5
2016	W-2612	MW	1/28/16	<0.5	<0.5	<0.5	6.9	<0.5	1.7	<0.5	2.2	6.8	<0.5	200 D	<0.5	1.7	<0.5
2016	W-2612	MW	4/28/16	<0.5	<0.5	<0.5	5.5	<0.5	3.6	<0.5	1.8	3.8	<0.5	100 D	<0.5	3.6	<0.5
2016	W-2612	MW	6/14/16	<0.5	<0.5	<0.5	6.4	0.52	4.1	<0.5	2	4	<0.5	150 D	<0.5	4.1	<0.5
2016	W-2612	MW	6/29/16	<0.5	<0.5	<0.5	7.1	<0.5	<1	<0.5	2.2	3.5	<0.5	160 D	<0.5	<0.5	<0.5
2016	W-2612	MW	7/28/16	<0.5	<0.5	<0.5	6.6	0.52	5.7	<0.5	2.1	3.7	<0.5	160 D	<0.5	5.7	<0.5
2016	W-2612	MW	8/31/16	<0.5	<0.5	<0.5	5.4	0.51	12	<0.5	1.7	3.9	<0.5	120 D	<0.5	12	<0.5
2016	W-2612	MW	9/27/16	<0.5	<0.5	<0.5	5.7	<0.5	20	<0.5	1.4	4.4	<0.5	110 D	<0.5	20	<0.5
2016	W-2612	MW	10/20/16	<0.5	<0.5	<0.5	4.9	<0.5	6.2	<0.5	1.8	2.3	<0.5	140 D	<0.5	6.2	<0.5
2016	W-2612	MW	11/16/16	<0.5	<0.5	<0.5	4.3	<0.5	4.4	<0.5	1.7	2.2	<0.5	110 D	<0.5	4.4	<0.5
2016	W-2612	MW	12/13/16	<0.5	<0.5	<0.5	3.7	<0.5	3	<0.5	1.6	1.3	<0.5	140 D	<0.5	3	<0.5
2016	W-2616	MW	3/3/16	<0.5	<0.5	<0.5	1.3	<0.5	3.5	<0.5	2	<0.5	1.1	99	<0.5	3.5	<0.5
2016	W-2616	MW	3/3/16 DUP	<0.5	<0.5	<0.5	1.3	<0.5	3.5	<0.5	2	<0.5	1	98	<0.5	3.5	<0.5
2016	W-2617	MW	3/3/16	<0.5	<0.5	<0.5	2	<0.5	92	2.8	4.1	<0.5	2	850 D	<0.5	91	<0.5
2016	W-2617	MW	5/24/16 DUP	<0.5	<0.5	<0.5	3.5	<0.5	1.2	7.7	7.4	<0.5	2.8	770 DH	<0.5	1.2	<0.5
2016	W-2617	MW	5/24/16	<0.5	<0.5	<0.5	3.1	<0.5	1.2	7	6.9	<0.5	2.6	860 D	<0.5	1.2	<0.5
2016	W-2617	MW	8/11/16	<0.5	<0.5	<0.5	3.3	<0.5	<1	8.2	7.9	<0.5	2.5	840 D	<0.5	0.89	<0.5
2016	W-2617	MW	11/21/16	<0.5	<0.5	<0.5	3.2	<0.5	<1	8.4	7.2	<0.5	2.4	650 D	<0.5	0.63	<0.5
2016	W-2617	MW	11/21/16 DUP	<0.5	<0.5	<0.5	4.4	<0.5	0.9	11	9.1	<0.5	3.3	950 D	<0.5	0.9	<0.5
2016	W-2618	MW	12/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	5.8	48	<0.5	0.62	<0.5
2016	W-2622	MW	8/29/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	0.55	3.2	<0.5	<0.5	<0.5
2016	W-2801	MW	1/13/16	<0.5	<0.5	<0.5	5.5	<0.5	2.4	3.1	1.9	2	6.4	220 D	<0.5	2.4	<0.5
2016	W-2801	MW	4/13/16	<0.5	<0.5	<0.5	1.7	<0.5	1.6	<0.5	0.81	8	33	240 D	<0.5	1.6	<0.5
2016	W-2801	MW	7/7/16	<0.5	<0.5	<0.5	5.6	<0.5	2.5	2.8	1.9	1.9	5.4	200 D	<0.5	2.5	<0.5
2016	W-2801	MW	10/11/16	<0.5	<0.5	<0.5	5.4	<0.5	2.5	2.5	1.7	1.6	4.2	180 D	<0.5	2.5	<0.5
2016	W-3001	MW	3/10/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.2	1.2	<0.5	14	<0.5	<0.5	<0.5
2016	W-3001	MW	3/10/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.1	1.2	<0.5	12 L	<0.5	<0.5	<0.5
2016	W-3001	MW	6/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.9	0.94	<0.5	11	<0.5	<0.5	<0.5
2016	W-3001	MW	12/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.2	1	<0.5	13	<0.5	<0.5	<0.5
2016	W-3001	MW	12/8/16 DUP	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H	<0.5 H	2.6 H	1.4 H	<0.5 H	14 H	<0.5 HO	<0.5 H	<0.5 H
2016	W-3002	MW	5/16/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	0.79	<0.5	<0.5	0.98	25	<0.5	<0.5	<0.5
2016	W-3002	MW	5/16/16 DUP	<0.5	<0.5	<0.5	1.2	<0.5	<1	0.79	<0.5	<0.5	0.9	25	<0.5	<0.5	<0.5
2016	W-3002	MW	12/6/16	<0.5	<0.5	<0.5	2	<0.5	<1	0.94	<0.5	<0.5	1.5	36	<0.5	<0.5	<0.5
2016	W-3002	MW	12/6/16 DUP	<0.5	<0.5	<0.5	2	<0.5	<1	0.9	<0.5	<0.5	1.4	35	<0.5	<0.5	<0.5
2016	W-3003	MW	5/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	3.6	<0.5	<0.5	<0.5
2016	W-3004	MW	3/14/16	<0.5	<0.5	<0.5	3.5	6.6	<1	4.8	2.9	<0.5	9	340 D	<0.5	<0.5	<0.5
2016	W-3004	MW	5/24/16 DUP	<0.5	<0.5	<0.5	1	5.1	<0.5	1.7	1.5	<0.5	2.8	73 DH	<0.5	<0.5	<0.5
2016	W-3004	MW	5/24/16	<0.5	<0.5	<0.5	1.3	5.4	<1	2.1	1.8	<0.5	3.3	84 D	<0.5	<0.5	<0.5
2016	W-3004	MW	8/2/16	<0.5	<0.5	<0.5	3	6.4	<1	4.9	2.8	<0.5	6.7	130 D	<0.5	<0.5	<0.5
2016	W-3004	MW	11/30/16	<10 DH	<10 DH	<10 DH	<10 DH	15 DH	<20 DH	22 DH	<10 DH	<10 DH	36 DH	1,300 DHL	<10 DH	<10 DH	<10 DH

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-3004	MW	11/30/16 DUP	<0.5	<0.5	<0.5	9.5	15	<0.5	25	9.8	0.8	44	1,500 D	1.2	<0.5	<0.5
2016	W-3101	MW	2/3/16	<0.5	<0.5	<0.5	2.5	<0.5	<1	<0.5	3.4	1.3	6.2	53	<0.5	<0.5	<0.5
2016	W-3101	MW	4/5/16	<0.5	<0.5	<0.5	1	<0.5	<1	<0.5	1.5	0.54	2.4	21	<0.5	<0.5	<0.5
2016	W-3101	MW	7/7/16	<0.5	<0.5	<0.5	0.95	<0.5	<1	<0.5	1.5	<0.5	2.1	21	<0.5	<0.5	<0.5
2016	W-3101	MW	10/3/16	<0.5	<0.5	<0.5	0.81	<0.5	<1	<0.5	1.5	<0.5	1.7	18	<0.5	<0.5	<0.5
2016	W-3102	MW	2/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.51	1	<0.5	<0.5	3.9	5.6	<0.5	<0.5
2016	W-3102	MW	4/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.64	1.1	<0.5	<0.5	5.3	12	<0.5	<0.5
2016	W-3102	MW	7/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.69	1.4	<0.5	<0.5	6	15	<0.5	<0.5
2016	W-3102	MW	10/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.62	1.3	<0.5	<0.5	5.2	14	<0.5	<0.5
2016	W-3103	MW	2/23/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.2	0.81	<0.5	2.4	5.3	<0.5	<0.5
2016	W-3103	MW	2/23/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.3	0.85	<0.5	2.5	5.4	<0.5	<0.5
2016	W-3103	MW	5/12/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.8	0.9	<0.5	2.8	5.8	<0.5	<0.5
2016	W-3103	MW	8/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	4.8	0.83	<0.5	3.1	5.2	<0.5	<0.5
2016	W-3103	MW	8/11/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5	1.2	<0.5	3.5	7.7	<0.5	<0.5
2016	W-3103	MW	12/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	3.7	0.72	<0.5	3.2	4.3	<0.5	<0.5
2016	W-3104	MW	3/15/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.4	<0.5	<0.5	1.4	<0.5	<0.5	<0.5
2016	W-3104	MW	5/24/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	1.6	<0.5	<0.5	<0.5
2016	W-3104	MW	8/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	<0.5	<0.5
2016	W-3104	MW	11/22/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	0.93	<0.5	<0.5	<0.5
2016	W-3105	MW	3/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	1.9	<0.5	<0.5	<0.5
2016	W-3105	MW	3/7/16 DUP	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	<0.5
2016	W-3105	MW	5/24/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	1.9	<0.5	<0.5	<0.5
2016	W-3105	MW	8/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	2.1	<0.5	<0.5	<0.5
2016	W-3105	MW	12/5/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	1.7	<0.5	<0.5	<0.5
2016	W-3106	MW	3/24/16	<0.5	<0.5	<0.5	4.3	1.1	<1	<0.5	5.8	0.85	9.1	84	<0.5	<0.5	<0.5
2016	W-3106	MW	3/24/16 DUP	<0.5	<0.5	<0.5	3.6	1.1	<1	<0.5	5.6	0.92	8.8	72 D	<0.5	<0.5	<0.5
2016	W-3106	MW	5/24/16	<0.5	<0.5	<0.5	4.6	1.2	<1	0.56	6.1	1.1	10	94	<0.5	<0.5	<0.5
2016	W-3106	MW	8/11/16	<0.5	<0.5	<0.5	5.5	1.4	<1	0.61	7.1	1.1	11	97 D	<0.5	<0.5	<0.5
2016	W-3106	MW	8/11/16 DUP	<0.5	<0.5	<0.5	5.4	1.5	<1	0.64	7	1.1	11	96 D	<0.5	<0.5	<0.5
2016	W-3106	MW	11/21/16	<0.5	<0.5	<0.5	6.3	1.3	<1	0.73	6.8	1.2	12	85 D	<0.5	<0.5	<0.5
2016	W-3107	MW	2/23/16	<0.5	<0.5	<0.5	0.72	<0.5	<1	<0.5	3.3	2.1	<0.5	4.4	<0.5	<0.5	<0.5
2016	W-3107	MW	4/6/16	<0.5	<0.5	<0.5	0.57	<0.5	<1	<0.5	2.8	1.4	<0.5	3.2	<0.5	<0.5	<0.5
2016	W-3107	MW	4/6/16 DUP	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	1.2	3.4	2.8	<0.5	4	<0.5	<0.5	<0.5
2016	W-3107	MW	4/12/16	<0.5	<0.5	<0.5	0.85	<0.5	<1	<0.5	3.7	2.1	<0.5	5.4	<0.5	<0.5	<0.5
2016	W-3107	MW	8/11/16	<0.5	<0.5	<0.5	0.75	<0.5	<1	<0.5	3.6	1.8	<0.5	3.8	<0.5	<0.5	<0.5
2016	W-3107	MW	11/7/16	<0.5	<0.5	<0.5	0.73	<0.5	<1	<0.5	3.6	2	<0.5	3.9	<0.5	<0.5	<0.5
2016	W-3204	MW	9/20/16	<0.5	<0.5	2	46	10	<1	5.9	3.3	0.56	20	370 D	1.7	0.74	<0.5
2016	W-3204	MW	12/7/16	<0.5	<0.5	1.9	43	9.8	<1	6.4	3.3	0.61	18	330 D	1.9	0.7	<0.5
2016	W-3205	MW	9/20/16	<0.5	<0.5	<0.5	1.7	<0.5	<1	43	8.6	15	2.4	1,500 D	<0.5	<0.5	<0.5
2016	W-3205	MW	12/7/16	<0.5	<0.5	<0.5	1.3	<0.5	<1	31	6.8	11	1.8	1,000 D	<0.5	<0.5	<0.5
2016	SIP-191-002	PZ	2/23/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	2.1	2.7	50	<0.5	<0.5	<0.5
2016	SIP-191-002	PZ	9/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	2	2.7	52	<0.5	<0.5	<0.5
2016	SIP-331-001	PZ	5/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.91	4.8	10	8.3	<0.5	<0.5	<0.5
2016	SIP-419-101	PZ	3/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.7	<0.5	<0.5	<0.5	22	<0.5	<0.5	<0.5
2016	SIP-419-202	PZ	3/9/16	<0.5	<0.5	<0.5	5.9	43	<1	12	5	<0.5	52	560 DL	<0.5	<0.5	<0.5
2016	SIP-419-202	PZ	9/14/16	<10 D	<10 D	<10 D	<10 D	34 D	<20 D	14 D	<10 D	<10 D	52 D	570 D	<10 D	<10 D	<10 D
2016	SIP-490-102	PZ	5/31/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	SIP-501-101	PZ	1/28/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	7.1	10	<0.5	7.9	<0.5	<0.5	<0.5
2016	SIP-501-101	PZ	4/28/16	<0.5	<0.5	<0.5	1.1	<0.5	<1	<0.5	6.6	7.5	<0.5	6.6	<0.5	<0.5	<0.5
2016	SIP-501-101	PZ	6/29/16	<0.5	<0.5	<0.5	1.3	<0.5	<1	<0.5	8	9.1	<0.5	8.4	<0.5	<0.5	<0.5
2016	SIP-501-101	PZ	8/31/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	8.1	7.9	<0.5	8.5	0.52	<0.5	<0.5
2016	SIP-501-101	PZ	10/20/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	7.4	7.6	<0.5	8.2	<0.5	<0.5	<0.5
2016	SIP-501-101	PZ	11/16/16	<0.5	<0.5	<0.5	1.1	<0.5	<1	<0.5	7	7.3	<0.5	8.4	<0.5	<0.5	<0.5
2016	SIP-501-101	PZ	12/13/16	<0.5	<0.5	<0.5	1.2	<0.5	<1	<0.5	7.4	8.8	<0.5	7.8	0.54	<0.5	<0.5
2016	W-518-1914	MW	2/11/16	<0.5	<0.5	<0.5	<0.5	<0.5	3.2	<0.5	<0.5	<0.5	56	2.4	<0.5	3.2	<0.5
2016	W-518-1914	MW	6/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	38	<0.5	<0.5	<0.5	3.5	1.9	<0.5	38	<0.5

Attachment C Table 1: 2016 Livermore Site ground water monitoring analytical results for VOCs.

Year	Well Name	Type	Date	1,1,1-Trichloroethane (µg/L)	1,1,2-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,1-Dichloroethene (µg/L)	1,2-Dichloroethane (µg/L)	1,2-Dichloroethene (total) (µg/L)	Carbon tetrachloride (µg/L)	Chloroform (µg/L)	Freon 113 (µg/L)	Tetrachloroethene (µg/L)	Trichloroethene (µg/L)	Trichlorofluoro methane (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)
2016	W-518-1914	MW	7/27/16	<0.5	<0.5	<0.5	<0.5	<0.5	53	<0.5	<0.5	<0.5	0.72	<0.5	<0.5	53	<0.5
2016	W-518-1915	MW	2/11/16	<0.5	<0.5	<0.5	2.7	<0.5	<1	<0.5	0.63	<0.5	30	340 D	<0.5	<0.5	<0.5
2016	W-518-1915	MW	4/20/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	3.5	3.2	<0.5	<0.5	<0.5
2016	W-518-1915	MW	7/27/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	6	19	<0.5	<0.5	<0.5
2016	W-518-1915	MW	11/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	13	70	<0.5	<0.5	<0.5
2016	SIP-543-101	PZ	11/30/16	<5 D	<5 D	<5 D	<5 D	<5 D	<10 D	<5 D	<5 D	<5 D	5.8 D	12 D	<5 D	<5 D	<5 D
2016	SIP-ETC-201	PZ	1/26/16	<0.5	<0.5	2.6	75	0.95	<1	<0.5	0.73	<0.5	380 D	230 D	<0.5	<0.5	<0.5
2016	SIP-ETS-401	PZ	11/16/16	<1 DH	<1 DH	1.7 DH	17 DH	3.7 DH	<2 DH	2.2 DH	18 DH	12 DH	36 DH	260 DH	<1 DH	<1 DH	<1 DH
2016	SIP-ETS-405	PZ	11/29/16	<1 D	<1 D	<1 D	1 D	<1 D	<2 D	<1 D	2.6 D	2.5 D	4.3 D	44 D	<1 D	<1 D	<1 D
2016	TW-11	MW	3/31/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	0.5	28	<0.5	0.54	3.7	<0.5	<0.5	<0.5
2016	TW-11	MW	8/30/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	TW-11A	MW	6/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.3	<0.5	<0.5	4.1	<0.5	<0.5	<0.5
2016	TW-21	MW	3/16/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	1.6	<0.5	<0.5	<0.5	<0.5
2016	UP-292-012	PZ	2/23/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	9	<0.5	0.91	<0.5	<0.5	<0.5
2016	UP-292-014	PZ	2/23/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	4.1	<0.5	0.88	<0.5	<0.5	<0.5
2016	GSW-006	MW	3/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	GSW-006	MW	9/8/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5
2016	GSW-008	MW	8/24/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	GSW-009	MW	2/4/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.5	0.67	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	GSW-009	MW	4/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.4	0.52	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	GSW-009	MW	8/9/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.5	0.64	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	GSW-009	MW	10/18/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	1.4	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	GSW-011	MW	10/3/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	0.67	1.4	<0.5	5.3	<0.5	<0.5	<0.5
2016	GSW-215	MW	3/14/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	GSW-266	MW	8/30/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	2.6	13	12	11	<0.5	0.9	<0.5
2016	GSW-367	MW	6/13/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	6.8	4.2	2.2	3.6	<0.5	<0.5	<0.5
2016	GSW-442	MW	3/17/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2016	GSW-443	MW	9/7/16	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	1.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Attachment C Table 2: 2016 Livermore Site ground water monitoring analytical results for tritium.

Year	Well Name	Type	Date	Tritium (pCi/L)
2016	W-008	MW	1/12/16	<100
2016	W-008	MW	1/12/16 DUP	<100
2016	W-017	MW	1/14/16	<100
2016	W-119	MW	1/14/16	112
2016	W-121	MW	1/12/16	<100
2016	W-148	MW	5/18/16	813
2016	W-148	MW	10/26/16	644
2016	W-151	MW	1/12/16	<100
2016	W-204	MW	1/6/16	181
2016	W-204	MW	5/25/16	331
2016	W-221	MW	1/13/16	<100
2016	W-258	MW	5/23/16	<100
2016	W-270	MW	4/5/16	<100
2016	W-304	MW	6/1/16	<100
2016	W-304	MW	11/23/16	<100
2016	W-305	MW	4/5/16	190
2016	W-354	MW	6/2/16	477
2016	W-354	MW	12/8/16	474
2016	W-356	MW	9/12/16	<100
2016	W-359	MW	4/5/16	149
2016	W-363	MW	1/6/16	698
2016	W-363	MW	5/25/16	866
2016	W-364	MW	8/23/16	<100
2016	W-373	MW	3/29/16	114
2016	W-556	MW	3/30/16	<100
2016	W-566	MW	1/7/16	225
2016	W-566	MW	4/5/16	<100
2016	W-566	MW	7/7/16	111 L
2016	W-566	MW	10/4/16	116
2016	W-571	MW	1/13/16	<100
2016	W-593	MW	5/26/16	<100
2016	W-594	MW	4/5/16	<100
2016	W-653	MW	3/30/16	<100
2016	W-912	MW	5/25/16	<100
2016	W-1012	MW	1/14/16	<100
2016	W-1108	MW	1/12/16	264
2016	W-1108	MW	4/18/16	123
2016	W-1108	MW	7/11/16	265 L
2016	W-1108	MW	10/5/16	542 O
2016	W-1117	MW	5/25/16	1190
2016	W-1117	MW	12/8/16	1210
2016	W-1201	MW	10/6/16	<100
2016	W-1207	MW	1/13/16	<100
2016	W-1211	MW	1/7/16	149
2016	W-1211	MW	4/7/16	<100
2016	W-1211	MW	7/12/16	<100
2016	W-1211	MW	10/5/16	201
2016	W-1219	MW	6/2/16	158
2016	W-1222	MW	5/23/16	709

Attachment C Table 2: 2016 Livermore Site ground water monitoring analytical results for tritium.

Year	Well Name	Type	Date	Tritium (pCi/L)
2016	W-1222	MW	11/30/16	1120
2016	W-1225	MW	5/25/16	235
2016	W-1225	MW	12/8/16	179
2016	W-1302-2	MW	1/21/16	3480
2016	W-1302-2	MW	4/13/16	3380
2016	W-1302-2	MW	7/21/16	3220
2016	W-1302-2	MW	10/20/16	3510
2016	W-1303	MW	1/12/16	208 F
2016	W-1306	MW	1/12/16	<100
2016	W-1308	MW	1/6/16	151
2016	W-1309	MW	1/7/16	<100
2016	W-1309	MW	4/18/16	<100
2016	W-1309	MW	7/11/16	<100 L
2016	W-1309	MW	10/4/16	166 O
2016	W-1406	MW	12/6/16	230
2016	W-1408	MW	12/6/16	272
2016	W-1410	MW	1/21/16	166
2016	W-1410	MW	4/5/16	<100
2016	W-1410	MW	7/18/16	<100
2016	W-1410	MW	10/6/16	104
2016	W-1414	MW	12/5/16	9170
2016	W-1418	MW	6/7/16	<100
2016	W-1503	MW	1/5/16	142
2016	W-1503	MW	4/7/16	169
2016	W-1503	MW	7/7/16	142 L
2016	W-1503	MW	10/13/16	391
2016	W-1505	MW	5/10/16	<100
2016	W-1505	MW	11/23/16	614
2016	W-1511	MW	11/23/16	186
2016	W-1516	MW	1/12/16	<100
2016	W-1516	MW	4/12/16	<100
2016	W-1516	MW	7/7/16	<100 L
2016	W-1516	MW	10/11/16	<100
2016	W-1518	MW	1/12/16	139
2016	W-1518	MW	4/12/16	185
2016	W-1518	MW	7/7/16	172 L
2016	W-1518	MW	10/11/16	162
2016	W-1520	MW	1/12/16	1060
2016	W-1520	MW	2/19/16	939
2016	W-1520	MW	3/9/16	967
2016	W-1520	MW	4/12/16	1240
2016	W-1520	MW	5/4/16	1400
2016	W-1520	MW	6/14/16	1300
2016	W-1520	MW	7/7/16	1250 L
2016	W-1520	MW	8/3/16	1460
2016	W-1520	MW	9/7/16	1290
2016	W-1520	MW	10/11/16	1520
2016	W-1520	MW	11/8/16	1420
2016	W-1520	MW	12/6/16	1360

Attachment C Table 2: 2016 Livermore Site ground water monitoring analytical results for tritium.

Year	Well Name	Type	Date	Tritium (pCi/L)
2016	W-1522	MW	1/12/16	2500
2016	W-1522	MW	2/19/16	2680
2016	W-1522	MW	3/9/16	2440
2016	W-1522	MW	4/12/16	2410
2016	W-1522	MW	5/4/16	2230
2016	W-1522	MW	6/14/16	1890
2016	W-1522	MW	7/7/16	1870 L
2016	W-1522	MW	8/3/16	2120
2016	W-1522	MW	9/7/16	1770
2016	W-1522	MW	10/11/16	2110
2016	W-1522	MW	11/8/16	1880
2016	W-1522	MW	12/6/16	1950
2016	W-1604	MW	5/24/16	562
2016	W-1604	MW	8/12/16	1170
2016	W-1604	MW	11/30/16	1170
2016	W-1605	MW	5/10/16	1520
2016	W-1605	MW	9/12/16	303
2016	W-1605	MW	11/30/16	609
2016	W-1606	MW	5/10/16	3700
2016	W-1606	MW	12/13/16	3630
2016	W-1608	MW	5/10/16	1670
2016	W-1608	MW	9/12/16	1280
2016	W-1608	MW	11/30/16	1730
2016	W-1609	MW	5/10/16	448
2016	W-1609	MW	9/12/16	709
2016	W-1609	MW	11/22/16	1280
2016	W-1610	MW	5/10/16	2500
2016	W-1610	MW	9/12/16	1050
2016	W-1610	MW	11/7/16	1490
2016	W-1801	MW	1/7/16	<100
2016	W-1801	MW	4/5/16	<100
2016	W-1801	MW	7/12/16	<100
2016	W-1801	MW	10/5/16	<100
2016	W-2204	MW	3/2/16	6880
2016	W-2204	MW	4/20/16	7070
2016	W-2204	MW	8/2/16	2600
2016	W-2204	MW	10/6/16	5050
2016	W-2205	MW	3/2/16	4740
2016	W-2205	MW	4/20/16	6060
2016	W-2205	MW	8/2/16	5960
2016	W-2205	MW	10/6/16	5110
2016	W-2207B	MW	3/2/16	<100
2016	W-2207B	MW	4/20/16	<100
2016	W-2207B	MW	8/2/16	<100
2016	W-2207B	MW	10/6/16	<100
2016	W-2208B	MW	4/20/16	129
2016	W-2208B	MW	8/2/16	130
2016	W-2211	MW	5/25/16	12400
2016	W-2212	MW	5/25/16	690

Attachment C Table 2: 2016 Livermore Site ground water monitoring analytical results for tritium.

Year	Well Name	Type	Date	Tritium (pCi/L)
2016	W-2212	MW	8/18/16	682
2016	W-2212	MW	11/22/16	687
2016	W-2302	MW	5/26/16	10900
2016	W-2302	MW	8/18/16	11800
2016	W-2302	MW	11/30/16	8590
2016	W-2601	MW	4/7/16	<100
2016	W-2606	MW	11/17/16	5570
2016	W-2607	MW	10/6/16	5060
2016	W-3004	MW	3/14/16	13300
2016	W-3004	MW	5/24/16	18200
2016	W-3004	MW	8/2/16	16600
2016	W-3004	MW	11/30/16	15700
2016	W-3204	MW	9/20/16	249
2016	W-3205	MW	9/20/16	<100
2016	SIP-331-001	PZ	5/18/16	520
2016	SIP-419-101	PZ	10/3/16	<100
2016	SIP-419-202	PZ	6/8/16	16100
2016	SIP-419-202	PZ	10/3/16	15500
2016	SIP-ETS-212	PZ	11/14/16	756
2016	SIP-ETS-405	PZ	11/29/16	129
2016	GSW-011	MW	4/5/16	<100

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