

**FIFTH FIVE-YEAR REVIEW REPORT FOR
TELEDYNE SEMICONDUCTOR/SPECTRA-PHYSICS LASERS, INC.
SUPERFUND SITE
SANTA CLARA COUNTY, CALIFORNIA**



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Executive Summary

This is the fifth Five-Year Review of the Teledyne Semiconductor/Spectra-Physics, Inc. Superfund Site (Site) located in Mountain View, Santa Clara County, California. The purpose of this Five-Year Review is to review information to determine if the remedy is and will continue to be protective of human health and the environment.

The Teledyne Semiconductor (Teledyne) and Spectra-Physics Lasers, Inc. (Spectra-Physics) properties were listed by the U.S. Environmental Protection Agency (EPA) as two separate Superfund sites. In 1991, EPA issued a Record of Decision (ROD) for the Teledyne and Spectra-Physics properties as well as the Teledyne/Spectra-Physics Combined Study Area (Study Area), which encompasses the full extent of the groundwater plume. The off-property parts of the Study Area consist of the Spring Street area located south of Highway 101, and the North Bayshore area located north of Highway 101. Contaminants of concern (COCs) are chlorinated volatile organic compounds (CVOCs). In 1991, EPA selected the following remedy for the Site to protect long-term human health and the environment:

- Soil vapor extraction and treatment at the former Spectra-Physics property;
- Groundwater extraction and treatment (GWET) by air stripping with discharge to a nearby creek at the former Teledyne property; and
- Groundwater extraction and discharge to the sanitary sewer for the off-property Spring Street extraction system (SSES) and North Bayshore extraction system (NBES).

Currently, Allegheny Technologies, Inc. the company currently responsible for the cleanup at Teledyne, is overseeing an enhanced reductive dechlorination (ERD) treatability study and operating a soil vapor extraction (SVE) system to mitigate the excess methane produced by the ERD study at the former Teledyne property. The GWET systems have been shut down and monitored natural attenuation (MNA) is ongoing in the North Bayshore area. Allegheny Technologies, Inc. and MKS Instruments, Inc. are conducting vapor intrusion investigation and mitigation efforts.

In 2018, EPA and the California Water Quality Control Board, San Francisco Bay Region (together, the Agencies) released a Proposed Plan to select a new remedy because the groundwater treatment system, central to the remedy, is no longer effective, and because vapor intrusion was not considered in the original remedy. The Agencies' preferred remedy is to continue ERD in the on-property source areas, followed by MNA to confirm that the remediation is occurring within a reasonable time. Vapor intrusion sampling and mitigation, if need, is also a component of the Agencies' preferred remedy, as well as, institutional controls related to building permits to provide additional protection from vapor intrusion pathway.

Study results have contributed significant new information that support the decision to select a site remedy to improve remedial effectiveness and cleanup time frames. The monitoring results from the ERD study have successfully demonstrated enhanced degradation of CVOCs in shallow- and intermediate-groundwater zones. Significant decreases in CVOC mass have occurred since implementation of the ERD study began. The results of the MNA study indicate that the plume size and CVOC concentrations in the North Bayshore Area are stable or reducing. The Site is progressing toward meeting its remedial action objective (RAO).

Some standards on which the cleanup levels were based have changed since the 1991 ROD. The standards for 1,2,4-trichlorobenzene (1,2,4-TCB) and chloroform have become more stringent. These changes do not affect protectiveness, however, because concentrations of 1,2,4-TCB and chloroform in groundwater are significantly lower than current Maximum Contaminant Levels (MCLs).

The land use has not changed since the last Five-Year Review. There are residential and light commercial buildings located in the vapor intrusion study area. Vapor intrusion evaluations of residential and commercial buildings are ongoing, and results confirm that vapor intrusion of CVOCs from shallow groundwater into structures is occurring within the study area. Mitigation is in progress for all buildings affected by the vapor intrusion pathway where consent from property owners has been received.

The remedy at the Teledyne Semiconductor/Spectra-Physics Lasers, Inc. Superfund Site is currently protective of human health and the environment because all identified vapor intrusion risks have been mitigated where access has been granted and institutional controls are in place and effective in preventing exposure to contaminated groundwater and soil. The Agencies have released a Proposed Plan to select a remedy to shorten the cleanup time. The preferred remedy calls for removing and permanently destroying the contaminants from both soils and groundwater and significantly reducing the toxicity, mobility, or volume of hazardous substances in both media. Additionally, the preferred remedy will incorporate institutional controls related to building permits to address protectiveness of the vapor intrusion pathway.

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List of Abbreviations

| | |
|-----------------|---|
| µg/L | micrograms per liter |
| ARAR | applicable or relevant and appropriate requirement |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulation |
| COC | contaminant of concern |
| CVOC | chlorinated volatile organic compound |
| DCA | dichloroethane |
| DCB | dichlorobenzene |
| DCE | dichloroethene |
| DWAL | Drinking Water Action Level |
| EPA | U. S. Environmental Protection Agency |
| ERD | enhanced reductive dechlorination |
| FYR | Five-Year Review |
| GAC | granular activated carbon |
| GWET | groundwater extraction and treatment |
| HVAC | heating, ventilation, and air conditioning |
| LEL | lower explosive limit |
| MCL | maximum contaminant level |
| MCLG | maximum contaminant level goal |
| MNA | monitored natural attenuation |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NPDES | National Pollutant Discharge Elimination System |
| NBES | North Bayshore Extraction System |
| PCE | tetrachloroethene |
| ppm | parts per million |
| RAO | remedial action objective |
| ROD | Record of Decision |
| RSL | Regional Screening Level |
| RWQCB | California Water Quality Control Board, San Francisco Bay Region |
| SCR | Site Cleanup Requirements |
| Site | Teledyne Semiconductor/Spectra-Physics, Inc. Superfund Site |
| SMP | Self-Monitoring Plan |
| Spectra-Physics | Spectra-Physics Lasers, Inc. |
| SSES | Spring Street Extraction System |
| SVE | soil vapor extraction |
| SVP | soil vapor monitoring points |
| TCA | trichloroethane |
| TCB | trichlorobenzene |
| TCE | trichloroethene |
| Teledyne | Teledyne Semiconductor |
| USACE | U.S. Army Corps of Engineers |

1. Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR for the Teledyne Semiconductor/Spectra-Physics, Inc. Superfund Site (Site) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, 42 U.S.C. § 9621, 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and EPA policy. The State of California, represented by the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB), is the lead agency for developing and implementing the remedy for the Site, and EPA provides final regulatory concurrence.

This is the fifth FYR for the Site. The triggering action for this policy review is the completion date of the previous FYR. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

The FYR was led by Melanie Morash, EPA Remedial Project Manager, and Roger Papler, RWQCB Project Manager. Participants included Cynthia Wetmore, EPA Region 9 Superfund Reporting Coordinator, and from the U.S. Army Corps of Engineers (USACE), Alison M. Suess, Ph.D. Chemist, and Benino McKenna, Hydrogeologist. The review began on November 15, 2018.

Table 1. Five-Year Review Summary Form

| SITE IDENTIFICATION | | |
|---|---|---|
| Site Name: Teledyne Semiconductor/Spectra-Physics, Inc. | | |
| EPA ID: Teledyne Semiconductor: CAD009111444 Spectra-Physics, Inc.:CAD009138488 | | |
| Region: 9 | State: CA | City/County: Mountain View/Santa Clara |
| SITE STATUS | | |
| NPL Status: Final | | |
| Multiple OUs? No | Has the site achieved construction completion? Yes | |
| REVIEW STATUS | | |
| Lead agency: State | | |
| Author name (Federal or State Project Manager): Melanie Morash, EPA and Roger Papler, RWQCB | | |
| Author affiliation: EPA Region 9 and California Regional Water Quality Control Board, San Francisco Bay Region | | |
| Review period: 11/15/2018 - 5/2/2019 | | |
| Date of site inspection: 3/13/2019 | | |
| Type of review: Policy | | |
| Review number: 5 | | |
| Triggering action date: 9/23/2014 | | |
| Due date (five years after triggering action date): 9/23/2019 | | |

1.1. Background

The Site is located in Mountain View, Santa Clara County, California. Mountain View has a population of 81,400, is located in the northwest portion of Silicon Valley in Santa Clara County and is part of the San Francisco Bay Metropolitan Region. The Teledyne Semiconductor (Teledyne) and Spectra-Physics Lasers, Inc. (Spectra-Physics) properties were listed by EPA as two separate Superfund sites. The former Teledyne property is located at 1300 Terra Bella Avenue and the Spectra-Physics property is located at 1250 Middlefield Road, in Mountain View, California. The Site consists of the former Teledyne and Spectra-Physics properties as well as the Teledyne/Spectra-Physics Combined Study Area (Study Area), which encompasses the full extent of the groundwater plume (Figure 1). The off-property parts of the Study Area consist of the Spring Street area located south of Highway 101, which is also called the Bayshore Freeway, and the North Bayshore area located north of Highway 101. Several other RWQCB Site Cleanup Program sites are located nearby or within the footprint of the North Bayshore area, as shown on Figure 1.

1.2. Physical Characteristics

The groundwater plume originating from the former Teledyne and Spectra-Physics properties is managed as one commingled plume by the successors to Teledyne and Spectra-Physics. The commingled groundwater contaminant plume extends downgradient, in a northerly direction toward the bay, for almost one mile. The plume passes under Highway 101, past Amphitheatre Parkway, to the former dewatering trench for the Mountain View Landfill located near the Amphitheatre.

Historical aerial photographs show that historical land use within the Study Area was agricultural, dating back to at least 1937. The Study Area was developed as an industrial area during the period from 1961 to 1973. The industrial companies historically located in the vicinity of the Study Area were involved in a wide range of manufacturing activities. In addition to agricultural and commercial use, the Study Area included residential developments.

The buildings at the former Teledyne property are still in use for light industrial activities, including commercial and laboratory businesses. The most up-gradient building at the former Spectra-Physics property has been converted to a community church; the other properties are occupied by a variety of commercial tenants. Northwest of and adjacent to the former Teledyne property, the western lateral portion of the plume underlies residences in the Spring Street area (see Figure 1). Buildings in the North Bayshore area are located north of Highway 101 and consist mostly of commercial offices. Land use north of and downgradient of the source properties includes a landfill for the City of Mountain View with an active golf course and an amphitheater overlying the landfill. According to a City of Mountain View public meeting on January 28, 2019 regarding future development in the Terra Bella Visioning Plan Area (the area around Terra Bella Avenue and south of Highway 101), future land use may include a hotel, as well as mixed residential/commercial use.

Domestic water supply wells previously present in the Study Area have been decommissioned, and the installation of new domestic wells is restricted. The Study Area is located in the jurisdiction of the Santa Clara Valley Water District public water supply.



Figure 1. Location Map for the Teledyne Semiconductor/Spectra-Physics, Inc. Superfund Sites, Study Area, and other nearby Superfund Sites

1.3. Hydrology

The Site is situated in the northwestern portion of the Santa Clara Valley that lies along the western edge of San Francisco Bay. The Santa Clara Valley is an alluvial plain that slopes gently northward, flanked by the Diablo Range to the east-northeast and the Santa Cruz Mountains to the west-southwest. The alluvium comprises a complex sequence of clay, silt, sand, and gravel. Within the Santa Clara Valley, two significant water-bearing zones have been identified as the Upper and Deep Aquifers.

The Upper Aquifer consists of approximately 70 feet of sand and gravel interbedded with silty clay and clayey silt. Underlying the Upper Aquifer is a 50- to 150-foot thick aquitard that consists of clay and silt. Underlying the aquitard is the Deep Aquifer that consists of approximately 600 feet of sand and gravel interbedded with silty clay and clayey silt. The Deep Aquifer is a source of water in the Santa Clara Valley.

The Upper Aquifer is divided into three zones as follows:

- A shallow zone extending from approximately 20 to 35 feet below ground surface (bgs);
- An upper intermediate zone extending from approximately 35 to 50 feet bgs; and
- A lower intermediate zone extending from approximately 50 to 70 feet bgs.

The shallow, upper intermediate, and lower intermediate zones consist of interconnected permeable lenses that are separated by mostly continuous aquitards of variable thickness. The estimated depth to shallowest groundwater beneath the Study Area is approximately 5 to 10 feet bgs. The flow of groundwater in the three zones is mostly from the south to the north, except where groundwater is drawn locally toward the extraction wells when they are in operation and preferential pathways direct groundwater flow to the northwest. The remedy has not changed general groundwater flow at the Site.

2. Remedial Actions Summary

2.1. Basis for Taking Action

The primary contaminants of concern (COCs) for the Site are chlorinated volatile organic compounds (CVOCs) in soil and groundwater. The presence of these contaminants in soil and groundwater provided the basis for taking action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The release of hazardous substances into the environment at the Site posed, or potentially posed, a threat to human health and the environment via inhalation, ingestion, and direct contact. In particular, the threat of potential contamination to the Deep Aquifer, which is a source of municipal drinking water, was a large concern.

2.2. Remedy Selection

RWQCB adopted the Final Site Cleanup Requirements (SCR) Order No. 91-025 in February 1991 and EPA finalized the Record of Decision (ROD) on March 22, 1991. The groundwater cleanup levels in EPA's ROD differ somewhat from those listed in the RWQCB SCR Order.

The final site cleanup remedy selected in the ROD for the Site consisted of the following elements:

- Soil vapor extraction and treatment at the Spectra-Physics property;
- Groundwater extraction and treatment (GWET) by air stripping with discharge under a National Pollution Discharge Elimination System (NPDES) permit at the Teledyne property; and
- Groundwater extraction and discharge to the sanitary sewer for the off-property North Bayshore Extraction System (NBES) and Spring Street Extraction System (SSES).

The remedial action objective (RAO) is to remove and permanently destroy the contaminants from both soils and groundwater or significantly reduce the toxicity, mobility, or volume of hazardous substances in both media. The RAO is intended to greatly reduce the possibility of contamination of current and potential drinking water supplies.

The ROD selected groundwater cleanup levels for twelve COCs to be the federal maximum contaminant level goal (MCLG) (if not equal to zero), the federal maximum contaminant level (MCL), or the State MCL, whichever is most stringent. The Final SCR Order No. 91-025 selected groundwater cleanup levels for ten COCs. The ROD supersedes SCR Order No. 91-025, except that for trans-1,2-dichloroethene (trans-1,2-DCE), the ROD did not select a cleanup level, so the cleanup level is defined by SCR Order No. 91-025.

Table 2. Cleanup Levels Selected in the ROD and in Order No. 91-025

| Chemical | ROD Cleanup Levels (ppb) | Source | SCR Order No. 91-025 Cleanup Standard (ppb) | Source |
|-----------------------|--------------------------|------------------------------------|---|-----------------------------|
| 1,1-DCA | 5 | State MCL | 5 | State MCL |
| 1,2-DCB | 600 | Federal MCLG and MCL | Not listed | Not listed |
| 1,1-DCE | 6 | State MCL | 6 | State MCL |
| <i>cis</i> -1,2-DCE | 6 | State MCL | 6 | State MCL |
| <i>trans</i> -1,2-DCE | Not listed | Not listed | 10 | State MCL |
| PCE | 5 | State and Federal MCL | 5 | State MCL |
| 1,2,4-TCB | 9 | Federal MCLG and MCL | 40 | Calculated cleanup standard |
| 1,1,1-TCA | 200 | Federal MCLG and MCL and State MCL | 200 | State MCL |
| 1,1,2-TCA | 3 | Federal MCLG | Not listed | Not listed |
| TCE | 5 | State and Federal MCL | 5 | State MCL |
| Toluene | 100 | State DWAL | 100 | State DWAL ¹ |
| vinyl chloride | 0.5 | State MCL | 0.5 | State MCL |

| Chemical | ROD Cleanup Levels (ppb) | Source | SCR Order No. 91-025 Cleanup Standard (ppb) | Source |
|------------|--------------------------|-------------|---|------------|
| Chloroform | 100 | Federal MCL | Not listed | Not listed |

¹DWAL = Drinking Water Action Level

The ROD did not explicitly include institutional controls in the selected remedy; however, SCR Order 91-025 required the parties to record restrictive covenants. Teledyne Inc. and Spectra-Physics Inc. recorded restrictive covenants prohibiting the use of groundwater on the properties with the Santa Clara County Recorder dated February 24, 1992 (No. 11260055) and August 11, 1994 (No. 12640287), respectively. The covenants restricted the installation of any groundwater wells on the properties except in connection with the remedial program or other remedial activities approved by the RWQCB. The covenants also prohibit destroying, damaging, or otherwise interfering with the operation of remedial program equipment except to allow the removal of remedial program equipment following termination of the applicable portion of the remedial program.

2.3. Remedy Implementation

Prior to the SCR and ROD, interim remedial activities included the following remedies:

- Spectra-Physics: Operation of a Soil Vapor Extraction system and removal of contaminated soil with a second Soil Vapor Extraction system installed at Spectra-Physics in 1992;
- Teledyne: Installation and operation of two GWET systems; and
- Spring Street and North Bayshore areas: Operation of GWET systems with discharges to the sanitary sewer system.

In 1995 and 1998, the two Soil Vapor Extraction systems at Spectra-Physics were decommissioned because the Soil Vapor Extraction achieved asymptotic levels and soil cleanup levels.

The NBES and SSES extraction wells, except NBES wells E-8 and E-13, were taken offline in November 2003 for a Monitored Natural Attenuation (MNA) treatability study. The SSES was restarted in 2013 to capture high CVOC concentrations resulting from CVOCs that had been desorbed by the ERD treatability study, then taken offline in 2015. The remaining NBES wells were shut down in 2017.

The on-property GWET system at the former Teledyne property was taken offline during the initial phase of the ERD treatability study in 2011. Allegheny Technologies, Inc. (aka TDY Industries, LLC) operate an SVE and monitoring program throughout to ensure that ERD-related activities do not result in unacceptable levels of CVOCs or methane gas generation.

Allegheny Technologies, Inc. and MKS Instruments, Inc. began vapor intrusion investigation and mitigation activities for residential and commercial buildings impacted by CVOCs in shallow groundwater in 2010, which is currently ongoing.

New covenants and environmental restrictions were signed by ECI Two Terra Bella LLC for the former Teledyne property on July 14, 2010, and by New Community Baptist Church for the former Spectra-Physics property on August 21, 2012. These covenants include restricting excavation, groundwater use, and residential, school, or extended daycare use.

2.4. Operation and Maintenance (O&M)

The off-property SSES wells were operated from 2007 to 2015, and NBES extraction wells E13 and E8 operated until 2017. The extracted groundwater from both extraction systems was discharged to the sanitary sewer system under a City of Mountain View permit. Quarterly monitoring of the discharge to the sanitary sewer was completed and submitted to the City of Mountain View.

Allegheny Technologies, Inc oversees the methane mitigation system at the former Teledyne property on a monthly basis to monitor performance and perform routine maintenance. The methane mitigation system was not operated from December 9, 2014 through January 5, 2015 due to blower failure; the system was restarted on January 6, 2015.

Groundwater monitoring is performed semiannually in accordance with the revised Semiannual Self-Monitoring Plan submitted to the RWQCB on February 9, 1994. The RWQCB approved revisions to the Self-Monitoring Plan on April 2, 1996, September 2003, and March 2007. A revision to the Self-Monitoring Plan was submitted in April 2017 but was revised in 2018 to reflect the discontinuation of MNA study at wells E-18 and E-13 and subsequent monitoring.

3. Progress Since the Last Five-Year Review

3.1. Previous Five-Year Review Protectiveness Statement and Issues

The protectiveness statement from the fourth FYR for the Site stated the following:

A protectiveness determination of the remedy at the Teledyne Semiconductor and Spectra-Physics, Inc. Joint Superfund Sites cannot be made at this time until further information is obtained. Additional vapor intrusion assessments must be conducted to determine if indoor air pathways are complete. When unacceptable levels are encountered in a particular building, mitigation plans are developed and implemented to ensure that levels of volatile organic compounds (VOCs) in indoor air are protective. It is expected that these actions will take approximately two years to complete, at which time a protectiveness determination can be made. To be protective in the long-run, a new remedy should be selected due to the declining effectiveness of the existing remedy.

The fourth FYR included two issues and recommendations.

Table 3. Status of Recommendations from the 2014 FYR

| Issue | Recommendations | Current Status | Current Implementation Status Description | Completion Date (if applicable) |
|--|--|-----------------------|--|--|
| The performance of the selected remedy in the ROD, groundwater extraction and treatment, has declined and new remedial actions are being investigated. | Complete ROD Amendment or prepare Explanation of Significant Differences selecting new remedial actions to include updated institutional controls | Ongoing | The Proposed Plan was issued in April 2018. The new remedy is under development and is expected to be finalized in 2020. | N/A |
| The FYR vapor intrusion evaluations conducted so far indicate that the subsurface-to-indoor air pathway is a concern at the site. | Continue to monitor and provide mitigation for vapor intrusion, including step-outs to lower concentration areas of the shallow TCE groundwater plume. | Ongoing | The vapor intrusion evaluation study areas for residential and commercial buildings were expanded in 2015 and 2017. Sampling and mitigation are complete in residences and is ongoing in commercial buildings. Completion is expected in 2020. | N/A |

3.2. Work Completed at the Site During this Five Year Review Period

3.2.1. Groundwater Monitoring

Groundwater monitoring continues to be performed by Arcadis, a consultant for the companies conducting the cleanup, on a semiannual basis per the state-approved Self-Monitoring Plan. Concurrent samples are collected by Fishbeck, Thompson, Carr & Huber, Inc. (FTC&H) to monitor the progress of the ERD program. Adjustments to the number of wells sampled per sampling event were made in response to the discontinuation of the MNA program in event-specific Self-Monitoring Plans. Required analyses for samples collected during monitoring events include VOCs using EPA Methods 8260 for 8010 list compounds.

3.2.2. Enhanced Reductive Dechlorination Study

The ERD treatability study is in progress. Allegheny Technologies, Inc. injects emulsified vegetable oil that enhances naturally occurring reduction of chlorinated compounds. The first and second ERD injection events were completed in 2011 and 2012. A third ERD injection event was implemented between February 2016 and January 2017, and a fourth ERD injection event was implemented between February 1, 2017 and February 5, 2017 (Arcadis, 2018c). To enhance the distribution of emulsified vegetable oil in the lower intermediate aquifer zone, three additional injection wells (B-29LI, B-30LI and B-31LI) were drilled and completed in March 2016 (Arcadis, 2018f).

These ERD activities have destroyed significant CVOC mass. In one location, ERD lowered groundwater-CVOC levels from up to 80,000 micrograms per liter ($\mu\text{g/L}$) to below MCLs within one year. Allegheny Technologies, Inc. implemented their fourth round of ERD injections in February 2017 and concentrations of CVOCs in groundwater continue to decrease at the former Teledyne property.

3.2.3. Vapor Intrusion Study

The vapor intrusion study began in 2010 and has continued throughout the past five years. Allegheny Technologies, Inc. and MKS Instruments, Inc. investigated and mitigated indoor air at residential and commercial properties, submitting quarterly reports to EPA and the RWQCB. All residences within the Study Area have been tested where consent from property owners has been received, and mitigation has been provided as appropriate, except for residences whose owners refused or were nonresponsive. Allegheny Technologies, Inc. and MKS Instruments, Inc.

continue to reach out to nonresponsive owners and new owners, in the case of property turnover. All commercial buildings in the Study Area except one have been tested under Heating, Ventilation, and Air-Conditioning (HVAC)-on conditions, and mitigation has been completed where necessary. HVAC-off sampling is currently ongoing. Mitigation systems were installed in the commercial buildings at 1245 Terra Bella Avenue (Arcadis, 2015a), 1277 Terra Bella Avenue (EKI, 2017), and 1255 Terra Bella Avenue (Arcadis, 2018a).

3.2.4. Proposed Plan

In April 2018, EPA released a Proposed Plan to select a new remedy because the groundwater treatment system that was central to the original remedy is no longer effective and because vapor intrusion was not considered in the original remedy. EPA held a public meeting on May 24, 2018 to explain and answer questions about the Proposed Plan. As stated in the Proposed Plan, EPA's preferred remedy is to continue ERD in the on-property source areas, followed by MNA to confirm that the remediation is occurring within a reasonable time. Vapor intrusion sampling and mitigation would continue, and institutional controls related to building permits to address protectiveness of the vapor intrusion pathway would be in place.

4. Five-Year Review Process

4.1. *Community Notification and Site Interviews*

On May 10, 2019 a public notice was published in the *San Jose Mercury News* announcing the commencement of the FYR process for the Site and inviting community participation. The public notice is available in Appendix F. EPA did not receive any calls as a result of this notice.

The FYR report will be made available to the public once it has been finalized. A copy of this document will be placed in the EPA Records Center, 75 Hawthorne Street, San Francisco, California and online at:

State website: <https://geotracker.waterboards.ca.gov/>

Enter file number 43S0128 for Teledyne Semiconductors
Enter file number 43S0120 for Spectra-Physics Lasers

EPA websites: <https://www.epa.gov/superfund/teledyne>
<https://www.epa.gov/superfund/spectra-physics>

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date (Appendix H). The reviewers contacted eight nearby households by phone. One neighbor responded and agreed to be interviewed. This neighbor has had no issues with the Site management or other related issues over the past five years and has been informed of progress at the Site by receiving mailed information about the Site, such as the Proposed Plan.

The reviewers also interviewed a site Operation and Maintenance (O&M) operator in person at the site inspection, with answers provided by e-mail correspondence. The O&M operator described the success of the ERD treatability study in reducing trichloroethene (TCE) concentrations in groundwater at the former Teledyne property. Treated water is reaching downgradient areas, as indicated by decreasing concentrations in downgradient wells, and decreasing soil gas VOC levels in downgradient areas. The O&M operator summarized progress on sampling and mitigation for residential and commercial buildings and estimated that the vapor intrusion study will be completed by December 31, 2019.

4.2. Data Review

4.2.1. Ground Water

The primary COCs remaining in the Study Area at concentrations above MCLs are TCE, *cis*-1,2-dichloroethene (*cis*-1,2-DCE), perchloroethene (PCE), and vinyl chloride. *Cis*-1,2-DCE and vinyl chloride are degradation products of TCE. This degradation process is enhanced by the ERD treatment process.

On the former Teledyne property, the ERD treatability established a highly reducing environment, where TCE is decreasing in concentration and the intermediate by-products of TCE dechlorination, *cis*-1,2-DCE and vinyl chloride, are temporarily increasing in concentration. The final degradation by-product of ERD is ethene. In the last five years of sampling, 11 wells on the former Teledyne property had concentrations of COCs that were non-detectable or below the cleanup levels and 29 wells reported concentrations of COCs above their respective MCL. On the former Spectra-Physics property, 21 wells have been sampled, with 10 of those wells containing concentrations of COCs above their respective MCL. Contaminant removal by destruction via the full-scale ERD treatability study has been substantial, as shown on pre- and post-ERD TCE concentration plume maps (Appendix C; Figures C-2 to C-7).

In the Spring Street area, concentrations of TCE in monitoring wells were mostly below the MCL and were stable or decreasing. In the North Bayshore area, concentrations of TCE and PCE were generally above the MCL and were decreasing, and concentrations of *cis*-1,2-DCE and vinyl chloride increased due to ERD activities. The outer boundary of the contaminated plume in the shallow groundwater zone has

reduced in size or location over the review period. The intermediate-zone plume is less extensive in the Spring Street area, compared to the shallow-zone plume. The intermediate zone plume extends east to the Space Parkway area and north to the North Bayshore area. CVOC concentrations in groundwater are limited to the shallow and intermediate zones and are not present in the Deep Aquifer, which is a drinking water source.

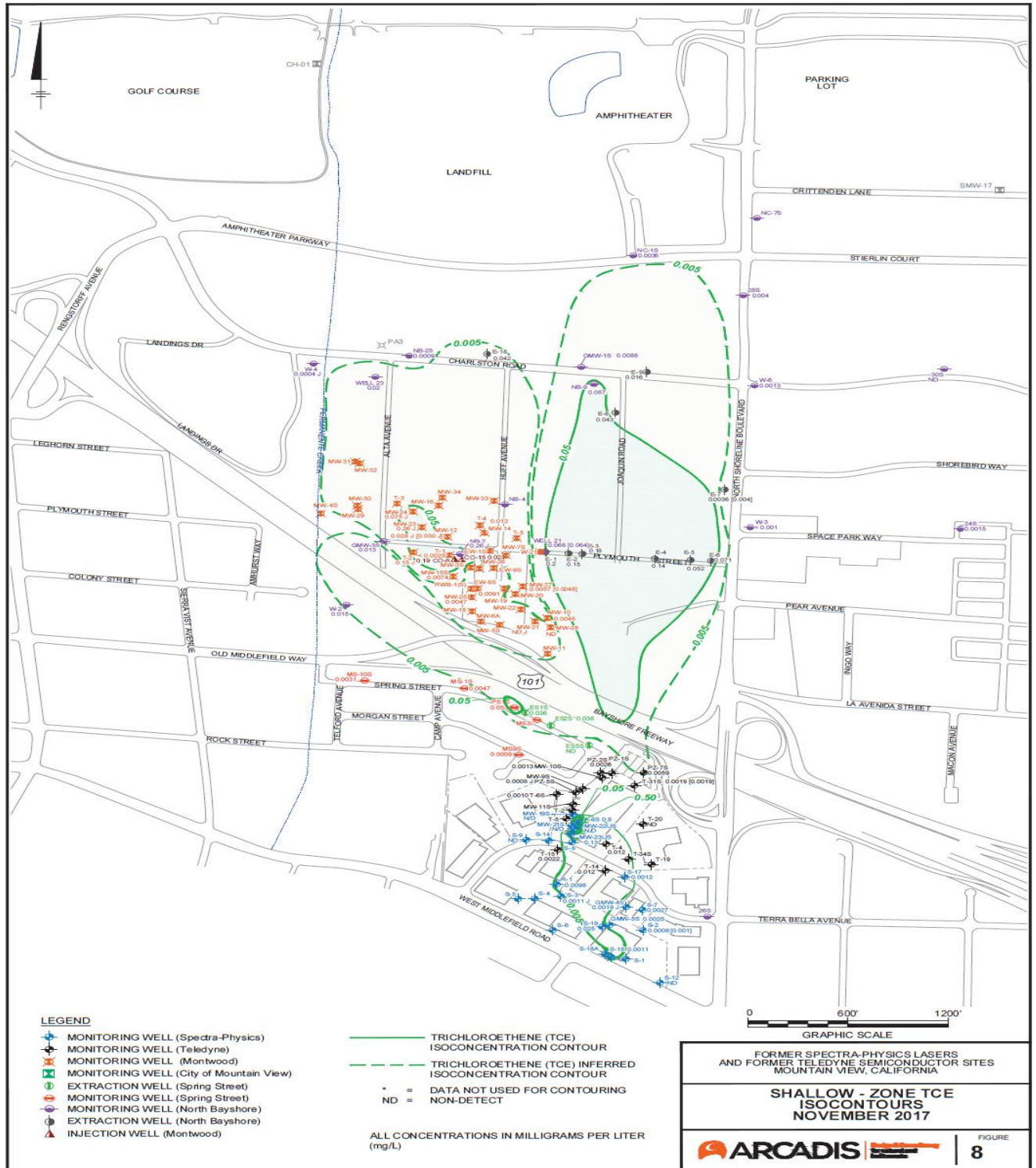


Figure 2: TCE Plume Delineation in Shallow Groundwater 2017

4.2.2. ERD Treatability Study and Related Monitoring

The ERD treatability study confirmed that ERD is successfully treating groundwater containing CVOCs, which supports a change in remedy specified in the ROD from GWET to ERD and MNA. The goal of the ERD treatability study was to develop strongly reducing conditions that persist for an extended period of time to facilitate dechlorination of TCE and the associated breakdown products *cis*-1,2-DCE and vinyl chloride. The degradation process is carried out by anaerobic bacteria, and a by-product of the process is the generation of methane.

The TCE mass dissolved in groundwater and sorbed onto aquifer solids south of Highway 101 was estimated to be 1,302 pounds prior to ERD in 2010 and had decreased to an estimated 73 pounds in 2015. This represents a 94 percent reduction of the CVOC mass due to ERD (Arcadis 2018c). Four ERD injection events have been conducted to date throughout the ERD treatment area. The first ERD injection event (2011-2012) and second ERD injection event (2013-2014) were designed for area-wide treatment. The third ERD injection event (March 2016, interior shallow zone wells A-25US, A-26US and A-15S) and fourth ERD injection event (February 2017, shallow zone well A-8S) targeted areas of residual TCE mass.

Allegheny Technologies, Inc. performed monitoring and operated the methane mitigation system to control elevated concentrations of methane and desorbed CVOCs resulting from the ERD treatability study. The system removed 50 pounds of methane in the previous five years (since September 29, 2014) and in total, 58 pounds of methane since startup in November 2011. CVOC concentrations have decreased at the monitoring locations during the past five years (Appendix C).

4.2.3. Indoor Air

The vapor intrusion study in the off-property residential and commercial buildings in the Spring Street and North Bayshore areas and at the former Spectra-Physics property is anticipated to be completed in 2020. Indoor air was sampled for TCE, *cis*-1,2-DCE, vinyl chloride, PCE, *trans*-1,2-DCE, 1,1-dichloroethane (1,1-DCA), 1,2-dichlorobenzene (1,2-DCB), 1,1,1-trichloroethane (1,1,1-TCA), chloroform, and Freon 113. Results were compared with the EPA Residential Screening Levels (RSLs) for residential and industrial/commercial air quality (USEPA, 2018). Allegheny Technologies, Inc. and MKS Instruments, Inc. submit quarterly reports to EPA and the RWQCB and will submit a complete vapor intrusion evaluation summary report when the vapor intrusion investigation is completed.

Residential Air Sampling

Investigation and mitigation measures are complete in the residential area, to the extent permitted by residents. The residential vapor intrusion investigation study area and sampling program was expanded twice (Arcadis, 2010, 2015a,d), ultimately including all residential buildings within 100 feet of the 5 micrograms per liter ($\mu\text{g/L}$) groundwater TCE isoconcentration contour. One residence that falls beyond 100 feet from the 5 $\mu\text{g/L}$ contour was conservatively included in the study area. If indoor air concentrations exceeded the long-term risk-based criteria, which is the EPA RSL corresponding to a 10-6 excess lifetime cancer risk, then a vapor intrusion mitigation system was offered to the property owner,

and, where installed, followed by several rounds of confirmatory indoor air sampling. Active mitigation systems were installed in three residences (see Appendix C for detailed results, and Appendix F for an interview relating to vapor intrusion progress). Eighteen (18) residences have not yet been sampled due to access not being granted. Five residences had exceedances of EPA's RSLs without follow-up sampling or mitigation due to access not being granted for further response actions. Allegheny Technologies, Inc. and MKS Instruments, Inc. periodically reach out to refusing and/or nonresponsive property owners.

Commercial Air Sampling

Evaluation of commercial buildings under HVAC-on conditions are complete with the exception of one building. Evaluation of commercial buildings under HVAC-off conditions are ongoing, with nine buildings remaining to be sampled (see Appendix C for detailed results, and Appendix F for an interview relating to vapor intrusion progress). The commercial vapor intrusion investigation study area and sampling program was expanded (Arcadis 2010, 2017b), ultimately including all commercial buildings north and south of Highway 101 that overlay the 100 µg/L shallow zone groundwater TCE isoconcentration contour. If indoor air concentrations exceeded short-term screening levels (ATSDR, 2016, and USEPA, 2013), then an interim response action, such as changing the building's HVAC system operation, was performed within 72 hours. Permanent, engineered systems were developed and installed in four buildings based on site-specific factors (Arcadis, 2017b), and comprise venting, depressurization, and SVE systems.

4.3. Site Inspection

The inspection of the Site was conducted on March 13, 2019. In attendance were Roger Papler, RWQCB, Benino McKenna, USACE, Ryan Mattson, Arcadis, Michelle McDuffy, Kilroy Realty Corporation, William Maloney, Spectra-Physics/Newport Corporation, Amy Wilson, TRC Consultant, Daniel P. Shea, MKS Instruments, Inc. and Christopher Abbot, MKS Instruments, Inc. The purpose of the inspection was to assess the protectiveness of the remedy.

The participants inspected the methane mitigation system on the former Teledyne property, the soil vapor monitoring points and ERD injection points inside the building at 1300 Terra Bella Avenue, and the SVE system south of the former Teledyne property at 1245 Terra Bella Avenue. The participants walked to the former Spectra-Physics property and inspected the sub-slab soil vapor sample points in the building at 1250 West Middlefield Road. The participants drove to the Spring Street and North Bayshore areas to observe the deactivated GWETS. All components of the remedial systems were in good condition and functioning properly.

5. Technical Assessment

5.1. Question A: Is the remedy functioning as intended by the decision documents?

The ROD prescribed groundwater extraction and treatment, and soil vapor extraction. The soil vapor extraction systems at Spectra-Physics were decommissioned by 1998 because the soil vapor extraction achieved soil cleanup levels. The groundwater extraction components of the remedy no longer operate. The ERD treatability study at the former Teledyne property is addressing remaining source area contamination and associated with this is an SVE system to mitigate excess methane and desorbed CVOCs resulting from ERD. The NBES and SSES have been shut down and MNA is ongoing.

EPA and RWQCB issued the Proposed Plan to implement these actions in the remedy.

The remedy removed COCs from soils and groundwater, and has significantly reduced the toxicity, mobility, and volume of COCs, and so the remedy is successfully addressing the RAO. The ERD treatability study has achieved significant reductions in COC concentrations in groundwater in the source areas. Groundwater monitoring results in most off-property wells outside of the area affected by ERD injections have indicated that COC concentrations in the plume are above cleanup levels and are either stable or decreasing. In some areas, TCE concentrations are decreasing while cis-1,2-DCE concentrations are increasing, which is a short-term result of ERD. Concentrations of cis-1,2-DCE are expected to decrease over time as the effects of ERD continue. MNA is ongoing and has been shown to be as effective as the previous groundwater extraction systems.

The ROD did not explicitly include institutional controls in the selected remedy. However, RWQCB Order 91-025 required the parties to record restrictive covenants, and Teledyne Inc. and Spectra-Physics Inc. recorded restrictive covenants prohibiting the use of groundwater on the properties in 1992 and 1994, respectively. Covenants and environmental restrictions on property were also signed by ECI Two Terra Bella LLC for the former Teledyne property in 2010 and by the New Community Baptist Church for the former Spectra-Physics property in 2012. The institutional controls in place include prohibitions on the use of groundwater, and no activities were observed that would have violated the institutional controls. In addition, EPA and RWQCB issued the Proposed Plan to include these institutional controls, and others regarding building permit review related to vapor intrusion, in the remedy.

5.2. Question B: Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

Yes, the toxicity data, cleanup levels, and RAOs used at the time of the remedy selection are still valid. As discussed in the previous FYR, the ROD did not address the vapor intrusion pathway. Allegheny Technologies, Inc. and MKS Instruments, Inc. are investigating and mitigating residential and commercial buildings affected by vapor intrusion. Vapor intrusion, which is a concern at the site, was not considered

in the original remedy. EPA and the RWQCB issued the Proposed Plan to address this exposure pathway in the remedy.

Some applicable or relevant and appropriate requirements (ARARs) have changed since the ROD was issued, and these changes do not affect the protectiveness of the remedy. The state and federal MCLs have become more stringent than the groundwater cleanup levels for 1,2,4-TCB and chloroform, respectively. These changes do not affect current or future protectiveness, because concentrations of 1,2,4-TCB and chloroform in groundwater are significantly lower than current MCLs. Other MCLs have become less stringent than groundwater cleanup levels since the 1991 ROD.

Toxicity factors for some COCs have changed since the ROD was issued, but cleanup levels are not risk-based, and were based on federal and state MCLGs and MCLs, and changes do not affect protectiveness. The cleanup level for toluene was based on the state Drinking Water Action Level (DWAL) at the time of the ROD, which was risk-based, but the state DWAL was replaced with a state MCL that is less stringent than the previous state DWAL.

The Site is progressing toward achieving the RAO. The RAO is to remove and permanently destroy the contaminants from both soils and groundwater or significantly reduce the toxicity, mobility, or volume of hazardous substances in both media.

5.3. Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, there is no other information that could call into question the protectiveness of the remedy.

6. Issues/Recommendations

Table 4. Issues and Recommendations Identified in the Five-Year Review

| Issues and Recommendations Identified in the Five-Year Review: | | | | |
|--|--|-------------------|-----------------|----------------|
| OU(s): N/A | Issue Category: Remedy Performance | | | |
| | Issue: The performance of the selected remedy in the ROD, groundwater extraction and treatment, has declined. Vapor intrusion, which is a concern at the site, was not considered in the original remedy. | | | |
| | Recommendation: Complete ROD Amendment selecting new remedial actions. | | | |
| Affect Current Protectiveness | Affect Future Protectiveness | Party Responsible | Oversight Party | Milestone Date |
| No | Yes | EPA/State | EPA/State | 12/31/2020 |

7. Protectiveness Statement

Table 5. Protectiveness Statement

| Sitewide Protectiveness Statement |
|--|
| <i>Protectiveness Determination:</i> Protective |
| <i>Protectiveness Statement:</i> The remedy at the Teledyne Semiconductor/Spectra-Physics Lasers, Inc. Superfund Site is currently protective of human health and the environment because all identified vapor intrusion risks have been mitigated where access has been granted and institutional controls are in place and effective in preventing exposure to contaminated groundwater and soil. The Agencies have released a Proposed Plan to select a remedy to shorten the cleanup time and to address vapor intrusion. Therefore, in order to be protective in the long-term, the ROD amendment should be completed. |

8. Next Review

The next five-year review report for the Teledyne Semiconductor/Spectra-Physics, Inc. Superfund Site is required five years from the signature date of this review.

Appendix A: List of Documents Reviewed

Arcadis U.S., Inc. (Arcadis). 2010. *Work Plan to Evaluate Potential Vapor Intrusion in the Off-Property Study Area and at 1250 West Middlefield Road Teledyne Semiconductor and Spectra-Physics Laser, Inc., Sites, Mountain View, California.* September 24.

Arcadis. 2015a. *Final Work Plan Addendum for Vapor Intrusion Evaluation of Residential Buildings in the Expanded Off-Property Study Area, 1300 Terra Bella Avenue and 1250 Middlefield Road, Mountain View, California.* January 6.

Arcadis. 2015b. *2014 Annual Methane Mitigation System Performance and Soil Vapor Monitoring Report. Former Teledyne Semiconductor and Former Spectra-Physics Lasers, Inc. Sites, Mountain View, California.* April 28.

Arcadis. 2015c. *Soil Vapor Extraction System Construction Completion Report and Operations and Maintenance Schedule, Former Spectra-Physics Lasers Site, 1245 Terra Bella Avenue, Mountain View, California.* May 22.

Arcadis. 2015d. *Work Plan Addendum for Vapor Intrusion Evaluation of Residential Buildings in the Second Expanded Off-Property Study Area. 1300 Terra Bella Avenue and 1250 Middlefield Road, Mountain View, California.* October 27.

Arcadis. 2016a. *Petition to Shut Down and Decommission the North Bayshore Extraction System, Former Teledyne Semiconductor and Former Spectra-Physics Lasers, Inc. Sites, Mountain View, California.* March 18.

Arcadis. 2016b. *2015 Annual Methane Mitigation System Performance and Soil Vapor Monitoring Report. Former Teledyne Semiconductor and Former Spectra-Physics Lasers, Inc. Sites, Mountain View, California.* May 16.

Arcadis. 2017a. *Groundwater Monitoring Report for the Semiannual Reporting Period, July 1 through December 31, 2016. Former Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor Sites, Mountain View, California.* January 31.

Arcadis. 2017b. *Work Plan Addendum for Vapor Intrusion Evaluation of the Expanded Commercial Building Study Area, Former Spectra-Physics Lasers and Former Teledyne Semiconductor Sites, Mountain View, California.* February 3.

Arcadis. 2017c. *2016 Annual Methane Mitigation System Performance and Soil Vapor Monitoring Report. Former Teledyne Semiconductor and Former Spectra-Physics Lasers, Inc. Sites, Mountain View, California.* March 30.

Arcadis 2017e. *Proposed Groundwater Self-Monitoring Plan (SMP) for the 2017 Semiannual Monitoring Event, for the Spectra-Physics Teledyne Semiconductor Superfund Site (The Site) comprised of the Former Teledyne Semiconductor and Former Spectra-Physics Lasers, Inc., Sites Located in Mountain View, California.* April 12

Arcadis. 2017f. *Groundwater Monitoring Report for the Semiannual Reporting Period, January 1 through June 30, 2017. Former Spectra-Physics Lasers, Inc., and Former Teledyne Semiconductor Sites, Mountain View, California.* July 28.

Arcadis. 2018a. *Sub-Slab Depressurization System Work Plan, 1255 Terra Bella Avenue, Former Spectra-Physics Lasers, Inc. Site, Mountain View, California.* March.

Arcadis. 2018b. *Groundwater Monitoring Report for the Semiannual Reporting Period July 1 through December 31, 2017, Former Spectra-Physics Lasers, Inc. and Former Teledyne Semiconductor Sites, Mountain View, California.* March 15.

Arcadis. 2018c. *2017 Annual Methane Mitigation System Performance and Soil Vapor Monitoring Report. Former Teledyne Semiconductor and Former Spectra-Physics Lasers, Inc. Sites, Mountain View, California.* April 5.

Arcadis. 2018d. *First Quarter 2018 - Vapor Intrusion Evaluation Data Submittal for the Former Teledyne Semiconductor and Former Spectra-Physics Lasers, Inc. Sites Located in Mountain View, California.* May 1.

Arcadis 2018e. *Revised Proposed Groundwater Self-Monitoring Plan (SMP) for the 2018 Semiannual Monitoring Event, for the Spectra-Physics Teledyne Semiconductor Superfund Site (The Site) comprised of the Former Teledyne Semiconductor and Former Spectra-Physics Lasers, Inc., Sites Located in Mountain View, California.* June 8

Arcadis. 2018f. *Final Revised Focused Feasibility Study, Former Spectra-Physics Lasers, Inc. and Former Teledyne Semiconductor Sites, Mountain View, California.* Prepared for: TDY Industries, LLC, regarding the former Teledyne Semiconductor Site, 1300 Terra Bella Avenue, Mountain View, California and Thermo Fisher Scientific Inc. regarding the former Spectra-Physics Lasers, Inc. Site, 1250 West Middlefield Road, Mountain View, California. July 31.

Agency for Toxic Substances and Disease Registry (ATSDR). 2016. *Minimal Risk Levels List.* Available at: <https://www.atsdr.cdc.gov/mrls/mrllist.asp>. Revised August 2018.

EKI Environment and Water, Inc. 2017. *Operation, Monitoring, and Maintenance Plan for Sub-Slab Depressurization (SSD) System, 1277 Terra Bella Avenue, Mountain View, CA.* October 4.

Fishbeck, Thompson, Carr & Huber, Inc. (FTCH) and S.S. Papadopoulos & Associates. 2016a. *Full-Scale Enhanced Reductive Dechlorination Treatability Study Additional Site Characterization Report, Former Teledyne Semiconductor/Spectra-Physics Sites, 1300 Terra Bella Avenue Property, Mountain View, California.* February.

FTCH. 2016b. *Third Enhanced Reductive Dechlorination Injection Event, Former Teledyne Semiconductor/Spectra-Physics Sites, 1300 Terra Bella Avenue Property, Mountain View, California.* July 29.

FTCH. 2017. *Fourth Enhanced Reductive Dechlorination Injection Event, Former Teledyne Semiconductor/Spectra-Physics Sites, Mountain View, California.* July 27.

FTCH. 2019. *Third Quarter 2018 - Methane Mitigation and Soil Vapor Monitoring (Former Teledyne Semiconductor and Former Spectra-Physics Lasers, Inc. Sites).* January 22.

United States Environmental Protection Agency (USEPA). 1991. *Record of Decision, Teledyne Semiconductor and Spectra-Physics, Inc. Joint Superfund Sites, Mountain View, California.* March 22.

USEPA. 2013. *EPA Region 9 Guidelines and Supplemental Information Needed for Vapor Intrusion Evaluations at the South Bay National Priorities List (NPL) Sites.* December 5.

USEPA. 2014. *Fourth Five-Year Review Report for Teledyne Semiconductor/Spectra-Physics, Inc. Superfund Site, Santa Clara County, California.* September 18.

USEPA. 2018. *Regional Screening Levels – Generic Tables.* Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables>. Revised November 2018.

Appendix B: Site Chronology

| Event | Date |
|---|----------------|
| Teledyne Semiconductors, Inc. (Teledyne) and Spectra-Physics Lasers, Inc. (Spectra-Physics) installed on-site sumps for acid neutralization and waste collection. | 1962 - 1977 |
| Teledyne used sumps for acid neutralization and waste collection. | Before 1980 |
| Spectra-Physics used sumps for collecting rinse waters. | Before 1987 |
| Teledyne started remediation investigations. | 1982 |
| Spectra-Physics started remediation investigations. | 1984 |
| Teledyne started interim remedial actions. | 1986 |
| Teledyne Semiconductor Superfund Site (Teledyne) added to the National Priorities List (NPL). | July 1987 |
| Spectra-Physics started soil-vapor extraction (SVE) and treatment. | 1989 |
| The off-site North Bayshore Extraction System (NBES) was started. | 1990 |
| Order 91-025 (Order) adopted by the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) for both sites approved remedies that include SVE; groundwater extraction and treatment (GWET), and discharge to surface water under a National Pollutant Discharge Elimination System (NPDES) permit; and groundwater extraction and discharge to a sanitary sewer. The Order defines Final Site Cleanup Requirements (SCR). | February 1991 |
| Spectra-Physics Lasers Superfund Site (Spectra-Physics) added to the NPL | February 1991 |
| The Record of Decision (ROD) for the Teledyne/Spectra-Physics Site was issued. | March 1991 |
| The first Five Year Review (FYR) was completed. | September 1999 |
| Allegheny Technologies, Inc. and Thermo Electron submit Ten-Year Review Report to RWQCB. | March 2001 |
| The monitored natural attenuation (MNA) proposal for the Study Area was submitted. | September 2003 |
| RWQCB approved the plan to study natural attenuation. | November 2003 |
| The majority of the NBES and the Spring Street Extraction System (SSES) were turned off for MNA study except for wells E-8 and E-13 in the NBES. | 2003 |
| Soil-gas analyses and vapor intrusion studies reports were submitted. | 2004 |
| Allegheny Technologies, Inc. and Thermo Electron submitted a three-year supplemental report to the Ten-Year Review. | June 2004 |
| The second FYR was completed. | September 2004 |
| The Work Plan for Pilot Study for Enhanced Reductive Dechlorination (ERD) at Teledyne was submitted. | September 2005 |
| RWQCB approved the groundwater ERD pilot study | October 2005 |
| The interim MNA Study report and Final ERD Pilot Study Report were submitted. | February 2007 |
| The SSES was restarted to capture high CVOC concentrations resulting from ERD-desorbed CVOCs from the ERD pilot study. | 2007 |
| A data gap investigation was performed. | 2007-2008 |
| The third FYR was completed. | September 2009 |

| Event | Date |
|--|----------------|
| The 2009 Draft Focused Feasibility study (FFS) was completed. | 2009 |
| Vapor intrusion investigations conducted in residences and commercial buildings. | 2010-present |
| A covenant and environment restriction for the Teledyne property was recorded by ECI Two Terra Bella LLC. | August 2010 |
| The first ERD injection event was performed and targeted the entire Site area. | 2011-2012 |
| An SVE methane mitigation system was installed to remove methane in soil generated as a result of the ERD treatability study. | December 2011 |
| A covenant and environment restriction for the Spectra-Physics property was recorded by New Community Baptist Church. | September 2012 |
| The Final FFS was completed, identifying source area ERD treatment followed by MNA and distal plume MNA, vapor intrusion mitigation measures, and Institutional Controls. | 2013 |
| The second ERD injection event was performed and targeted the entire Site area. | 2013-2014 |
| The fourth FYR was completed | September 2014 |
| The on-property GWETS and the SSES received RWQCB approval for shut-down and decommissioning. | July 2015 |
| The residential vapor intrusion investigation study area and sampling program was expanded, ultimately including all residential buildings within 100 feet of the 5 µg/L TCE isoconcentration contour, and conservatively including one residence beyond that limit. | October 2015 |
| The third ERD injection event targeted areas of residual TCE mass. | March 2016 |
| The commercial vapor intrusion investigation study area and sampling program was expanded, ultimately including all commercial buildings north and south of Highway 101 that that overlay the 100 µg/L shallow zone TCE isoconcentration contour. | February 2017 |
| The fourth ERD injection event targeted areas of residual TCE mass. | February 2017 |
| The final operating NBES wells, E13 and E8, were shut down. | 2017 |
| EPA and RWQCB issued Proposed Plan Fact Sheet | April 2018 |
| EPA and RWQCB convened a public meeting for the Proposed Plan | May 24, 2018 |

Appendix C: Data Review and Analysis

Groundwater

The Site encompasses hundreds of wells in the shallow and intermediate zones, including monitoring and extraction wells and piezometers (Figure C-1). Wells that were monitored during the last five years, and wells that have exceedances of one or more COCs, are shown in Table C-1 (Arcadis 2017e, Arcadis 2018e). Trend analyses were conducted on selected wells that were cited in the previous FYR Report using the Mann-Kendall method. These wells were selected so as to continue monitoring concentration trends in known areas of MCL exceedances.

On-Property Monitoring Wells

Teledyne

During the review period, 40 wells were monitored and sampled at the former Teledyne property. The former Teledyne property is the ERD study area, so concentrations of COCs in this area reflect the pattern of a highly reducing environment, where TCE is decreasing in concentration and *cis*-1,2-DCE and vinyl chloride are temporarily increasing in concentration. In the last five years of sampling, 11 wells had no detections of COCs or had detections that were below the cleanup levels; 29 wells contained concentrations of COCs above their respective MCL. Figures C-2 to C-7 provide side by side comparisons of pre- and post-ERD TCE and CVOC concentrations distributed in groundwater for the on-Property and Spring Street Area. As shown on these figures, the mass removal (by destruction) resulting from the full-scale ERD treatability study has been substantial.

Spectra-Physics

Over the last five years, 21 wells have been sampled on the former Spectra-Physics property with 10 of those wells containing concentrations of COCs above their respective MCL. Concentrations of COCs in the shallow and intermediate zones have shown significant decreases during the review period which is attributed to the ongoing ERD injections at the adjacent former Teledyne property. Figures C-2 to C-7 provide side by side comparisons of pre- and post ERD TCE and CVOC concentrations distributed in groundwater for the on-property and Spring Street area.

Shallow-Zone Monitoring Well S-3

Monitoring well S-3 is located near the center of the former Spectra-Physics property. Concentrations of TCE were below the MCL (5 µg/L) between 2014 and 2018. The maximum detected concentration was 0.6 µg/L (May 2014). *Cis*-1,2-DCE was detected above the MCL (70 µg/L) at concentrations ranging from 310 µg/L in November 2015 to 210 µg/L in June 2015. These values are within the range of historical concentrations detected for *cis*-1,2-DCE, though there is an overall decreasing trend in concentrations since the maximum detection of 610 µg/L observed in 2004. Vinyl chloride concentrations ranged from 7.2 to 14.0 µg/L during the period 2014-2018 with the detections all above the MCL (2 µg/L).

Results from a Mann-Kendall trend test are shown in Appendix C and represent the time period from 2009 to 2018. The results show *cis*-1,2-DCE concentrations to be stable. The trends indicate that vinyl chloride is increasing. These results are expected from natural TCE reductive dechlorination processes.

Intermediate-Zone Monitoring Well S-15I

The intermediate-zone well S-15I is also located near the center of the former Spectra-Physics property. TCE was detected above the MCL during the period 2014-2018 with a maximum detected concentration of 6.6 µg/L in May 2014. In well S-15I, *cis*-1,2-DCE was not detected above the MCL with a maximum concentration of 21 µg/L observed in 2014 and decreasing trends in the 2014-2018 timeframe. Vinyl chloride was not detected above the laboratory reporting limit of 0.5 µg/L at this well between 2014 and 2018. The Mann-Kendall trend analysis for well S-15I indicates that TCE, *cis*-1,2-DCE and total CVOCs are decreasing.

Off-Property Monitoring Wells

Groundwater monitoring occurred at approximately 63 off-property wells during the review period. Table 4-1 shows which of these wells still have concentrations of COCs that exceed MCLs. Downgradient off-property shallow-zone monitoring wells (NC-7S, W-4, NC-1S, Well 23) were evaluated to determine if the plume is stable or if concentrations are decreasing. Wells NC-7S and Well W-4 had no detected COCs. This confirms that the plume is not migrating further downgradient or to the west of Permanente Creek. Concentrations of TCE and *cis*-1,2-DCE at wells NC-1S and Well 23 were above the MCLs. Vinyl chloride and *cis*-1,2-DCE were found above the MCL at well W-3. Mann-Kendall trend analysis results show that TCE, *cis*-1,2-DCE and total CVOCs are all increasing at Well 23, and all COCs are decreasing at well NC-1S.

Downgradient off-site intermediate-zone monitoring wells were also evaluated. Well-28I had no detections for all constituents sampled in the last five years. Well NC-2I exceeded the MCL for TCE and *cis*-1,2-DCE in all but one sampling event during the last five years. Mann-Kendall trend analysis results for TCE and *cis*-1,2-DCE concentrations at well NC-2I showed that both of these COCs are increasing. Well NB-26I is also downgradient and had concentrations that exceeded the MCL for TCE during the review period. The trend analysis for TCE, *cis*-1,2-DCE and total CVOCs at well NB-26I were increasing.

Spring Street Area

Seventeen wells were monitored in the Spring Street area over the last five years. Concentrations of TCE near the Spring Street area are generally above the MCL and appear to be stable or slightly decreasing. However, groundwater-TCE concentrations in wells MS-2I, and MS-10S are not above the MCL. TCE concentrations are generally decreasing in the Spring Street area. The maximum TCE concentrations for the Spring Street area were found in the intermediate-zone well ES-3I, but appear to be decreasing over the last five years of monitoring. Concentrations of *cis*-1,2-DCE show decreasing trends in well MS-9S but show increasing trends in ES-3I (Appendix C). Concentrations of vinyl chloride show increasing trends in wells ES-3I, ES-4I and ES-5S in the Spring Street area. These trends can be attributed to the ongoing ERD study at the upgradient Teledyne property which can demonstrate elevated concentrations

of daughter products while simultaneously showing decreasing concentrations of parent products. Concentrations of vinyl chloride are highest in wells ES-5S and ES-4I with a maximum of 97 µg/L and 320 µg/L, respectively. Figures C-2 to C-7 provide side by side comparisons of pre- and post-ERD TCE and CVOC concentrations distributed in groundwater for the on-property and Spring Street area.

North Bayshore Extraction Wells

The NBES consists mostly of extraction and monitoring wells. Almost every well sampled in the shallow-zone and intermediate-zone of the North Bayshore area had concentrations of TCE, *cis*-1,2-DCE, PCE and vinyl chloride above MCLs, with the exception of well NB-25. On average, concentrations of these COCs were higher in the shallow-zone wells than the intermediate-zone wells. It appears that concentrations of TCE and PCE are decreasing throughout the North Bayshore area and concentrations of *cis*-1,2-DCE and vinyl chloride are being affected by ERD treatments.

The previous FYR recommended that downgradient wells 23 and NB-26I should continue to be monitored, due to increasing concentrations of TCE and *cis*-1,2-DCE. During the current review period, the concentrations of TCE, *cis*-1,2-DCE and total CVOCs have shown increasing trends in both wells. The 2018 Feasibility Study cited additional downgradient CVOC source areas identified as contributing to the distribution of CVOCs in groundwater (Arcadis, 2018f). The off-property sites identified as the Montwood and Peery Arrillaga sites (see Figure 1) are upgradient of wells 23 and NB-26I and could potentially be impacting the local groundwater in these wells. The Montwood site is approximately 600 feet south-southwest and the Peery Arrillaga site is immediately adjacent to the well locations. The impact of the ongoing ERD study at the Teledyne property on downgradient concentrations in wells 23 and NB-26I is likely to be minimal due to the well locations being approximately 3600 feet downgradient of the ERD study area.

Enhanced Reductive Dechlorination

ERD Treatability Study

Four ERD injection events have been conducted to date throughout the ERD treatment area. The first and second ERD injection events (2011-2012 and 2013-2014, respectively) were designed for area-wide treatment. The third and fourth ERD injection events (March 2016, interior shallow zone wells A-25US, A-26US and A-15S, and February 2017, shallow zone well A-8S, respectively) targeted areas of residual TCE mass. The ERD groundwater monitoring network consists of eight shallow-zone wells, four upper-intermediate zone wells and five lower-intermediate zone wells. There are 169 injection wells distributed between the shallow aquifer zone, upper-intermediate zone, and lower-intermediate aquifer zone, and the wells were installed between 2011 and 2015.

Methane Mitigation System and Soil Vapor Monitoring

The methane mitigation system was installed at the Teledyne property in October 2011 in response to elevated methane resulting from ERD treatment that was detected in soil-vapor along the northwestern property boundary. The system was expanded in 2013 and 2014. The system includes a 140-gallon vapor-liquid separator and two vapor treatment vessels with 1,000 pounds of granular activated carbon (GAC) in

each vessel. The system has removed 50 pounds of methane in the previous five years (since September 29, 2014) and in total, 58 pounds of methane since startup in November 2011. The system consists of 23 soil vapor extraction (SVE) wells in the following locations:

- Fifteen SVE wells (SVE-1 through SVE-15) installed along the northwestern property boundary to a depth of nine feet below ground surface (ft bgs) with 4.5 to 9.0 ft bgs screen intervals;
- Five SVE wells (SVE-16 through SVE-20) installed under the southwestern corner of the building located at the former Semiconductor property to a depth of 7 ft bgs with 3.5 to 7 ft bgs screen intervals; and,
- Three SVE wells (SVE-21 through SVE-23) installed during the March 2014 expansion in the northwestern corner of the property boundary to a depth of 8 ft bgs with 3.0 to 8.0 ft bgs screen intervals.

The soil gas monitoring program was developed in 2010 to monitor changes in methane and CVOCs in soil gas associated with the full-scale ERD study. There are 19 soil vapor monitoring points (SVPs), which, along with the 23 SVE wells, are monitored for methane and CVOCs. The action level for methane is 10% of the lower explosive limit (LEL) (5,000 ppm) along the property boundary (SVP-5 through SVP-9 and SVP-22) or beneath the onsite building (SVP-1, SVP-2, SVP-10, and SVP-17 through SVP-19). SVP-3 and SVP-4 are not subject to the 10% LEL action level for methane because they are not along a property boundary or beneath the building. They are located in a parking lot upgradient of the property boundary extraction barrier, where they are not influenced by the methane mitigation system.

During the ERD injection event from January through March 2014, elevated methane was measured at some locations due to the increased biological activity from the injections. Methane concentrations at SVP-6 were measured above the 10% LEL methane action level from January 28, 2014 through June 19, 2014, peaking at 1248% LEL on February 13, 2014. Methane concentrations at SVE-4 were measured at 198% LEL on March 11, 2014. System optimizations were made and the methane concentrations decreased below the action limit. On June 25, 2014, the knock-out tank was bypassed to reduce noise levels (noise complaints were made by nearby residents) and to improve system extraction capacity. In December 2014, the knock-out tank was replaced with a more efficient unit in order to maintain the elevated extraction capacity and to ensure that a moisture removal mechanism was in place (Arcadis, 2015b).

The methane mitigation system did not operate from December 9, 2014 through January 5, 2015 due to a blower failure. The blower was replaced and the system resumed operation on January 6, 2015. During the system outage, methane concentrations along the property boundary and beneath the southwest portion of the building increased, but only exceeded the 10% LEL methane action level at SVP-6 (288% LEL on 12/22/2014) and SVP-7 (152% LEL on 12/22/2014). Methane concentrations decreased below the action level when system operation resumed (Arcadis, 2016b).

SVE-9 was offline from January to March 2015 due to a cracked well casing. Methane was detected at 22% LEL on March 31, 2015. The well was subsequently repaired, and methane was not detected at SVE-9 for the remainder of the reporting period (Arcadis, 2016b).

Elevated methane concentrations were detected at SVP-3 and SVP-4 in the past five years, but these SVPs are not subject to the methane action level. All other SVP and SVE monitoring results were below the 10% LEL methane action level in the past five years.

Allegheny Technologies, Inc. performed a rebound test at eight SVE wells (SVE-1, SVE-3, SVE-4, SVE-5, SVE-8, SVE-9, SVE-10 and SVE-23) starting in May 2017. The goal of the rebound test was to turn off the selected wells to allow for future system expansion inside the on-property building to address prior exceedances of TCE in indoor air. During the June 2017 monitoring event, the wells were screened for methane and CVOCs. The wells were left on and screened again the next day. The data showed that methane and CVOCs readings did not rebound, and trigger levels were not exceeded. The wells were closed and monitored monthly for CVOCs and methane. During the September 2018 event, these eight SVE wells were operated and screened for methane and CVOCs at the start of the test and again following one full day of operation. The wells were left operating at the end of the September 2018 screening event. These wells were screened again for CVOCs and methane during the fourth quarter of 2018 (Arcadis, 2017c and FTCH, 2019).

CVOC concentrations have decreased at the monitoring locations during the past five years. CVOC concentrations vary across the SVPs, with detections of TCE (up to 9500 $\mu\text{g}/\text{m}^3$), *cis*-1,2-DCE (up to 1100 $\mu\text{g}/\text{m}^3$), PCE (up to 1000 $\mu\text{g}/\text{m}^3$), *trans*-1,2-DCE (up to 120 $\mu\text{g}/\text{m}^3$), chloroform (up to 84 $\mu\text{g}/\text{m}^3$), and Freon 113 (up to 76 $\mu\text{g}/\text{m}^3$) being the most common as of August 2018 (Arcadis, 2015b, 2016b, 2017c, and 2018c, and FTCH, 2019).

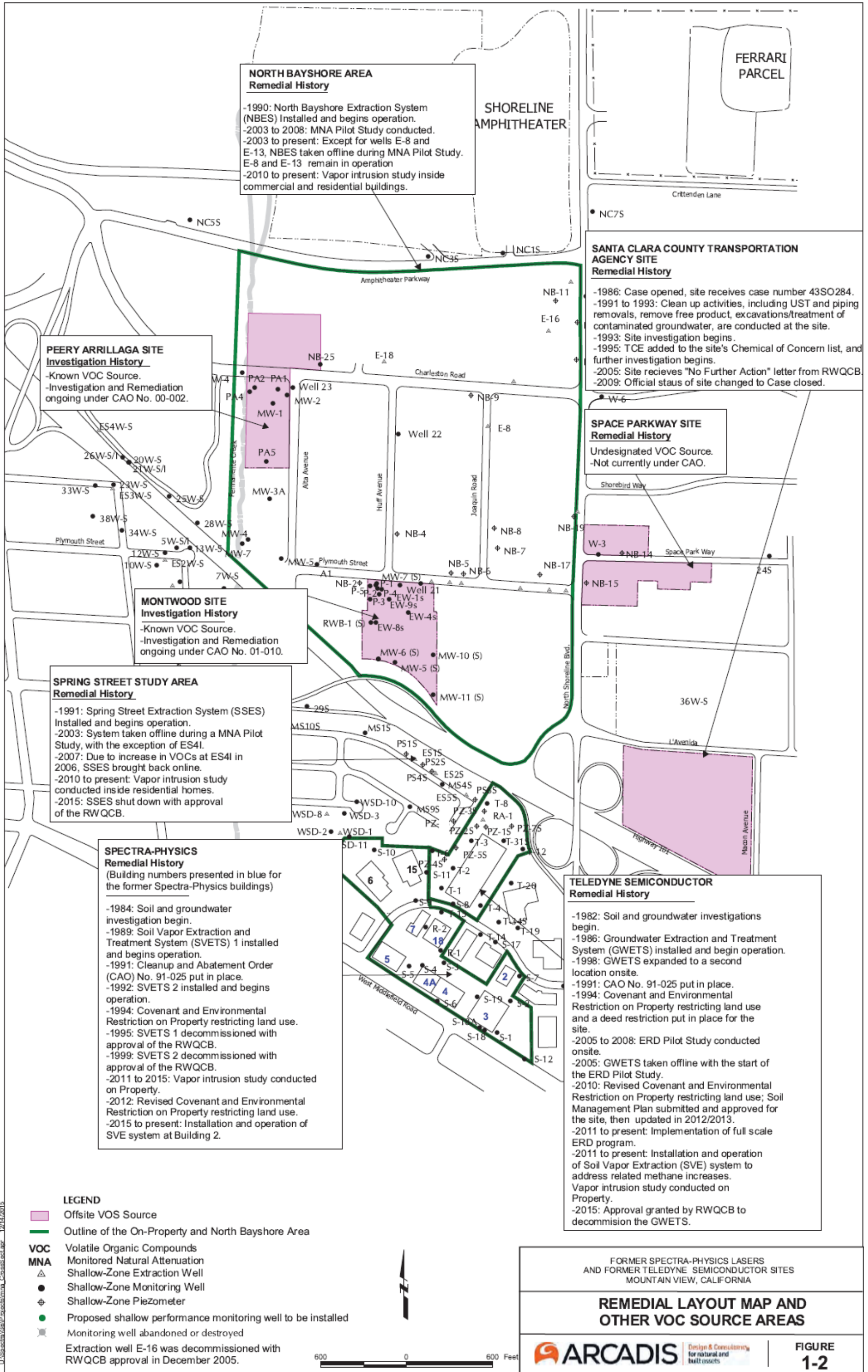


Figure C-1: Site Plan with Remedial Layout and additional CVOC Source Areas

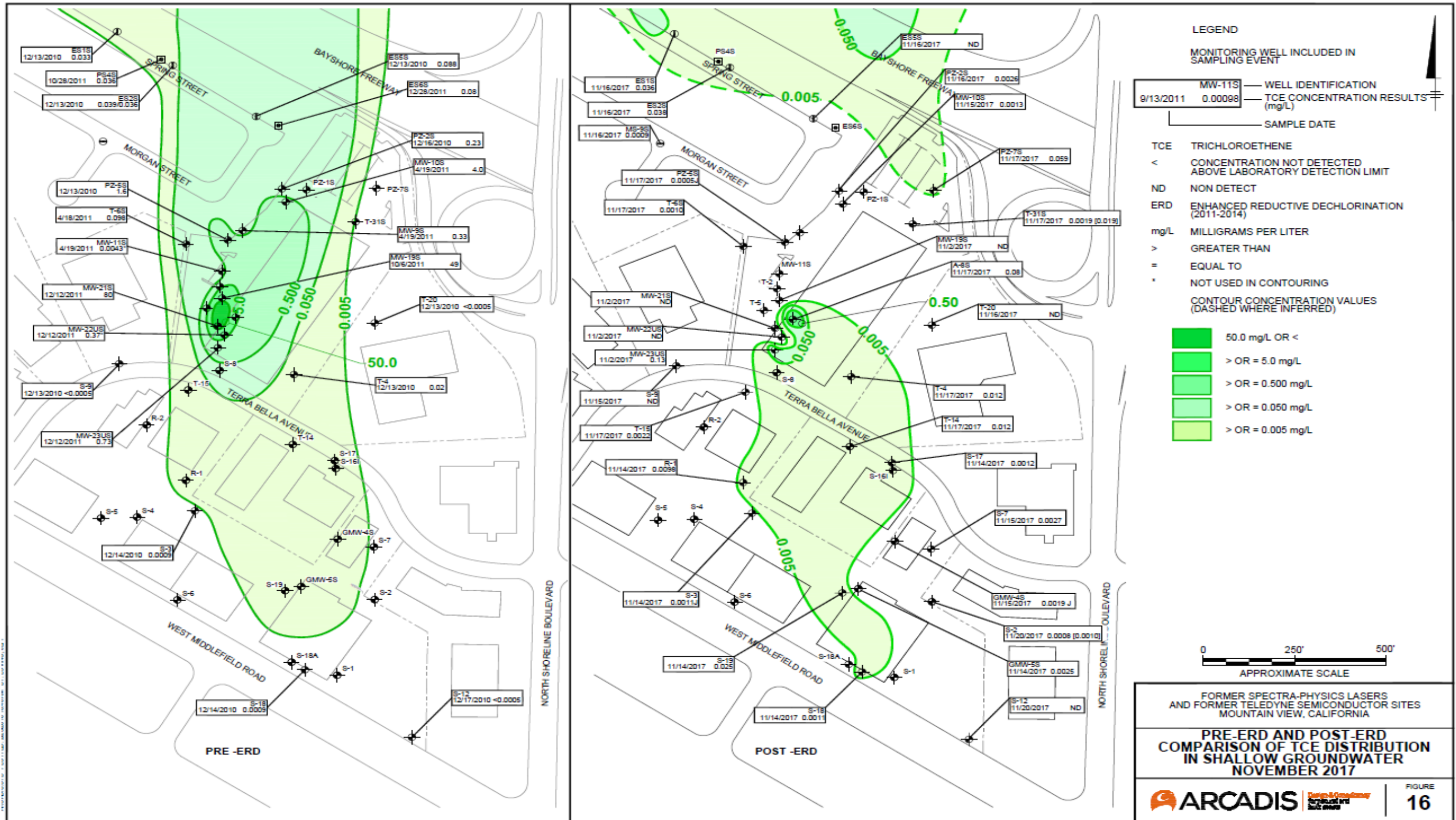


Figure C-2: Pre-ERD and Post-ERD Comparison of TCE Distribution in Shallow Groundwater November 2017

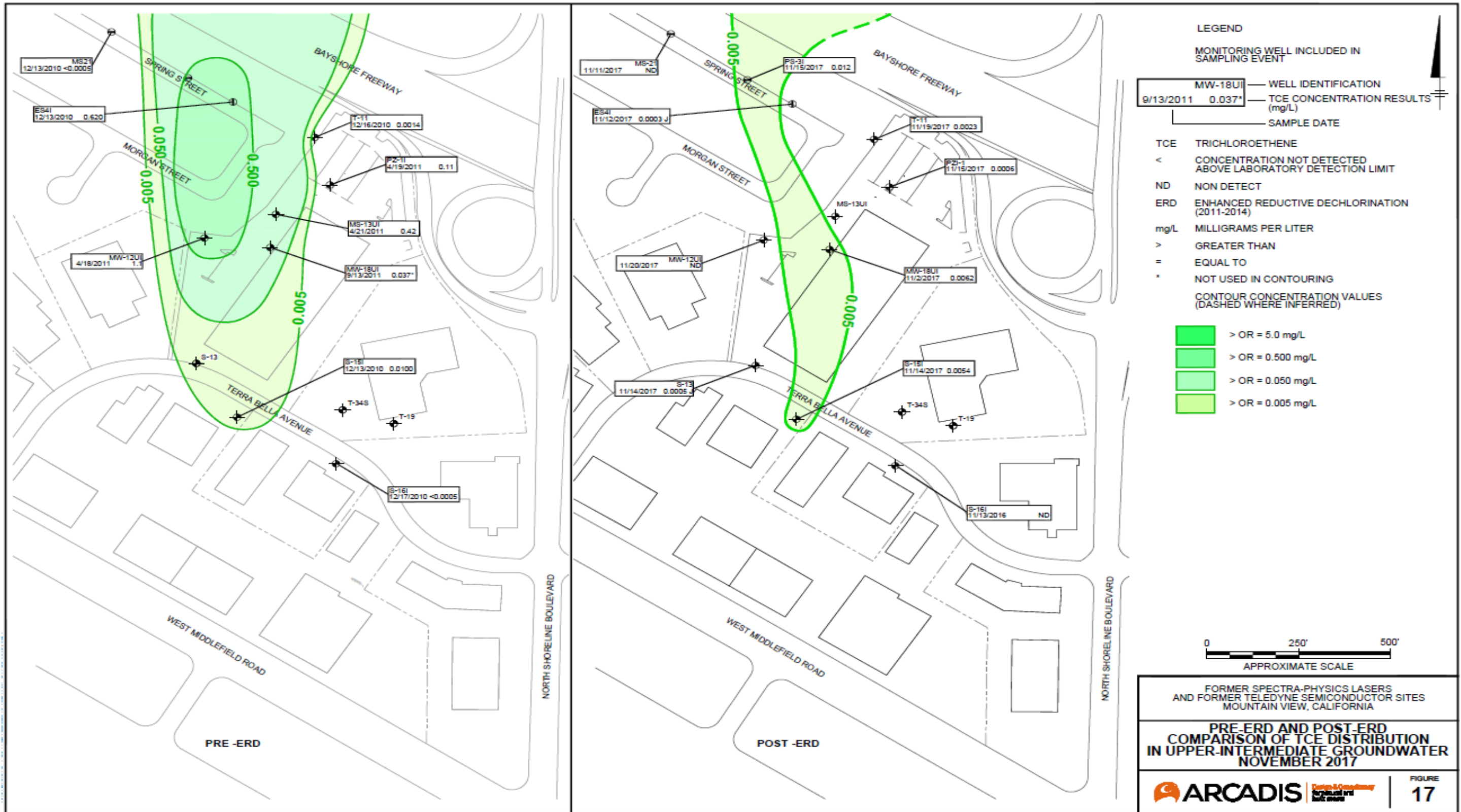


Figure C-3: Pre-ERD and Post-ERD Comparison of TCE Distribution in Upper-Intermediate Groundwater November 2017

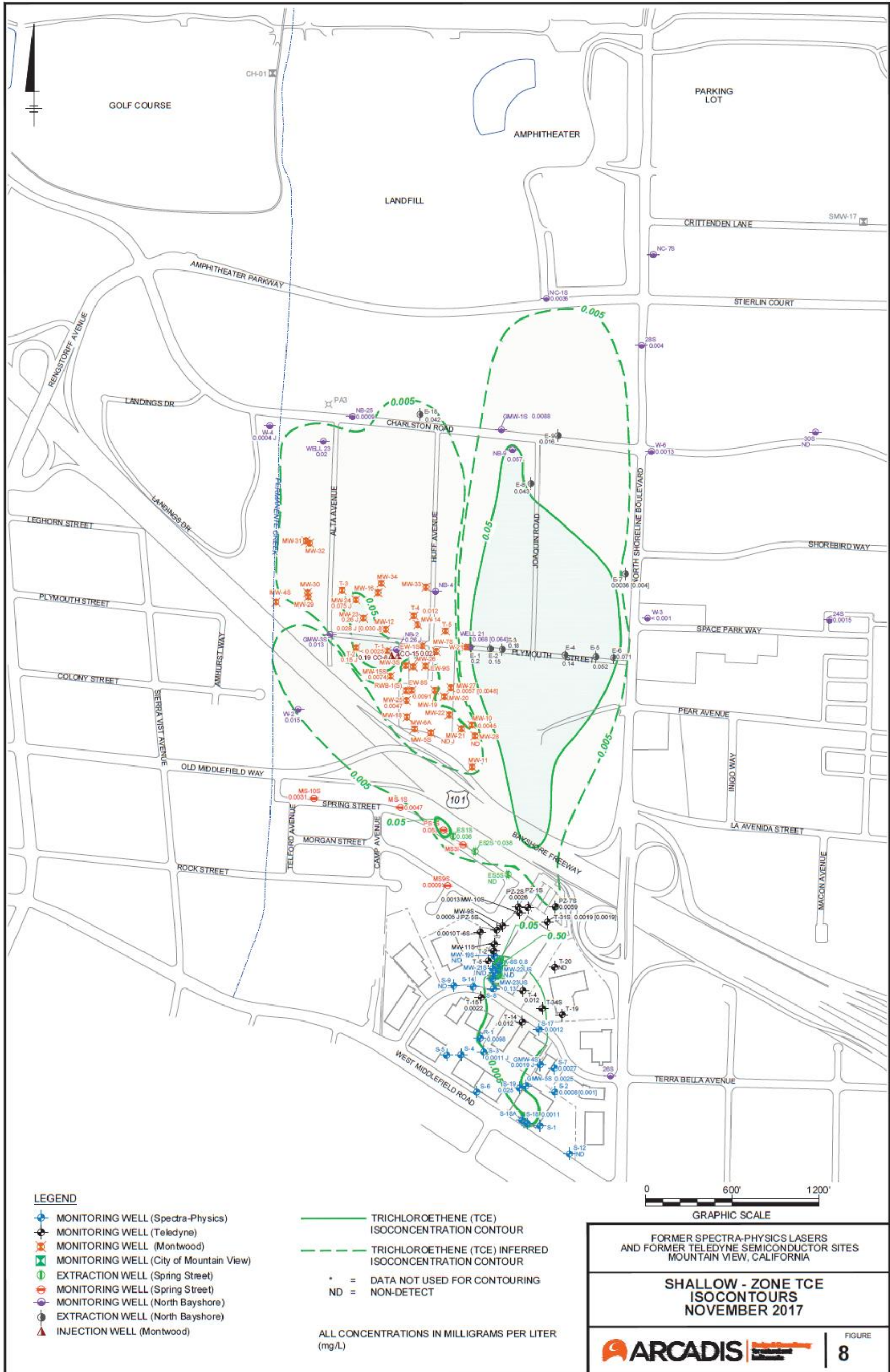
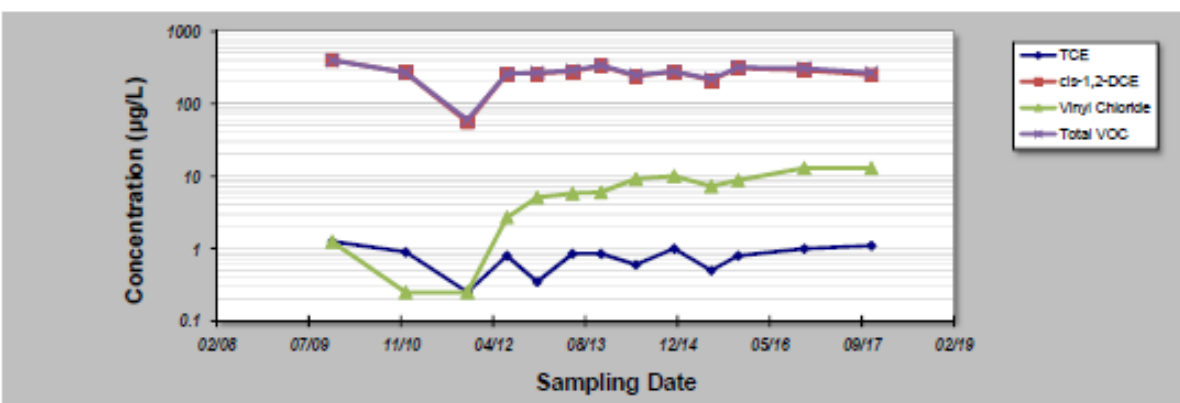


Figure C-8: TCE Plume Delineation in Shallow Groundwater 2017

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 7-Feb-19 Job ID: S-3
 Facility Name: Teledyne-Spectra Constituent:
 Conducted By: Ben McKenna Concentration Units: µg/L

| Sampling Point ID: | | TCE | cis-1,2-DCE | Vinyl Chloride | Total VOC | | |
|-----------------------------|---------------|----------------------|-------------|----------------|-----------|--|--|
| Sampling Event | Sampling Date | CONCENTRATION (µg/L) | | | | | |
| 1 | 10-Nov-09 | 1.25 | 400 | 1.25 | 400 | | |
| 2 | 14-Dec-10 | 0.9 | 270 | 0.25 | 270 | | |
| 3 | 14-Nov-11 | 0.25 | 56 | 0.25 | 60 | | |
| 4 | 15-Jun-12 | 0.8 | 260 | 2.7 | 260 | | |
| 5 | 26-Nov-12 | 0.35 | 260 | 5.1 | 270 | | |
| 6 | 6-Jun-13 | 0.85 | 280 | 5.8 | 290 | | |
| 7 | 8-Nov-13 | 0.85 | 330 | 6 | 340 | | |
| 8 | 16-May-14 | 0.6 | 240 | 9.2 | 250 | | |
| 9 | 9-Dec-14 | 1 | 280 | 10 | 280 | | |
| 10 | 28-Jun-15 | 0.5 | 210 | 7.3 | 220 | | |
| 11 | 21-Nov-15 | 0.8 | 310 | 8.8 | 320 | | |
| 12 | 14-Nov-16 | 1 | 290 | 13 | 310 | | |
| 13 | 14-Nov-17 | 1.1 | 250 | 13 | 270 | | |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | |
| Coefficient of Variation: | | 0.37 | 0.30 | 0.69 | 0.29 | | |
| Mann-Kendall Statistic (S): | | 11 | -2 | 64 | 3 | | |
| Confidence Factor: | | 72.5% | 52.4% | >99.9% | 54.8% | | |
| Concentration Trend: | | No Trend | Stable | Increasing | No Trend | | |



Notes:

- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S≠0 = No Trend; < 90%, S=0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifal, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

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Figure C-9: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well S-3

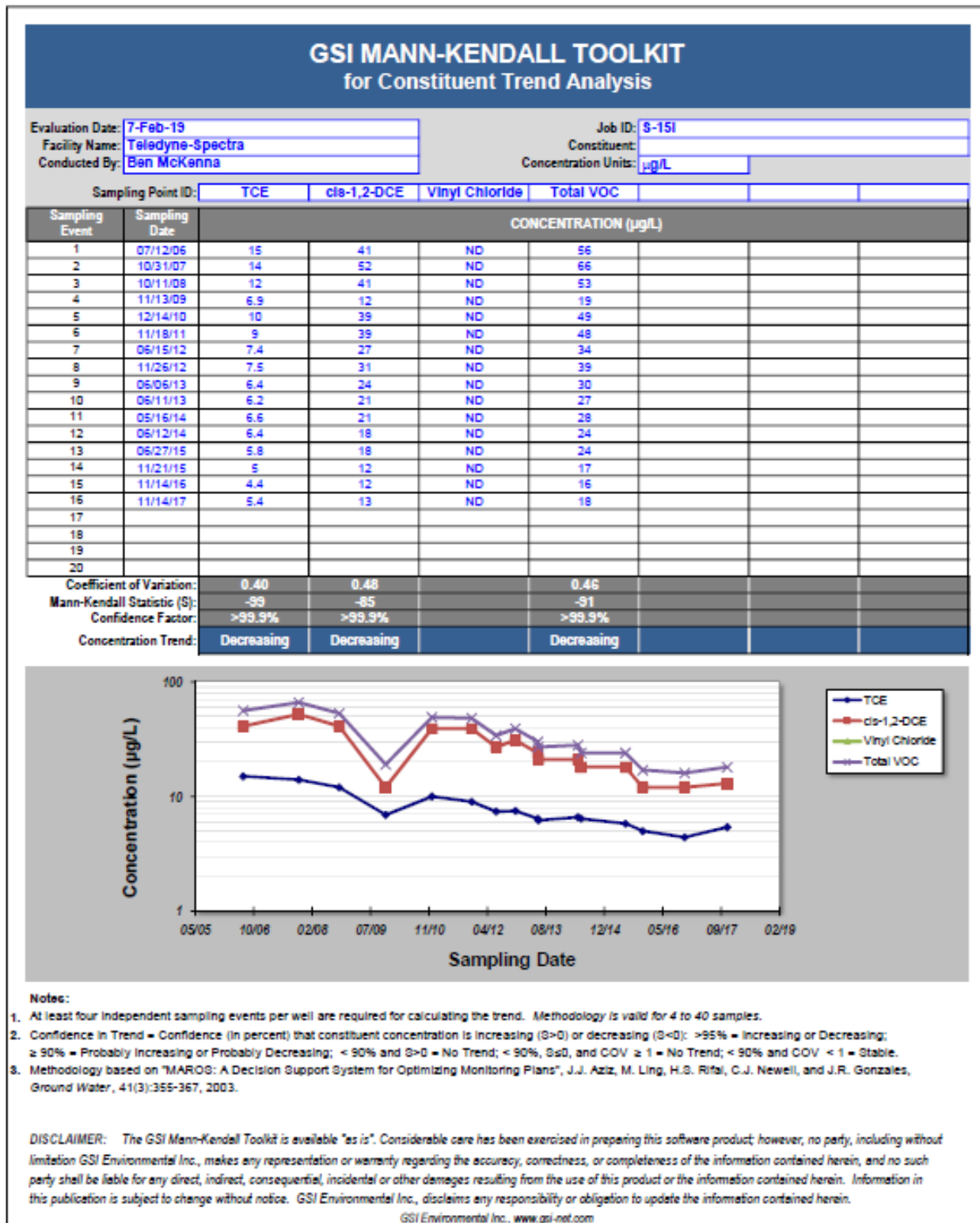


Figure C-10: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well S-15I

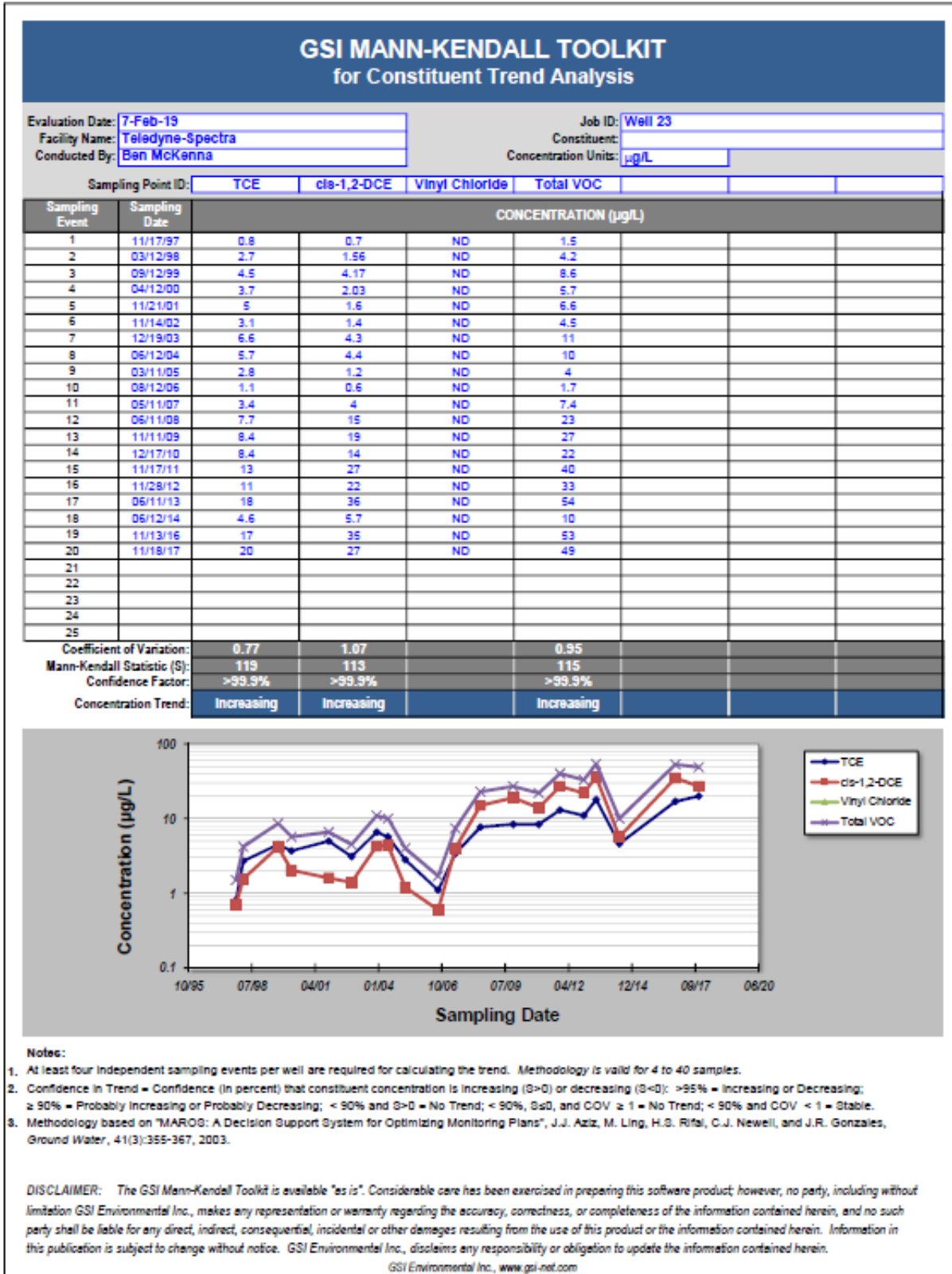


Figure C-11: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well 23

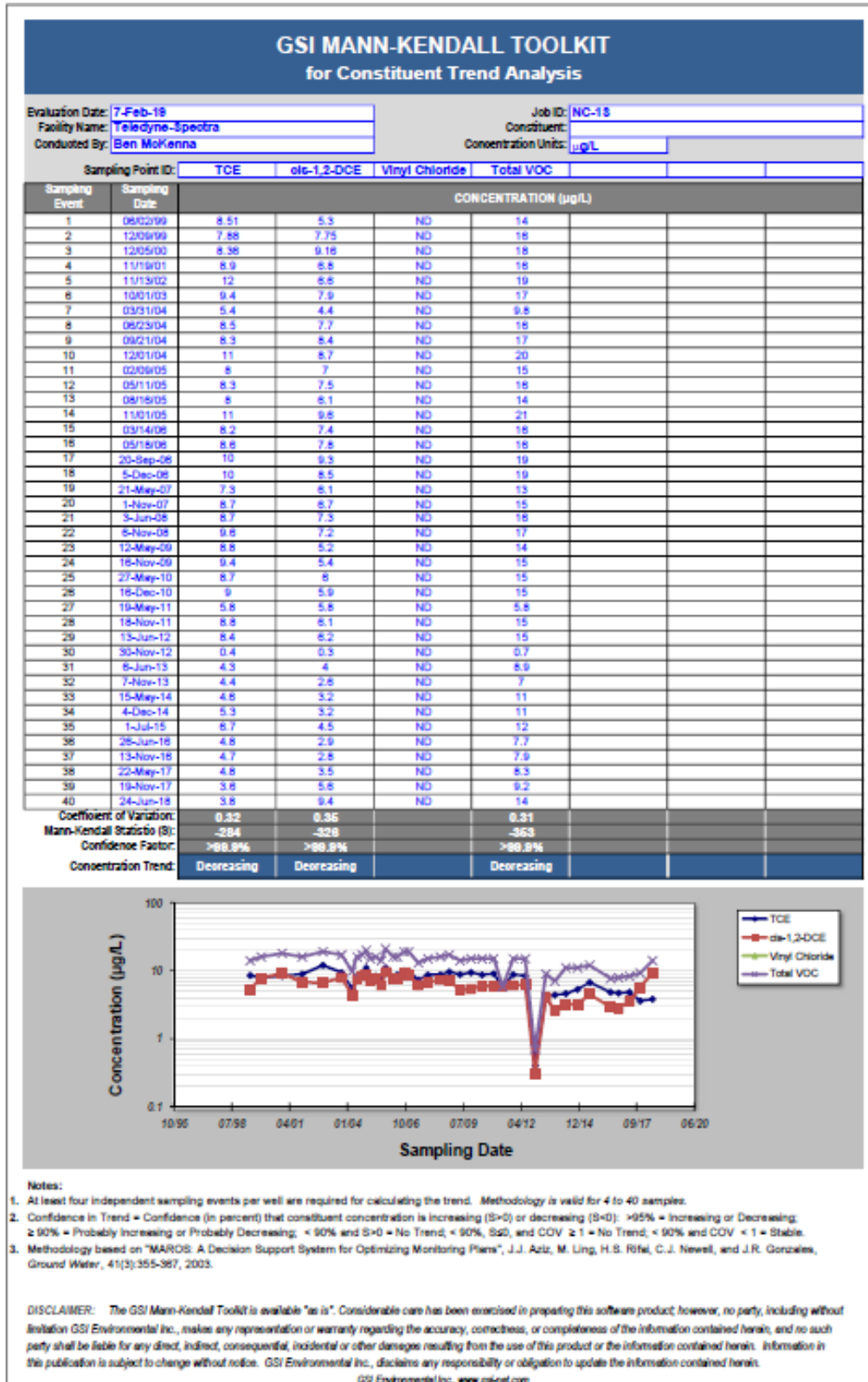


Figure C-12: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well NC-1S

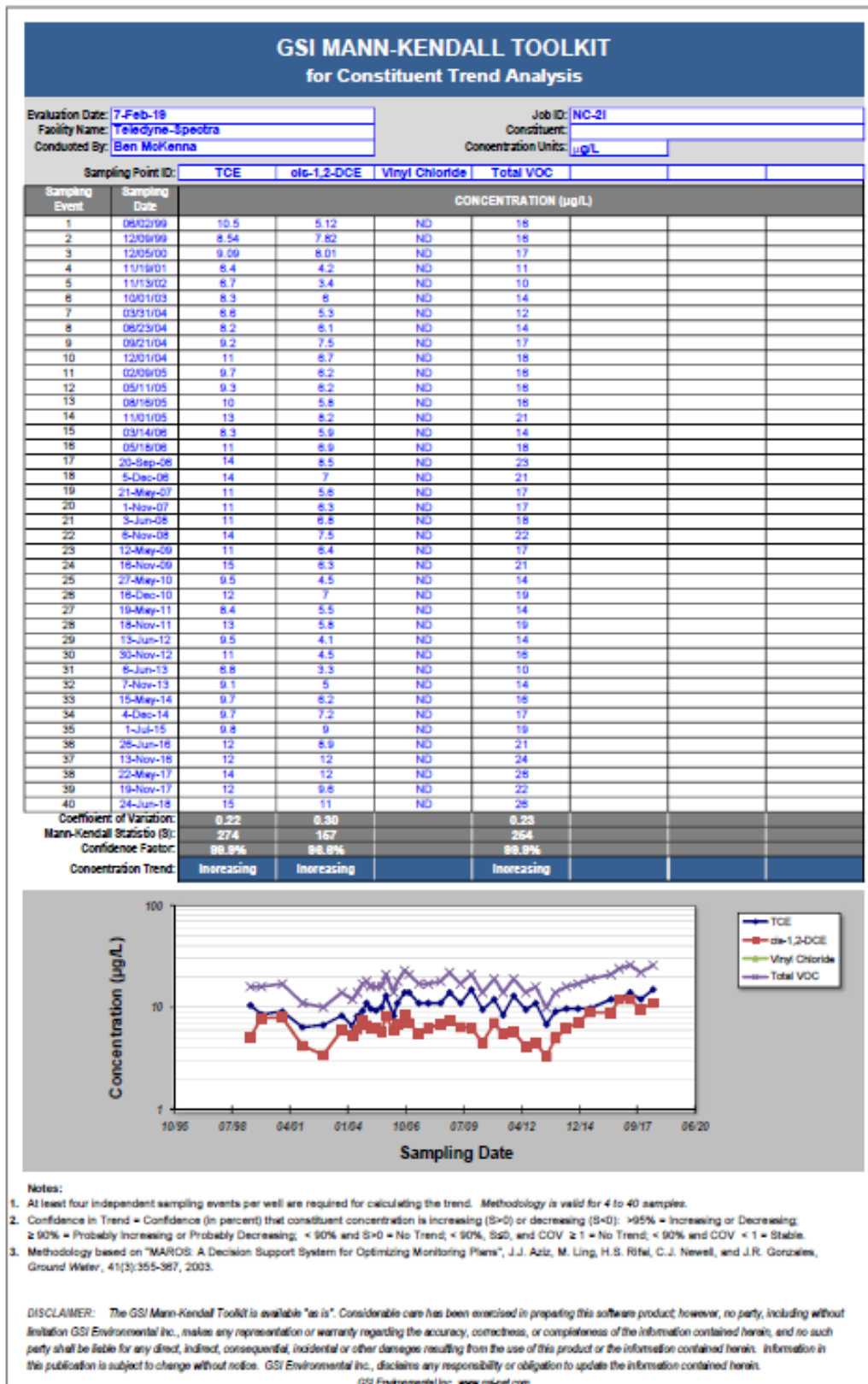


Figure C-13: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well NC-21

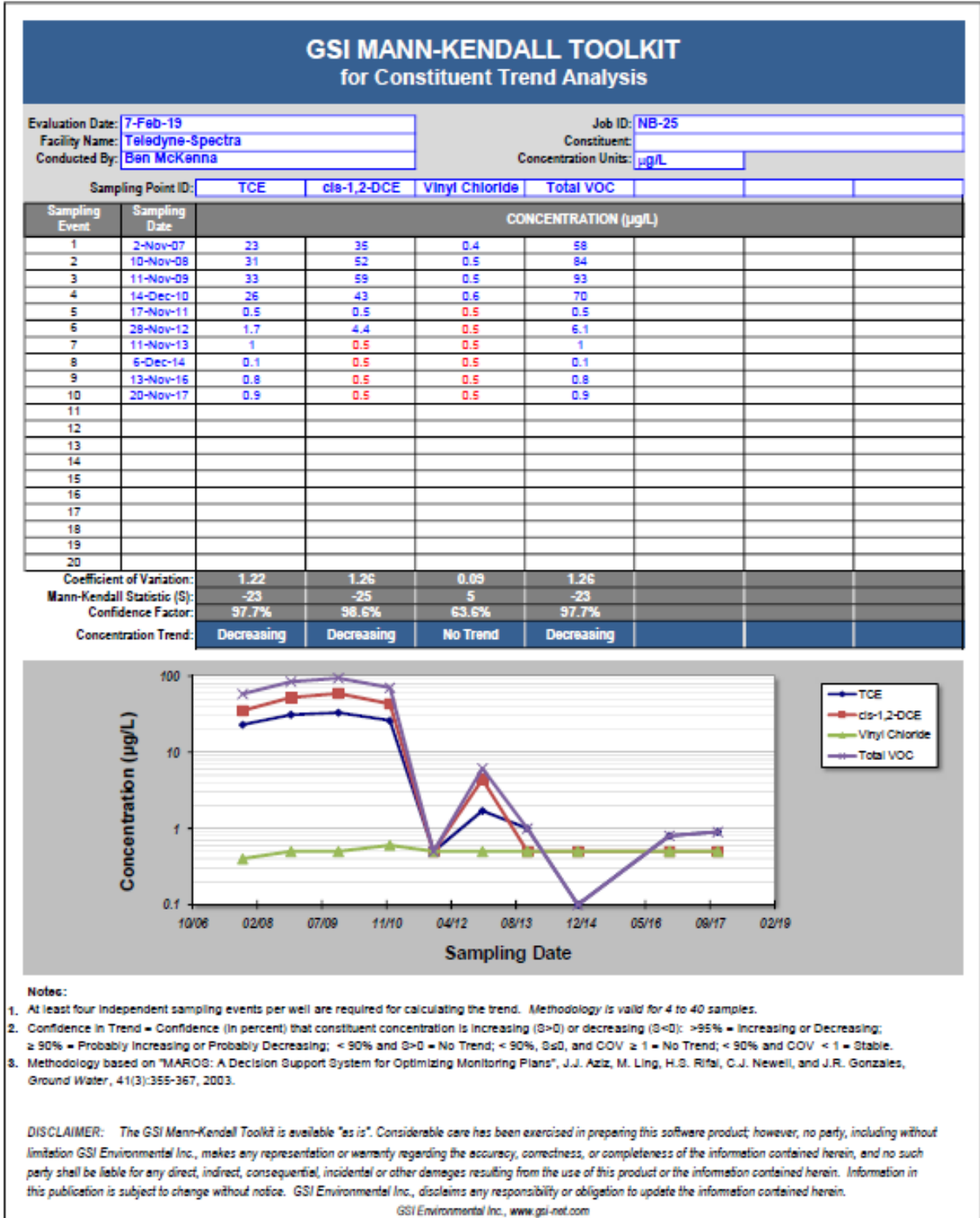


Figure C-14: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well NB-25

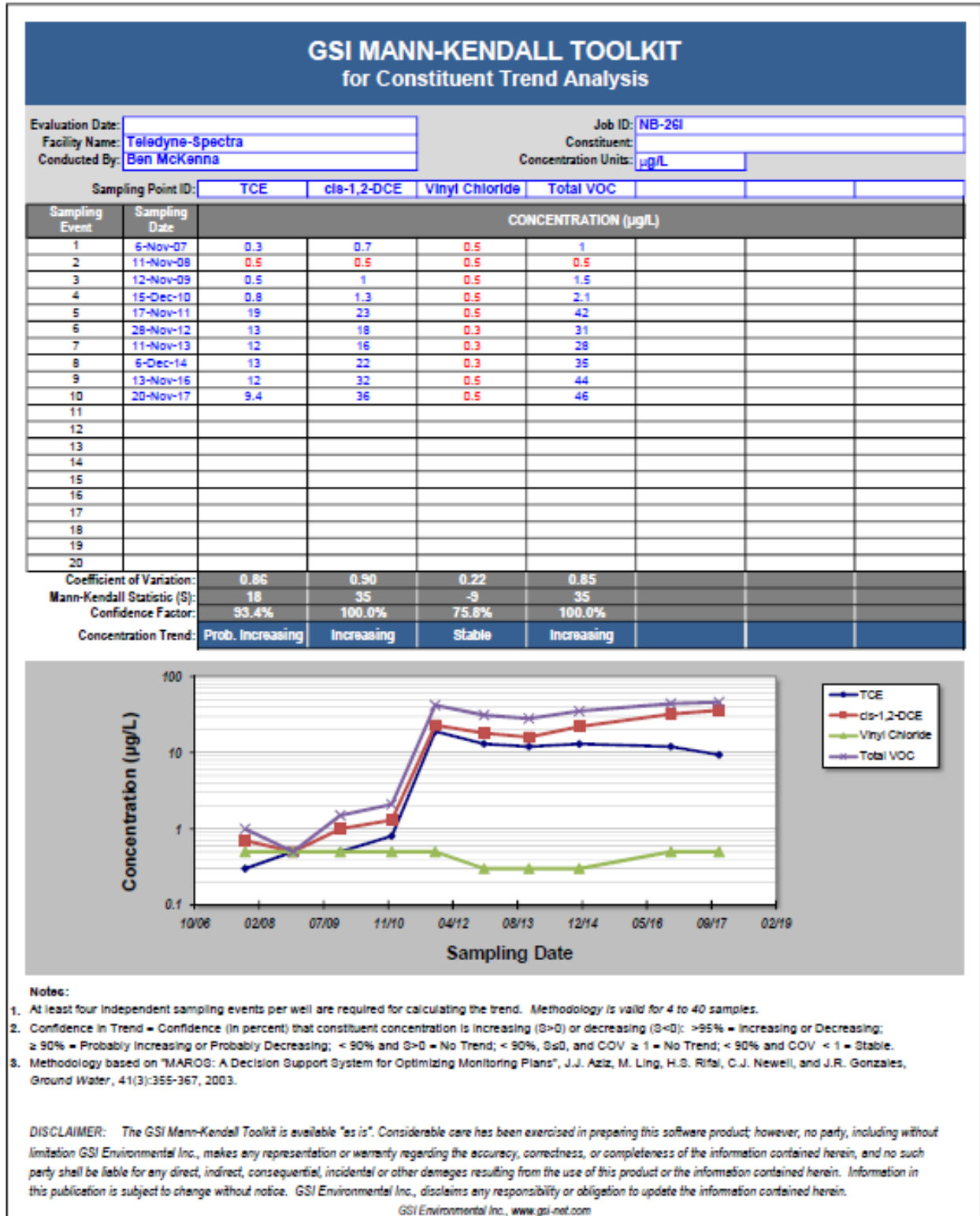


Figure C-15: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well NB-26i

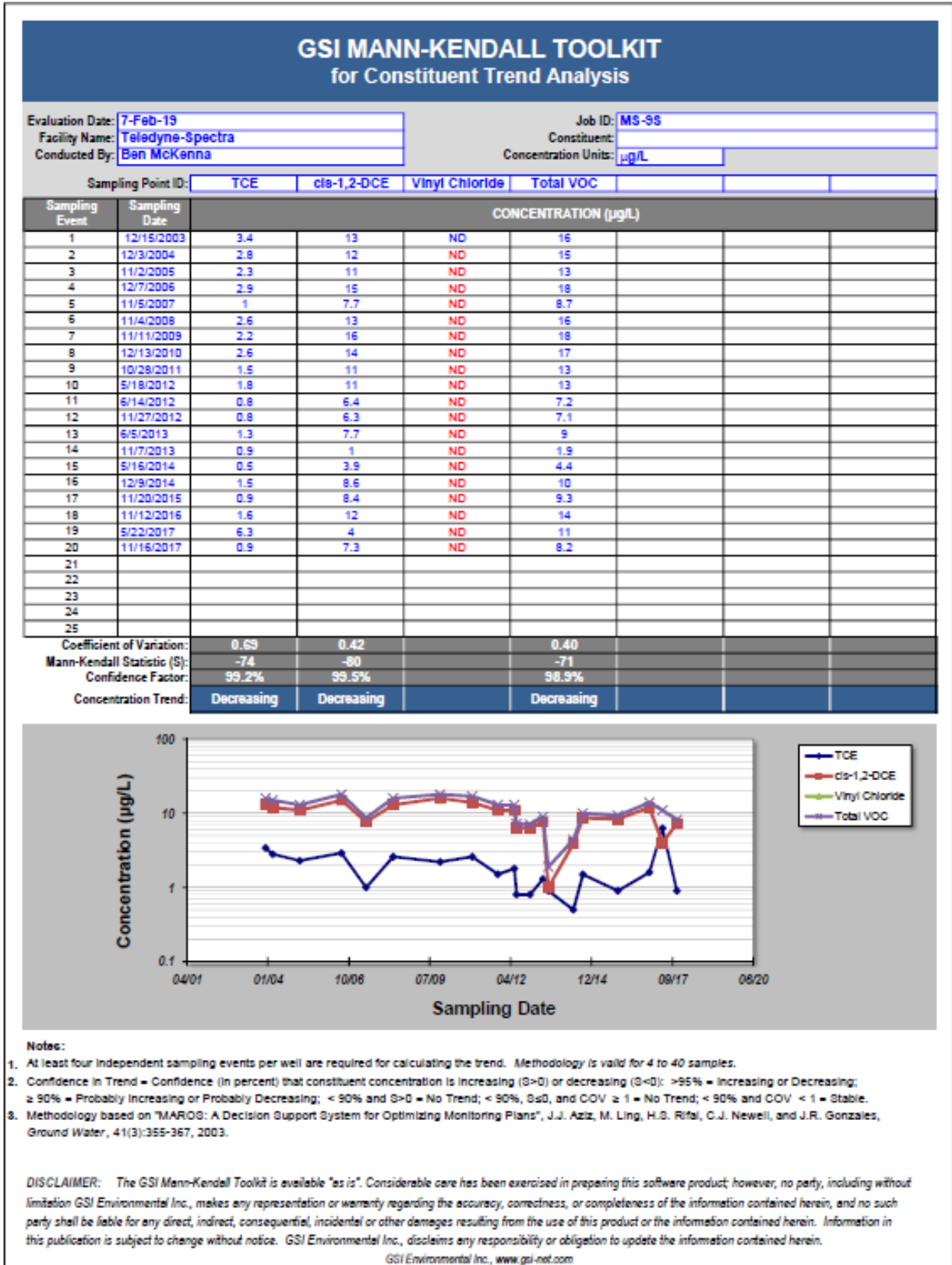


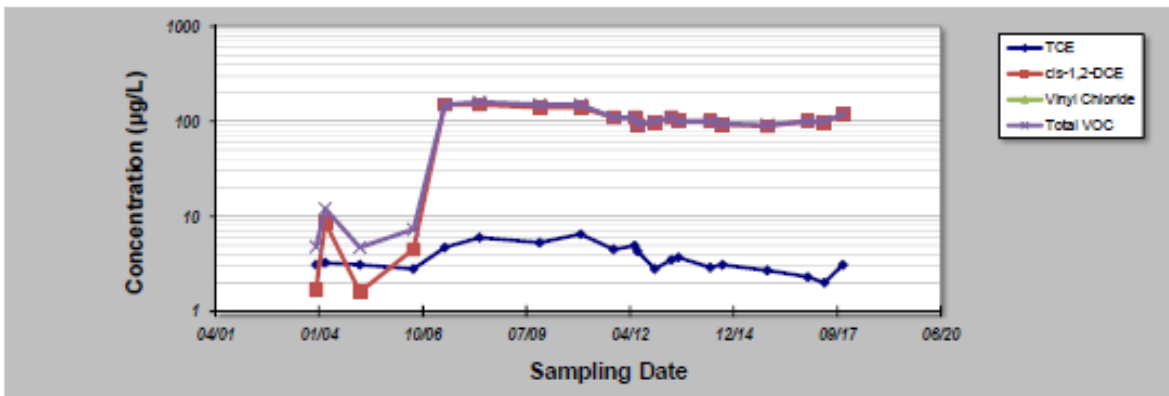
Figure C-16: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well MS-9S

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 7-Feb-19 Job ID: MS-10S
 Facility Name: Teledyne-Spectra Constituent: _____
 Conducted By: Ban McKenna Concentration Units: µg/L

Sampling Point ID: TCE cis-1,2-DCE Vinyl Chloride Total VOC

| Sampling Event | Sampling Date | CONCENTRATION (µg/L) | | | |
|-----------------------------|---------------|----------------------|-------------|----------------|-----------|
| | | TCE | cis-1,2-DCE | Vinyl Chloride | Total VOC |
| 1 | 12/15/2003 | 3.1 | 1.68 | ND | 4.8 |
| 2 | 12/3/2004 | 3.24 | 8.67 | ND | 12 |
| 3 | 11/2/2005 | 3.1 | 1.6 | ND | 4.7 |
| 4 | 12/7/2006 | 2.8 | 4.5 | ND | 7.3 |
| 5 | 11/5/2007 | 4.7 | 150 | ND | 150 |
| 6 | 11/4/2008 | 6 | 150 | ND | 160 |
| 7 | 11/11/2009 | 5.3 | 140 | ND | 150 |
| 8 | 12/13/2010 | 6.5 | 140 | ND | 150 |
| 9 | 10/28/2011 | 4.5 | 110 | ND | 110 |
| 10 | 5/18/2012 | 4.9 | 110 | ND | 110 |
| 11 | 5/14/2012 | 4.3 | 90 | ND | 94 |
| 12 | 11/27/2012 | 2.8 | 97 | ND | 100 |
| 13 | 6/5/2013 | 3.5 | 110 | ND | 110 |
| 14 | 11/7/2013 | 3.7 | 100 | ND | 100 |
| 15 | 5/16/2014 | 2.9 | 100 | ND | 100 |
| 16 | 12/9/2014 | 3.1 | 92 | ND | 95 |
| 17 | 11/20/2015 | 2.7 | 89 | ND | 92 |
| 18 | 11/12/2016 | 2.3 | 100 | ND | 100 |
| 19 | 5/22/2017 | 2 | 97 | ND | 100 |
| 20 | 11/16/2017 | 3.1 | 120 | ND | 120 |
| 21 | | | | | |
| 22 | | | | | |
| 23 | | | | | |
| 24 | | | | | |
| 25 | | | | | |
| Coefficient of Variation: | | 0.33 | 0.53 | | 0.52 |
| Mann-Kendall Statistic (S): | | -67 | 5 | | 8 |
| Confidence Factor: | | 98.5% | 55.1% | | 58.9% |
| Concentration Trend: | | Decreasing | No Trend | | No Trend |



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
 - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S=0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
 - Methodology based on "MAROG: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzalez, Ground Water, 41(3):355-367, 2003.

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Figure C-17: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well MS-10S

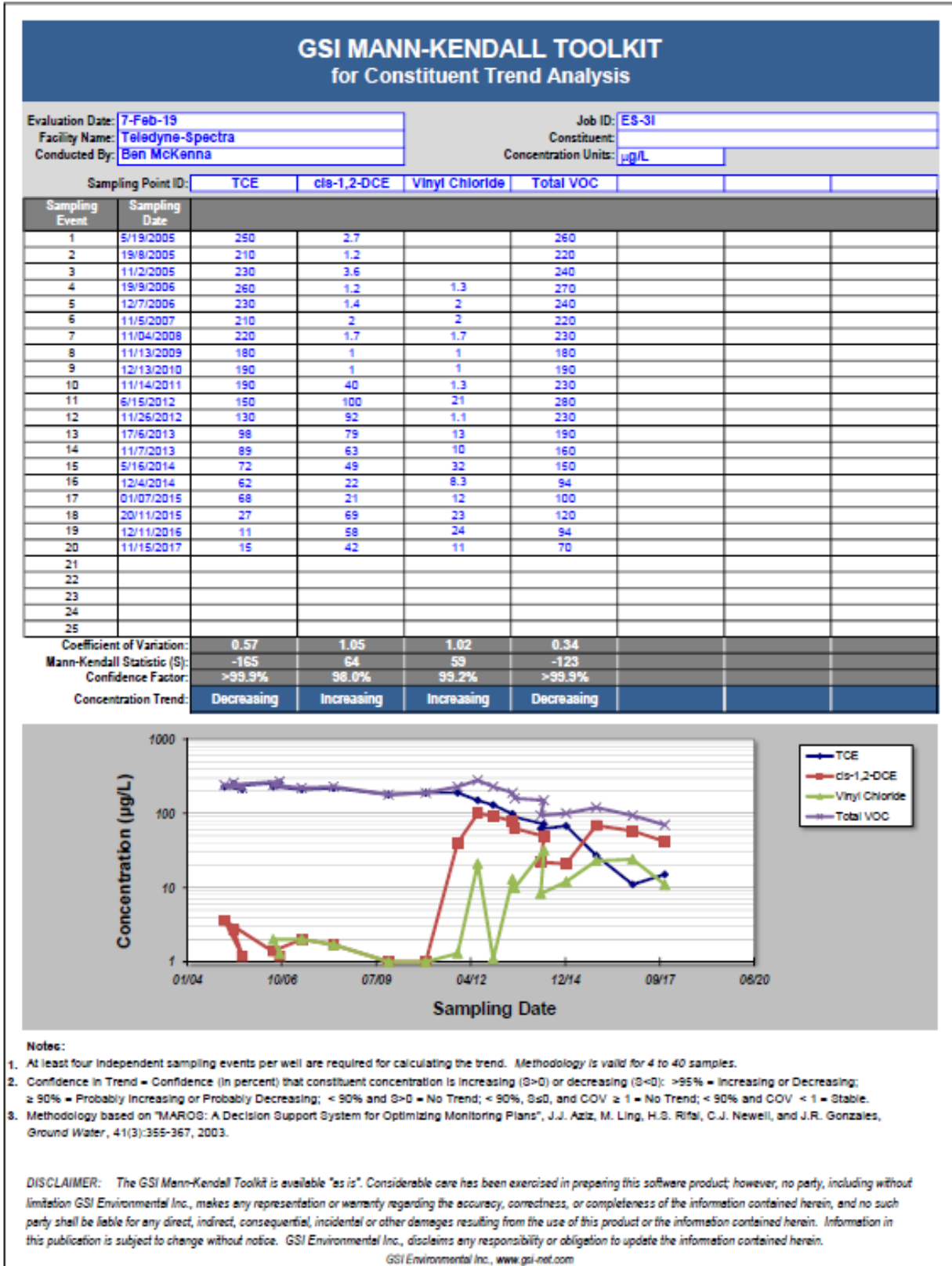


Figure C-18: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well ES-3I

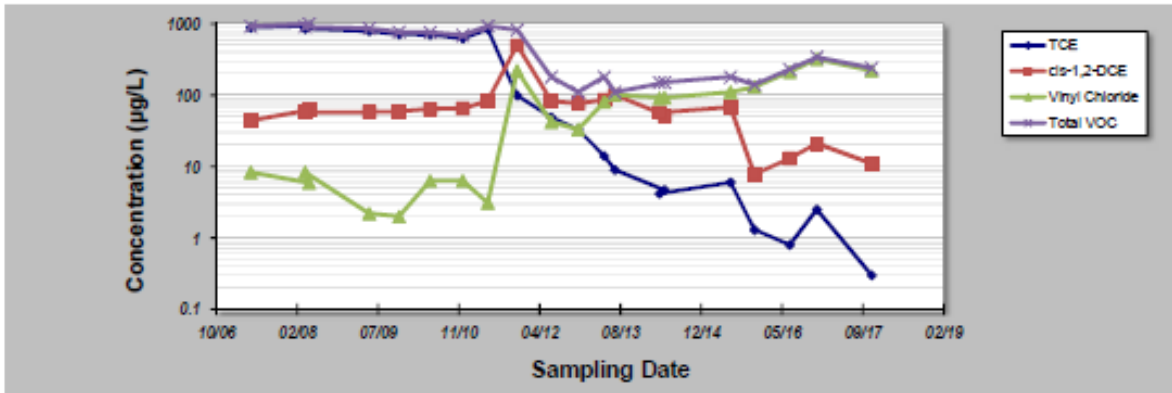
GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 7-Feb-19 Job ID: ES-4I
 Facility Name: Teledyne-Spectra Constituent:
 Conducted By: Ben McKenna Concentration Units: µg/L

Sampling Point ID: TCE cis-1,2-DCE Vinyl Chloride Total VOC

| Sampling Event | Sampling Date | TCE | cis-1,2-DCE | Vinyl Chloride | Total VOC |
|----------------|---------------|-----|-------------|----------------|-----------|
| 1 | 11/5/2007 | 880 | 44 | 8.3 | 920 |
| 2 | 6/5/2008 | 930 | 62 | 5.9 | 1000 |
| 3 | 11/4/2008 | 850 | 58 | 8.3 | 910 |
| 4 | 5/13/2009 | 790 | 58 | 2.2 | 860 |
| 5 | 11/13/2009 | 710 | 59 | 2 | 770 |
| 6 | 5/25/2010 | 700 | 64 | 6.3 | 760 |
| 7 | 12/13/2010 | 620 | 65 | 6.3 | 690 |
| 8 | 5/17/2011 | 840 | 83 | 3.1 | 930 |
| 9 | 11/14/2011 | 99 | 500 | 220 | 820 |
| 10 | 6/13/2012 | 49 | 83 | 42 | 180 |
| 11 | 11/26/2012 | 33 | 76 | 33 | 110 |
| 12 | 6/5/2013 | 14 | 86 | 80 | 180 |
| 13 | 11/7/2013 | 9 | 100 | 100 | 110 |
| 14 | 5/14/2014 | 4.7 | 52 | 52 | 150 |
| 15 | 12/4/2014 | 4.2 | 57 | 90 | 150 |
| 16 | 5/26/2015 | 6 | 68 | 110 | 180 |
| 17 | 11/21/2015 | 1.3 | 7.8 | 130 | 140 |
| 18 | 6/26/2016 | 0.8 | 13 | 210 | 230 |
| 19 | 11/12/2016 | 2.5 | 21 | 320 | 340 |
| 20 | 11/15/2017 | 0.3 | 11 | 220 | 240 |
| 21 | | | | | |
| 22 | | | | | |
| 23 | | | | | |
| 24 | | | | | |
| 25 | | | | | |

| | | | | |
|-----------------------------|------------|----------|------------|------------|
| Coefficient of Variation: | 1.20 | 1.31 | 1.11 | 0.73 |
| Mann-Kendall Statistic (S): | -172 | -22 | 125 | -91 |
| Confidence Factor: | >99.9% | 75.0% | >99.9% | 99.9% |
| Concentration Trend: | Decreasing | No Trend | Increasing | Decreasing |



Notes:

- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S=0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifal, C.J. Newell, and J.R. Gonzales, Ground Water, 41(3):355-367, 2003.

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Figure C-19: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well ES-4I

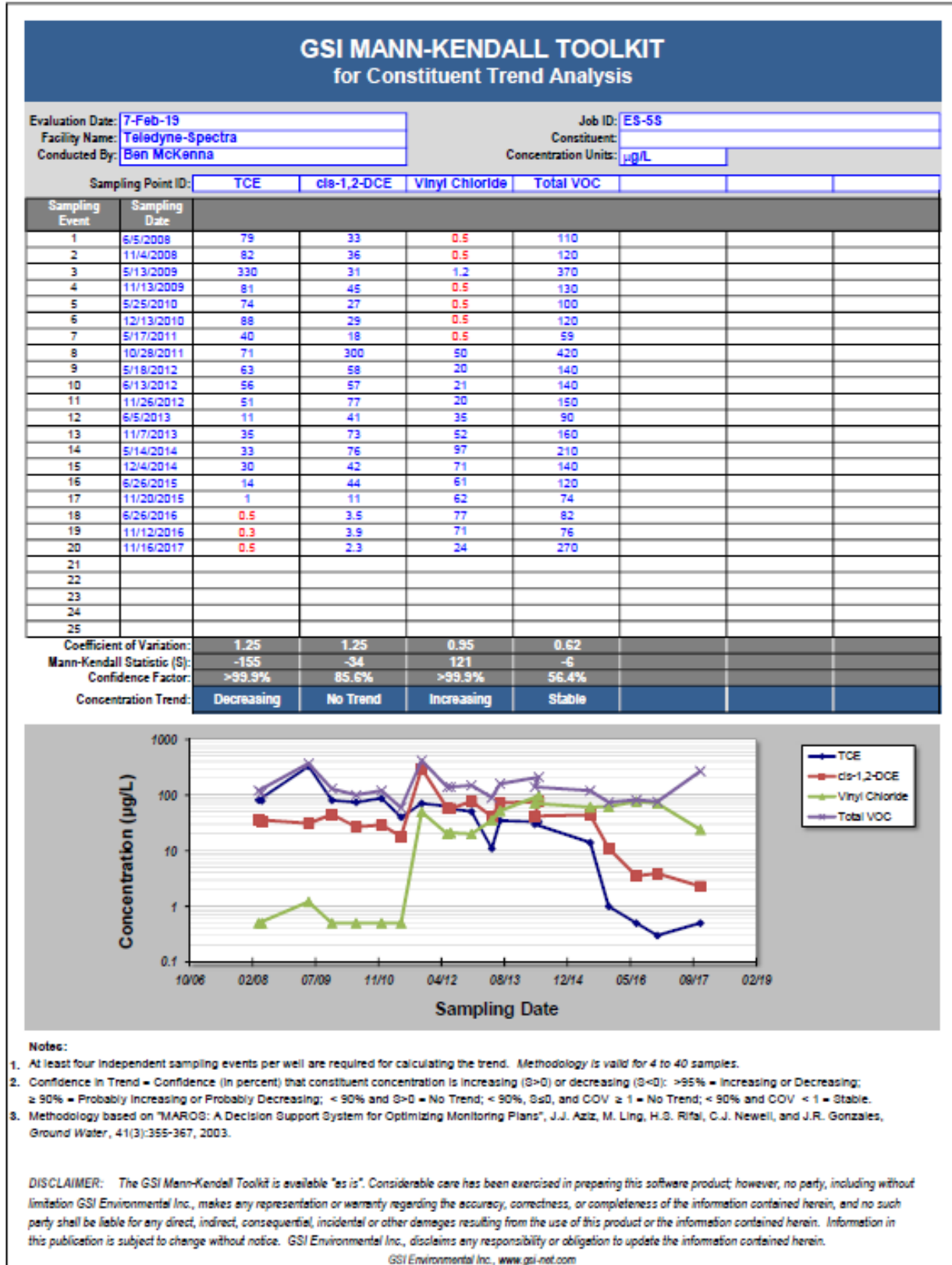
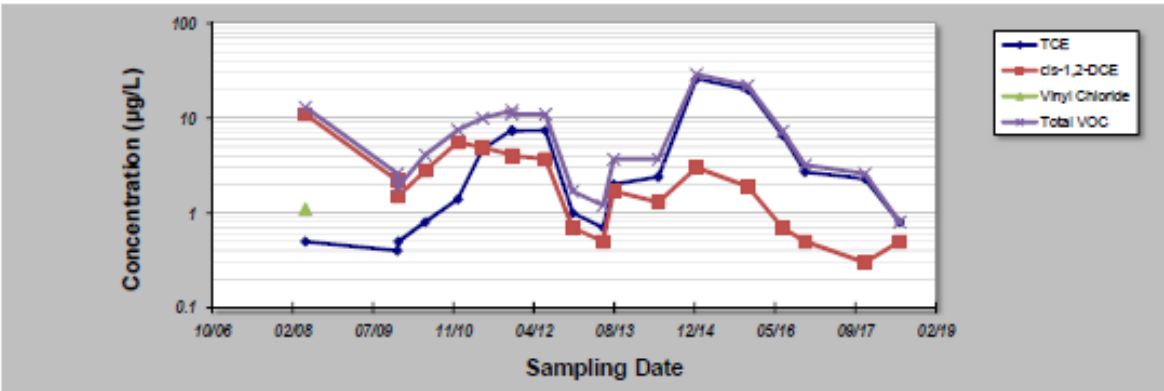


Figure C-20: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well ES-5S

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 7-Feb-19 Job ID: T-11
 Facility Name: Teledyne-Spectra Constituent:
 Conducted By: Ben McKenna Concentration Units: µg/L

| Sampling Point ID: | TCE | cis-1,2-DCE | Vinyl Chloride | Total VOC | | | |
|-----------------------------|---------------|-------------|----------------|-----------|-----|--|--|
| Sampling Event | Sampling Date | | | | | | |
| 1 | 11/5/2008 | 0.5 | 11 | 1.1 | 13 | | |
| 2 | 5/12/2009 | 0.4 | 2.2 | ND | 2.6 | | |
| 3 | 11/12/2009 | 0.5 | 1.5 | ND | 1.9 | | |
| 4 | 5/27/2010 | 0.8 | 2.8 | ND | 4.1 | | |
| 5 | 12/16/2010 | 1.4 | 5.6 | ND | 7.5 | | |
| 6 | 5/19/2011 | 4.7 | 4.9 | ND | 10 | | |
| 7 | 11/18/2011 | 7.5 | 4.1 | ND | 12 | | |
| 8 | 11/18/2011 | 7.3 | 4 | ND | 11 | | |
| 9 | 6/13/2012 | 7.4 | 3.7 | ND | 11 | | |
| 10 | 11/29/2012 | 1 | 0.7 | ND | 1.7 | | |
| 11 | 6/5/2013 | 0.7 | 0.5 | ND | 1.2 | | |
| 12 | 6/17/2013 | | 0 | ND | 0 | | |
| 13 | 11/8/2013 | 2 | 1.7 | ND | 3.7 | | |
| 14 | 5/15/2014 | 2.4 | 1.3 | ND | 3.7 | | |
| 15 | 7/1/2015 | 26 | 3 | ND | 29 | | |
| 16 | 11/22/2015 | 20 | 1.9 | ND | 22 | | |
| 17 | 6/26/2016 | 6.6 | 0.7 | ND | 7.3 | | |
| 18 | 11/13/2016 | 2.7 | 0.5 | ND | 3.2 | | |
| 19 | 11/19/2017 | 2.3 | 0.3 | ND | 2.6 | | |
| 20 | 6/24/2018 | 0.8 | 0.5 | ND | 0.8 | | |
| 21 | | | | | | | |
| 22 | | | | | | | |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 25 | | | | | | | |
| Coefficient of Variation: | 1.38 | 1.02 | | 1.01 | | | |
| Mann-Kendall Statistic (S): | 53 | -98 | | -27 | | | |
| Confidence Factor: | 96.6% | 99.9% | | 79.8% | | | |
| Concentration Trend: | Increasing | Decreasing | | No Trend | | | |



Notes:

- At least four independent sampling events per well are required for calculating the trend. Methodology is valid for 4 to 40 samples.
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S=0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.B. Rifai, C.J. Newell, and J.R. Gonzalez, Ground Water, 41(3):355-367, 2003.

DISCLAIMER: The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.
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Figure C-21: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well T-11

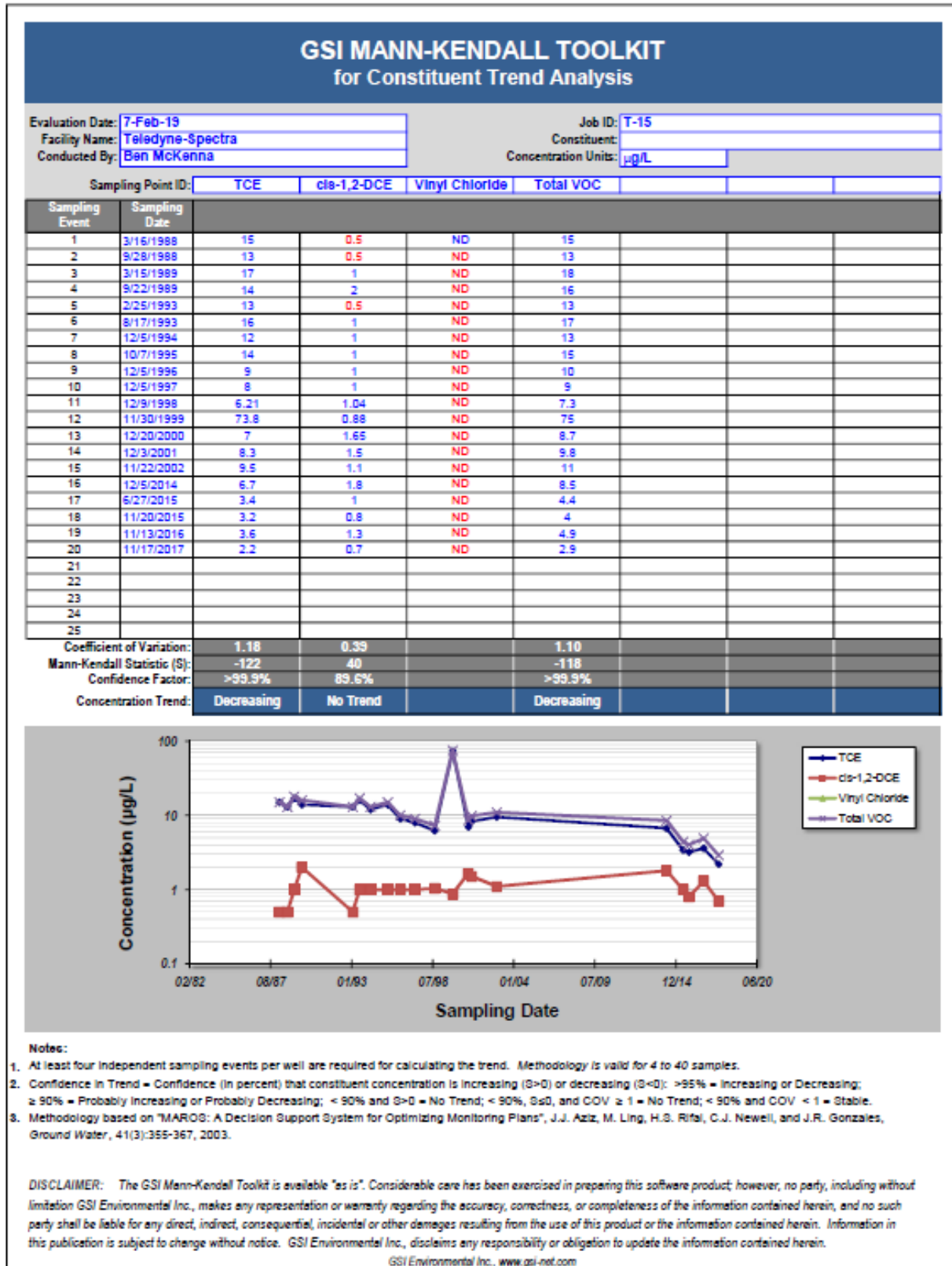


Figure C-22: Mann-Kendall trend analysis for TCE, cis-1,2-DCE, Vinyl Chloride and Total CVOCs in Well T-15

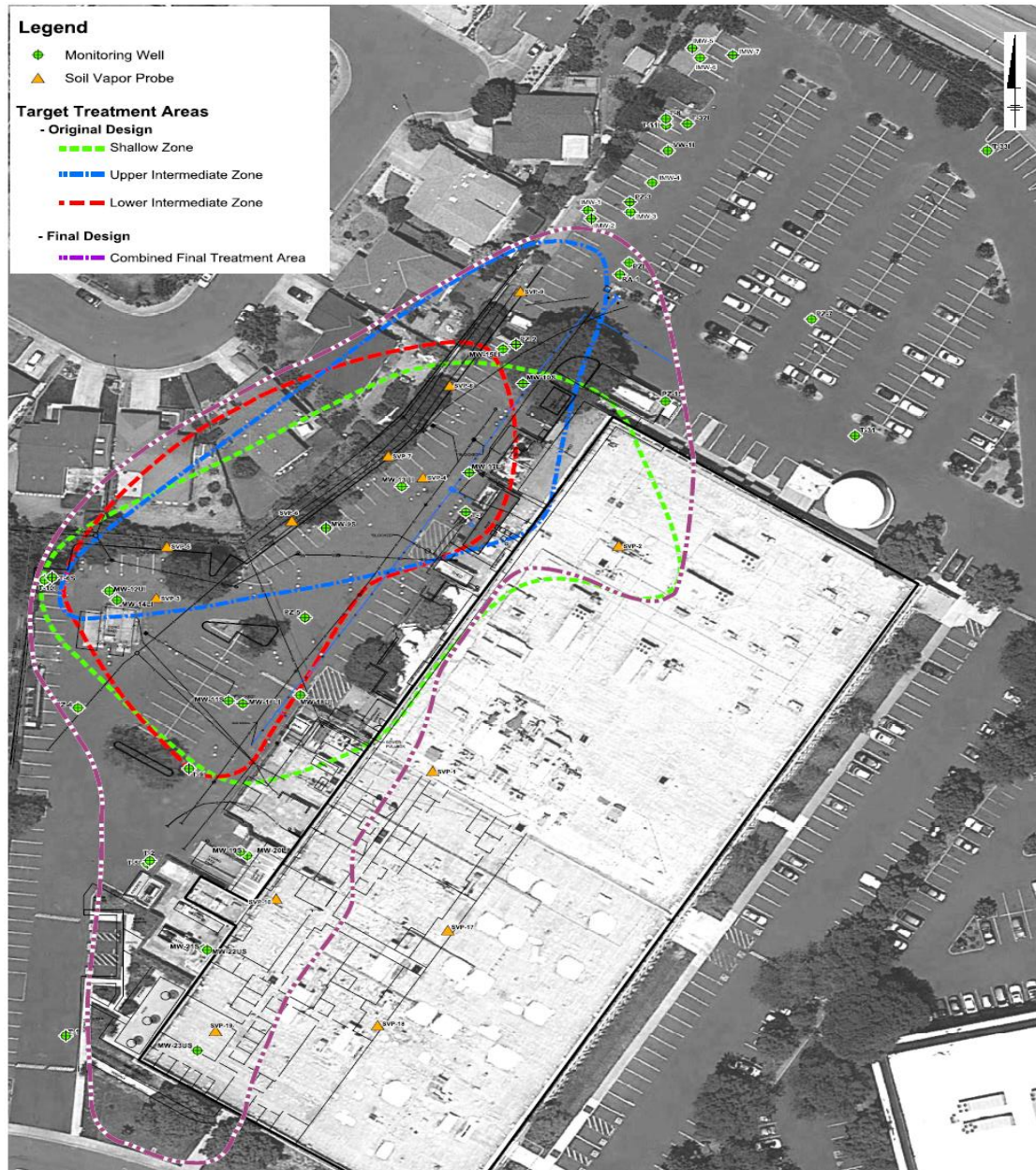


Figure C-23: ERD Treatability Study Location Map

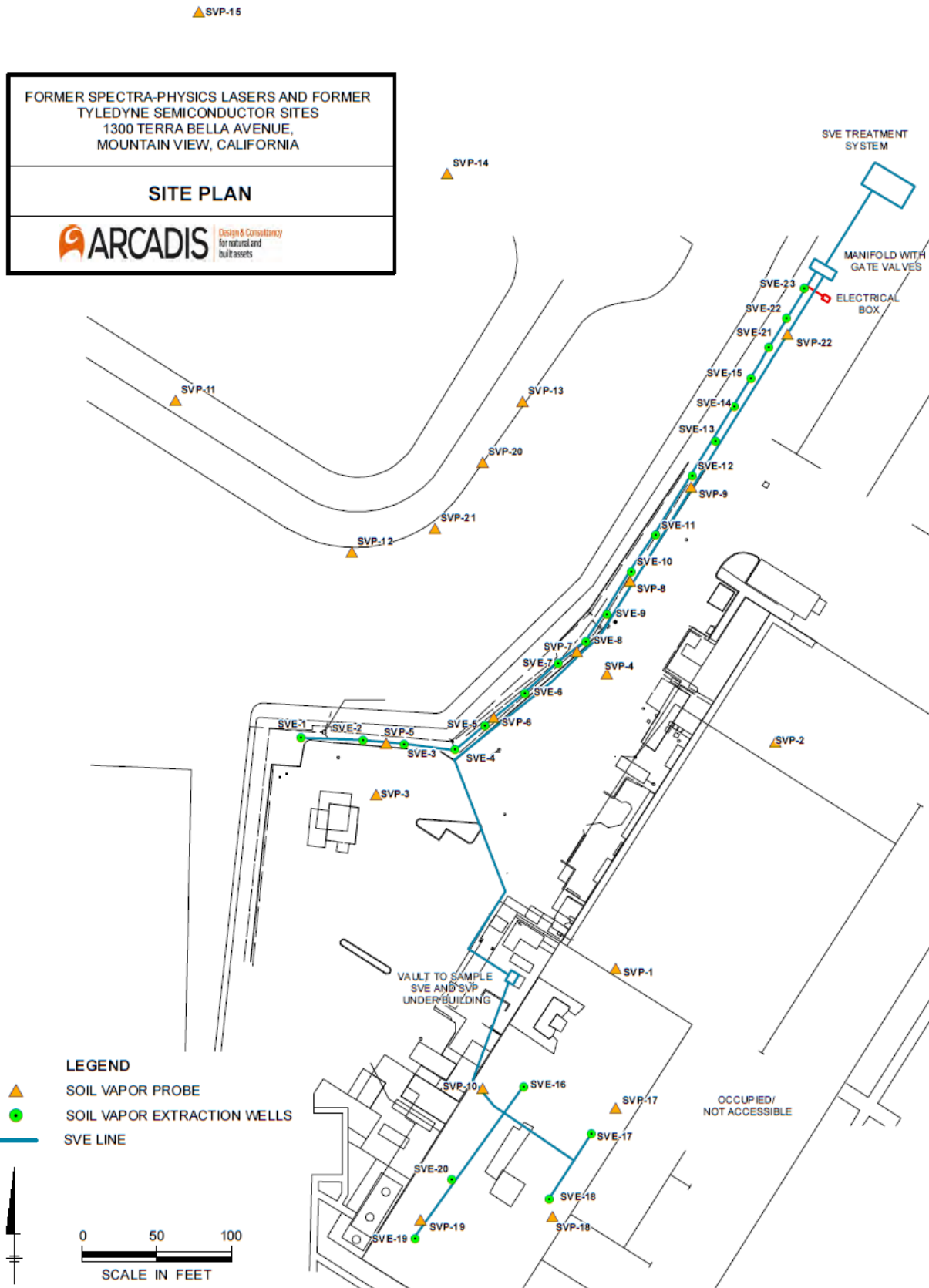


Figure C-24. Methane Mitigation System and Soil Vapor Monitoring



Figure C-25. Residential and Commercial Buildings Included in the Vapor Intrusion Study Area.

Table C-1. Wells Sampled Since Previous Five-Year Review

| Spectra-Physics On-Property | Off-Property Monitoring Wells | Spring Street Monitoring and Extraction Wells | North Bayshore Extraction Wells | Teledyne On-Property Wells |
|-----------------------------|-------------------------------|---|---------------------------------|----------------------------|
| S-1 | <u>W-1</u> | <u>MS-1S</u> | <u>E1</u> | <u>T-2</u> |
| <u>S-2</u> | <u>W-2</u> | MS-2I | <u>E2</u> | <u>T-4</u> |
| <u>S-3</u> | W-2A | MS-3I | <u>E3</u> | T-5 |
| S-4 | W-3 | <u>MS-4S</u> | <u>E4</u> | <u>T-6S</u> |
| S-5 | W-4 | MS-6I | <u>E5</u> | <u>T-7</u> |
| S-7 | W-4A | <u>MS-9S</u> | <u>E6</u> | <u>T-9</u> |
| <u>S-8</u> | W-6 | <u>MS-10S</u> | <u>E7</u> | T-10 |
| S-9 | W-6A | <u>PS-1S</u> | <u>E8</u> | <u>T-11</u> |
| S-11 | <u>W-21</u> | <u>PS-3I</u> | <u>E9</u> | T-13 |
| S-12 | <u>Well 23</u> | <u>PS-4S</u> | <u>E10</u> | <u>T-14</u> |
| S-13 | W-24S | <u>PS-5I</u> | <u>E11</u> | <u>T-15</u> |
| S-14 | W-24I | <u>PS-6S</u> | <u>E12</u> | T-19 |
| <u>S-15I</u> | <u>W-27I</u> | <u>ES-1S</u> | <u>E13</u> | T-20 |
| S-16I | W-28S | <u>ES-2S</u> | <u>E14</u> | T-31S |
| <u>S-17</u> | W-28I | <u>ES-3I</u> | <u>E15</u> | T-34S |
| <u>S-18</u> | W-30S | <u>ES-4I</u> | <u>E18</u> | <u>PZI-1</u> |
| S-18A | W-30I | <u>ES-5S</u> | <u>E19</u> | <u>PZ1S</u> |
| <u>S-19</u> | <u>NC1S</u> | | NB-25 | <u>PZ-2S</u> |
| <u>GMW-4S</u> | <u>NC2I</u> | | <u>NB-26I</u> | <u>PZ-5S</u> |
| <u>GMW-5S</u> | NC7S | | <u>GMW-1I</u> | <u>PZ-7S</u> |
| <u>R-1</u> | <u>NB-9</u> | | <u>GMW-1S</u> | <u>MW-9S</u> |
| | <u>NB-18I</u> | | <u>GMW-2I</u> | <u>MW-10S</u> |
| | | | <u>GMW-3S</u> | MW-11S |
| | | | <u>GMW-3I</u> | <u>MW-19S</u> |
| | | | | MW-21S |
| | | | | MW-22US |
| | | | | <u>MW-23US</u> |
| | | | | MW-12UI |
| | | | | <u>MW-13UI</u> |
| | | | | <u>MW-14LI</u> |
| | | | | <u>MW-15LI</u> |
| | | | | <u>MW-16LI</u> |
| | | | | <u>MW-17LI</u> |
| | | | | <u>MW-18UI</u> |
| | | | | <u>MW-20LI</u> |
| | | | | <u>A-8S</u> |
| | | | | <u>B-25US</u> |
| | | | | <u>B-26US</u> |
| | | | | <u>B-27US</u> |
| | | | | <u>B-28US</u> |

Notes: **Bold, underlined values** are wells that had an exceedance of one or more COCs.

Appendix D: ARAR Assessment

Section 121(d)(2)(A) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) specifies that Superfund remedial actions must meet any Federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). ARARs are those standards, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

Changes (if any) in ARARs are evaluated to determine if the changes affect the protectiveness of the remedy. The 1991 Record of Decision (ROD) identified chemical-, action-, and location-specific ARARs for the site. The State of California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) Site Cleanup Requirements (SCR) Order No. 91-025 (SCR Order) identified chemical-, and action-specific ARARs. Each ARAR and any change to the applicable standard or criterion are discussed below.

Chemical-specific groundwater ARARs identified in the selected remedy are listed in Table D-1. Since the ROD and SCR Order were issued in 1991, the following standards have become more stringent:

- For 1,2,4-trichlorobenzene (1,2,4-TCB), a state Maximum Contaminant Level (MCL) was instituted that is more stringent than the original and current federal MCL.
- Chloroform, at the federal level, is now regulated as part of total trihalomethanes (TTHMs), which now has a more stringent federal Maximum Contaminant Level Goal (MCLG) and MCL.

The SCR Order also identified a soil chemical-specific ARAR for total CVOCs of 2.5 parts per million (ppm) between depths of 0 and 10 feet, and 0.5 ppm between depths of 10 and 14 feet. Soil cleanup or monitoring is no longer a part of the ongoing remedy, and this is no longer applicable.

Federal and State laws and regulations other than the chemical-specific ARARs (action- and location-specific ARARs) that have been promulgated or changed since the 1991 ROD are described in Table D-2. ARARs identified in the 1991 ROD that are no longer pertinent due to the current remedy phase are not included in the table. Although there have been changes to the ARARs since the 1991 ROD, there have not been changes that affect the protectiveness of the remedy.

The following action-specific ARARs have not changed since the 1991 ROD, and therefore do not affect protectiveness:

- California Resolution 68-16 “Antidegradation Policy”
- OSWER Directive 9355.00-28 “Control of Air Emissions from Superfund Groundwater Air Strippers and Superfund Sites”

Table D-1. Summary of Groundwater ARARs

| Chemical | 1991 ROD and 1991 Board Order Cleanup Levels ¹ | | | Current MCLs | | | Notes |
|------------------------------------|---|-------------------|-------------------|-------------------|-------------------|-----------------|--|
| | Calif. MCL (µg/L) | USEPA MCLG (µg/L) | USEPA MCL (µg/L) | Calif. MCL (µg/L) | USEPA MCLG (µg/L) | UEPA MCL (µg/L) | |
| 1,1-DCA | <u>5</u> | -- | -- | 5 | -- | -- | No changes |
| 1,2-DCB | -- | <u>600</u> | <u>600</u> | 600 | 600 | 600 | State has adopted federal MCL |
| 1,1-DCE | <u>6</u> | 7 | 7 | 6 | 7 | 7 | No changes |
| <i>cis</i> -1,2-DCE ² | <u>6</u> | 70 | 70 | 6 | 70 | 70 | No changes |
| <i>trans</i> -1,2-DCE ³ | <u>10</u> | NA | NA | 10 | 100 | 100 | No changes |
| PCE | <u>5</u> | 0 | <u>5</u> | 5 | 0 | 5 | No changes |
| 1,2,4-TCB | -- ⁴ | <u>9</u> | <u>9</u> | 5 | 70 | 70 | Federal MCL is now less stringent than ROD; State MCL is now more stringent than ROD |
| 1,1,1-TCA | <u>200</u> | <u>200</u> | <u>200</u> | 200 | 200 | 200 | No changes |
| 1,1,2-TCA | 32 | <u>3</u> | 5 | 5 | 3 | 5 | State MCL is now equal to federal MCL; ROD remains most stringent |
| TCE | <u>5</u> | 0 | <u>5</u> | 5 | 0 | 5 | No changes |
| Toluene | <u>100</u> ⁵ | 1,000 | 1,000 | 150 | 1,000 | 1,000 | State DWAL removed, replaced with state MCL less stringent than ROD |
| vinyl chloride | <u>0.5</u> | 0 | 2 | 0.5 | 0 | 2 | No changes |
| Chloroform | -- | -- | <u>100</u> | -- | 70 | 80 ⁶ | Federal MCLG and MCL are more stringent than it was in 1991 ROD. |

Notes:

1. **Bold, underlined** cleanup levels were applied as the ROD and/or SCR Order cleanup levels.
2. The ROD only identified "1,2-DCE" as an ARAR and applied the MCL for *cis*-1,2,-DCE.
3. Only the SCR Order identified *trans*-1,2-DCE as an ARAR. No federal MCL or MCLG was identified.
4. The SCR Order identified a calculated cleanup standard of 40 µg/L for 1,2,4-TCB.
5. State DWAL at the time of the ROD and SCR Order.
6. Chloroform is now regulated as part of TTHMs. The federal MCL for TTHMs is 80 µg/L.

Table D-2. Summary of ARAR Changes since 1991 ROD

| Requirement and Citation | Document | Description | Effect on Protectiveness | Comments | Amendment Date |
|--|-----------------|--|---------------------------------------|--|--|
| Section 1412 of the Safe Drinking Water Act 42 U.S.C. Section 300g-1 | 1991 ROD | Federal requirements for safe drinking water. The ROD states that a remedial goal was set to the most stringent of the: federal MCLG (if not equal to zero), federal MCL, or state MCL. | Changes do not affect protectiveness. | Revisions include changes to how MCLs are established. Any effect of subsequent changes are captured in Table C-1. | Aug. 6, 1996 |
| Calif. Dept. of Health Services (DHS) Drinking Water Action Levels (DWALS) California Health and Safety Code § 116455 | 1991 ROD | State of California health-based drinking water advisories for chemicals without MCLs. The ROD noted the DWAL for toluene was 100 ppb. | Changes do not affect protectiveness. | Revisions renamed the DWAL to Drinking Water Notification Levels. These are now regulated under the Division of Drinking Water. Changes to notification levels are captured in Table C-1. | Jan. 1, 2005 |
| City of Mtn. View Industrial Waste Ordinance Mountain View City Code, Chapter 35, Article III, Division 3, | 1991 ROD | City of Mountain View requirements for discharges to the sanitary sewer. | Changes do not affect protectiveness. | Any changes to city industrial waste discharge requirements do not affect protections of the remedy. | Dec. 6, 1994 Sept. 24, 2002 Dec. 7, 2004 Nov. 27, 2007 Mar. 26, 2013 |
| Federal Clean Water Act Pretreatment Standards 40 CFR 403.5 | 1991 ROD | National pretreatment standards for discharges to the sanitary sewer. | Changes do not affect protectiveness. | Changes streamlines pretreatment regulations and expanded the definition of limits that can be implemented by local agencies. | June 29, 1995 Oct. 14, 2005 |

| Requirement and Citation | Document | Description | Effect on Protectiveness | Comments | Amendment Date |
|---|----------|---|---------------------------------------|---|---|
| Bay Area Air Quality Management District (BAAQMD) Regulation 8, Rule 47 | 1991 ROD | State of California regulations on air stripping and soil vapor extraction operations. | Changes do not affect protectiveness. | Any changes BAAQMD air discharge requirements do not affect protections of the remedy. | June 15, 2005 June 15, 1994 Oct. 6, 1993 |
| RCRA Land Disposal Restrictions 40 CFR 268 | 1991 ROD | Federal requirements for land disposal of hazardous wastes. ROD noted this was relevant and appropriate to disposal of treatment medial. | Changes do not affect protectiveness. | Any changes to RCRA land disposal requirements do not affect protections of the remedy. | 1992: Mar 6, Aug 18 1993: Feb 16, May 24 1994: Jun 20, Sep 19 1995: Jan 3, May 11 1996: Apr 8, Jun 28, Oct 28 1997: Jan 14, Feb 19, May 12, Jun 17, Jul 14, Dec 5 1998: May 4, May 26, Aug 6, Sep 4, Sep 24, Nov 30 1999: Mar 17, May 11, May 26, Jul 6, Oct 20, 2000: Jun 8, Nov 8, Dec 26 2001: Jun 26, Nov 20 2002: May 22, May 28 2004: Feb 11, Nov 19 2005: Feb 24, Jun 14, Aug 3, Aug 5 Feb 24 2006: Feb 7, Apr 4, Jul 14 2008: May 14 2010: Mar 18, Dec 17 2011: June 13 2012: Aug 22 2016: Nov 28 |

Appendix E: Press Notice



REGIONAL WATER BOARD AND EPA BEGIN 5TH FIVE-YEAR REVIEW OF CLEANUP AT TELEDYNE SEMICONDUCTOR/SPECTRA-PHYSICS LASERS SUPERFUND SITE IN MOUNTAIN VIEW, CA

The California Regional Water Quality Control Board, San Francisco Bay Region (Regional Water Board) and the U.S. Environmental Protection Agency (EPA) are conducting a review of cleanup actions at the Teledyne Semiconductor/Spectra-Physics Lasers Superfund Site in Mountain View (Site). The site includes two adjacent source properties: the Teledyne Semiconductor Superfund site (Teledyne property), located at 1300 Terra Della Avenue, and the Spectra-Physics Lasers Superfund site (Spectra-Physics property), located at 1200 Modified Road. The site also includes the groundwater solvent plume extending northwards from the two source properties. The review evaluates whether the cleanup actions for the site are protective of human health and the environment.

For this review, the Regional Water Board and EPA will study site-specific information for the period between 2014-2019 to evaluate how well the cleanup remedies are working. To do this, the project managers will conduct facility inspections and talk with company representatives, other regulatory authorities, and interested members of the public. The methods, findings and conclusions from the review will be documented in the Five-Year Review report, to be issued by Fall 2019. The report will be available to the public online at the websites listed below.

Any member of the public who wishes to participate in an interview and provide input is welcome to contact the agencies at the contact information below.

Groundwater investigations began at the site in the 1980s to determine the extent of solvent contamination resulting from discharges at the Teledyne and Spectra-Physics manufacturing facilities. Groundwater and soil vapor extraction and treatment were conducted to contain and treat the groundwater and soil vapor, contaminated with a variety of solvents including trichloroethene (TCE). Cleanup activities at the Teledyne and Spectra-Physics source properties included: removal of leaking tanks, equipment and contaminated soils; groundwater and soil vapor extraction; and, in-place cleanup efforts consisting of bioremediation, an approach that stimulates the naturally occurring underground microbes to break down the solvents into harmless end products. TCE indoor air sampling in residences and commercial buildings is ongoing. Measures are being taken whenever necessary to prevent unacceptable levels of TCE vapors from building up indoors.

The Regional Water Board and EPA invite the community to learn more about this review process and provide input by contacting the Regional Water Board Project Manager, Roger Pieper, at (916) 622-2435 or by e-mail to roger.pieper@waterboards.ca.gov.

You can find more site information, including recent technical documents, by visiting the following websites:

State website: <http://www.waterboards.ca.gov/>
 Enter file number 4350100 for Teledyne Semiconductor
 Enter file number 4350120 for Spectra-Physics Lasers

EPA website: <http://www.epa.gov/epaospr/remediation>
<http://www.epa.gov/epaospr/remediation>

CNS-32473879

LocalNews

Burglars strike four cars at Mountain View Icon movie theater

By Kevin Forestieri

Four vehicles were burglarized April 30 outside of the Icon Movie Theatre in the San Antonio Shopping Center, according to police. Two laptops were reportedly stolen in the heist.

All four thefts occurred between 6 p.m. and 9:40 p.m. In all four cases, an unknown number of thieves smashed the windows of parked cars at the 2500 block of California Street. A backpack containing an Apple laptop was taken from one vehicle and a Dell laptop was taken from another, police said.

Nothing was stolen from two of the vehicles, but in both those cases there was evidence that the thief or thieves tried to access the trunk of the car, police said.

Among the victims were two Mountain View residents, one East Palo Alto resident and one Menlo Park resident. All four of the burglarized cars were electric — two Teslas and two Chevrolets, a Bolt and a Volt.

Detectives are investigating the case, and could not immediately confirm whether all four thefts are related.

Mountain View is in the midst of a significant increase in auto burglaries this year, averaging between 80 and 100 reported cases per month since the start of the year. The most commonly targeted areas include downtown Mountain View, the Century Cinema 16 parking lots and the In-N-Out Burger parking lot on Rengstorff Avenue.

The San Antonio shopping center has not been a hot spot


for auto burglaries in previous years, but the number of reported cases is up this year, according to the crime tracking website CrimeReports.

In a separate incident just days before the Icon theater thefts, Mountain View police arrested two 19-year-old East Bay men at the Century Cinema theaters after they were reportedly spotted trying to open car door handles in the parking lots. Initial reports came from a security guard who reported the suspicious activity around 3:50 p.m. on April 27.

Officers found two men in the parking lot and reportedly found burglary tools in their possession. A third suspect inside a Honda SUV sped out of the parking lot toward Shoreline Boulevard, but officers did not pursue the driver.

The two men who were arrested could not provide a reason for being in the theater parking lots, according to police, and theater staff confirmed that neither had purchased a ticket at the box office. They were both arrested on suspicion of loitering and possession of burglary tools.

Nothing was reportedly stolen during the April 27 incident, police said.



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Call for Nominations

The El Camino Hospital Board of Directors is seeking individuals interested in serving as a member of its Quality, Patient Care and Patient Experience Committee. Candidates will have significant experience in at least one of the following areas: (1) Innovation [within or outside of healthcare], (2) Customer or Patient Experience, (3) Data and Technology Expertise or (4) Recent Patient (or Family of Patient) Experience at El Camino Hospital. An active executive or healthcare professional might be appropriate, as would consultants and advisors to the local community.

To inquire about the open position or to nominate someone you know, please email nominations@elcaminohealth.org

Submissions due by **May 24, 2019**

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Appendix F: Interview Forms

| Five-Year Review Interview Record | | | | |
|--|--|-------------------------|---|--------------|
| Site: | Teledyne Semiconductor/Spectra-Physics, Inc. | EPA ID No: | Teledyne Semiconductor: CAD009111444 Spectra-Physics, Inc.: CAD009138488 | |
| Interview Type: Phone Interview Location of Visit: NA Date: January 30, 2019 Time: 2:00 PM | | | | |
| Interviewers | | | | |
| Name | Title | Organization | | |
| Roger Papler | Engineering Geologist | San Francisco Bay RWQCB | | |
| Alison Suess | Chemist | USACE Seattle District | | |
| Interviewees | | | | |
| Name | Organization | Title | Telephone | Email |
| Resident (Anonymous) | Community Member | NA | NA | NA |
| | | | | |
| Summary of Conversation | | | | |
| <p>1) What is your overall impression of the project? (general sentiment)</p> <p>The Resident said that he knows the project is trying hard to get the site cleaned up. The Resident said that he had a previous complaint about noise from the SVE unit before the previous Five-Year Review (FYR). The previous unit used to keep the Resident and family awake, and after his complaint, a quieter unit was put in. He has had no issue since the previous FYR.</p> <p>The Resident asked how long the unit will be operating, and Roger Papler answered that as long as there is a potential impact on adjacent residential areas, the soil-vapor extraction will continue. The Resident asked where the soil-vapor goes, and Roger answered that it goes through carbon, which captures contaminants, and then clean air is discharged. The Resident asked how soil-vapor concentrations are known, and Roger explained that there are soil-vapor monitoring wells and soil-vapor is monitored at those points.</p> <p>2) What effects have site operations had on the surrounding community?</p> <p>The Resident said that he doesn't have much input. He said that he has been a resident for 30 years and that he has had no problem. He said that about 5 years ago, unrelated to the Superfund Site cleanup, an irrigation pipe burst at the property and flooded his backyard with 6-8 inches of water. He contacted city of Mountain View to report the issue, determine the owner, and verify that the water was shut off.</p> <p>3) Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.</p> <p>The Resident said not to his knowledge, since the noise problem from before the previous FYR was solved.</p> <p>4) Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.</p> <p>The Resident said no.</p> <p>5) Do you feel well informed about the site's activities and progress?</p> <p>The Resident said that he receives letters describing what is going on. He received the Proposed Plan in the mail recently. He said that he has contact information for Roger Papler if he has concerns.</p> <p>6) Do you have any comments, suggestions, or recommendations regarding the project?</p> <p>The Resident said that he wishes the pollution had not occurred in the first place, but has no other comments. Roger briefly summarized the cleanup progress that has been made that was discussed at the May 2018 Public Meeting. The Resident additionally noted there have been public meetings about a plan to construct a multi-story building on the former Teledyne Property.</p> | | | | |
| Additional Site-Specific Questions | | | | |
| None | | | | |

| Five-Year Review Interview Record | | | | |
|--|--|--------------------|------------------------|---|
| Site: | Teledyne Semiconductor/Spectra-Physics, Inc. | | EPA ID No: | Teledyne Semiconductor: CAD009111444 Spectra-Physics, Inc.: CAD009138488 |
| Interview Type: In-Person Interview During Site Visit (Additional Questions via Email, March 4, 2019) | | | | |
| Location of Visit: Teledyne Semiconductor/Spectra-Physics, Inc. Superfund Site | | | | |
| Date: | | | | |
| Time: | | | | |
| Interviewers | | | | |
| Name | Title | | Organization | |
| Benino McKenna | Hydrogeologist | | USACE Seattle District | |
| Alison M. Suess, Ph.D. | Chemist | | USACE Seattle District | |
| Interviewees | | | | |
| Name | Organization | Title | Telephone | Email |
| Ryan Mattson | Arcadis | Principal Engineer | (925) 296-7835 | Ryan.Mattson@arcadis.com |
| | | | | |
| Summary of Conversation | | | | |
| <p>1) What is your overall impression of the project?</p> <p>The project has been extremely successful over the past 5 years. The TDY/SP RPs are aggressively moving to remediate the remaining TCE source areas in groundwater and soil gas. The ERD full-scale treatability study implemented at the former Teledyne Semiconductor property has proven that ERD source area treatment is a more successful remedy than long-term groundwater extraction as evidenced by the dramatic reductions in VOC concentrations following ERD application. In addition, a new SVE system is being installed at the former Teledyne Semiconductor property to further remediate vadose zone soil beneath this former source area.</p> <p>MNA has been successful in mitigating groundwater VOC levels in the vicinity of the Spectra-Physics property. Currently, a two-year monitoring program is being implemented to monitor the progress of groundwater remediation in this area. The RP is willing to implement ERD in this area, should the monitoring results indicate a need to do so. A robust SVE system is being constructed to remediate residual vadose zone soil sources at the former Spectra-Physics Lasers property.</p> | | | | |
| <p>2) Is the remedy functioning as expected? How well is the remedy performing?</p> <p>The full-scale ERD treatability study has shown great reduction of TCE concentrations in groundwater at the source areas when compared to the previously selected groundwater extraction and treatment remedy. The maximum TCE concentration has dropped from 80 mg/L to 0.094 mg/L in shallow groundwater at the Teledyne Semiconductor source area since ERD was implemented in 2011 with subsequent injection events occurring in 2013-2014, 2016 and 2017. The VI issue at NBCB-8 identified in 2013 is no longer present in 2018, likely as the result of the arrival of treated groundwater from the ERD area. Treated groundwater has arrived at the first set of off-property downgradient wells, which are located on Plymouth St. in the North Bayshore Area, as evidenced by the steeper decline in TCE concentrations observed in these wells starting around 2016. The methane mitigation system at the former Teledyne Semiconductor building effectively controls methane generated by ERD.</p> <p>The RPs have promptly tested for potential VI and mitigated identified VI for nearby residents to the maximum extent allowed by the residents. Three active crawl space residential VIMS are currently operating without issue.</p> <p>There are no commercial VI issues for potentially affected buildings under current building operating conditions. HVAC system operation has been successful in mitigating vapor intrusion at the former Spectra-Physics Lasers source property as an interim measure while an SVE system to further augment vapor mitigation and to remove potential residual VOC mass from the subsurface is being designed and installed.</p> | | | | |
| <p>3) What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?</p> <p>VOC concentrations in groundwater in the Spring Street and North Bayshore areas have declined to the point where RWQCB has approved shutdown and dismantlement of the groundwater extraction systems. Around 2016, we began to see a steeper decline in groundwater TCE concentrations in off-property wells located on Plymouth St. in the North Bayshore Area. These are the first set of off-property wells downgradient of the ERD treatability study at former Teledyne Semiconductor property. In general, a decreasing trend in TCE concentrations has also been observed in wells monitored at the former Spectra-Physics Lasers property as part of a monitored natural attenuation trial evaluation.</p> <p>Significant attenuation has been observed in soil gas VOC levels in the vicinity of the SVE system at 1245 Terra Bella, which is immediately downgradient of the former Spectra-Physics Lasers source property. Similarly, significant attenuation has been observed in soil gas VOC levels in the Spring Street Area, which is immediately downgradient of the full-scale ERD treatability study area at the former Teledyne Semiconductor property.</p> | | | | |

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

The SVE and methane mitigation systems are inspected monthly. During the monthly visits, routine maintenance is performed, required data are recorded, and prescribed samples are collected. The SVE and methane mitigation systems have alarms in place which, under an upset condition, will activate an autodialer to call out for non-routine maintenance. Technicians based within an hour travel distance of the SVE and methane mitigation systems are assigned to perform the routine and non-routine O&M. The residential VI systems are inspected annually. Long term groundwater monitoring is performed biennially with a subset of wells monitored annually.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.

The methane mitigation system at the former Teledyne Semiconductor property was expanded to provide additional methane mitigation protection when the ERD footprint was expanded in 2014. O&M requirements and sampling routines have been adjusted accordingly over the past five years. These changes did not detract from and in some cases improved the protectiveness of the remedy.

6) Have there been unexpected O&M difficulties or costs at the site in the last five years? If so, please give details.

There have been no significant difficulties for O&M. Replacement of a circuit breaker and a transformer on the methane mitigation system at the former Teledyne Semiconductor property was required in 2018 and 2019, respectively. From time to time the commercial SVE systems shut down due to power failures, or high water levels in the condensation tank. Autodialer systems have effectively minimized downtime by notifying the appropriate parties (Arcadis or FTCH) who have quickly returned the systems to operational status.

7) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

Given the groundwater plume is largely in a mature and stable state, the RPs have proposed a reduced long-term groundwater monitoring program consisting of annual and biennial monitoring to replace the current semiannual and annual monitoring program. This change is expected to reduce sampling costs by approximately \$225,000 NPV over the next 10 years.

8) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

New vapor intrusion screening levels/regulations have come into effect since the original remedy was selected. The preferred remedial alternative in the Final Revised Focused Feasibility Study for remedy change includes a vapor intrusion toolkit to evaluate and mitigate VI. The remedy changes once formalized in a ROD amendment will ensure continuing protectiveness of the remedy.

9) Do you have any comments, suggestions, or recommendations regarding the project?

The RPs have been proactive in implementing additional state-of-the-art remedial solutions to reduce cleanup time and protect human health, safety, the environment, and the community. We respectfully request that the regulatory process be expedited to formally adopt as the approved remedy Alternative 3 in the FFS, which was presented by the USEPA and RWQCB to the public in May 2018.

Additional Site-Specific Questions (Email Questionnaire)

Vapor Intrusion:

1) How many, if any residences have not been sampled?

A total of 18 residences in the study area have not been sampled due to residents not responding to communications/outreach or refusing access:

- SSRB-40, SSRB-42, SSRB-NS-A, SSRB-NS-B, SSRB-NS-D, SSRB-NS-H, SSRB-NS-I, SSRB-NS-L, SSRB-NS-M, SSRB-NS-Q, SSRB-NS-R, SSRB-NS-V, SSRB-NS-Z, SSRB-NS-BB, SSRB-NS-EE, SSRB-NS-FF, SSRB-NS-GG, SSRB-NS-HH.

2) How many residences have a vapor mitigation system in place? Do all residences with exceedances have a vapor mitigation system in place?

Active vapor mitigation systems are installed and operating on three residences: SSRB-6, SSRB-8, SSRB-21.

Not all residences with exceedances have a vapor mitigation system in place. For the purposes of the list below, an exceedance is defined as a site-related constituent of concern (COC) detection in breathing zone indoor air above the

USEPA's Regional Screening Levels (RSLs) on the most recent round of indoor air sampling. COC detections greater than the RSLs were observed at a total of five residences that currently do not have a vapor mitigation system in place.

TDY/SP could not proceed with vapor mitigation or follow up sampling due to residents not responding to communications/outreach or refusing access at each of these residences. The residences are listed below:

- SSRB-10, SSRB-13, SSRB-23, SSRB-24, SSRB-27.

3) How many commercial buildings have not yet been sampled with "HVAC off" (presuming all have been sampled with "HVAC on")?

There is currently one commercial building in the study area yet to be sampled with HVAC on:

- NBCB-20.

There are currently nine commercial buildings yet to be sampled with HVAC off:

- NBCB-4, NBCB-7, NBCB-9, NBCB-11, NBCB-12, NBCB-15, NBCB-20, SPCB-3, SPCB-19.
 - Access has been negotiated to seven of these properties and TDY/SP is actively planning HVAC off sampling with the respective property managers for six of the buildings.
 - HVAC off sampling will be performed at SPCB-3 after the SSD/SVE system is installed in 2019.
 - Access negotiations are ongoing at two commercial properties (NBCB-12, NBCB-20)

4) How many commercial buildings have vapor mitigation systems in place, other than "HVAC on"? Are there buildings without vapor mitigation systems that had exceedances?

Four commercial buildings have vapor mitigation systems in place other than normally operating HVAC on:

- SPCB - 3: 24/7 HVAC operation above room with exceedance (new SSD/SVE system being constructed)
- SPCB-13: SVE system (also functions as precautionary VIMS)
- SPCB-16: SVE system (also functions as precautionary VIMS)
- SPCB-18: SSD system (precautionary VIMS)

All commercial buildings that have been sampled and with known HVAC on exceedances on the most recent round of indoor air sampling have a vapor mitigation system in place.

5) When is the VI study estimated to be completed?

The residential VI study is essentially complete with at least two rounds of sampling having been conducted, one in the heating and one in the cooling seasons. VI concentrations are less than U.S. EPA residential screening levels. The residential VI study is complete for all sampled properties with the exception of a second round of post-mitigation sampling at RB-21. Reasonable attempts will be made to conduct additional residential VI activities whenever there is a change in residency at any of the properties that were not sampled or mitigated due to previous property owner responsiveness or denial of access.

Completion of the commercial VI study is anticipated by December 31, 2019.

Appendix G: Site Inspection and Photographs from Site Inspection Visit

Trip Report

Teledyne Semiconductor-Spectra Physics Superfund Site, Mountain View, California

1. INTRODUCTION

- a. Date of Visit: 13 March 2019
- b. Location: Mountain View, California
- c. Purpose: A site visit was conducted to visually inspect and document the conditions of the remedy, the site, and the surrounding area for inclusion into the Five-Year Review Report.
- d. Participants:

| | | |
|--------------------|---|-------------------------|
| Roger Papler | California Regional Water Quality Control Board | (510) 622-2435 |
| Benino McKenna | USACE Seattle District Hydrogeologist | (206) 764-3803 (author) |
| Ryan Mattson | Arcadis Principal Engineer | (925) 296-7835 |
| Michelle McDuffy | Kilroy Realty Corporation | (650) 289-5330 |
| William Maloney | Spectra Physics/Newport Corporation | (650) 464-5737 |
| Amy Wilson | TRC Consultants | |
| Daniel P. Shea | MKS Instruments, Inc. | |
| Christopher Abbott | MKS Instruments, Inc. | |

2. SUMMARY

A site visit to the Teledyne Semiconductor-Spectra Physics Superfund Site was conducted on 13 March 2019. Participants from the California Regional Water Quality Control Board (Water Board), Arcadis, MKS Instruments, Kilroy Realty, Spectra Physics/Newport, TRC Consultants and USACE met at the former Teledyne Site at 1300 Terra Bella Ave. The weather was sunny, clear with a light breeze and cool (temperature approximately 58° F).

The Teledyne-Spectra Site is located in Mountain View, California, and is comprised of multiple sites including: Teledyne Semiconductor source area site; Spectra Physics Lasers source area site; and the North Bayshore area. The buildings at the source area on Terra Bella Avenue are still in use for light industrial activities. Most of the buildings formerly used by Spectra-Physics are still in use although at least one is vacant and another, on West Middlefield Road, was vacated by industrial/commercial occupants and is being used as a church. Northwest of and adjacent to the former Teledyne property, the western lateral portion of the plume underlies the residences in the Spring Street area. Buildings above the plume in the down-gradient area, to the north of Highway 101, are almost exclusively

commercial offices. This area is considered the North Bayshore area. Remediation is currently being conducted on site consisting of Enhanced Reductive Dechlorination (ERD) injections and soil vapor extraction (SVE) systems. Participants toured the sites and inspected the above-referenced systems.

3. DISCUSSION

On 11 March, Ben McKenna flew to San Jose, California to meet with multiple parties for five Year Review Site Visits at multiple sites. On 13 March, Ben McKenna met the Water Board and other participants at 1300 Terra Bella Ave to inspect the former Teledyne property methane monitoring system in the rear parking lot of the site. The site is accessed from California Highway 101 South and North Shoreline Boulevard and is located northwest of downtown San Jose. Water Board and USACE participants were met on site by Arcadis consultants and proceeded to inspect the methane monitoring system on site and the associated extraction points, conveyance piping and monitoring wells. All components of the remedial system appeared in good shape and functioning properly.

The participants next toured the inside of 1300 Terra Bella Ave. (currently occupied by the Elementum company) to inspect the soil vapor monitoring points and ERD injection points inside the building.

After inspecting the interior of 1300 Terra Bella participants walked south of the former Teledyne property to 1245 Terra Bella Ave where a SVE system was installed to mitigate potential soil vapor intrusions at the 1245 Terra Bella site.

The participants next walked to the former Spectra-Physics property at 1250 West Middlefield Road to inspect the Community Baptist Church that now occupies the site. Arcadis proceeded to show participants the sub-slab soil vapor sample points that were installed in the building and gave a brief review of the sampling history. Arcadis also reviewed the results of the indoor air sampling and explained the mitigation measure of continuous positive pressure HVAC operations have successfully mitigated the indoor air impacts. Arcadis recently completed a sub-slab depressurization study where soil vapor test probes were installed throughout the building and were used to measure the amount of vacuum induced to aid in future sub-slab mitigation measures. Future remediation for the site includes the installation of an SVE system to mitigate potential sub-slab soil vapor intrusion.

Lastly the participants drove down the Spring Street and North Bayshore areas to observe the existing Groundwater Extraction and Treatment Systems (GWETS). All GWET systems for the Teledyne-Spectra Superfund site have been deactivated and no active pumping is currently ongoing.

After viewing the deactivated GWET systems in the North Bayshore Area and Spring Street areas the site inspections were concluded and all participants left the site by 1600.

4. ACTIONS

The USACE will incorporate information obtained from the site visit into the Five Year Review report.



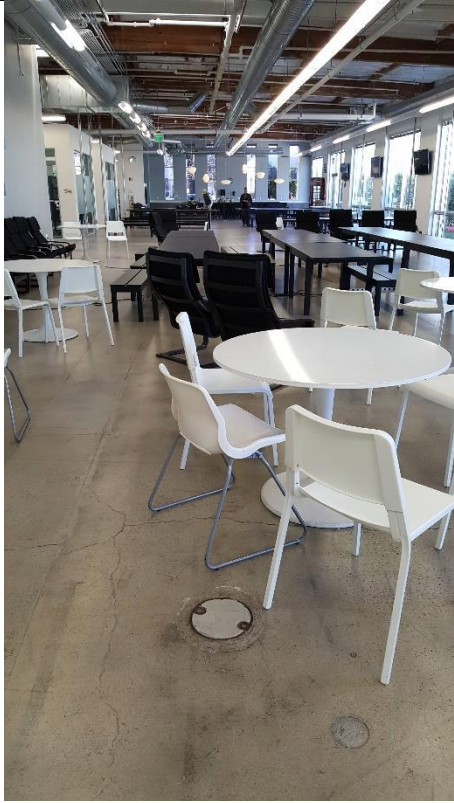
1300 Terra Bella Methane Mitigation System Compound



1300 Terra Bella Methane Mitigation System GAC Vessels



1300 Terra Bella Methane System INF Sample Port



1300 Terra Bella Methane Mitigation System Effluent Stack



1300 Terra Bella Interior Soil Vapor Probe



1300 Terra Bella Interior ERD Injection Well



1245 Terra Bella Building



1245 Terra Bella SVE System



1250 West Middlefield Road Occupant



1250 West Middlefield Road Interior Soil Vapor Probe

