2024
Annual Site Environmental Report

Department of Energy Operations at the Energy Technology Engineering Center – Area IV
Santa Susana Field Laboratory

October 2025

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NORTHWIND PORTAGE, INC.

2024 Annual Site Environmental Report

Department of Energy Operations at the Energy Technology Engineering Center – Area IV Santa Susana Field Laboratory

October 2025

Contract No. 89303324DEM000108
Task Order No. 89303324FEM400407

Prepared for:
U.S. Department of Energy

Prepared by:
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CERTIFICATE OF ACCURACY

I certify that I have personally examined, and am familiar with, the information submitted herein and, based on inquiry of those individuals immediately responsible for preparing this report, believe that the submitted information is true, accurate, and complete.

JB Quinby

JB Quinby (Sep 25, 2025 12:17:28 PDT)

Britt Quinby
Program Manager
North Wind Portage, Inc.
Santa Susana Field Laboratory

Adobe Acrobat Sign Transaction Number: CBJCHBCAABAA9jh9ZEKd9XPGbwysicSfma7ylJnGAZ0B

September 2025

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U. S. Department of Energy
Energy Technology Engineering Center
980 Enchanted Way, Suite 108
Simi Valley, CA 93065

September 29, 2025

SUBJECT: DOE Certification for the 2024 Annual Site Environmental Report for the Energy Technology Engineering Center (ETEC)

North Wind, Inc. has prepared the subject report for the U.S. Department of Energy (DOE). It is a comprehensive summary of the Department's environmental protection activities at ETEC located in Area IV of the Santa Susana Field Laboratory (SSFL) facility in Ventura County, California for Calendar Year 2024. Site Environmental reports are prepared annually for all DOE sites with significant environmental activities.

To the best of my knowledge, this report accurately summarizes the results of the 2024 environmental monitoring and restoration program at ETEC for DOE. This statement is based on reviews conducted by DOE-ETEC staff and by the staff of North Wind, Inc.

Sincerely,

JOSHUA MENGERS

Digitally signed by JOSHUA MENGERS
Date: 2025.09.29 13:59:30 -07'00'

Dr. Josh Mengers
ETEC Director, Site Manager

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Acronyms

AOC	Administrative Order on Consent
ASME	American Society of Mechanical Engineers
BCG	biota concentration guide
bgs	below ground surface
BMP	best management practice
Boeing	The Boeing Company
CAA	Clean Air Act
Cal-EPA	California Environmental Protection Agency
CDM	Camp Dresser & McKee
CDPH	California Department of Public Health
CFR	Code of Federal Regulations
CMS	Corrective Measures Study
Co-60	cobalt-60
CoC	chain of custody
Cs-137	cesium-137
DCS	derived concentration standard
DPH/RHB	Department of Public Health/Radiological Health Branch
DMR	discharge monitoring report
DOE	Department of Energy
DRO	diesel-range organic
DTSC	Department of Toxic Substances Control
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ETEC	Energy Technology Engineering Center
Eu-152	europium-152
FONSI	Finding of No Significant Impact

FR	Federal Register
FSDF	Former Sodium Disposal Facility
GRO	gasoline-range organic
GWIM	groundwater interim measure
H-3	tritium
HMSA	Hazardous Materials Storage Area
HWMF	Hazardous Waste Management Facility
LARWQCB	Los Angeles Regional Water Quality Control Board
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LUT	look-up table
MDL	method detection limit
MEI	maximally exposed individual
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NBZ	Northern Buffer Zone
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOI	notice of intent
North Wind	North Wind Portage, Inc.
NOA	notice of availability
NPDES	National Pollutant Discharge Elimination System
OCY	Old Conservation Yard
OSLD	optically stimulated luminescent detector
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity

PCE	tetrachloroethylene
PFAS	per- and polyfluoroalkyl substances
QA	quality assurance
QAPP	Quality Assurance Program Plan
QAPjP	Quality Assurance Project Plan
QC	quality control
R&D	research and development
Ra-226	radium-226
Ra-228	radium-228
RAD	radiochemical
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RHB	Radiologic Health Branch
RMHF	Radioactive Materials Handling Facility
ROD	record of decision
RPD	relative percent difference
RL	reporting limit
SDG	sample delivery group
SIM	selective ion monitoring
SIP	State Implementation Plan
SNAP	Systems for Nuclear Auxiliary Power
SPCC	spill prevention, control, and countermeasure
SPTF/CHCF	Sodium Pump Test Facility / Component Handling & Cleaning Facility
Sr-90	strontium-90
SRE	Sodium Reactor Experiment
SSFL	Santa Susana Field Laboratory
STP	Site Treatment Plan
TCA	trichloroethane
TCE	trichloroethene

TLD	thermoluminescent dosimeter
TO-15	Toxic Organics Method 15
TPH	total petroleum hydrocarbons
U	uranium
USFWS	U.S. Fish and Wildlife Service
VCAPCD	Ventura County Air Pollution Control District
VOC	volatile organic compound
WQSAP	Water Quality Sampling and Analysis Plan

1. EXECUTIVE SUMMARY

The 2024 Annual Site Environmental Report describes the environmental conditions related to work performed for the U.S. Department of Energy (DOE) at Area IV of the Santa Susana Field Laboratory (SSFL) as required by DOE Order (O) 231.1B, Administrative Change 1, "Environment, Safety and Health Reporting" (DOE 2011). This report is used to communicate internally to DOE, and externally to the public, the environmental monitoring results and the state of environmental conditions related to DOE activities at Area IV at SSFL. The report summarizes:

- Environmental management performance for DOE activities (e.g., environmental monitoring of effluents and estimated radiological doses to the public from releases of radioactive materials)
- Environmental occurrences and responses reported during the calendar year
- Compliance with environmental standards and requirements
- Significant programs and efforts related to environmental management.

In 2024, DOE continued implementation of routine environmental monitoring, surveillance, and maintenance activities at Area IV of the SSFL. This included quarterly perimeter air monitoring and dosimetry, quarterly radiation and contamination surveys at the Radioactive Materials Handling Facility (RMHF), and both quarterly groundwater level monitoring and annual groundwater sampling and reporting. Quarterly surface water reporting was also conducted and reported to the Boeing Company. Ongoing surveillance and maintenance tasks included inspection and upkeep of DOE infrastructure, vegetation control, road maintenance, and ensuring the structural integrity and operability of groundwater monitoring wells. Additionally, groundwater management activities at the Building 4024 basement involved regular inspection, monitoring, pumping, storage, transport, and off-site disposal of infiltrated groundwater. These actions support regulatory compliance and environmental stewardship in alignment with DOE's cleanup responsibilities at SSFL.

Based on this monitoring data, no activities occurred in Area IV in 2024 that would have released effluents into the atmosphere. Therefore, the potential radiation dose to the public through airborne release was zero. Similarly, the radiation dose to an off-site member of the public (maximally exposed individual) due to direct radiation from SSFL is indistinguishable from background.

Results of the radiological monitoring program continue to indicate that there were no significant releases of radioactive material from Area IV at the SSFL. All potential exposure pathways were sampled and/or monitored, including air, soil, surface water, groundwater, direct radiation, transfer of property (i.e., land, structures, and/or waste), and recycling. No radioactive waste was processed for disposal during 2024. No liquid radioactive waste was released into the environment.

In addition, DOE achieved several key accomplishments advancing environmental compliance and remediation efforts at the SSFL. A key accomplishment was the installation, inspection, and commissioning of the automated Groundwater Interim Measure (GWIM) system at the Former Sodium Disposal Facility (FSDF), enabling the efficient extraction, storage, and off-site disposal of contaminated groundwater. Installation began on March 19, 2024, passed final inspection on May 9, 2024, and became fully operational on June 3, 2024, following comprehensive start-up and testing. The GWIM system design capacity allows incorporation of additional wells to further increase the mass removal of contaminants of concern in the future. Additional groundwater-related activities performed across Area IV during 2024 included routine sampling of monitoring wells across the FSDF and the Hazardous Materials Storage Area (HMSA), and annual sampling of near-surface seep wells in the Northern Buffer Zone (NBZ) and on neighboring Brandeis University property.

DOE also initiated a laboratory Method Reporting Limit (MRL) study to evaluate the ability of analytical laboratories to meet the project's soil cleanup requirements. Soil samples from Areas II and IV were sent to multiple laboratories nationwide to assess MRL attainability, analytical capacity, and turnaround times. This effort will determine whether current project reference values are achievable or if adjustments to DOE's provisional soil look-up table (LUT) values are necessary.

DOE, in collaboration with the National Aeronautics and Space Administration (NASA) and Boeing, initiated an evaluation of off-site backfill material sources to replace contaminated soil anticipated for removal from SSFL. This effort included site visits to multiple commercial and county-owned soil facilities to conduct qualitative assessments. Sampling and chemical analyses at select sites are planned to continue into 2025.

Substantial progress was made on regulatory and technical documentation efforts in 2024. DOE submitted several essential work plans and technical memoranda, which underwent formal review and received approval from the Department of Toxic Substances Control (DTSC), reinforcing compliance with applicable state environmental regulations, as summarized below:

DTSC Approval of Work Plans and Technical Memoranda in 2024:

- Final HMSA Pilot Test Work Plan with Field Sampling and Analysis Plan and Quality Assurance Project Plan (QAPP) (approved 1/19/2024)
- Area IV Fault Evaluation Approach Technical Memorandum
- Implementation Plan for Laboratory Method Reporting Limits and Backfill Source Studies (approved 9/4/2024)
- 2022 FSDF GWIM Status Report (approved 9/9/2024)
- Per- and Polyfluoroalkyl Substances (PFAS) Search Term Evaluation Summary for Area IV (approved 9/24/2024)
- Groundwater Risk Assessment for Area IV (approved 10/11/2024)
- PFAS Groundwater Sampling and Analysis Work Plan (approved 12/18/2024)

- Burro Flats Fault and North Fault Investigation Work Plan (approved 12/18/2024)
- Sampling Table and Schedule for Q1 2025 Water Quality Sampling and Analysis Plan (WQSAP) (acknowledged 12/18/2024).

These achievements reflect DOE's continued commitment to regulatory compliance, environmental stewardship, and transparent coordination with DTSC and stakeholders.

The following sections in this report provide information related to ensuring protection of human health and the environment for DOE's operations in Area IV:

- **Section 2, Introduction**—Highlights the location, setting, and mission of DOE operations at SSFL.
- **Section 3, Compliance Summary**—Identifies and provides the status of applicable permits and other regulatory requirements for DOE's closure mission.
- **Section 4, Environmental Management System**—Summarizes the programs in place to characterize, monitor, and respond to known or potential releases to the environment that may pose a threat to human health and the environment.
- **Section 5, Environmental Radiological Protection Program and Dose Assessment—** Summarizes the data collection activities and associated results for radiological contaminants.
- **Section 6, Environmental Non-Radiological Program Information—**Summarizes the data collection activities and associated results for non-radiological contaminants.
- **Section 7, Groundwater Protection and Monitoring Program**—Addresses collection and analysis of groundwater samples and measurement of the water levels at SSFL.
- **Section 8, Ambient Air Monitoring Program**—Addresses daily air monitoring, along with the collection and analysis of air samples at SSFL.
- **Section 9, Soil Program**—Summarizes soil investigation with the objectives of determining the nature and extent of chemicals in soil and the potential threat to groundwater.
- **Section 10, Quality Assurance Program**—Summarizes the quality assurance/ quality control (QA/QC) elements incorporated into the data analysis program.

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2. INTRODUCTION

This Annual Site Environmental Report presents DOE's environmental monitoring results, compliance status, and site stewardship activities conducted in 2024 at Area IV of the SSFL located in Ventura County, California.

The mission of DOE at SSFL Area IV is to safely manage and remediate legacy contamination resulting from past nuclear and energy-related operations, while protecting human health and the environment. This includes ongoing environmental monitoring, waste management, remediation efforts, and regulatory compliance to support site closure goals.

During calendar year 2024, DOE's primary operations at Area IV focused on:

- Conducting environmental monitoring and sampling of air, groundwater, soil, surface water, and biota to assess radiological and chemical conditions.
- Continuing remediation and waste management activities to address legacy contamination.
- Implementation of decontamination and decommissioning of inactive legacy site areas and structures.
- Ongoing surveillance, inspection, and maintenance of Area IV property, remaining infrastructure, monitoring and remediation equipment, facilities, and related assets to ensure continued operability.
- Coordinating with regulatory agencies and stakeholders to maintain compliance with applicable environmental requirements.
- Preparing technical documentation and supporting decision-making related to site closure and long-term stewardship.

This report fulfills the requirements of DOE O 231.1B, "Environment, Safety and Health Reporting," and DOE O 458.1, "Radiation Protection of the Public and the Environment." It provides:

- A summary of site operations, environmental setting, and regulatory context,
- A summary of environmental monitoring programs and results,
- Evaluation of environmental compliance with applicable federal, state, and local regulations,
- Radiological and chemical calculations verifying no associated public exposure, and
- Ongoing progress updates towards remediation, closure, and legacy management efforts.

The data and analyses in this report are intended to inform site managers, regulators, and the public of DOE's environmental stewardship at Area IV, reflecting a commitment to transparency and environmental protection.

2.1 Site Location and Setting

The SSFL site occupies 2,850 acres located in the Simi Hills of Ventura County, California, approximately 48 kilometers (km) (30 miles) northwest of downtown Los Angeles. SSFL is situated on rugged terrain with elevations at the site varying from 500 to 700 meters (m) (1,640 to 2,250 feet [ft]) above sea level. The location of the SSFL site in relation to nearby communities is shown in Figure 2-1. No significant agricultural land use exists within 30 km (19 miles) of the SSFL site. Undeveloped land surrounds most of the SSFL site.

Boeing owns the majority of the site, which is divided into four administrative areas (Areas I through IV) and undeveloped land (Table 2-1). Figure 2-2 illustrates the arrangement of the site. Area IV consists of approximately 290 acres, of which DOE leases 90 acres. Boeing and DOE-operated facilities (Figures 2-3 and 2-4) share the Area IV portion of this site. While the land immediately surrounding Area IV is undeveloped, suburban residential areas are at greater distances from Area IV. The community of Santa Susana Knolls lies 4.8 km (3.0 miles) to the northeast, the Bell Canyon area begins approximately 2.3 km (1.4 miles) to the southeast, and the American Jewish University is adjacent to the north. Except for the Pacific Ocean, which is approximately 20 km (12 miles) south, no recreational body of water of noteworthy size is located in the surrounding area. Four major reservoirs providing domestic water to the greater Los Angeles area are located within 50 km (30 miles) of SSFL; the closest to SSFL (Bard Reservoir, near the west end of Simi Valley) is more than 10 km (6 miles) from Area IV.

Figure 2-1. Map Showing Location of SSFL

Table 2-1. Owners and Size of Administrative Areas at SSFL

Subdivisions			
Owner	**Jurisdiction**	**Acres**	**Subtotals**
Boeing	Boeing—Area IV (DOE leased) Boeing—Areas I and III Boeing (Undeveloped land)	289.9 784.8 1,324.6	2,399.3
U.S. Government	NASA (former AFP 57) NASA (former AFP 64)	409.5 41.7	451.2
		Total Acres	2,850.5

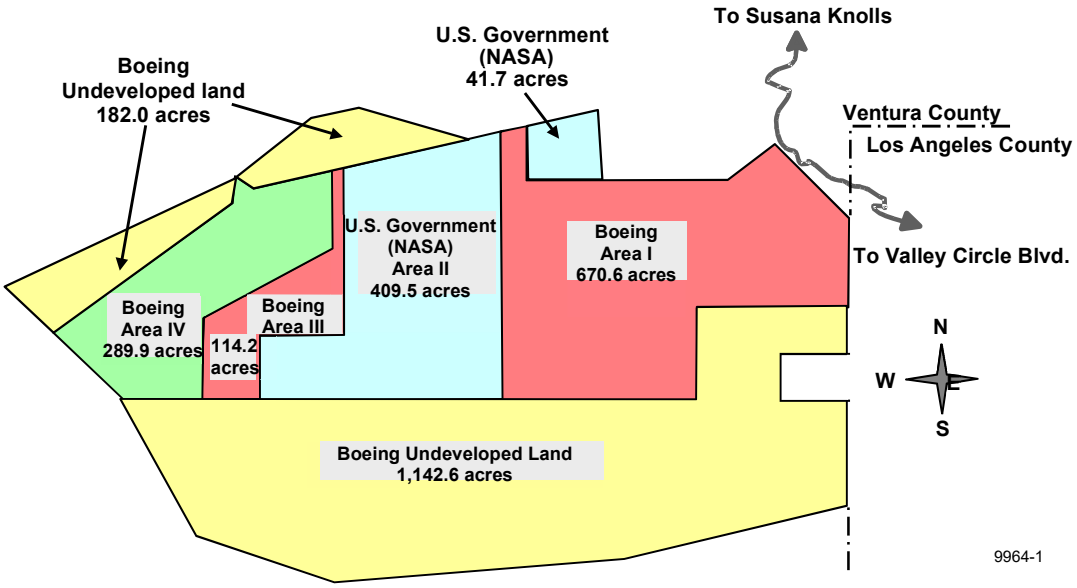

Figure 2-2. Santa Susana Field Laboratory Site Arrangement

Figure 2-3. Santa Susana Field Laboratory Site, Area IV

2.2 Operational History

SSFL has been used for various research, development, and test projects funded by several U.S. Government agencies, including DOE, Department of Defense, and NASA. Since 1956, various research and development (R&D) projects had been conducted in Area IV, including small tests and demonstrations of reactors and critical assemblies, fabrication of reactor fuel elements, and disassembly and de-cladding of irradiated fuel elements. Details for these projects can be found at the DOE website devoted to the ETEC closure (https://www.energy.gov/).

All nuclear R&D operations in Area IV ceased in 1988. The only work related to nuclear operations after 1988 has been the cleanup and decontamination of the remaining inactive radiological facilities and off-site disposal of radioactive waste. In 1998, DOE awarded Boeing a contract for the closure of all DOE facilities in Area IV. Environmental remediation and restoration activities at SSFL are conducted as directed by DOE.

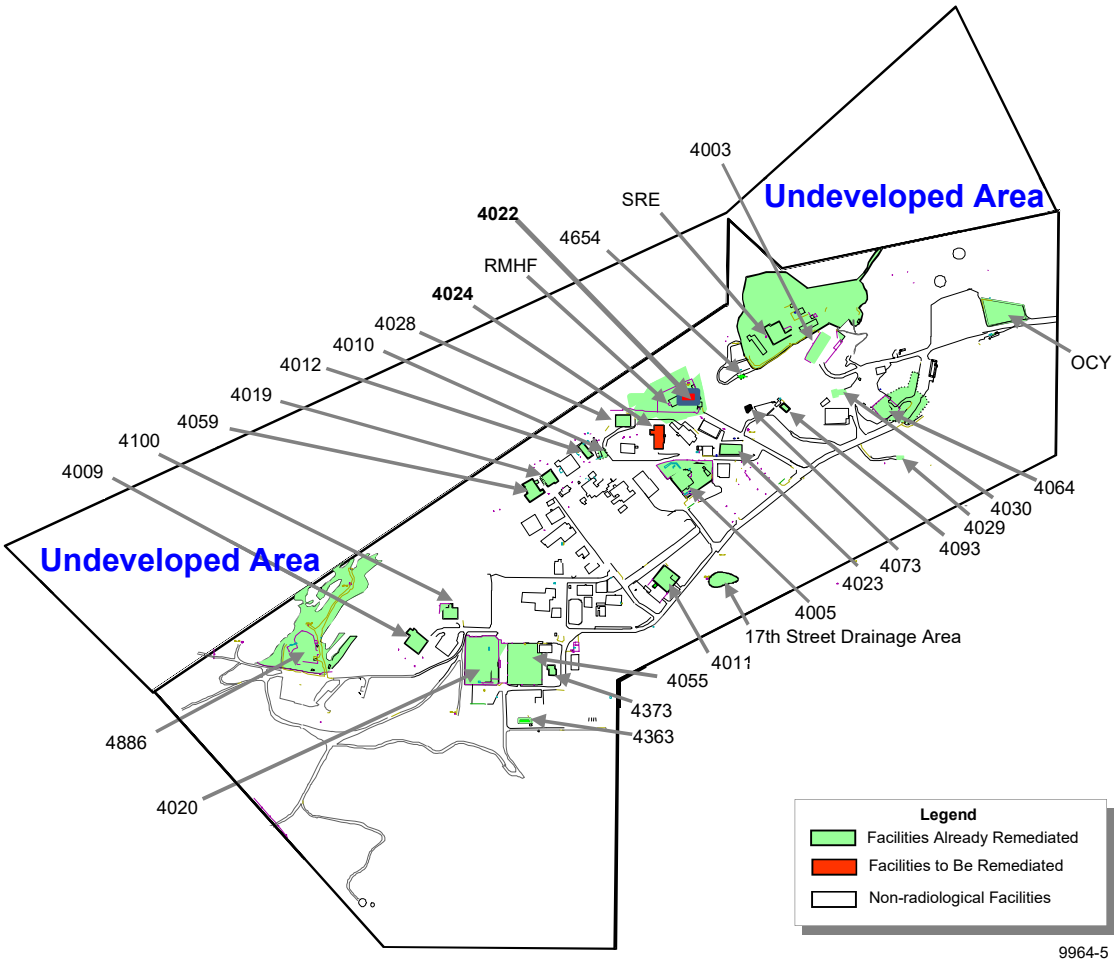

Figure 2-4. Map of Former and Current Radiological Facilities in Area IV

2.3 Facility Descriptions

A total of 28 radiological facilities operated in Area IV during its operational history (see Figure 2-4). As of the end of 2014, 20 had been released for unrestricted use and four had been declared suitable for unrestricted release by DOE. The RMHF above-grade building structures were demolished in 2020. The vaults below Building 4022 at the RMHF are still present and will be remediated in the future. The other DOE-owned buildings (4019, 4024, and 4029) were demolished in 2020. The basement associated with Building 4024 is still present, and demolition is anticipated in the future (see Figure 2-4). There are four remaining former radiological facilities in Area IV that have been declared free of contamination and are owned by Boeing: Buildings 4009, 4011, 4055, and 4100.

In addition to radiological facilities, two inactive sodium and related liquid metal test facilities (Sodium Pump Test Facility/Component Handling & Cleaning Facility [SPTF/CHCF] and the Hazardous Waste Management Facility [HWMF]) were located in Area IV, as well as various support facilities. These were constructed at SSFL to support development testing of components

for liquid metal electrical power production systems. These facilities underwent closure and above-grade demolition in 2020.

2.3.1 Radiological Facilities

Radioactive Materials Handling Facility

The RMHF complex consisted of Buildings 4021, 4022, 4034, 4044, 4075, 4563, 4621, 4658, 4663, 4665, and 4688, with the above-grade portions of the buildings demolished in 2020. Sump 4614 was a holdup pond located at the base of the drainage channel west of the RMHF complex. The use of the pond was discontinued, and the pond was excavated in 2006. The drainage channel and pond have been replaced with an above-ground storage tank that receives storm water runoff from the RMHF via a drainage pipe.

Historical operations at RMHF included processing, packaging, and temporary storage of radioactive waste materials for off-site disposal at DOE-approved facilities. The radioactive waste included uranium, plutonium, mixed fission products such as cesium-137 (Cs-137), strontium-90 (Sr-90), and activation products, including cobalt-60 (Co-60), europium-152 (Eu-152), and tritium (H-3).

Historically, no effluents were released into the atmosphere through the stack at the RMHF, and no radioactive liquid effluents were released from the facility. DOE developed a Resource Conservation and Recovery Act (RCRA) closure plan for Buildings 4021, 4022, and 4621 of the RMHF complex, collectively permitted as an Interim Status (Part A) facility, which DTSC approved on August 14, 2020. Demolition of the RMHF structures was completed in November 2020. The Phase 1 Closure Plan, which addresses the demolition of all above-grade building structures, was completed, and accepted by DTSC, on August 14, 2020.

Building 4024

Building 4024, Systems for Nuclear Auxiliary Power (SNAP) Environmental Test Facility, housed four experimental reactor systems in the 1960s. Following the termination of the experimental projects, all equipment and fuel were removed from the facility. The shielding concrete in the vaults has low-level activation products, including Co-60 and Eu-152. Building remediation began in 2004, and portions of the building used to support the office space and the mechanical ventilation systems were demolished.

The ventilation stack was removed, and a geophysical study supporting final building demolition was completed. In 2007, the final demolition of the building was put on hold by DOE pending completion of the environmental impact statement (EIS). The Final EIS was issued in November 2018, asbestos abatement was performed in 2020, and demolition of above-grade structures was completed in May 2021.

Figure 2-5 shows the aboveground structures that have been demolished to date and the four buildings, owned by Boeing, that still exist.

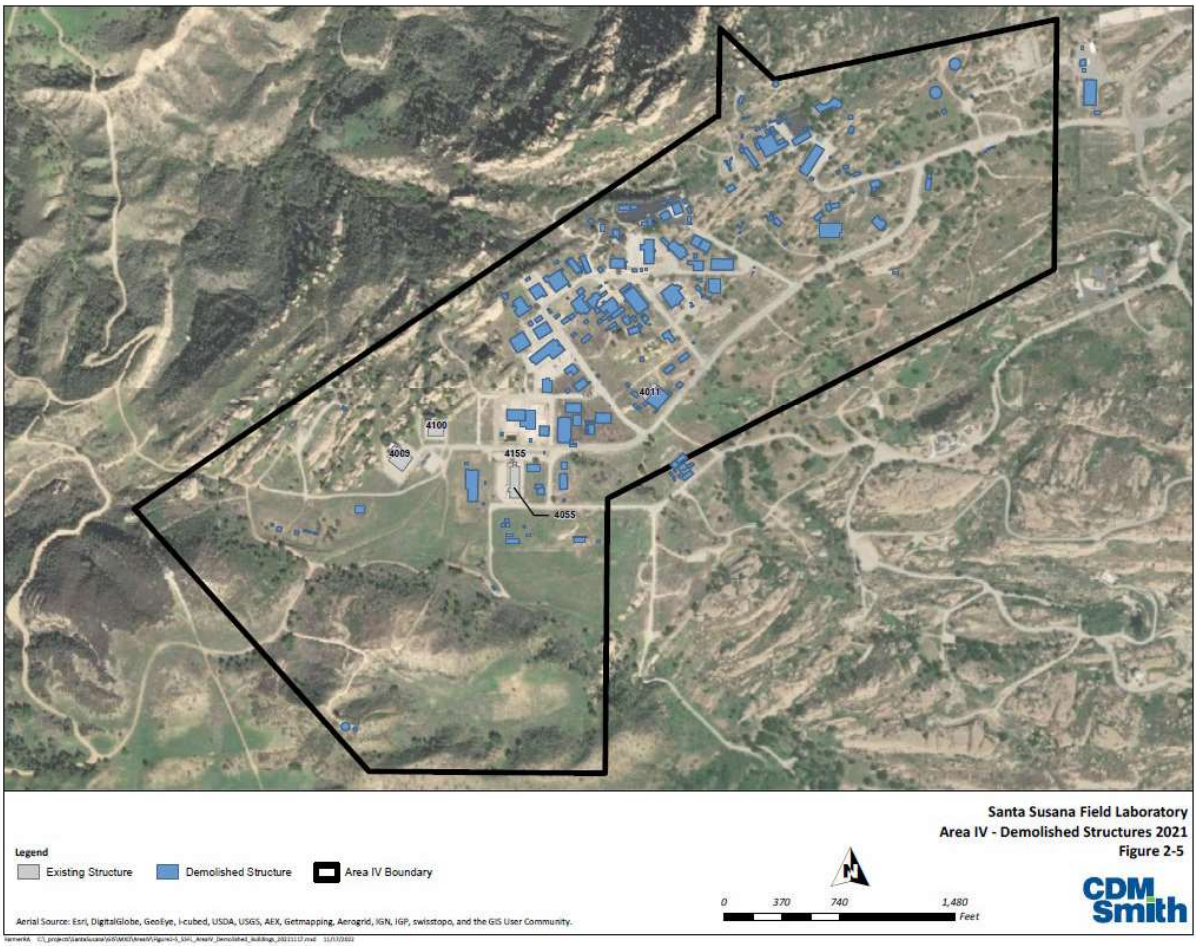

Figure 2-5. Area IV – Existing and Demolished Structures

2.3.2 Former Sodium Facilities

Sodium Pump Test Facility / Component Handling & Cleaning Facility

All utility connections to the SPTF/CHCF buildings were severed in 2007. Demolition of Building 4461 was completed in early 2007. In May 2007, DOE halted demolition and the remaining buildings (4462 and 4463) were placed into a safe shutdown condition. Asbestos abatement started in 2020, and demolition was completed in October 2021.

Hazardous Waste Management Facility

Historical operations at the HWMF performed under the RCRA permit included the storage of sodium, sodium-potassium, or lithium waste or equipment contaminated with these metals at Building 4029; transfer of the wastes and contaminated equipment to Building 4133; and treatment of the metal wastes and contaminated equipment at Building 4133. At the Building 4133 location, the metal wastes treated were placed in an iron bowl in a metal-lined treatment chamber. The bowl was heated using natural gas and the waste metals reacted with the air to form metal oxides. The metal oxides were then removed from the air with an air pollution control device (an air scrubber) under a Ventura County Air Pollution Control District

(VCAPCD) Permit. After the heat treatment, the residual metal oxides were rinsed from the inside area of the treatment chamber with water. The air scrubber produced liquid wastewater which, along with the treatment chamber rinse water, was drained to a below-grade tank and then pumped to an above-ground tank for temporary storage. Both tanks were located within the Building 4133 boundary. The alkali wastewater was transferred to wastewater trucks for off-site disposal.

The HWMF was approved for closure and demolition by the DTSC in 2006. In May 2007, DOE halted plans for demolition pending completion of the EIS. The EIS was finalized in November 2018. DOE developed a RCRA closure plan for the HWMF, which DTSC approved on November 9, 2020. Phase 1 of the closure plan, which addresses the demolition of all above-grade building structures, was initiated in 2020. Both buildings were demolished in November/ December 2020.

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3. COMPLIANCE SUMMARY

The ETEC site is subject to various environmental statutes and regulations as well as DOE and Executive Orders as discussed in the following sections. In 2024, the site successfully complied with all applicable requirements, with no regulatory violations, permit deviations or environmental releases noted. Two regulatory agencies with oversight responsibilities made visits to the site during 2024, as presented in Table 3-1.

Table 3-1. 2024 Agency Inspections, Audits, and Visits Related to DOE Operations

Date	Agency	Subject Area	Results
January 17, 2024	CDPH	Quarterly Environmental TLD Exchange	Compliant
April 10, 2024	CDPH	Quarterly Environmental TLD Exchange	Compliant
July 15, 2024	CDPH	Quarterly Environmental TLD Exchange	Compliant
September 30, 2024	CDPH	Quarterly Environmental TLD Exchange	Compliant
October 21 – 24, 2024	DTSC	MRL Sampling – Site Observation	No Issues

CDPH = California Department of Public Health
DTSC = Department of Toxic Substances Control
MRL = method reporting limit
TLD = thermoluminescent dosimeter

3.1 Compliance Status

3.1.1 Environmental Restoration and Waste Management

RCRA

RCRA allows the Environmental Protection Agency (EPA) broad authority to regulate the handling, treatment, storage, and disposal of hazardous wastes. This authority has been delegated to the California Environmental Protection Agency (Cal-EPA) and DTSC. DOE owns and co-operates two areas that are RCRA-permitted treatment and storage facilities within ETEC: the RMHF and the HWMF. Although the permits remain active, the areas are undergoing closure, with Phase 1 completed for both in 2020 (see below). Permit numbers are listed in Section 3.1.5.

- **RMHF—**In 2024, remaining concrete slabs and subsurface structures for Buildings 4021, 4022, and 4621 of the RMHF Complex continued to be permitted collectively as an Interim Status (Part A) facility. Above-grade building structures were demolished in 2020 pursuant to Phase 1 of the DTSC-approved closure plan. The permit will remain active until final closure (Phase 2 and 3 completion) has been achieved.
- **HWMF—**In 2024**,** remaining concrete slabs for Buildings 4029 and 4133 of HWMF continued to be permitted collectively as an Interim Status (Part A) facility. Above-grade building structures were demolished in 2020 pursuant to Phase 1 of the DTSC-approved closure plan. The permit will remain active until final closure (Phase 2 and 3 completion) has been achieved.
- **RCRA Facility Investigation (RFI)—**Under the Hazardous and Solid Waste Amendments of 1984, RCRA facilities can be brought into the corrective action process when an agency is considering any RCRA permit action for the facility. SSFL was initially made subject to the

corrective action process in 1989 by the EPA, Region IX. The EPA has completed the Preliminary Assessment Report and the Visual Site Inspection portions of the RCRA Facility Assessment process. ETEC has transitioned from the RFI phase to the Corrective Measures Study (CMS) phase. DOE first drafted the CMS report and submitted it to DTSC in September 2018. DTSC and the Los Angeles Regional Water Quality Control Board (LARWQCB) provided comments on the initial draft CMS report to DOE on April 30, 2020. DOE revised the CMS report and resubmitted it to DTSC in September 2020 (CDM Smith 2020). DTSC and LARWQCB provided additional comments on the revised draft CMS report in September 2022. DOE provided DTSC with a response to those comments in December 2022. In April 2023, DTSC and LARWQCB responded to the December 2022 response to comment submission. DOE responded back in May 2023. On September 18, 2023, DTSC and LARWQCB responded with comments again. In each round of comments, DTSC and LARWQCB have requested additional studies, work plans, and modeling to be completed and the results of which to be incorporated into the CMS report. Since 2022, DOE has been completing the requested work to address the outstanding comments from DTSC and LARWQCB. Additional studies, work plans, and modeling continued throughout 2024 and into 2025. Once the requested work plans and evaluation reports have been approved by DTSC, DOE will incorporate the findings into the revised CMS report and submit it to DTSC. Following DTSC's concurrence on the reports and work plans, DOE will formally submit the documents for final DTSC approval.

- **Administrative Order on Consent—**In December 2010, DOE and DTSC signed an Administrative Order on Consent (AOC) https://www.energy.gov/etec/consent-orders, which defined the process for characterization of the soil and the cleanup end-state for Area IV of the SSFL, including regional "background" for chemicals that currently have a background value, and MRLs for those chemicals that have no background value. Background values and MRLs have been incorporated into an LUT, per the AOC, by DTSC. The LUT provides the cleanup standards, per the AOC, for Area IV.

  In November 2012, EPA made recommendations to DTSC regarding how the AOC LUT values for radionuclides should be calculated based on background soil data (EPA 2012). Subsequently, in January 2013, DTSC issued draft provisional LUTs for 16 radionuclides (DTSC 2013a). In May 2013, DTSC issued a "Chemical LUT Technical Memorandum" for more than 130 chemicals (DTSC 2013b). Both DTSC's and DOE's technical staff have identified implementation issues with the DTSC published soil cleanup values. Several of the LUT values fall within the range of background, meaning remediation of soil could remove uncontaminated soils. To develop the laboratory MRLs, DTSC modified analytical methods, resulting in MRLs not supported by the analytical industry. DOE remains in negotiations with DTSC on correcting those errors.

  Groundwater investigation and remediation are still being conducted under RCRA corrective action requirements specified in the 2007 Consent Order among DTSC, DOE, NASA, and Boeing. Groundwater and soil samples collected and analyses performed during 2024 at DOE locations are summarized in Sections 7 and 9.

Federal Facilities Compliance Act

Historically, any mixed wastes were managed in accordance with the Federal Facilities Compliance Act–mandated Site Treatment Plan (STP), approved in October 1995. All mixed wastes that required extended on-site storage were managed within the framework of the STP. Characterization, treatment, and disposal plans for each of several different waste streams are defined in the STP with enforceable milestones. Previous management of mixed waste has been in full compliance with the STP. In 2022, mixed wastes were newly generated in association with the building demolition on the ETEC project and were transported to a licensed or permitted facility outside of the State of California. Because demolition is complete, there were no mixed wastes that needed to be managed or shipped from the ETEC site in 2024.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) establishes a national policy to ensure that consideration is given to environmental factors in federal planning and decision-making. For those projects or actions with a potential to affect human health or the environment, DOE requires that appropriate NEPA actions (e.g., Categorical Exclusion, Environmental Assessment [EA], Finding of No Significant Impact [FONSI], or Notice of Intent [NOI], draft EIS, final EIS, and/or Record of Decision) be incorporated into project planning documents.

DOE issued a FONSI and the final EA report on March 31, 2003. Subsequently, the Natural Resources Defense Council, City of Los Angeles, and the Committee to Bridge the Gap filed a lawsuit in federal court claiming DOE had violated NEPA; the Comprehensive Environmental Response, Compensation, and Liability Act; and the Endangered Species Act. Pursuant to a court order, DOE released the *Draft EIS for Remediation of Area IV and the Northern Buffer Zone of the SSFL* (DOE 2017) on January 6, 2017, with EPA publishing a Notice of Availability (NOA) in the *Federal Register* (FR) on January 13, 2017, opening the 60-day public comment period. A subsequent notice was issued on March 17, 2017, extending the comment period for an additional 30 days. DOE considered all comments received in preparation of the final EIS document, with the NOA for the *Final EIS for the Remediation of Area IV and the Northern Buffer Zone of the SSFL* (DOE 2018) published in the FR on December 28, 2018.

The Final EIS analyzes the potential environmental and community impacts of remediation alternatives for soil, buildings, and groundwater associated with Area IV and the Northern Buffer Zone and presents the preferred remediation alternatives, which are consistent with the site's end use as open space and are protective of human health and the environment. Based on the analysis presented in the Final EIS (http://www.ssflareaiveis.com/), in September 2019, DOE issued the Record of Decision for building demolition detailing the path forward for achieving remediation objectives established for the remaining building structures in these areas (fr-rod-eis-0402-ssfl-area-iv-buildings-2019-09-27.pdf). In November 2020 DOE issued the Record of Decision for groundwater remediation, identifying proposed remedies for seven chemical or radiological impacted locations in Area IV (FINALSIGNEDDOC-Federal Register Notice for ETEC Groundwater ROD Issuance Signed (11-2-20).pdf).

3.1.2 Radiation Protection

DOE O 458.1 establishes requirements to protect the public and the environment against undue risk from radiation associated with radiological activities conducted under the control of DOE pursuant to the AEA of 1954, as amended. The objectives of this Order are to conduct DOE radiological activities so that exposure to members of the public is maintained within the dose limits established in the Order; to control the radiological clearance of DOE real and personal property and to ensure that potential radiation exposures to members of the public are as low as reasonably achievable (ALARA). The radiological monitoring programs at SSFL comply with this order as well as all applicable federal, state, and local environmental regulations. The monitoring results (Section 5) indicate that SSFL does not pose any significant radiological impact to the health and safety of the public. All potential pathways to the public or the environment, as illustrated in Figure 3-1, are monitored. These include air, soil, surface water, groundwater, direct radiation, transfer of property (i.e., land, structures, and/or waste), and recycling.

3.1.3 Air Quality and Protection

Clean Air Act

The 1970 Clean Air Act (CAA) (amended in 1977 and 1990) authorized the EPA to establish National Ambient Air Quality Standards (NAAQS) to limit the concentrations of pollutants in ambient (i.e., outdoor) air. The EPA has promulgated NAAQS for six "criteria" pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), 10-micron and 2.5-micron particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb). All areas of the United States must maintain ambient levels of these pollutants below the ceilings established by the NAAQS; any area that does not meet the standards is considered a NAAQS "nonattainment" area. Under the CAA, states are required to develop State Implementation Plans (SIPs) that define how each state will carry out its responsibilities under the CAA, mainly through promulgation and enforcement of air pollution control rules and regulations. However, the EPA must approve each SIP, and it can enforce the CAA itself under a Federal Implementation Plan if it deems a state's SIP unacceptable and the state or region is unwilling or unable to develop an acceptable SIP. Other requirements, including National Emission Standards for Hazardous Air Pollutants (NESHAP), New Source Performance Standards, and ambient air monitoring programs, were established to ensure that ambient air quality is acceptable for public health and environmental protection.

Area IV is regulated by the VCAPCD and must comply with all applicable rules, regulations, and permit conditions. DOE previously operated under Permit to Operate No. 00271. In 2008, this permit was consolidated with the existing Federally Enforceable State Operating Permit No. 00232 for SSFL, which presently covers Areas I, III, and IV. The NASA property – Area II and the former LOX Plant site located in Area I – was removed from the permit in January 2014. On December 15, 2014, VCAPCD issued administrative changes to the permit, relieving Boeing from responsibility for Area IV, except for activities and contractors under Boeing's direct control. DOE activities currently being performed in Area IV are not subject to air permitting. DOE conducts air monitoring, as described in Section 8, and the data are published in quarterly reports submitted to DTSC.

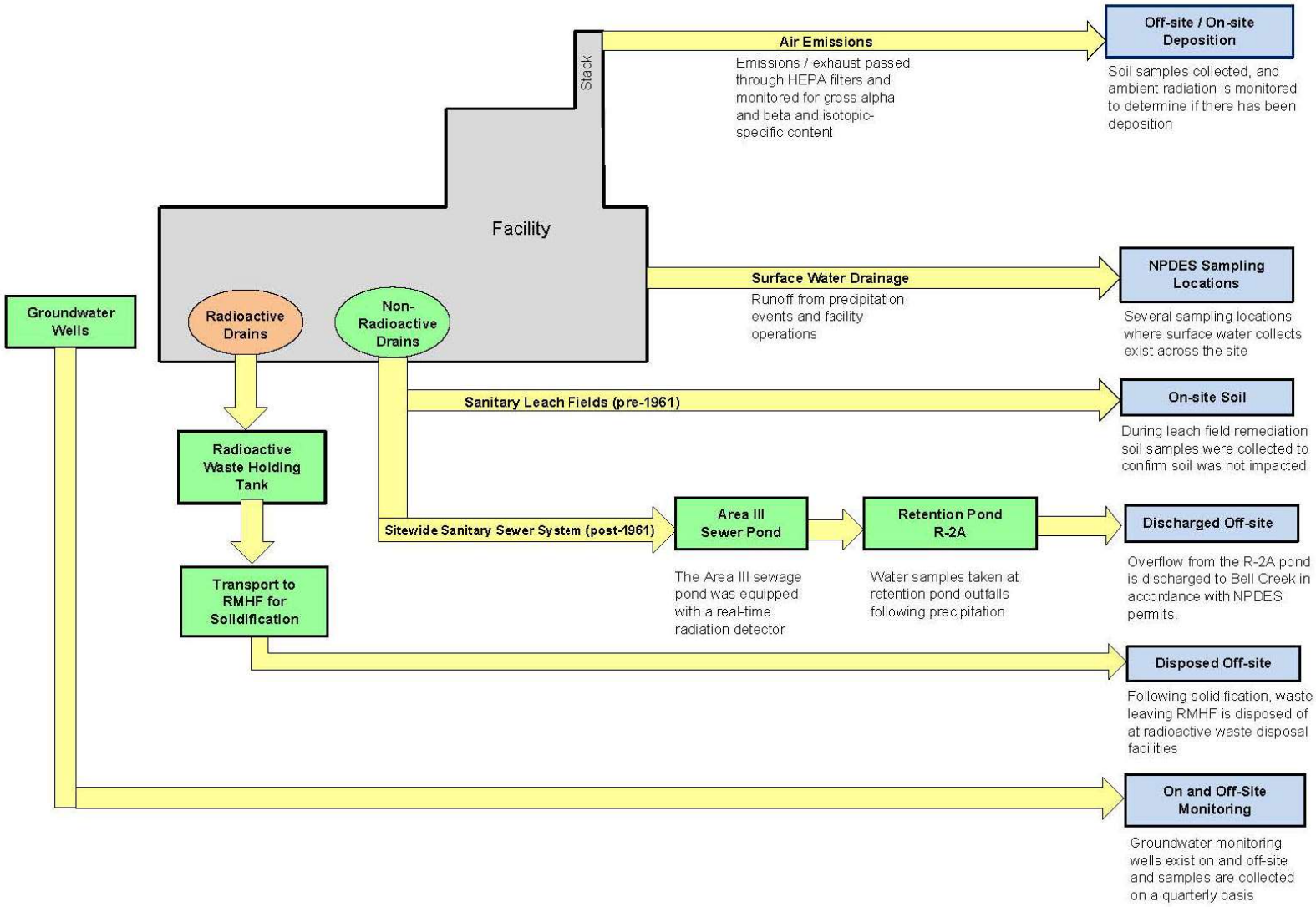

Figure 3-1. Conceptual Model of Potential Pathways

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3.1.4 Water Quality and Protection

Clean Water Act

The Clean Water Act is the primary authority for water pollution control programs, including the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES program regulates point source discharges of surface water and the discharge of storm water runoff associated with industrial activities.

Surface water discharges from SSFL are regulated under the California Water Code (Division 7), as administered by the LARWQCB. The existing Boeing NPDES Permit (CA0001309) for SSFL, which was renewed and became effective January 1, 2024, requires monitoring of storm water runoff, treated groundwater, and fire suppression water into Bell Creek, a tributary to the Los Angeles River. The permit also regulates the discharge of storm water runoff from Area IV northwest slope locations into the Arroyo Simi, a tributary of Calleguas Creek. Storm water is collected at the five northwest outfalls (RMHF: Outfall 003; Sodium Reactor Experiment [SRE]: Outfall 004; FSDF #1: Outfall 005; FSDF #2: Outfall 006; and Building 4100: Outfall 007), pumped to a centralized storage and treatment center at Silvernale Pond in Area III, and subsequently discharges into Bell Creek. The permit applies the numerical limits for radioactivity established for drinking water suppliers to these discharges. The permit requires radiological measurements of gross alpha, gross beta, tritium, Sr-90, total combined radium-226 (Ra-226) and radium-228 (Ra-228), potassium-40, Cs-137, and uranium isotopes. North Wind Portage, on behalf of DOE, provided quarterly Discharge Monitoring Reports (DMRs) in 2024, notifying Boeing of any activities related to the following surface water activities:

1) Waste manifests related to stormwater or spilled materials.
2) Copies of all Initial Site Assessment and Remediation Act (ISRA)/Best Management Practices (BMPs) effectiveness/performance monitoring data.
3) Figures/descriptions of any maintenance or installation of BMPs.
4) List of all new orders, permits, 401c documents, California Water Code Section 13383 letters related to stormwater and/or protection of waters of the U.S.

During 2024, DOE did not have any reportable surface water–related activity information/data addressing any of the categories listed above in its quarterly DMRs.

https://www.boeing.com/sustainability/environment/santa-susana/monitoring-reports#accordion-f9ee1141e6-item-ef5a41c2cf

Dischargers whose projects disturb ≥1 acre of soil or whose projects disturb <1 acre but are part of a larger common plan of development that in total disturbs ≥1 acre, are required to obtain coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit Order 2009-0009-DWQ). Construction activity subject to this permit includes clearing, grading, and disturbances to the ground (i.e., stockpiling and/or excavation). During 2024 there were no activities requiring a stormwater CGP.

The Oil Pollution Act (OPA) requires the development of a spill prevention, control, and countermeasure (SPCC) plan for facilities meeting certain industry categories and/or having the capacity to store an aggregate of 1,320 gallons of oil in containers 55-gallons or greater in size to prevent uncontrolled discharge into or upon the navigable waters of the State of California or the United States. Although ETEC does not currently meet criteria to require an SPCC plan, Boeing does maintain the SSFL Facility Spill Prevention and Response Plan, which serves as the site-wide SPCC Plan. ETEC utilizes BMPs outlined in this plan to ensure that oils/hazardous materials are handled properly.

3.1.5 Other Environmental Statutes and Executive Orders

Endangered Species Act (ESA)

The ESA of 1973 (16 U.S.C. §1531 et sq.) protects Federally listed threatened and endangered species and their habitats from "take" and ensures that Federal actions do not jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. If any aspect of a DOE action may affect a listed species or designated critical habitat, consultation with the U.S. Fish and Wildlife Service (USFWS) and/or the National Oceanic and Atmospheric Administration – National Marine Fisheries Service is required. Based on information provided by DOE, the USFWS prepared the Biological Opinion for Cleanup of Area IV of SSFL (2018-F-0407, transmitted 8/31/2018). The Biological Opinion includes 17 conservation measures that DOE will execute to avoid or reduce negative effects to federally listed species and designated critical habitat. The 17 conservation measures apply to the planning and execution of ground disturbance, demolition, and remediation activities at SSFL DOE Area IV (https://www.ssflareaiveis.com/ba_documentation.aspx). In 2024, conservation measures were implemented for all field activities that triggered regulatory requirements. Documented occurrences of listed species and designated critical habitats were monitored as part of ongoing surveillance, maintenance, investigation, and monitoring programs.

E.O. 13751 Safeguarding the Nation from the Impacts of Invasive Species (December 5, 2016)

In accordance with Executive Order 13751 invasive species are defined as, "with regards to a particular ecosystem, a non-native organism whose introduction does or is likely to cause economic or environmental harm or harm to human health." Several invasive species have been documented during surveys conducted in 2009 (SAIC 2009a, 2009b). Area IV of the SSFL, including the NBZ, is recovering from a wildfire that burned through the area in September 2005. The 2009 survey (SAIC 2009a) noted that the NBZ was relatively free of human disturbance and, consequently, was relatively free of invasive species. The same was noted for most of the hilly area in the southwestern part of Area IV, including much of the critical habitat of the Braunton's milk-vetch. The previously developed portions of Area IV and nearby areas had a higher concentration of invasive species (SAIC 2009b, 2010) than other portions of Area IV. Currently, areas that are more vulnerable to invasion than would otherwise be because of the relative openness of the vegetation compared to pre-fire conditions include the following: areas where woody vegetation is re-establishing after the 2005 fire, and areas where subsequent mowing and other mechanical vegetation reduction measures were performed from 2010 through

2014. Table 3-2 presents the invasive plant species that have been identified at the SSFL ETEC Area IV and the NBZ.

Table 3-2. Invasive Plant Species Present at the SSFL Area IV and the Northen Buffer Zone and the California Invasive Plant Council (Cal-IPC) and the California Department of Food and Agriculture (CDFA) Ratings

Common Name	*Scientific Name*	*Cal IPC Overall Rating*	*CDFA Rating*	*Comments*
Castor bean	*Ricinus communis*	Limited	---	Not noted during surveys but would be a high priority to contain and eradicate if discovered.
Fountain grass	*Pennisetum setaceum*	Moderate	non-rated	Becoming widespread along roads and facilities sites. Occupies same habitat in sandstone boulders as Santa Susana Tarplant.
Giant reed or Arundo	*Arundo donax*	High	B	Not noted during surveys but would be a high priority to contain and eradicate if discovered.
Horehound	*Marrubium vulgare*	Limited		Numerous localized occurrences.
Italian thistle	*Carduus pycnocephalus*	Moderate	C	Occurrences on site in formerly disturbed areas.
Mexican fan palm	*Washingtonia robusta*	Moderate	---	Volunteer plants of this or a similar species occurring chiefly along roadsides.
Milk thistle	*Silybum marianum*	Limited	C	Occurrences on site in formerly disturbed areas north of critical habitat.
Puncture vine	*Tribulus terrestris*		C, NW	Localized.
Purple star thistle	*Centaurea calcitrapa*	Moderate	B, NW	Localized on access road to water tank. Adjacent to critical habitat.
Russian thistle	*Salsola tragus*	Limited	C	Localized.
Shortpod mustard, summer mustard	*Hirschfeldia incana*	Moderate	---	Widespread on previously disturbed areas.
Smilo grass	*Piptatherum miliaceum*	Limited	---	Numerous localized occurrences mostly on previously disturbed sites.
Stinkwort	*Dittrichia graveolens*	Moderate	Non-rated	Numerous occurrences in areas of formerly disturbed areas becoming widespread around wells and access roads.
Tamarisk	*Tamarix ramosissima*	High	B	On some remediated sites
Tocalote, Malta star thistle,	*Centaurea melitensis*		NW	Widespread on site with weedy annual grasses.
Tree tobacco	*Nicotiana glauca*	Moderate	---	Common at previously disturbed sites.
Tree-of-heaven	*Ailanthus altissima*	Moderate	C	Several localized occurrences.
Wild mustard	*Brassica spp.*	Limited to High depending on species	---	Very dense populations noted at previously disturbed areas north of critical habitat.
Wild radish	*Raphanus sativus*	Limited	B	Several localized occurrences.
Yellow star thistle	*Centaurea solstitialis*	High	C	Several localized occurrences.

Table 3-2 Notes:

California Invasive Plant Council (Cal-IPC) Ratings:

High – These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.

Moderate – These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

Limited – These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. These species may already be extensively naturalized limiting potential for further spread. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

California Department of Food and Agriculture (CDFA) Ratings:

"**A**" rated weeds are normally limited in distribution throughout the state. Eradication, containment, rejection or other holding action at the state-county level. Quarantine interceptions to be rejected or treated at any point in the state.

"**B**" rated weeds are more widespread. Eradication, containment, control or other holding action at the discretion of the commissioner. State endorsed holding action and eradication only when found in a nursery.

"**C**" rated weeds are generally widespread throughout the state. Action to retard spread outside of nurseries at the discretion of the commissioner. Reject only when found in a crop seed for planting or at the discretion of the commissioner.

"**Q**" rated species are treated as temporary "A" weeds. Denoting action outside nurseries at the state-county level pending determination of a permanent rating.

"**D**" rated weeds are organisms considered to be of little or no economic importance. No action. Anything not rated as an "A", "B", "C" or "Q" weed is given a "D" rating. In other words, the plant is not considered a significant weed. (California Noxious & Invasive Weed Action Plan, 2005)

"**NW**" noxious weed

During all on-site activities performed in 2024, including surveillance, maintenance, inspection, groundwater and soil sampling, monitoring activities, investigations, and remediation, project personnel ensured that vehicle tires were brushed to remove seeds when exiting off-road areas to minimize the dispersion of invasive plant species. In addition, on a quarterly basis, vegetation maintenance is performed on access roads and areas surrounding monitoring wells to provide safe access during monitoring and sampling events and reduce fire hazards. During ongoing vegetation maintenance activities, observed invasive plant species are removed by project personnel.

In 2024, remediation activities and associated soil disturbance were limited, thereby reducing the likelihood of introduction or proliferation of invasive plant species. However, as remediation efforts are expected to ramp up in the future, a comprehensive invasive plant management plan will be developed to implement strategies aimed at preventing and minimizing the risk of invasive species establishment and spread.

National Historic Preservation Act (NHPA)

The NHPA of 1966 (54 U.S.C. §100101 formerly 16 U.S.C. §470, as amended), requires Federal agencies to establish programs to identify, record, and protect cultural resources and to assess the impact of proposed projects on historic or culturally important sites, structures, or objects within the area of potential effect for a proposed project. The NHPA further requires Federal agencies to assess all archaeological sites, historic buildings, and objects on such sites to determine qualification for inclusion in the National Register of Historic Places (NRHP). In addition, the NHPA requires Federal agencies to consult with State Historic Preservation Offices and the Federal Advisory Council on Historic Preservation, as appropriate, when determining if proposed actions would adversely affect properties eligible for listing on the NRHP.

In accordance with the Programmatic Agreement (PA) between DOE and the State Historic Preservation Officer (SHPO 2019) under the National Historic Preservation Act, pursuant to Stipulation V, the 18 remaining building slabs in Area IV are permitted for demolition because all were formally determined not eligible for listing on the National Register for Historic Places, either as individual resources or as historic district contributors and there are no known archaeological sites in the immediate vicinity of the building slabs. Pursuant to the *Monitoring and Inadvertent Discovery Plan* (DOE 2020) (https://www.energy.gov/sites/default/files/2022-12/SSFL%20Cultural%20Monitoring%20Plan_Jun%202020_Public.pdf), cultural resource clearance surveys will be performed by a professional archaeologist who meets the PA's qualification standards and a Native American representative in accordance with the PA prior to commencement of field activities involving demolition, remediation, and/or soil disturbance. Although the site did not engage in activities that would trigger conservation measures in 2024, site walkdowns are routinely performed as part of ongoing surveillance and maintenance activities to ensure that areas already designated as cultural resources are not disturbed.

Migratory Bird Treaty Act (MBTA)

The MBTA of 1918 (16 U.S.C. 703–712) and its amendments implement four international conservation treaties and are intended to ensure the sustainability of populations of all protected migratory bird species.

DOE, the USFWS, and the National Nuclear Security Administration authored and signed an Addendum to the Memorandum of Understanding on Migratory Birds among the agencies in 2003. The MOU expired in 2018 and the Addendum allowed the extension of the MOU as currently written, while the agencies work together to evaluate the MOU to ensure that it still meets the stated purpose, scope, and responsibilities identified in Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (66 FR 3853, 2001). The USFWS Biological Opinion referenced previously also addresses conservation measures for migratory bird species.

Emergency Planning and Community Right-to-Know Act (EPCRA)

EPCRA (42 U.S.C. §11001 et seq.), also known as Title III of SARA, requires Federal facilities that use, produce, or store extremely hazardous substances, hazardous substances, hazardous chemicals, and/or toxic chemicals in quantities that exceed specific thresholds to report these inventories and planned or accidental environmental releases to Federal, State, and local emergency planning authorities.

SSFL as a site files Tier II and Form R reports, as required, with Boeing requesting chemical information from ETEC annually for the roll-up evaluation. The ETEC project does not typically use or store hazardous materials, with de minimis quantities potentially used as sample preservatives.

E.O. 11988, Floodplain Management (May 24, 1977)

Not Applicable. There are no floodplains located within the ETEC site footprint.

E.O. 11990, Protection of Wetlands (May 24, 1977)

Not Applicable. In 2024, there were no on-site activities that affected or required protection of wetland areas.

3.1.6 Permits and Licenses (Area IV)

Table 3-3 lists the permits applicable to activities in Area IV.

Table 3-3. SSFL Permits

Permit/License	Facility	Valid
Air (VCAPCD)		
Permit 00232	Combined permit renewed	Current
Treatment/Storage (Cal-EPA/DTSC)		
CAD000629972 (93-3-TS-002)	HWMF (Bldg. 4133 and Bldg. 4029)	Active pending final closure.
CA3890090001	RMHF	Active pending final closure.
NPDES (LARWQCB)		
CA0001309	SSFL	Current

3.2 Current Issues and Actions

3.2.1 Area IV Environmental Impact Statement

In 2003, DOE issued the *Final Environmental Assessment for Cleanup and Closure of the Energy Technology Engineering* Center. In 2004 the EA was challenged in Federal Court, and in 2007 the Court directed DOE to complete an EIS. DOE issued an Advance NOI to prepare the EIS in October 2007. DOE conducted EIS scoping meetings in the Simi Valley, San Fernando Valley, and Sacramento areas. In the meantime, DOE embarked on completing the environmental data collection program needed for the EIS. In 2010 DOE signed the AOC, which identified a multi-agency (DTSC, USEPA, and DOE) soil data collection program. Work on the EIS was put on hold until completion of the soil program.

The AOC soil program was completed in 2015 and DOE reinitiated work on the EIS. DOE published in 2014 a Supplemental Notice Intent to prepare the EIS and held scoping meetings in the Simi Valley and San Fernando Valley areas. In January 2017, USEPA published in the *Federal Register* the notice announcing the availability of the *Draft Environmental Impact Statement for Remediation of Area IV and Northern Buffer Zone of the Santa Susana Field Laboratory* for a 60-day review and comment period. In December 2018, USEPA published the *Federal Register* notice for the Final EIS. The EIS addressed DOE's objectives for remediation of buildings, groundwater, and soils.

DOE then published two NEPA records of decision (RODs) related to the Final EIS. The first ROD published in September 2019 identified DOE's plan to demolish DOE's remaining 18 buildings in Area IV. The second ROD published in November 2020 identified DOE's plans for

groundwater remediation in Area IV. DOE remains in active negotiations with California DTSC on the soil cleanup action, and thus a soils ROD has not been published.

Stemming from the DTSC soil cleanup negotiations, several issues with implementation of an AOC soil cleanup identified a need for additional soil remediation alternatives. DOE determined a need to assess under the NEPA process those alternatives, and in December 2024 published an NOI to prepare a Supplemental EIS for Soil Remediation.

The ETEC EIS-related documents are located at: http://www.ssflareaiveis.com/

3.2.2 Radiological

During 2024, the asphalt pad and vault covers of the RMHF, as well as the basement and basement cover of the SNAP Environmental Test Facility (Building 4024), remained in a safe shutdown mode with operations limited to routine inspections and surveys. There are no remaining above-grade structures within the RMHF or Building 4024.

3.2.3 Disposal of Non-Radiological Waste

During 2024, groundwater that infiltrates into the cells and French drain of Building 4024 was pumped into frac tanks and sampled for radionuclides and chemicals prior to being shipped off-site as non-hazardous wastewater. Approximately 107,387 gallons of water were pumped out of the Building 4024 sump into frac tanks and shipped to the Crosby and Overton, Inc., wastewater treatment facility in Long Beach, CA.

During 2024, groundwater generated from GWIM pumping and monitoring well sampling was stored in a 5,000-gallon water storage tank at the FSDF, which was then profiled and disposed of as non-hazardous waste. Additional information regarding the GWIM can be found in Section 7.3.

Non-radiological waste disposal information is provided in Table 3-4.

Table 3-4. Non-Radiological Wastes Disposal

Type of Waste	Quantity	Hauler	Disposal Facility
Non-hazardous Building 4024 water	107,387 gallons	American Integrated Services Phone: (805) 639-0884	Crosby and Overton. Inc. 1610 W. 17th Street Long Beach, CA 90813 Facility Phone: (562) 432-5445
FSDF GWIM	35,752 gallons	American Integrated Services Phone: (805) 639-0884	Crosby and Overton. Inc. 1610 W. 17th Street Long Beach, CA 90813 Facility Phone: (562) 432-5445

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4. ENVIRONMENTAL MANAGEMENT SYSTEM

The ETEC site has operated under an Environmental Management System (EMS) framework since the current contractor's first contract award in October 2014. This contract required that the operating company develop and maintain an EMS consistent with the requirements of ISO 14001:2004, *Environmental Management Systems – Requirements with Guidance for Use*. In response, the ETEC EMS Description (EMSD) was developed and implemented to define the scope of the EMS and provide consistency in evaluating environmental aspects and associated impacts related to planned project activities as well as consistency in significance determinations. The scope of the EMS encompassed major activities/programs that were being conducted under the ETEC Environmental Monitoring and D&D Contract. Overarching goals were tied to the Integrated Safety Management System/EMS Performance Objectives Measures, with zero Environmental Notices of Violation and zero Environmental Non-compliances established. Implementing plans and procedures were developed in support of the goals to ensure success was achieved. The EMSD and supporting documents were in effect until the award of a new contract in July 2024. Through July 2024, no new project activities requiring an EMS aspect/impact evaluation were undertaken, with EMS goals successfully met. In July 2024, the new contract award required an updated EMS framework to meet the requirements of ISO 14001:2015, *Environmental Management Systems – Requirements with Guidance for Use*. The EMSD was modified to meet the new ISO standard requirements, with the same overarching goals in place. Transition and new plan/procedure development activities dominated the remainder of the year, with no new aspect/impact evaluations occurring prior to the end of the year.

The previous contract did not require ETEC to maintain a site-specific SSP, with the new contract implementing that requirement. The FY 2025 SSP related to the new contract was in draft form when DOE O 436.1 was rescinded and was not finalized based on this rescission.

4.1 Environmental Protection/Monitoring Program

The purpose of the environmental protection/monitoring program is to detect and measure the presence of hazardous and radioactive materials; maintain compliance with federal, state, and local laws and regulations; and identify other undesirable impacts on the environment. It includes remediation efforts to correct or improve contaminated conditions at the site and prevent off-site impact. For this purpose, the environment is sampled and monitored, and effluents are analyzed. Goals of this program include demonstrating compliance with applicable regulations and protecting human health and the environment. Environmental restoration activities at SSFL include a thorough review of past programs and historical practices to identify, characterize, and correct all areas of potential concern. The key requirements governing the monitoring program are DOE O 231.1B, "Environment, Safety and Health Reporting" (DOE 2011), and DOE O 458.1, "Radiation Protection of the Public and the Environment" (DOE 2013). Additional guidance is drawn from California regulations and licenses, and appropriate standards.

The basic policy for control of radiological and chemical materials requires that adequate containment of such materials be provided through engineering controls, that facility effluent releases be controlled to federal and state standards, and that external radiation levels be reduced

to as low as reasonably achievable through rigid operational controls. The environmental protection/monitoring program provides a measure of the effectiveness of these operational procedures and of the engineering safeguards incorporated into facility designs.

4.1.1 Historical Radiological Monitoring

Monitoring the environment for potential impacts from past nuclear operations has been a primary focus of DOE since the inception of operations in the mid-1950s.

In the mid-1950s, the Atomic Energy Commission, in concert with its contractor, Atomics International (then a Division of North American Aviation), began initial plans for nuclear research at its facilities in the west San Fernando Valley. In 1955, prior to initial operations, a comprehensive monitoring program was initiated to sample and monitor environmental levels of radioactivity in and around its facilities.

During the 60-year history of nuclear research and later environmental restoration, on-site and off-site environmental monitoring and media sampling have been extensive. In the early years, soil/vegetation sampling was conducted monthly. Sampling locations extended to the Moorpark freeway to the west, to the Ronald Reagan freeway to the north, to Reseda Avenue to the east, and to the Ventura freeway to the south. Samples were also taken around the Canoga and De Soto facilities, as well as around the Chatsworth Reservoir. This extensive off-site sampling program was terminated in 1989 when all nuclear research and operations (except remediation) came to an end.

During the 1990s, extensive media sampling programs were conducted in the surrounding areas, including the Brandeis-Bardin Institute (now known as the American Jewish University) and the Santa Monica Mountains Conservancy to the north, Bell Canyon to the south, the Rocketdyne Recreation Center in West Hills to the east, and various private homes in Chatsworth and West Hills. Samples were also taken from such distant areas as Wildwood Park and Tapia Park. In addition, monitoring of off-site radiation, groundwater, and storm water runoff from the site was routinely performed during this time.

Ongoing radiological environmental sampling and monitoring ensures that DOE operations at SSFL, including cleanup, do not adversely affect either on-site personnel or the surrounding community.

Additional details about on-site and off-site monitoring are available at:

https://www.energy.gov/etec/historical-documentsFrom 2009 through 2012, the EPA conducted extensive radiological sampling in off-site locations (Background Study) and on-site locations (Area IV Radiological Study). Results are available through the Department of Energy (DOE) Area IV tab at:

https://dtsc.ca.gov/santa_susana_field_lab/ssfl_document_library/

4.1.2 Non-radiological Monitoring

Extensive monitoring programs for chemical contaminants in soils, surface water, and groundwater are in effect to ensure that the existing environmental conditions and restoration activities do not pose a threat to human health or the environment. Extensive soil sampling has been performed under the RFI and other site-specific remedial programs.

Groundwater beneath Area IV is extensively monitored for chemical groundwater conditions. Groundwater sampling and analysis is conducted using a DTSC-approved sampling and analysis plan and EPA-approved analytical methods and laboratories. Section 7 discusses groundwater monitoring that was conducted during 2024.

Surface storm water is contained, treated, and monitored in compliance with Boeing's NPDES permit, which was most recently renewed on October 19, 2023, and became effective on January 1, 2024. All sources of air emissions were monitored as required by the VCAPCD.

4.2 Environmental Training

North Wind conducts training and development programs as an investment in human resources to meet both organizational and individual goals. These programs are designed to improve employee performance, ensure employee proficiency, prevent obsolescence in employee capability, and prepare employees for changing technology requirements and possible advancement.

All training is administered through North Wind University. The Program Manager is responsible for individual employee development through formal training, work assignments, coaching, counseling, and performance evaluation. Managers and employees are jointly responsible for defining and implementing individual training development goals and plans, including on-the-job training.

North Wind currently maintains a list of more than 110 courses for North Wind Santa Susana personnel and contractors. Classes are available as both computer-based training and instructor-led training. Specialized training programs on new technological developments and changes in regulations are provided, as needed, to ensure effective environmental protection and worker health and safety. Additional off-site courses are also encouraged.

4.3 Community Outreach and Public Participation

In 2024, DOE conducted or participated in the following community outreach and public participation activities:

1. The DOE ETEC team hosted several site tours for elected officials and their staff, as well as with a social media influencer known for debunking myths and misconceptions about decommissioned sites such as SSFL.

- **January 2024:** Ventura County Supervisor Janice Parvin and her staff visited the SSFL site to gain a deeper understanding of the facility, address community concerns, and receive updates from the DOE on ongoing cleanup efforts and related activities.
- **March 2024:** Simi Valley Mayor Fred Thomas and Simi Valley City Manager Samantha Argabrite visited the SSFL site to learn more about the facility, discuss community concerns, and receive updates from the DOE on ongoing cleanup efforts and related activities.
- **July 2024:** The U.S. Governmental Accountability Office (GAO) visited the site as part of the DOE Office of Environmental Management soils review. ETEC hosted multiple GAO representatives as well as Rob Seifert, DOE's Director of Office of Infrastructure Disposition and Regulatory Policy for EM.
- **October 2024 –** Dr. Joshua Mengers, Federal Project Director for ETEC, and Rob Seifert hosted Scott Lichtig, Cal EPA's Deputy Secretary for Environmental Policy; Katherine Butler, DTSC Director; and Elizabeth "Thanne" Berg, DTSC's Site Mitigation and Restoration Program Deputy Director.
- **October 2024** – Andrew Walker, social media influencer who operates the YouTube Channel Radioactive Drew, visited the site to gather footage for a video looking at ETEC's history, collect radioactivity measurements at the site, and discuss the Sodium Reactor Experiment and possible future plans for SSFL.

2. From January to April 2024, DOE participated in the DTSC-hosted Groundwater University, a series of virtual workshops to educate the public about groundwater at SSFL and prepare them to review and comment on future groundwater decision documents for the site. The series culminated with a site tour in April, where Dr. Mengers spoke about DOE's groundwater activities.
3. In April 2024, DOE's ETEC team issued the first of the revitalized *CleanUpdate* Newsletter, a quarterly publication sharing SSFL news and activities at the site with the community. News and activities shared throughout 2024 included a graduate fellow's data collection for a scat study, the installation of the FSDF GWIM contaminated groundwater extraction system, the discovery of spadefoot toads that had not been observed on-site for a decade, and the collection of soil samples, which lay the groundwork for soils remediation by identifying backfill sources and laboratory capabilities.
4. In August 2024, DOE, the California State Historic Preservation Office (SHPO), and the Santa Ynez band of Chumash Indians signed an amendment to the Programmatic Agreement under the National Historic Preservation Act. The 10-year extension allows DOE to continue making progress toward cleanup at SSFL and provides a roadmap for making decisions that affect cultural resources at ETEC. This extended agreement was shared with stakeholders via email blast.
5. In October 2024, DOE hosted a booth at the Simi Valley Street Fair, a biannual event hosted by the Simi Valley Chamber of Commerce that attracts thousands of local community members. During the event, attendees could learn about SSFL, STEM careers at DOE, and

internship opportunities, or pick up a copy of the *CleanUpdate* or EM Strategic Vision. ETEC staff also offered a seed ball activity for those interested.

6. In November and December 2024, the DOE participated in two Soil Smarts workshops hosted by the DTSC that provided a community update on the next steps for cleanup at SSFL, including the implementation of soil remediation. The November workshop was virtual, while the December workshop was conducted in-person at the DTSC's Chatsworth office.
7. The DOE ETEC team made substantial updates to the ETEC website, with improvements continuing into 2025 to enhance its usability for the public.

Left to right – Samantha Argabrite, Simi Valley City Manager; Fred Thomas, Simi Valley Mayor; Dr. Joshua Mengers, DOE ETEC Federal Project Director; Pamela Hartman, DOE ETEC Deputy Federal Project Director; Melissa Simon, DOE ETEC Community Outreach Manager

Left to right – Rob Seifert, DOE Director of Office of Infrastructure Disposition and Regulatory Policy for the Office of Environmental Management; Dr. Joshua Mengers, DOE ETEC Federal Project Director; Elizabeth "Thanne" Berg, DTSC Site Mitigation and Restoration Program Deputy Director; Katherine Butler, DTSC Director; Scott Lichtig, Cal EPA Deputy Secretary for Environmental Policy

Left to right – Radioactive Drew YouTube Channel photographer (unknown); Andrew Walker, YouTube Channel Radioactive Drew social media influencer; Dr. Joshua Mengers, DOE ETEC Federal Project Director

Left to right – Two members of the public (unknown); Dr. Joshua Mengers, DOE ETEC Federal Project Director

Left to right – Dr. Tara Schoenwetter, ETEC Project Biologist; Pamela Hartman, DOE ETEC Deputy Federal Project Director; Elizabeth Lisann, Senior Policy Advisor at U.S. Nuclear Regulatory Commission; Dr. Joshua Mengers, DOE ETEC Federal Project Director; Alex Walters, Graduate Student

Installation of the FSDF GWIM groundwater extraction system

The discovery of the spadefoot toads that have not been seen onsite for a decade

Field team set up at backfill study soil sample collection location

Native American monitoring during intrusive activities installation of the FSDF GWIM groundwater extraction system

DOE tent exhibit at the Simi Valley Street Fair

5. ENVIRONMENTAL RADIOLOGICAL PROTECTION PROGRAM AND DOSE ASSESSMENT

The environmental radiological monitoring program at SSFL started before the first radiological facility was established in 1956. The program has continued with modifications to suit the changing operations. The selection of monitoring locations was based on several site-specific criteria (i.e., topography, meteorology, hydrology, and the locations of the nuclear facilities). The prevailing wind direction for the SSFL site is generally from the northwest, with some seasonal diurnal shifting to the southeast quadrant.

Multiple air samples are continuously collected to determine if any airborne radioactive material is present. Ambient air samples are measured on-site for gross alpha and gross beta for screening purposes. These screening measurements can quickly identify an unusual release and provide long-term historical records of radioactivity in the environment. Air sampling at ETEC during 2024 was performed by North Wind. Following screening, the air samples are combined into composite samples and sent to an off-site laboratory to be analyzed for specific radionuclides.

Direct radiation is monitored by optically stimulated luminescent dosimeters (OSLDs). The OSLDs used to monitor direct radiation at ETEC were placed by North Wind and analyzed by Landauer. These OSLDs are complemented by thermoluminescent dosimeters (TLDs) installed by the State of California Department of Public Health/Radiological Health Branch (DPH/RHB) for independent surveillance.

Surface water samples collected by Boeing at ETEC are analyzed for radioactivity (as well as chemical constituents) and the results compared with NPDES limits intended to protect aquatic organisms.

Groundwater was sampled by North Wind in 2024 in accordance with the monitoring programs in place at the site. Samples were analyzed for chemical constituents as well as radioactivity. The results were compared to required screening values. The analytical data suite used for laboratory analysis is updated annually after review of the previous year's data.

5.1 Radiological Discharges and Doses

The only historical emission source from DOE facilities in Area IV was the exhaust stack at the RMHF, which was demolished in 2020.

The EPA limit for emissions of radionuclides to ambient air from a DOE site was established to prevent an effective dose equivalent from exceeding 10 millirems per year (mrem/y), as specified in 40 CFR 61, Subpart H. The regulation also specifies that radiation exposure dose to the maximally exposed individual (MEI) be calculated using the EPA's CAP88-PC computer model (EPA 2014). Since no effluents were released to the atmosphere from the DOE facility at SSFL, the potential airborne radiation exposure dose to the MEI was zero.

5.1.1 Estimation of Radiation Dose

Individual Dose

Monitoring of the airborne and external radiation dose is performed to ensure that no individual is exposed to radiation above the limits. The monitoring conducted in 2024 demonstrated that no individual was exposed near the DOE or EPA limits. The population radiation dose was estimated to be 0 mrem/y, well below the most restrictive limit of 10 mrem/y, as stated in DOE O 458.1, "Radiation Protection of the Public and the Environment" (DOE 2013).

In accordance with regulations, the total effective dose equivalent to any member of the public from all pathways (combining internal and external dose) shall not exceed 100 mrem/y (above background) for any DOE facility. The four TLDs deployed along the RMHF fence line near elevated sources of radiation at ETEC have an annual average exposure of 127 mrem/y. Even if a person spent the entire year at this fence line, the hypothetical external dose with background subtracted would be 3 mR/y (135 mR minus 132 mR at the background location). This is less than the 100 mrem dose limit (note that for gamma rays, 1 mR is the same as 1 mrem). In reality, because no member of the public spends any appreciable time near the RMHF fence line, the external dose to a member of the public is zero.

For DOE operations, the air pathway standard is 10 mrem/y committed effective dose equivalent, as established by the EPA.

Public exposure to radiation and radioactivity is shown in Table 5-1. The table presents the estimated exposures in comparison to the regulatory standards. Dose values in the table represent both internal and external exposures.

Table 5-1. Public Exposure to Radiation from DOE Operations at SSFL

All pathways	
1. Maximum estimated external dose to an individual from direct radiation	0 mrem/y
2. Maximum estimated internal dose to an individual	0 mrem/y
Limit ("Radiation Protection of the Public and the Environment," DOE Order 458.1)	100 mrem/y
Air pathway (reported in NESHAP report)	0 mrem/y
Limit (40 CFR 61, Subpart H)	10 mrem/y

Population Dose

Since no effluents were released to the atmosphere during 2024, the potential collective dose to the general population was zero person-rem.

5.2 Clearance of Property Containing Residual Radioactive Material

Property was not released from Area IV during 2024.

5.3 Addressing Radiation Protection of Biota

Radiation protection of the biota is also required. It is estimated through standardized processes using actual soil contamination concentrations. As shown below, the total estimated biota radiation dose is approximately 1.2% of the limit.

DOE O 458.1, "Radiation Protection of the Public and the Environment" (DOE 2013), requires that populations of aquatic organisms be protected using a dose limit of 1 rad/day. While there is no formal DOE dose limit for terrestrial biota, DOE strongly recommends that its site activities meet the internationally recommended dose limits for terrestrial biota, which are:

- The absorbed dose to aquatic animals will not exceed 1 rad/day (10 mGy/day) from exposure to radiation or radioactive material
- The absorbed dose to terrestrial plants will not exceed 1 rad/day (10 mGy/day) from exposure to radiation or radioactive material
- The absorbed dose to terrestrial animals will not exceed 0.1 rad/day (1 mGy/day) from exposure to radiation or radioactive material.

There is no aquatic system in Area IV of SSFL. Therefore, the protection of aquatic organisms on-site is not an issue.

Terrestrial biota (i.e., vegetation and small wild animals) are abundant at SSFL. They are subject to potential exposure from radioactivity in the soil. The DOE Technical Standard, "A Graded Approach for Evaluating Doses to Aquatic and Terrestrial Biota" (DOE 2002), provides a methodology for demonstrating compliance with the requirement for protection of biota. RESRAD-BIOTA, a computer program developed by DOE, implements the graded approach for biota dose evaluation. There are three levels of dose evaluations in RESRAD-BIOTA. The first level is a conservative screening tool for compliance demonstration. Once the screening test in Level 1 is met, no further evaluation is necessary. In the Level 1 dose evaluation, measured radionuclide concentrations in environmental media are compared with the biota concentration guides (BCGs). Each radionuclide-specific BCG represents the limiting concentration in environmental media that would not cause the biota dose limits to be exceeded.

EPA soil concentrations in Area IV, taken in 2011 and 2012, are used for the Level 1 dose evaluation. Table 5-2 summarizes the comparison results. The total BCG fraction in Area IV, as shown in Table 5-2, is less than 1, indicating that the potential exposure is less than the dose limit recommended by DOE.

Table 5-2. Terrestrial Biota Radiation Exposure as a Fraction of Dose Limit

Isotope	Soil			
	Draft LUT (pCi/g)	BCG Limit (pCi/g)	Avg. Soil Concentration above LUT (pCi/g)	Avg. Site Isotopic Partial Fraction
Am-241	3.86E-02	3.89E+03	1.50E-05	3.966E-09
Cm-243/244	3.96E-02	4.06E+03	9.00E-06	2.223E-09
Co-60	3.63E-02	6.92E+02	4.00E-06	6.080E-09
Cs-137	2.25E-01	2.08E+01	2.11E-01	1.012E-02
Eu-152	7.39E-02	1.52E+03	3.40E-05	2.252E-08
Pu-238	2.54E-02	5.27E+03	9.00E-06	1.624E-09
Pu-239/240	2.30E-02	6.11E+03	1.65E-04	2.705E-08
Sr-90	1.17E-01	2.25E+01	4.68E-02	2.082E-03
Th-230	2.38E+00	9.98E+03	9.85E-04	9.872E-08
Th-232	3.44E+00	1.51E+03	0.00E+00	0.00E+00
Th-234	3.54E+00	2.16E+03	1.30E-03	6.026E-07
U-233/234	2.18E+00	5.13E+03	2.56E-03	4.991E-07
U-235/236	1.52E-01	2.77E+03	1.47E-04	5.322E-08
U-238	1.96E+00	1.58E+03	1.49E-03	9.445E-07
			Sum of Partial Fraction	**0.012**

5.4 Unplanned Radiological Releases

There were no unplanned radiological releases from Area IV during 2024.

5.5 Environmental Radiological Monitoring

Monitoring during 2024 at Area IV was conducted for groundwater, air, and soil. The following sections discuss the details of the programs for radiological and non-radiological monitoring:

- Groundwater monitoring (Section 7),
- Air monitoring (Section 8), and
- Soil investigations (Section 9).

Monitoring for ambient radiation was also conducted and is discussed in the following section.

5.5.1 Ambient Radiation

Both North Wind and the state RHB deployed external radiation dosimeters to measure radiation that could leave the site and to determine if there were any changes in background that would require investigation. No results were detected to indicate changes in background or radiation leaving the site.

Previous reports noted agreement between the North Wind measurements and the state measurements; any variance between the two sets of data is within the statistical range of both data sets.

The locations of the North Wind OSLDs and the state TLDs are shown on Figure 5-1. Locations marked with an "S" have North Wind dosimeters, and all other locations have state dosimeters. There is also a dosimeter at the SSFL front gate.

Figure 5-1. Locations of External Ambient Radiation Dosimeters

All dosimeters are exchanged quarterly. The quarterly results are summed to obtain the annual ambient gamma radiation exposure in milli-Roentgens/year (mR/y). Note that an mR is very similar to an mrem in terms of impact; however, the unit mrem cannot be properly applied to an environmental measurement. The annual ambient exposure data obtained during 2024 from these dosimeters are shown in Table 5-3.

Table 5-3. 2024 SSFL Ambient Radiation Dosimetry Data

Location Identifier	OSLD (mR/y) (North Wind)	TLD (mR/y) (California)	Comment
SS-1/017	142	145	OSLD and TLD collocated at SSFL front gate. Away from ETEC, not included in average.
SS-3/001	136	143	OSLD and TLD collocated at electric substation boundary fence (Substation 719).
SS-4/002	142	151	OSLD and TLD collocated W of former sodium disposal facility (H Street West Boundary).
SS-6/003	146	150	OSLD and TLD collocated at NE corner of Building 4353 former location.
006	NA	146	Near sodium disposal facility, NE site boundary at Building 4133.
SS-11/007	136	108*	OSLD and TLD collocated at Building 4036, east side.
SS-12/008	136	163	OSLD and TLD collocated at RMHF NW property line boundary.
009	NA	165	RMHF N boundary fence, middle. Close to elevated radiation sources from Building 4021. Excluded from annual average.
SS-14/010	136	141	OSLD and TLD collocated at RMHF NW property line boundary (W of Building 4614).
013	NA	145	RMHF, NE fence line. Close to elevated radiation sources from Building 4021. Excluded from annual ambient average.
014	NA	139	RMHF, N central fence line. Close to elevated radiation sources from Building 4021. Excluded from annual ambient average.
015	NA	150	RMHF, NW fence line. Close to elevated radiation sources from Building 4021. Excluded from annual average.
016	NA	174	RMHF, Building 4075, N fence line. Near fixed contamination area, excluded from annual ambient average.
018	NA	164	RMHF north boundary west.
019	NA	154	Off-site, Indian Falls Estates.
Average	139	143	Only data in both sets compared.

Location identifiers shown in bold font are most representative of ambient background conditions near the ETEC site. These dosimeters were used to calculate the annual average exposure. The monitoring results from the state TLDs are comparable to, but slightly higher than, the OSLDs deployed by North Wind. This is attributed to differences in the dosimeters themselves. Note that the off-site TLD location at Indian Falls Estates is 154 mR/y and the average of the ETEC ambient OSLDs dosimeters is 139 mR/y, as measured by the OSLDs, and

143 mR/y, as measured by the TLDs. Ambient conditions at ETEC may reasonably be considered representative of natural background.

The state TLD location 008 measured is 163 mR/y. This location is farthest away from the RMHF and is likely measuring natural background radioactivity from the sandstone rock formation and not elevated radiation levels within the RMHF.

Four of the state's TLDs were deployed inside the RMHF fence near fixed subsurface elevated radiation sources at ETEC. Although no member of the public spends any significant time, if any time at all, near these four locations, the dosimeters measure radiation at all times.

When natural background of 154 mR/y is subtracted from the highest measurement of 174 mR/y, the result of 20 mR/y is below the DOE public dose limit of 100 mrem/y. This satisfies the requirements specified in DOE O 458.1, "Radiation Protection of the Public and the Environment" (DOE 2013). These dosimeter results demonstrate that the potential external exposure at the site boundary is below DOE's dose limit.

For comparison, a worker exposed to the average of these measurements (143 mR/y) for 2,000 working hours per year would receive approximately 31 mrem/y. When background is subtracted, the dose for the hypothetical worker is reduced to approximately <1 mrem/y.

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6. ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION

6.1 Non-Radiological Environmental Monitoring

SSFL maintains a comprehensive environmental program consisting of air, groundwater, and soil investigation to ensure compliance with applicable regulations, to prevent adverse environmental impacts, and to restore the quality of the environment from past operations. The following sections discuss the details of these programs conducted during 2024 for radiological and non-radiological monitoring:

- Groundwater monitoring (Section 7),
- Air monitoring (Section 8), and
- Soil investigations (Section 9).

6.2 Fire Protection Management and Planning

The SSFL Area IV on-site project personnel performing site maintenance, monitoring and sampling, data collection, and remediation-related tasks made a coordinated effort to prevent, control, and respond to fire-related risks to personnel, property, and the environment during daily activities. The following measures were assessed and implemented monthly during 2024 to evaluate, prevent, and manage against potential fires at Area IV:

- Site-specific fire risk assessments were conducted for on-site operations, materials, equipment, and environmental conditions for fire hazard identification.
- Vegetation maintenance was performed regularly surrounding monitoring wells, occupied on-site offices, access roads, and parking areas for the protection of DOE infrastructure and assets, and prevention of accidental fires resulting from on-site work tasks.
- Good housekeeping practices were implemented, as well as organization and proper storage of flammable materials and fuel canisters.
- Routine equipment maintenance was completed to prevent overheating or fuel leaks.
- No-smoking policy was strictly enforced on-site.
- Suitable fire extinguishers were kept in all on-site vehicles and regularly occupied offices/buildings and routinely inspected and tested for operability. All project personnel were trained in the correct usage of fire extinguishers and fire watch protocols.

Emergency response planning included the development and communication of fire emergency response, part of the broader Emergency Action Plan for the SSFL Area IV. On-site personnel reviewed the procedures, including evacuation routes, assembly areas, and emergency contact procedures in the event of a fire. Routine emergency (fire) drills and response training were conducted monthly to ensure preparedness and familiarity with emergency procedures.

6.3 Recreational Hunting and Fishing

Recreational hunting and fishing are not permitted at Area IV of the SSFL and therefore are not applicable.

7. GROUNDWATER PROTECTION AND MONITORING PROGRAM

Wells installed in both the Chatsworth Formation and the shallow subsurface are sampled annually to monitor groundwater conditions in Area IV in accordance with the WQSAP (Haley & Aldrich 2010a). Well locations are shown in Figure 7-1. The purpose of these wells is to monitor concentrations of chemicals and/or radioactivity released by historical DOE operations. Groundwater samples are analyzed for a suite of chemical constituents, while some are selected and analyzed for radioactivity, including gross alpha, gross beta, gamma-emitting radionuclides, Ra-226, Ra-228, Sr-90, H-3, and isotopic uranium. Complete analytical results are presented in the Annual Groundwater Reports, which can be found under the *RCRA Facility Investigation – Groundwater* tab in the SSFL Document library located at the following link:

https://www.dtsc-ssfl.com

The *RCRA Facility Groundwater Remedial Investigation Report Area IV* was submitted in August 2018 (CDM 2018a). The *Report on Annual Groundwater Monitoring, Area IV 2024* was submitted in March 2025 (North Wind 2025a).

A site-wide groundwater monitoring program has been in place at SSFL since 1984. Area IV contains 121 shallow and deep wells and 12 seep wells. Routine chemical and radiological monitoring of the wells and seep wells is conducted according to the monitoring plan submitted to DTSC for the Site-Wide Groundwater Monitoring Program and the RFI Program. The following activities stipulated by the Site-Wide WQSAP were conducted during 2024:

- Measurement of groundwater levels
- Collection and submission of groundwater samples from select wells for analytical analysis
- Data validation, data analysis, and database management
- Sampling to support GWIM.

The locations of the wells and piezometers within and around DOE areas in Area IV are shown in Figure 7-1. Groundwater quality parameters and sampling frequency have been determined based on historical water quality data, location of known or potential sources of groundwater contamination, operational requirements of groundwater extraction and treatment systems, and regulatory direction. Wells are gauged quarterly for groundwater levels and sampled annually. The specific analysis dictated for each well is modified annually by DOE and is determined by review of existing data and conditions. Ongoing coordination with DOE and state and federal regulators ensures that applicable analyses are being performed, and that the analysis for each location (including emerging contaminants) is carefully considered and addressed. The groundwater monitoring program for Area IV includes the analysis of the following parameters, which are analyzed using the appropriate EPA methods:

- Volatile organic compounds (VOCs; including 1,4-dioxane)
- Metals
- Fluoride and nitrate
- Total petroleum hydrocarbons (TPH)
- Perchlorate

- Radionuclides.

Sampling events were conducted in the first and third quarters of 2024. Sampling of groundwater wells is typically conducted during the first quarter of each year. Third quarter was included during 2024 due to high rainfall. Groundwater reports are submitted to the regulatory agencies following each sampling event. Summaries of the 2024 results of groundwater contaminants of concern for Area IV are presented in Table 7-1. Historical time series plots are located in Appendix A. Further information regarding the groundwater monitoring program can be found in the *Report on Annual Groundwater Monitoring, Area IV 2024* (North Wind 2025a). Groundwater reports are provided online under the *RCRA Facility Investigation – Groundwater* tab in the SSFL Document Library at the following link: https://www.dtsc-ssfl.com

Groundwater wells are screened in alluvium, weathered bedrock, and unweathered bedrock. Figure 7-1 shows the location of Area IV groundwater wells. For regulatory purposes, "near-surface groundwater" is defined to occur perched or vertically continuous with deeper groundwater within the site's unconsolidated deposits (e.g., alluvium) and shallow weathered bedrock, whereas deep groundwater, referred to as "Chatsworth Formation groundwater," occurs in unweathered bedrock. The alluvium is indicated to generally consist of unconsolidated sand, silt, and clay. Groundwater is ephemeral in some portions of the alluvium and upper weathered Chatsworth Formation. The principal water-bearing system at SSFL is the fractured Chatsworth Formation, predominantly composed of weak- to well-cemented sandstone with interbeds of siltstone and claystone. Several hydraulically significant features (i.e., fault zones and shale beds) are present at SSFL and may act as aquitards or otherwise influence the groundwater flow system.

Table 7-1. Ranges of Contaminants of Concern in 2024 Groundwater Samples

Analytes	Ranges of Detected Results	Screening Values
1,1-Dichloroethane (µg/L)	0.36 J/J to 0.7 J/J	5[1]
1,1-Dichloroethene (µg/L)	0.38 J/J to 3.48	6[1]
1,2-Dichloroethane (µg/L)	no detections	0.55[1]
1,4-Dioxane (µg/L)	0.0476 J/J to 9.15 B/	1[2]
Carbon Tetrachloride (µg/L)	no detections	0.5[1]
cis-1,2-Dichloroethene (µg/L)	0.46 J/J to 9.45	6[1]
Tetrachloroethylene (PCE) (µg/L)	0.4 J/J to 22.5	5[3]
trans-1,2-Dichloroethene (µg/L)	0.79 J/J to 0.92 J/J	10[1]
TCE (µg/L)	0.35 J/J to 9.75	5[3]
Vinyl Chloride (µg/L)	no detections	0.5[1]
Nitrate (mg/L)	16.2 J/J	10[3]
TPH DRO (µg/L)	71.8 J/J to 362	100[4]
TPH GRO (µg/L)	17 J/J to 54.6 J/J	5[4]
Tritium (pCi/L)	710 to 20,000	20,000[3]

1 = California maximum contaminant level
2 = Notification level (site-specific values developed by DTSC)
3 = Primary maximum contaminant level
4 = Taste/odor
J = Estimated value
B = Method blank contamination
Qualifiers presented as laboratory qualifier / data validation qualifier.

7.1 Groundwater Elevation Monitoring

Area IV static water level measurements were gauged quarterly during 2024 to identify the effects of winter rainfall recharge to near-surface groundwater and the decline in water levels following the rains.

In a quarter-over-quarter comparison, static water level measurements in Q4 2023, Q1 2024, Q2 2024, Q3 2024, and Q4 2024 show a generally consistent increase in water levels from Q4 2023 to Q1 2024 and Q2 2024. With some exceptions, water levels generally stabilized or decreased between Q2 2024 and Q4 2024.

As noted in Table 7-2, even with the 6.65-foot average increase in water levels from Q1 2024 to Q2 2024, there were several wells where the static water level decreased. The data also show that the average static water level increases due to the heavy rains during Q1 2024 occurred primarily between Q1 2024 and Q2 2024. The range of static water level changes across the site are indicative of the various types of recharge mechanisms and geologic conditions present, including topographic (surface terrain), stratigraphic (bedding orientation and grain size), and structural (faults, fractures, and lineaments) (North Wind 2025a).

Table 7-2. Average and Maximum Increase or Decrease of Static Water Levels by Time

Time Interval	Average Increase/ (Decrease)	Maximum Increase	Maximum (Decrease)
Q4 2023 to Q1 2024	2.26 ft	16.12 ft	(8.29) ft
Q1 2024 to Q2 2024	6.65 ft	38.95 ft	(8.59) ft
Q2 2024 to Q3 2024	(2.05) ft	3.36 ft	(16.19) ft
Q3 2024 to Q4 2024	(2.04) ft	1.58 ft	(8.69) ft

7.2 Former Sodium Disposal Facility Groundwater Interim Measure

In November 2017, DOE initiated a GWIM at the FSDF using near-surface well RS-54 as the pumping well. The well exhibited TCE and 1,1,1-trichloroethane (1,1,1-TCA) concentrations greater than 1,000 micrograms per liter (µg/L), the target concentration for initiating the GWIM.

In May and June 2018, eight near-surface coreholes (C-20 through C-27) were drilled between 54 and 64 feet bgs at the FSDF as part of a VOC source investigation of the near-surface bedrock. Corehole C-21 exhibited elevated VOC concentrations and was added to the GWIM extraction well network in June 2018. In 2019, corehole C-25 exhibited a VOC concentration greater than 1,000 µg/L and was added as a pumping well; however, continuous groundwater extraction cannot be performed at this corehole during years with less precipitation because of insufficient groundwater. Corehole C-24 began exhibiting VOCs greater than 1,000 µg/L in July 2022 and was formally added as a GWIM extraction well in 2022. From 2019 to 2022, however, water was regularly removed via manual pumping to increase contaminant mass removal.

In June 2020, five new coreholes (C-28, through C-32) were drilled at the FSDF as part of the continuing bedrock fracture source delineation effort. None of the coreholes produced groundwater volumes greater than 10 gallons before being pumped dry.

One corehole, C-28, exhibited VOCs at concentrations greater than 1,000 µg/L in 2022 but was not pumped that year because of low yield and low groundwater levels (the well exhibited between 0 and 5 feet of water in the corehole that year). In 2023, the corehole exhibited sufficient water and the well was added to the network. Corehole C-29 was added to the network in 2023, even though concentrations of TCE in the corehole have not exceeded 1,000 µg/L, as it provides an opportunity to increase contaminant mass removal.

Well RS-18 has been included in the network since 2018, even though concentrations of TCE in this well have not exceeded 1,000 µg/L. The location of RS-18 at the toe of the plume provides an opportunity for contaminant mass removal; the well is opportunistically pumped to contribute to source control.

The FSDF GWIM continued in calendar year 2024 and included seven wells (C-21, C-24, C-25, C-28, C-29, RS-18, and RS-54) in the extraction network.

Installation of Automated Extraction System—CDM Smith teamed with Sustainable Technologies to design and install an automated groundwater extraction system for the GWIM during Q2 2024. Construction of the system started in late March 2024 and finished in May 2024. The automated extraction system replaces manual pumping of three coreholes (C-21, C-24, and C-29) and one near-surface well (RS-54) to enhance VOC-impacted water extraction and mass removal from the near-surface water-bearing sandstone fractures.

The system is powered by solar panels and operates (unattended) during daylight hours when sufficient electricity is generated. Volumes of water pumped from each extraction well are automatically recorded by totalizers and a web-based control for each well. The extraction pumps are controlled by water level switches in the wells through low-level sensors and can turn on only if water is available and no system alarm has triggered. Water extracted by the pumps is transmitted via aboveground and underground piping to a 5,000-gallon water storage tank.

GWIM Sampling—During GWIM operation in 2024, water samples from extraction wells were collected and analyzed on a near monthly schedule for VOCs and 1,4-dioxane and semi-annually for metals and mercury (total and dissolved). The FSDF GWIM will continue in 2025 because 2024 sample results showed that groundwater VOC concentrations remained above the 1,000 µg/L VOC threshold in several samples. Data for the FSDF GWIM can be found in the *Former Sodium Disposal Facility Groundwater Interim Measure Status Report – 2024 Annual Report* (CDM Smith 2025a).

Near-Surface Water Extraction and Mass Removal—A total of 35,752 gallons of near-surface water and 66.4 grams of VOCs were extracted in 2024 by a combination of manual and automated pumping at the seven wells in the GWIM extraction network. A total of 57,136 gallons of near-surface water and 235.3 grams of VOCs have been removed from 2017 through 2024.

The cumulative volume (gallons) of water extracted from the seven GWIM extraction wells is as follows:

Year	RS-54[1]	C-21[1]	C-24[1]	C-25	C-28	C-29[1]	RS-18	Total
2017	193.4	NA	NA	NA	NA	NA	NA	193
2018	140.3	54.8	NA	NA	NA	NA	18.0	213
2019	1,681.9	1,193.9	1,060.2	118.0	NA	NA	188.2	4,242
2020	2,026.0	1,830.2	1,778.8	7.0	21.0	5.0	805.0	6,473
2021	1,127.6	295.2	0.0	0.0	10.0	0.0	8.3	1,441
2022	773.0	244.0	504.5	0.0	8.3	12.5	1.0	1,543
2023	1,578.3	3,587.3	1,501.5	418.8	53.3	50.0	88.5	7,278
2024	4,165.5	7,588.5	22,323.3	6.8	75.4	305.3	1,287.5	35,752
Cumulative Total	**11,686**	**14,794**	**27,168**	**551**	**168**	**373**	**2,397**	**57,136**

NA indicates the well had not yet been added to the GWIM extraction well network.
[1] In June 2024, the well was incorporated into the automated GWIM system.

The cumulative mass (grams) of VOCs removed via the seven GWIM extraction wells is as follows:

Year	RS-54[1]	C-21[1]	C-24[1]	C-25	C-28	C-29[1]	RS-18	Total
2017	9.3	NA	NA	NA	NA	NA	NA	9.3
2018	6.8	0.7	NA	NA	NA	NA	0.0	7.5
2019	35.6	9.8	2.1	0.3	NA	NA	0.3	48.2
2020	21.1	18.8	2.9	0.0	0.2	< 0.1	1.8	44.8
2021	10.1	4.2	0.0	0.0	< 0.1	0.0	0.0	14.3
2022	7.7	3.7	1.6	0.0	< 0.1	< 0.1	0.0	13.0
2023	8.7	19.1	2.4	0.6	0.8	0.1	0.1	31.8
2024	15.3	34.5	14.0	0.0	1.0	0.2	1.4	66.4
Cumulative Total	**114.5**	**90.9**	**23.0**	**1.0**	**2.0**	**0.4**	**3.5**	**235.3**

NA indicates well has not yet been added to the GWIM extraction well network.
[1] In June 2024, the well was incorporated into the automated GWIM system.

Investigation-Derived Waste—In 2024, water generated from GWIM pumping and monitoring well sampling was stored in a 5,000-gallon water storage tank at the FSDF. Groundwater investigation-derived waste (IDW) stored at the FSDF was profiled and disposed of as non-hazardous waste.

7.3 Additional Groundwater Sampling Activities

CDM Smith collected samples from various locations in Area IV for specific data quality objectives (DQOs) during 2024. Each sampling activity is summarized in the following paragraphs.

Supplemental First-Quarter Water Quality Sampling—During Q1 2024, DTSC requested major ion composition sampling (total dissolved solids [TDS], chloride, fluoride, sulfate, total alkalinity, carbonate alkalinity, and bicarbonate alkalinity) for use as a baseline before pilot testing in-situ biological and chemical reduction at the HMSA. The results of the sampling event are provided in *First Quarter 2024 Groundwater Sampling of Area IV Wells* (CDM Smith 2024a).

Seep Sampling—During Q2 2024, seep wells were sampled and analyzed for VOCs, 1,4-dioxane, metals and mercury (total and dissolved), perchlorate, tritium, and gross alpha/ gross beta. The results of the sampling event are provided in *2024 Sampling Results for Near-Surface Seep Monitoring Wells* (CDM Smith 2024b).

FSDF GWIM Monitoring Data—In addition to the GWIM water samples collected from the extraction wells discussed in Section 7.2, water samples were collected in Q1 and Q4 2024 to monitor the FSDF groundwater investigation area. Samples were analyzed for VOCs, 1,4-dioxane, and metals and mercury (total and dissolved). Selected samples were also analyzed for GRO, extractable fuel hydrocarbons (EFH), and/or perchlorate. The results of the Q1 sampling event are provided in *First Quarter 2024 Groundwater Sampling of Area IV Wells* (CDM Smith 2024a). The results of the Q4 sampling event will be provided along with data from FSDF GWIM extraction wells in the FSDF GWIM 2024 annual report scheduled for submission in March 2025.

FSDF Borehole Isolation—Following implementation of borehole isolation activities at C-08, RD-23, RD-54A, and RD-65, groundwater samples were collected in Q1 and Q2 2024 at the four deep bedrock wells and each of their accompanying vadose zone sumps. Samples were analyzed for VOCs, 1,4-dioxane, metals and mercury (total and dissolved), GRO, EFH, and perchlorate. The results of the borehole isolation sampling, including sampling completed in Q4 2023, are provided in the *Borehole Interval Isolation Report, Former Sodium Disposal Facility*, which was submitted to DTSC in April 2025 (CDM Smith 2025b).

HMSA Data Gap Well Sampling—Following the installation and development of six new monitoring wells in November and December 2023 to better characterize the horizontal extent of VOCs in the shallow groundwater at the HMSA, 16 groundwater monitoring wells at the HMSA, the nearby Process Development Unit, and PCE Plume were sampled in January 2024. Newly installed wells were sampled and analyzed for VOCs, 1,4-dioxane, metals and mercury (total and dissolved), GRO, EFH, gross alpha/beta, and tritium.

Following heavy rain in late January and February 2024, the six newly installed wells (PZ-164 through PZ-169) and six selected existing wells (PZ-041, PZ-108, PZ-120, PZ-122, PZ-162, and PZ-163) were sampled in February 2024 to assess the effect of precipitation on VOC concentrations. Samples from these 12 wells were analyzed for VOCs, 1,4-dioxane, and metals and mercury (total and dissolved). Results of this sampling are reported in the *HMSA Groundwater Data Gap Report*, submitted to DTSC in April 2025 (CDM Smith 2025c).

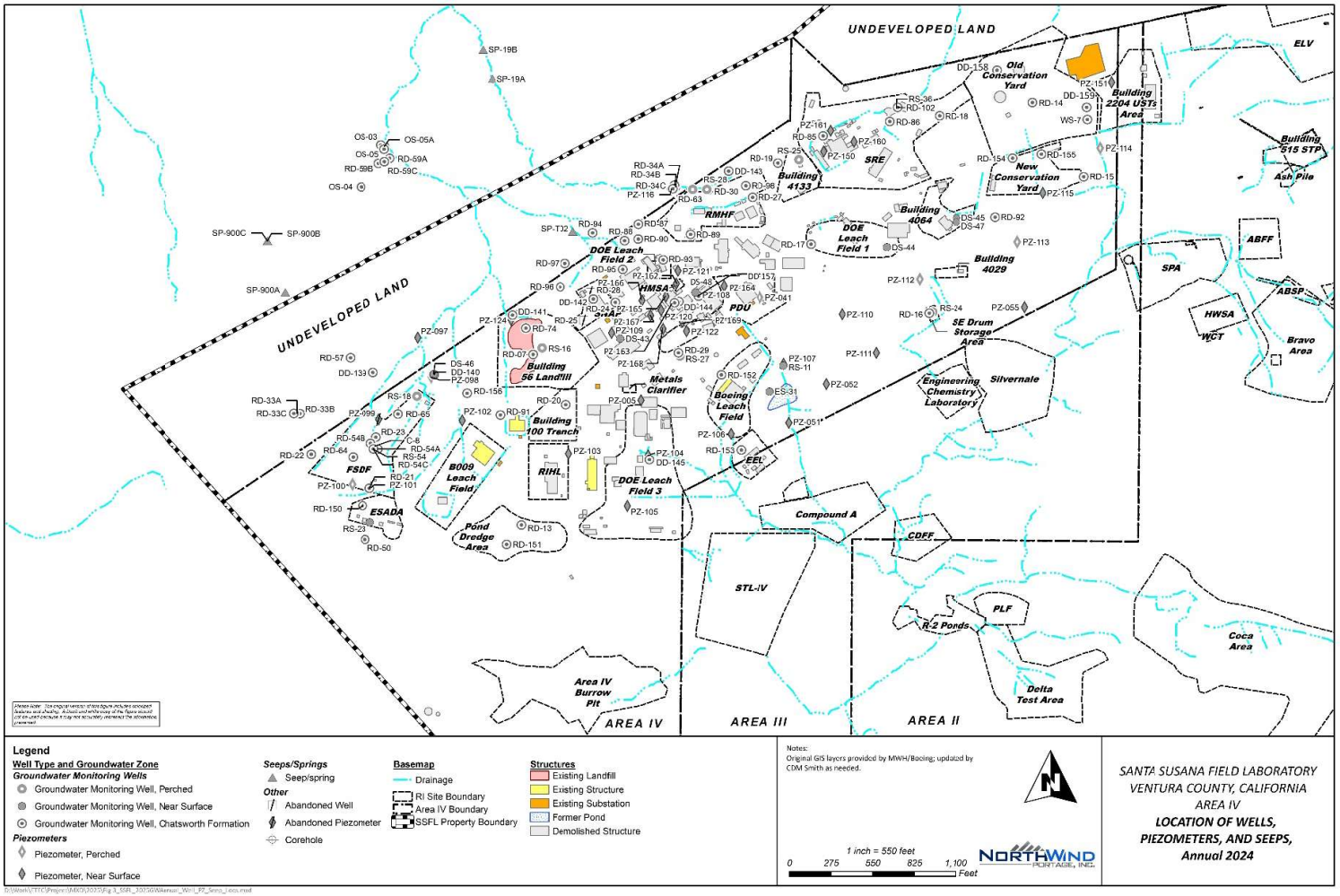

Figure 7-1. Area IV Well, Piezometer, and Seeps Locations

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8. AMBIENT AIR MONITORING PROGRAM

Air particulates are collected on filters at six locations (Figure 8-1). Two locations are within the confines of the ETEC site (ETEC samplers), and four locations are on the ETEC site boundary (DOE samplers).

The two ETEC samplers operate on 7-day sampling cycles. The sample volume of a typical weekly ambient air sample is approximately 50.4 cubic meters (m^3). The four DOE sampler filters are changed twice each week. The cycle is 3 days and then 4 days. The volume of air sampled is approximately 32 m^3 and 57 m^3, depending on whether the sample interval is 3 or 4 days. The sampling frequency of the six locations is shown in Table 8-1.

Airborne particulate radioactivity is collected on glass fiber (Type A/E) filters. The samples are analyzed for gross alpha and beta radiation following a minimum 120-hour decay period to allow the decay of short-lived radon progeny (background radioactivity).

During 2024, 407 air sample filters were collected from the DOE samplers. Each was analyzed individually. The individual measurements were then reviewed to determine if any events required investigation. No events required investigation in 2024.

Quarterly, the filters from each of the six samplers were aggregated and then sent to an off-site laboratory for radiochemical analysis. The filters were analyzed for expected background and possibly site-released material. Analyses of air samples indicate that there have been no airborne releases at the site distinguishable from background.

The results are compared to the derived concentration standards (DCSs) specified in DOE-STD-1196-2011 (DOE 2022). The conservative guideline for alpha activity is 8.1×10^{-14} microcuries per milliliter (µCi/mL) (assuming plutonium-239), and the guideline for beta activity is 1.0×10^{-10} µCi/mL (assuming Sr-90). The values found on the air samples are less than 1% of the DCS, before correcting for background, and most radionuclides are indistinguishable from background.

The radionuclides tested include actinium-228, beryllium-7, Cs-137, Co-60, potassium-40, polonium-210, thorium-228, thorium-230, thorium-232, uranium-234, uranium-235, uranium-238, plutonium-238, plutonium-239, americium-241, Sr-90, Ra-226, Ra-228, and plutonium-241. None of the analytes was more than 1% of the most restrictive limit.

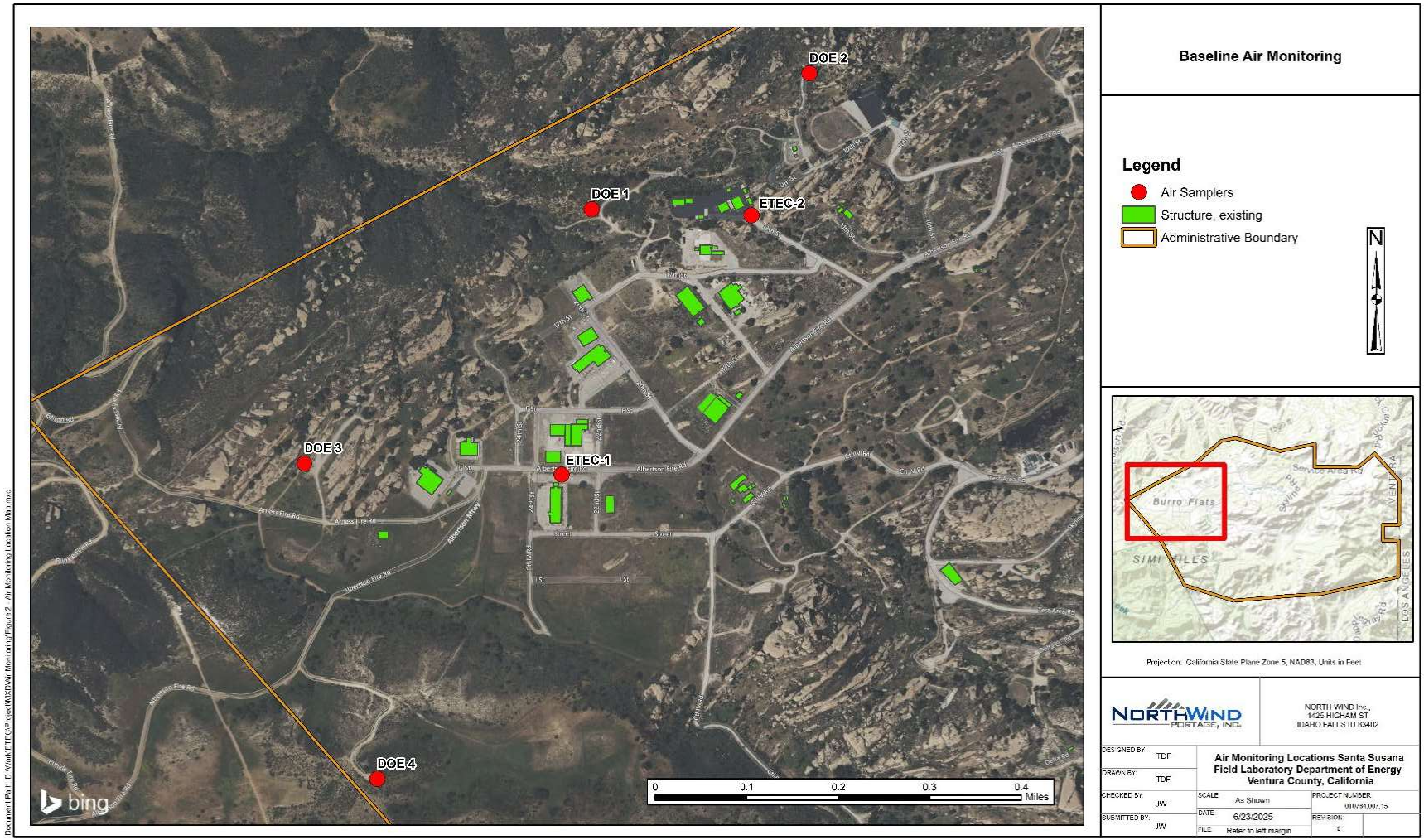

Figure 8-1. DOE Perimeter and ETEC Air Sampler Locations

Table 8-1. Sampling Locations

Station	Location	Sampling Frequency
Ambient Air Sampler Locations		
ETEC-1	SSFL Site, Building 4020, northeast of former 4020 site	W
ETEC-2	SSFL Site, RMHF Facility, next to main gate	W
DOE-1	North perimeter near RMHF	BW (3 or 4 days)
DOE-2	Northeast perimeter	BW (3 or 4 days)
DOE-3	Northwest perimeter	BW (3 or 4 days)
DOE-4	West-Southwest perimeter	BW (3 or 4 days)

Codes		Locations	
BW	Twice Each Week	SSFL	Santa Susana Field Laboratory
W	Weekly Sample		

Air monitoring data are published quarterly. Data from locations DOE-1 through DOE-4 are submitted to DTSC quarterly.

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9. SOIL PROGRAM

The soils investigation program started at the SSFL site in 1996 and was completed in late 2014. Future remedial actions are being planned for impacted soils at the site. From 2010 to 2014, potential chemically contaminated soils in Area IV were evaluated under the DTSC/DOE AOC sampling program. The agreement between DOE and DTSC outlines an approach to investigate and clean up soil contamination in Area IV to specified LUT levels under DTSC oversight, with the objectives of determining the nature and extent of chemicals in soil and assessing the potential threat to groundwater quality in Area IV, the adjacent undeveloped land in the NBZ, and in contiguous areas where soil contamination has migrated. Prior to the signing of the AOC on December 6, 2010, investigation of chemical contamination in soil was performed as part of the RFI program under DTSC oversight.

The Phase 3 Chemical Data Gap Sampling Investigation was completed in 2014. Recent information regarding the Phase 3 chemical data sampling investigation can be found at:

https://www.energy.gov/etec/chemical-co-located-sampling

To address the source of trichloroethylene (TCE) found in groundwater at the FSDF, a source investigation was performed by obtaining bedrock cores and analyzing core material for TCE. The results indicated that the primary bedrock VOC source is in the vicinity of well RS-54 (CDM Smith 2018b).

The Draft Chemical Data Summary Report, which summarizes the data from all soil samples collected to date, was prepared in 2016 and released by DOE in January 2017 for DTSC review and approval. The Draft Chemical Data Summary Report can be found at:

https://www.energy.gov/etec/chemical-data-summary-report-0

Additionally, DOE will continue evaluation of Area IV sampling data and results of the soils treatability studies for soil cleanup remedial alternatives. The Final EIS was released by DOE during November 2018. Recent information regarding the Final EIS can be found at:

https://www.ssflareaiveis.com/final_documentation.aspx

Information regarding the 2010 AOC requirements and AOC soil sampling efforts can be found at:

https://www.energy.gov/etec/consent-orders

In 2003, DOE issued the *Final Environmental Assessment for Cleanup and Closure of the Energy Technology Engineering* Center. In 2004 the EA was challenged in Federal Court, and in 2007 the Court directed DOE to complete an EIS. DOE issued an Advance NOI to prepare the EIS in October 2007. DOE conducted EIS scoping meetings in the Simi Valley, San Fernando Valley, and Sacramento areas. In the meantime, DOE embarked on completing the environmental data collection program needed for the EIS. In 2010 DOE signed the AOC, which

identified a multi-agency (DTSC, USEPA, and DOE) soil data collection program. Work on the EIS was put on hold until completion of the soil program.

The AOC soil program was completed in 2015 and DOE reinitiated work on the EIS. DOE published in 2014 a Supplemental NOI to prepare the EIS and held scoping meetings in the Simi Valley and San Fernando Valley areas. In January 2017, USEPA published in the *Federal Register* the notice announcing the availability of the *Draft Environmental Impact Statement for Remediation of Area IV and Northern Buffer Zone of the Santa Susana Field Laboratory* for a 60-day review and comment period. In December 2018, USEPA published the *Federal Register* notice for the Final EIS. The EIS addressed DOE's objectives for remediation of buildings, groundwater, and soils.

DOE then published two NEPA RODs related to the Final EIS. The first ROD, published in September 2019, identified DOE's plan to demolish DOE's remaining 18 buildings in Area IV. The second ROD, published in November 2020, identified DOE's plans for groundwater remediation in Area IV. Since the issuance of the 2018 SSFL Area IV EIS, DOE identified some challenges for soil remediation: the provisional LUT values developed to define background are not implementable; backfill soils needed to restore the site are not available at the established cleanup standards; the provisional cleanup standards set for some contaminants are lower than laboratory detection capabilities; and the pristine sites used to develop the provisional LUT values would not pass as clean. DOE remains in active negotiations with the California DTSC on the soil cleanup action, and thus a soils ROD has not been published.

Stemming from the DTSC soil cleanup negotiations, several issues with implementation of an AOC soil cleanup identified a need for additional soil remediation alternatives. DOE determined a need to assess under the NEPA process those alternatives, and in December 2024 published an NOI to prepare a Supplemental EIS (SEIS) for soil remediation. The soil remediation alternatives to be evaluated in the SEIS include the following:

- **Updated LUT Values Alternative** – DOE, working with DTSC staff, identified issues with the AOC LUT background threshold values and MRLs and DOE developed proposed "Updated" LUT values that reduce the false-positive decision error rate.
- **Multiple Lines of Evidence (MLE) Alternative** – Looking at options for addressing issues with AOC soil cleanup implementation, DTSC developed a soil cleanup option termed the "Multiple-Lines of Evidence" approach, which means using different types of proof to support an idea, making the argument stronger and more reliable. According to DTSC, the MLE approach uses risk assessment to ensure the protection of human health while minimizing unnecessary removal of clean soil and destruction of critical habitats and cultural resources.
- **Resident with Garden Risk-based Alternative** – The Boeing Company and DTSC entered into a settlement agreement providing a framework for the soil cleanup action for Boeing's cleanup at SSFL. Standard risk assessment protocols would be followed in identifying locations for a soil cleanup action.
- **No Action Alternative** – In accordance with DOE NEPA regulations, DOE will evaluate a "no action" alternative. As required under NEPA, this alternative is to establish the baseline against which the environmental effects from other analyzed alternatives can be compared.

To support and resolve the challenging issues of the AOC soil cleanup and the updated LUT values alternative in the SEIS, DOE drafted the *Implementation Plan for the Laboratory Method Reporting Limits and Backfill Source Studies* (CDM Smith 2024c) on August 23, 2024, which was subsequently approved by DTSC on September 9, 2024. In October 2024, soil samples were collected, split, and submitted to 15 commercial laboratories for the laboratory MRL study and to 3 commercial laboratories for the backfill source studies.

The MRL study field implementation began on October 21, 2024, and was completed on December 12, 2024. The backfill source study field implementation is scheduled for completion in 2025. The MRL and backfill source study results are planned to be reported in 2025.

In addition, related to the LUT assessment and update, DTSC failed to sample its background site for TPH chemicals. Alternatively, DTSC chose to identify a cleanup strategy based on future studies of the issue. To produce TPH data that reflected background TPH from NOM, DOE elected to return to the DTSC soil background site and sample the soil for the presence of TPH and NOM. In 2024, discussions were conducted regarding the implementation of a supplemental background study for TPH to further support the updated LUT values alternative in the SEIS. DOE will develop a work plan, conduct sample collection, and report the results.

The SEIS draft chapters will be developed in 2025, a preliminary draft is anticipated for released in 2026, and public comment and final report anticipated for completion in 2027.

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10. QUALITY ASSURANCE PROGRAM

QA/QC practices encompass all aspects of the SSFL comprehensive environmental monitoring program consisting of air, groundwater, and soil investigations to ensure compliance with applicable regulations, to assess SSFL off-site human health exposures to radionuclides and chemicals, and to evaluate the potential impact of site operations on the environment. This section discusses the QA activities conducted in regard to the 2024 monitoring activities:

- Water quality samples were collected pursuant to the Site-Wide Groundwater Monitoring Program (Haley & Aldrich 2010b) and the RFI Program (CDM Smith 2015).
- GWIM groundwater samples were collected and analyzed to assess the VOC extraction of the pumping wells.
- Ambient air monitoring was conducted on a bi-weekly basis for VOCs and radiological constituents.
- Soil samples were collected as part of the MRL study.

10.1 Site-Wide Groundwater Monitoring Program

During 2024, water quality samples were collected pursuant to the Site-Wide Groundwater Monitoring Program (Haley & Aldrich 2010b) and the RFI Program (CDM Smith 2015).The Quality Assurance Project Plan for Groundwater Monitoring (QAPjP; North Wind 2025b) reflect how quality requirements are fulfilled in support of the environmental monitoring activities at SSFL, including EM-QA-001, *Office of Environmental Management Quality Assurance Program* (DOE 2012). The QAPP and QAPjP present the QA/QC procedures associated with tracking, reviewing, and auditing to ensure that the data collected in the field and in the off-site laboratory are of sufficient quality, as well as to ensure that the project work meets the outlined QA requirements for intended data use. The QAPP and QAPjP are formatted to provide a direct correlation to the management/performance/
assessment criteria specified in 10 CFR 830 and DOE O 414.1D, with references to the applicable requirements of American Society of Mechanical Engineers (ASME) NQA-1.

The primary goal of an Environmental Surveillance program is to provide high-quality data so that the necessary assessments and decisions based on the data can be made. This section presents information on measures taken by the groundwater environmental monitoring program in 2024 to ensure the high quality of data collected and reported.

10.1.1 Background

The following summarizes the inorganic, metals, organic, and radiochemical data validation completed for 33 EPA Level IV sample delivery groups (SDGs) containing results from the groundwater monitoring program at SSFL Area IV in Ventura County, California. Of the 33 SDGs collected, 18 were from Quarter 1 and 15 were from Quarter 3. The data for this effort were acquired from sampling efforts completed from February 12, 2024, through March 4, 2024, for the Quarter 1 sampling event and August 19, 2024, through September 3, 2024, for the Quarter 3 sampling event. GEL Laboratories, LLC, generated all the data for this summary.

The data were validated using the requirements and protocols outlined in the following documents and analytical methods:

- *Site-Wide Water Quality Sampling and Analysis Plan, Revision 1, Santa Susana Field Laboratory, Ventura County, California,* Appendix A, December (Haley & Aldrich 2010a)
- *Groundwater Monitoring, Quality Assurance Project Plan, Revision 1, Santa Susana Field Laboratory, Ventura County, California,* Appendix B, December (Haley & Aldrich 2010b)
- *U.S. EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, OSWER 9240.1-46, USEPA-540-R-08-01, November* (EPA 2020a)
- *U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, OSWER 9240.1-35, EPA 540-R-01-008, November* (EPA 2020b)
- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, EPA publication SW-846, Third Edition, update V (EPA 2015)
- *Multi Agency Radiological Laboratory Analytical Protocols Manual (MARLAP)*, EPA 402-B-04-001A, July 2004 (EPA et al. 2004)
- *Evaluation of Radiochemical Data Usability, ES/ER-MS-5,* April 1997 (Paar and Porterfield 1997).

The following sections provide an overview of the data sets and findings of the data validation effort.

10.1.2 Sampling Summary

The SSFL 2024 groundwater data set consists of 33 EPA Level IV SDGs with a total of 280 water samples, including QC samples (matrix spike/matrix spike duplicates [MS/MSD], field blanks, rinsate blanks, trip blanks, and field duplicates). Five SDGs from Quarter 1 (655532, 655689, 656201, 656334, and 656500) and three SDGs from Quarter 3 (683096, 683260, and 683873) underwent a Level IV EPA validation, comprising more than 20% of the overall data per analysis for these sampling efforts. The remaining SDGs for both events underwent an EPA Level III validation.

The samples were analyzed for the following: VOCs, 1,4-dioxane, gasoline-range organics (GRO), diesel-range organics (DRO), dissolved and total metals (including mercury), perchlorate, fluoride, nitrate, tritium, and dissolved and total radiochemical (RAD). Table 10-1 provides the total annual number of normal (non-QC) samples analyzed for each analysis compiled from the chains of custody (CoCs).

Table 10-1. Annual Summary of Analyses for SSFL Area IV Groundwater Sampling

Analysis	Method		Number of Normal Samples Analyzed
Volatile Organic Compounds	USEPA SW-846 8260B		70
1,4-Dioxane	USEPA SW-846 8270D Selective Ion Monitoring (SIM)		68
DRO and/or GRO	USEPA SW-846 8015D		51
Fluoride and Nitrate	EPA 300.0		2
Perchlorate	USEPA SW-846 6850 Modified		2
Metals (Total & Dissolved)	USEPA SW-846 6020B USEPA SW-846 7470A		62 Total 62 Dissolved
Radiochemical (Total & Dissolved)	Isotopic U	DOE EML HASL-300, U-02-RC Modified	16 Total 16 Dissolved
	Gamma Spectroscopy	EPA 901.1	18 Total 16 Dissolved
	Gross Alpha/Beta	EPA 900.0/SW846 9310	16 Total 16 Dissolved
	Strontium-90 (Sr-90)	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	23 Total 23 Dissolved
	Radium-226 (Ra-226)	EPA 903.1 Modified	16 Total 16 Dissolved
	Radium-228 (Ra-228)	EPA 904.0/SW846 9320 Modified	16 Total 16 Dissolved
	Tritium	EPA 906 Modified	9 Tritium

Note: Table 10-1 represents the quantity of normal samples only (i.e., non-QC samples).

10.1.3 Quality Control Sample Summary

Trip Blanks and Field Blanks:

Eleven trip blank samples and one field blank sample were collected during each quarterly groundwater event. All trip blank and field blank results were either non-detect or qualified "U" and no data qualification was warranted. All validated data points are considered usable for evaluating site conditions.

Field Duplicates:

Nine pairs of field duplicates were collected during Quarter 1, and 10 pairs of field duplicates were collected during Quarter 3. One field duplicate pair was outside the 35% relative percent difference (RPD) acceptance criterion: RD-64_021324_01_L and RD-64_021324_36_L in SDG 655532. This field duplicate pair exceeded the 35% RPD criteria for aluminum, cobalt, iron, and manganese. Both of these samples have been qualified with a "J" validation flag for the aforementioned analytes with RPD exceedances. All remaining field duplicate precision results were within the 35% RPD criterion, and all validated data points are considered usable for evaluating site conditions.

10.1.4 Validation Qualifications

Qualifications were assigned in accordance with the *U.S. EPA Contract Laboratory Program National Functional Guidelines* (EPA 2020a and 2020b) and resulted from:

- Preparation and CoC issues
- Exceeded holding times
- Poor initial and continuing calibration criteria
- Positive blank detections
- Poor laboratory control sample (LCS), laboratory control sample duplicate (LCSD), MS, MSD, and serial dilution sample performance
- Results reported below the quantitation limits
- Validator professional judgment.

Table 10-2 summarizes the annual data qualifications assigned to site-wide groundwater monitoring program data for the combined Quarter 1 and Quarter 3 sampling efforts. Definitions of the data validation qualifiers used in this assessment are provided in Table 10-3.

Table 10-2. Summary of Annual Data Validation Qualifications for the Site-Wide Groundwater Monitoring Program

	Validation Qualifier:	J	J-	U or Not Qualified	UJ
Method	Total # Records	# Records	# Records	# Records	# Records
DRO and/or GRO	190	28	3	143	16
Fluoride & Nitrate	9	2	0	7	0
Perchlorate	6	1	0	5	0
Metals	3809	425	0	3384	0
Radiochemical	1473	68	0	1361	44
Volatile Organic Compounds	3602	97	0	3496	9

Table 10-3. Data Validation Qualifier Definitions

Flag	Definition
Organics and Inorganics	
U	The analyte was analyzed for but was not detected above the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
R	The data are unusable. The sample results are rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.
Radiochemical	
No Qualifi-cation	The analysis was performed, and radioactivity was detected (e.g., the radioanalytical result is statistically positive at the 95% confidence interval and is above its MDC). **NOTE:** *The radionuclide is considered to be present in the sample.*
U	The analysis was performed, but no radioactivity was detected (e.g., the radioanalytical result was not statistically positive at the 95% confidence interval and/or the result was below its MDC). The "U" qualifier flag is also applicable to any result reported as zero (0) (± an associated uncertainty). **NOTE:** *The radionuclide is not considered to be present in the sample.*
UJ	The analysis was performed, but the result is highly questionable due to analytical and/or laboratory quality control anomalies. The use of such a result is strongly discouraged. Analytical and quality control anomalies include such items as: significant blank contamination, known photopeak interferences and/or photopeak resolution problems, known matrix interferences, unacceptable laboratory control sample recoveries, serious instrument calibration problems, improper sample preservation, etc. The "UJ" qualifier flag could designate a possible false positive result in the case of a result that is statistically positive at the 95% confidence level. The "UJ" qualifier flag could indicate the result is considered an estimated non-detect (a non-detect that may be due to loss of analyte from lack of sample preservation, holding time exceedances, etc.). The specific use of the "UJ" flag is included by the validator in the text of the validation report. **NOTE:** *The radionuclide may or may not be present in the sample and the result is considered highly questionable.*
J	The analysis was performed, and radioactivity was detected (e.g., the radionuclide result is statistically positive at the 95% confidence interval and is above its MDC). However, the result is questionable due to analytical and/or laboratory quality control anomalies/irregularities and should therefore be used only as an estimated (approximated) quantity. Analytical and/or quality control anomalies include such items as: laboratory duplicate imprecision, unsatisfactory analytical yields, insufficient laboratory control sample recoveries, unacceptable PE sample results, instrument calibration problems, improper sample preservation, etc. **NOTE:** *The radionuclide is considered to be present in the sample; however, the result may not be an accurate representation of the amount of activity actually present in the sample.*
R	The analysis result is unusable and was rejected due to severe analytical and/or quality control problems. **NOTE:** *The radionuclide may or may not be present, and the result is known to be inaccurate or imprecise.*

10.1.5 Data Completeness

Completeness of the data collection program is defined as the percentage of samples planned for collection, as listed in the WQSAP and Groundwater Monitoring QAPP (Haley & Aldrich 2010a, 2010b) versus the actual number of samples collected during the field program (see Equation A).

$$\textbf{Equation A: } \%Completeness = C \times \frac{100}{n}$$

Where:

C = actual number of samples collected
n = total number of samples planned

Completeness for acceptable data is defined as the percentage of acceptable data obtained judged to be valid versus the total quantity of data generated (see Equation B). Acceptable data include both data that pass all the QC criteria (i.e., unqualified data) and data that may not pass all the QC criteria but had appropriate corrective actions taken (i.e., qualified but usable data).

$$\textbf{Equation B: } \%Completeness = V \times \frac{100}{n'}$$

Where:

V = number of measurements judged valid
n' = total number of measurements made

The overall completeness goal, as defined in the WQSAP and Groundwater Monitoring QAPP (Haley & Aldrich 2010a, 2010b) for this sampling event, is 90% for each analytical test for all project data.

The completeness achieved for acceptable data was 100% of the groundwater sample results for the number of measurements judged to be valid versus the total number of measurements made for all samples analyzed. No sample data points were rejected ('R' qualified).

The completeness goal for the number of measurements judged to be valid was met for 2024 site-wide groundwater monitoring program. The data reported are suitable for their intended use for characterization of groundwater in Area IV of SSFL.

10.1.6 Assessment of Data Usability and Reconciliation with the Site-Wide WQSAP Goals

No major findings were discovered during field operations. For both quarters of the annual groundwater sampling events, 100% of the data validated and reported are suitable for their intended use for site characterization.

The reporting limits (RLs) reported generally met the expected limits proposed by the analytical laboratory in their subcontract agreements with North Wind. Sample results that were qualified as estimated ('J') are usable for project decisions. Decisions based on results close to the RL should be made with a degree of caution.

The field duplicate precision criteria were met and all radiological field duplicate error ratio criterion of <2 was met.

The achievement of the completeness goal for the number of samples collected was met. The completeness goal for the number of sample results acceptable for use provides sufficient quality data to support project decisions for the wells that were sampled during the 2024 sampling events.

10.2 GWIM

During 2024, GWIM monitoring coreholes and monitoring wells were sampled using a nondedicated bladder pump that was decontaminated before each use in accordance with the Site-Wide Groundwater Monitoring Program SOPs (Haley & Aldrich 2010b).

GWIM samples were sent to EMAX Laboratories, Inc., for analysis of the following:

- VOCs using U.S. Environmental Protection Agency (EPA) Method 8260B
- 1,4-dioxane using EPA Method 8260B Selective Ion Monitoring
- Perchlorate using EPA Method 6850
- Extractable fuel hydrocarbon (EFH) and gasoline-range organics (GRO) using EPA Method 8015B
- Total and dissolved metals using EPA Method 6020A
- Total and dissolved mercury using EPA Method 7470A.

Analytical results were validated using the U.S. EPA Contract Laboratory Program National Functional Guidelines (EPA 2020a and 2020b).

DQOs for data are expressed using measurement performance data quality indicators that include precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS). DQOs provide a mechanism for ongoing quality control (QC) and evaluation and measurement of data quality throughout the project. These DQOs are outlined in the WQSAP (Haley & Aldrich 2010).

Data review was conducted to demonstrate that the measurement performance criteria established in the WQSAP were met. In general, the following data measurement criteria were considered:

- Achievement of analytical method and reporting limit requirements
- Adherence to and achievement of appropriate laboratory analytical and field QC requirements
- Achievement of required measurement performance criteria for PARCCS parameters
- Adherence to sampling and sample handling procedures
- Adherence to the sampling design and deviations documented.

Data verification, validation, and assessment were used to verify adherence to the WQSAP procedures and requirements. These assessments were used to reconcile the planned objectives detailed in the WQSAP against the investigation results.

The WQSAP calls for low-flow purging and sampling, which cannot be performed at the four automated extraction wells (C-21, C-24, C-29, and RS-54). These wells pump water daily during daylight hours at preset speeds using dedicated GWIM submersible pumps when water is available. The constant pumping results in the water present in the corehole being representative of the targeted near-surface seepage water without additional purging. Sampling of these extraction wells is difficult when water availability is limited in the wells and requires a unique sampling procedure that is documented in a stand-alone SOP, SSFL SOP 29. Future sampling from the extraction wells will follow SSFL SOP 29 to keep the method consistent and results comparable. In addition, low-flow purging and sampling were not performed at well C-23 because of tree roots that prevented the pump from accessing below the top 2 feet of the water column. Instead, a grab sample was collected at well C-23 using a disposable bailer.

Applicable sample results were qualified based on field duplicates, field blanks, laboratory blanks, surrogates, calibration criteria, laboratory control sample criteria, MS criteria, internal standards, and holding times. No sample results were rejected. Sample results that required qualification are usable for project decisions. Perchlorate was inadvertently not analyzed for at well RS-54. This well will be sampled in Q1 2025, and perchlorate will be analyzed then. This missing perchlorate result does not affect the overall DQOs for Q4 sampling activities. Based on the data review, all collected Q4 2024 data met DQOs.

10.3 Ambient Air

10.3.1 Background

Ambient air sampling is performed throughout the year, with VOC samples being analyzed biweekly for Toxic Organics Method 15 (TO-15) by ALS Environmental, Simi Valley, CA, and radiological samples being analyzed at the end of each quarter by GEL Laboratories, LLC, Charleston, SC.

10.3.2 VOCs

There were 26 annual VOC sampling events for the collection of TO-15 air samples. Each of the four locations was sampled during each sampling event. A minimum of 20% of the VOC results underwent third-party data validation. During 2024, 8 of the 26 SDGs underwent data validation.

For the VOCs, the only QC samples collected were field duplicates. 26 field duplicates were collected during 2024 (one per event). Verification of sample and duplicate analyte detection are calculated using the following equation:

$$RPD = \left| \frac{Field\ Duplicate\ Result - Parent\ Sample\ Result}{\left[\frac{Field\ Duplicate\ Result + Parent\ Sample\ Result}{2}\right]} \right| x\ 100$$

Validated field duplicates were within the quality objective of +/- 15% RPD. Data completeness goals for VOCs exceeded the project goal of 85%, and the VOC data were deemed usable for their intended purpose.

10.3.3 Radiological

Samples analyzed at the off-site laboratory are QC-checked at the laboratory. These QC checks include blanks, laboratory replicates, MSs, and MSDs. While some QC tests for radium appeared to be biased low, the results do not indicate the release of radium, which is not a contaminant of concern at the site because it is a natural radionuclide. In 2024, 100% of the radiological analytical results have undergone Level IV, third-party data validation, and all data radiological data were deemed usable for their intended purpose.

10.4 MRL Soil Investigation

The MRL study for the SSFL site was conducted in fall of 2024. This study was conducted to evaluate method detection limit (MDL) and MRL capabilities of analytical laboratories throughout the industry. Fifteen laboratories were sent 8 samples to be analyzed for Aroclors, dioxins/furans, energetics, general chemistry, herbicides, metals, mercury, methyl mercury, pesticides, phthalates, polycyclic aromatic hydrocarbons, semivolatile organic compounds, TPH with and without silica gel cleanup, VOCs, and radionuclides. Not every laboratory performed every analytical method as some were method specific, such as the radionuclide laboratories.

Approximately 61 laboratory data packages were validated by CDM Smith validators not associated with the sample collection. Validation was performed using the following documents as well as applicable method-specific quality control parameters:

- National Functional Guidelines for Inorganic Superfund Methods Data Review (EPA 2020b)
- National Functional Guidelines for Organic Superfund Methods Data Review (EPA 2020a)
- National Functional Guidelines for High Resolution Superfund Methods Data Review (EPA 2020c)
- Multi-Agency Radiological Laboratory Analytical Protocols Manual (MARLAP) (EPA et al. 2004).

DQOs for data are expressed as measurement performance data quality indicators that include PARCCS. DQOs provide a mechanism for ongoing QC and evaluation and measurement of data quality for the MRL study objectives.

Data review was conducted to demonstrate that the measurement performance criteria established in the Implementation Plan (IP) were met. In general, the following data measurement criteria were considered:

- How well applicable laboratory analytical QC requirements were implemented
- Whether required PARCCS measurement performance criteria were met
- How well field staff adhered to the sampling design, including sampling and sample handling procedures
- How well field staff documented field deviations from the QAPP, and impacts of those deviations on data quality.

Data verification, validation, and assessment were used to verify adherence to the IP procedures and requirements and reconcile the planned sampling objectives against the sampling results. There were no significant deviations from the IP. Associated sample results were qualified as nondetect or estimated when laboratory control criteria elements were outside of criteria. A small number of sample results were rejected. The qualified results do not affect the evaluation of the MDL/MRL study. The sample results qualified as estimated are usable for project decisions. The rejected results also provide information on the MDLs and MRLs but will be used with a high degree of caution in this evaluation. The DQOs were met for most analytes, and most of the validated data are suitable for their intended use with the qualifiers applied.

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Appendix A
Time Series Plots of Analytical Data

Appendix A

Time Series Plots of Analytical Data

Time series plots for trichlorothene (TCE), perchlorate, and tritium are presented in this Appendix. Only primary sample results for the following wells are presented in the plots.

TCE

FSDF/ESADA
RD-21
RD-33A
RD-33B
RD-33C
RD-54A
RD-54B
RD-54C
RD-64
RD-65
RS-18
RS-54

RMHF
RD-30
RD-34A
RD-34B
RD-34C
RD-63
RD-98
RS-28

Bldg 65 Metals Clarifier
PZ-005
PZ-104
PZ-105

TCE

Bldg 56 Landfill
RD-07

HMSA/PDU
PZ-108
PZ-120

B4057/59/626
PZ-109

OCY
RD-14

Bldg 4100 Trench
RD-20

Bldg 4133
RD-19

Offsite

RD-59A
RD-59B
RD-59C

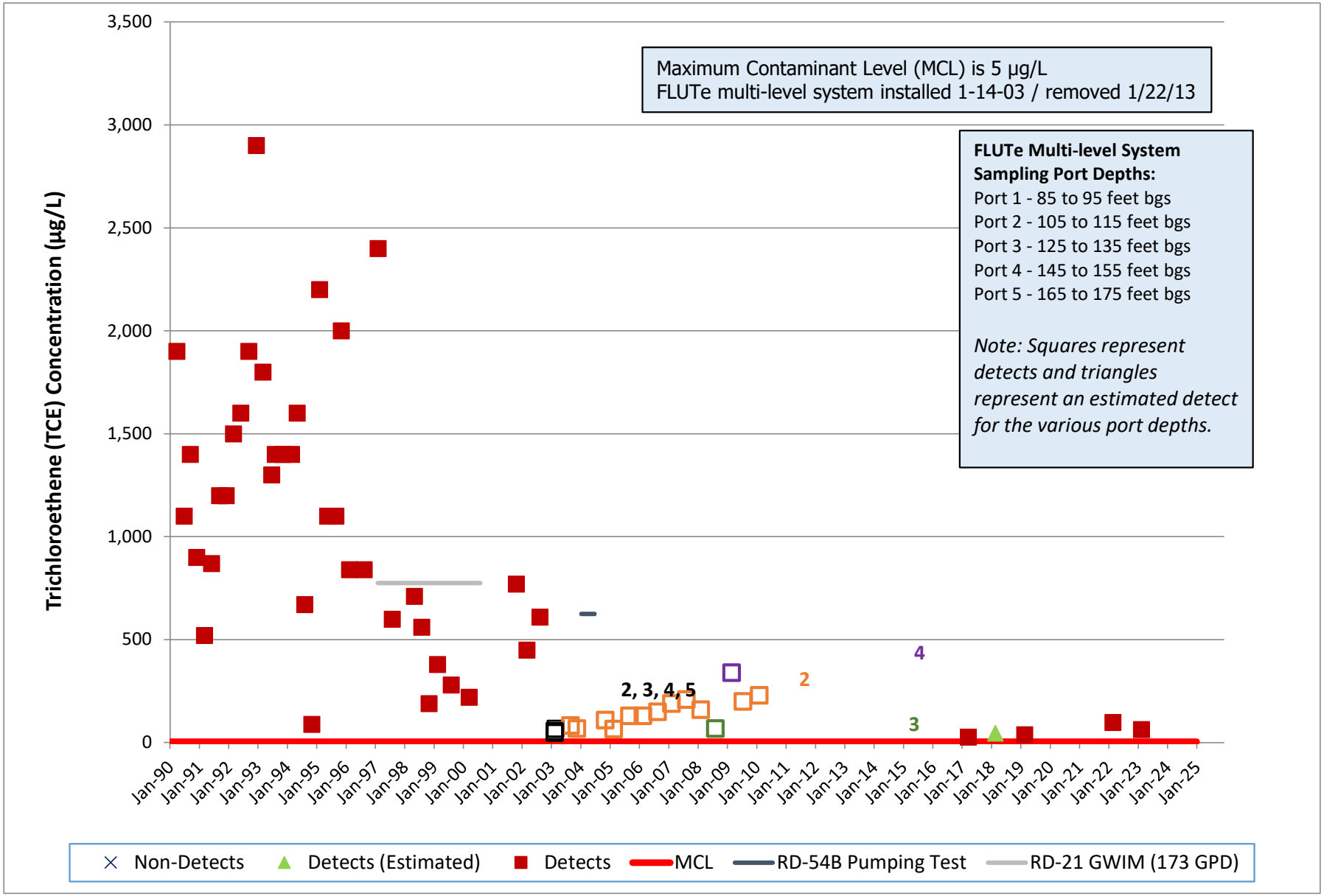
Perchlorate

FSDF/ESADA
RD-21
RD-54A
RS-18
RS-54

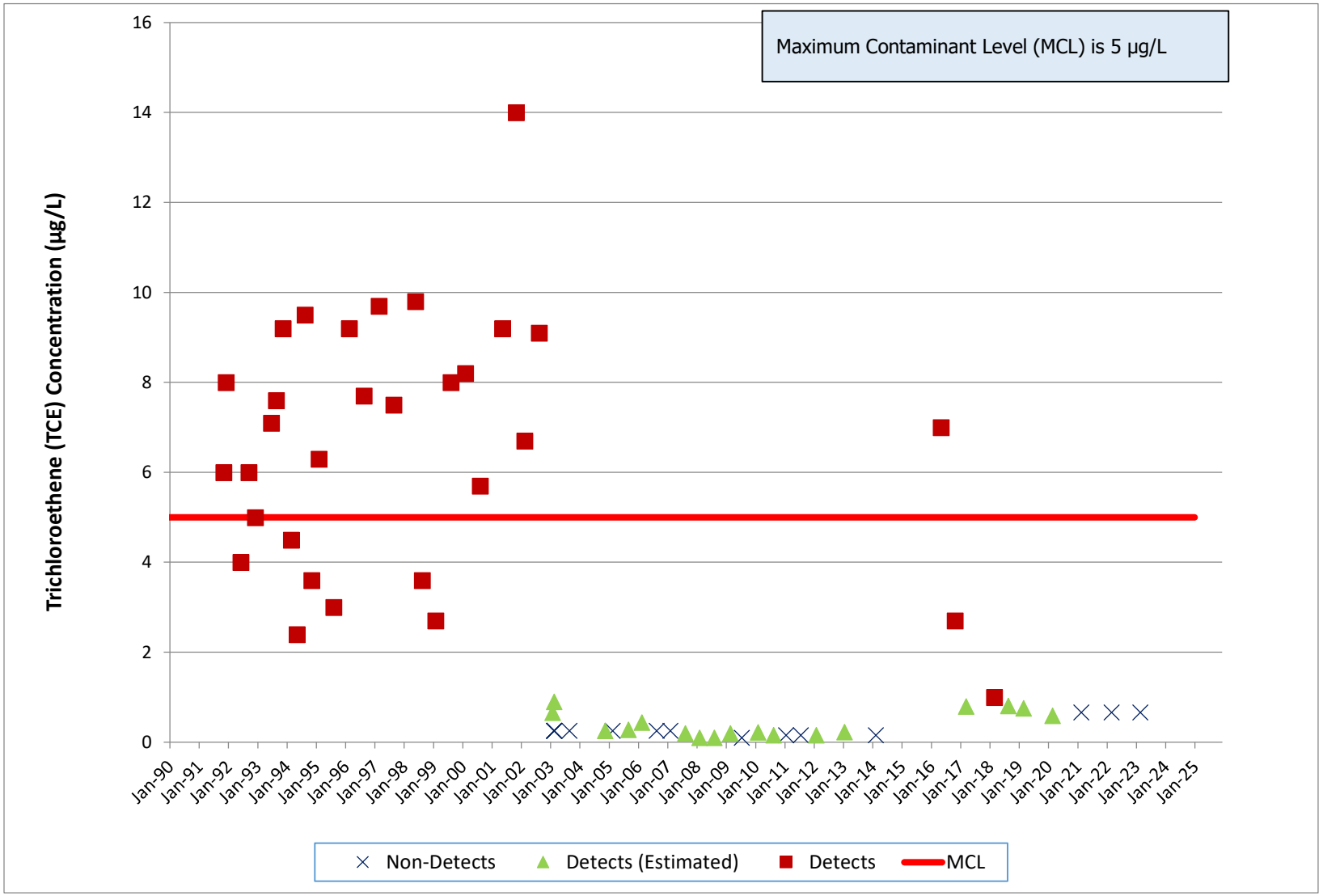
Tritium Plume

RD-34A
RD-88
RD-90
RD-93
RD-94
RD-95

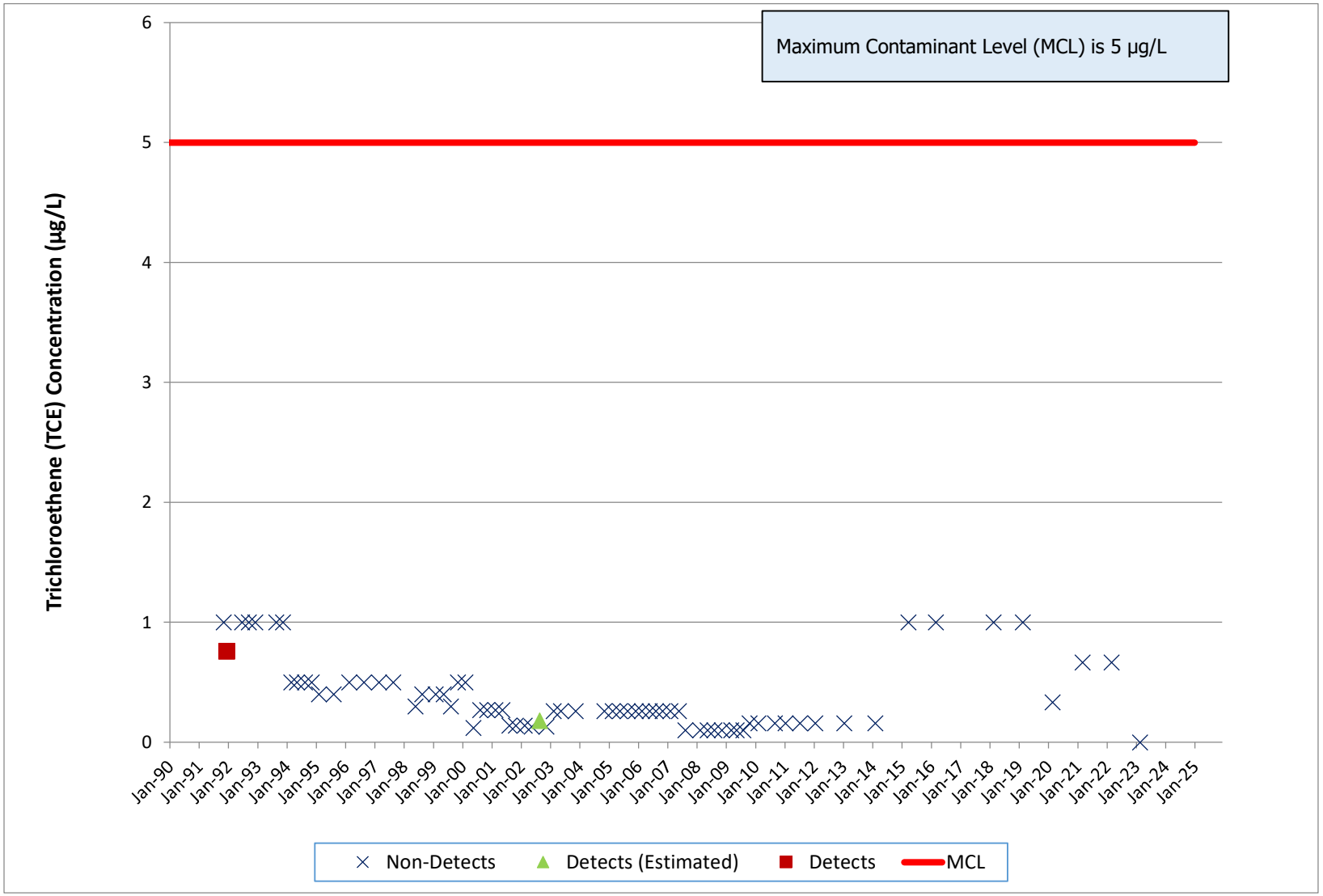
RD-21, FSDF/ESADA
Trichloroethene



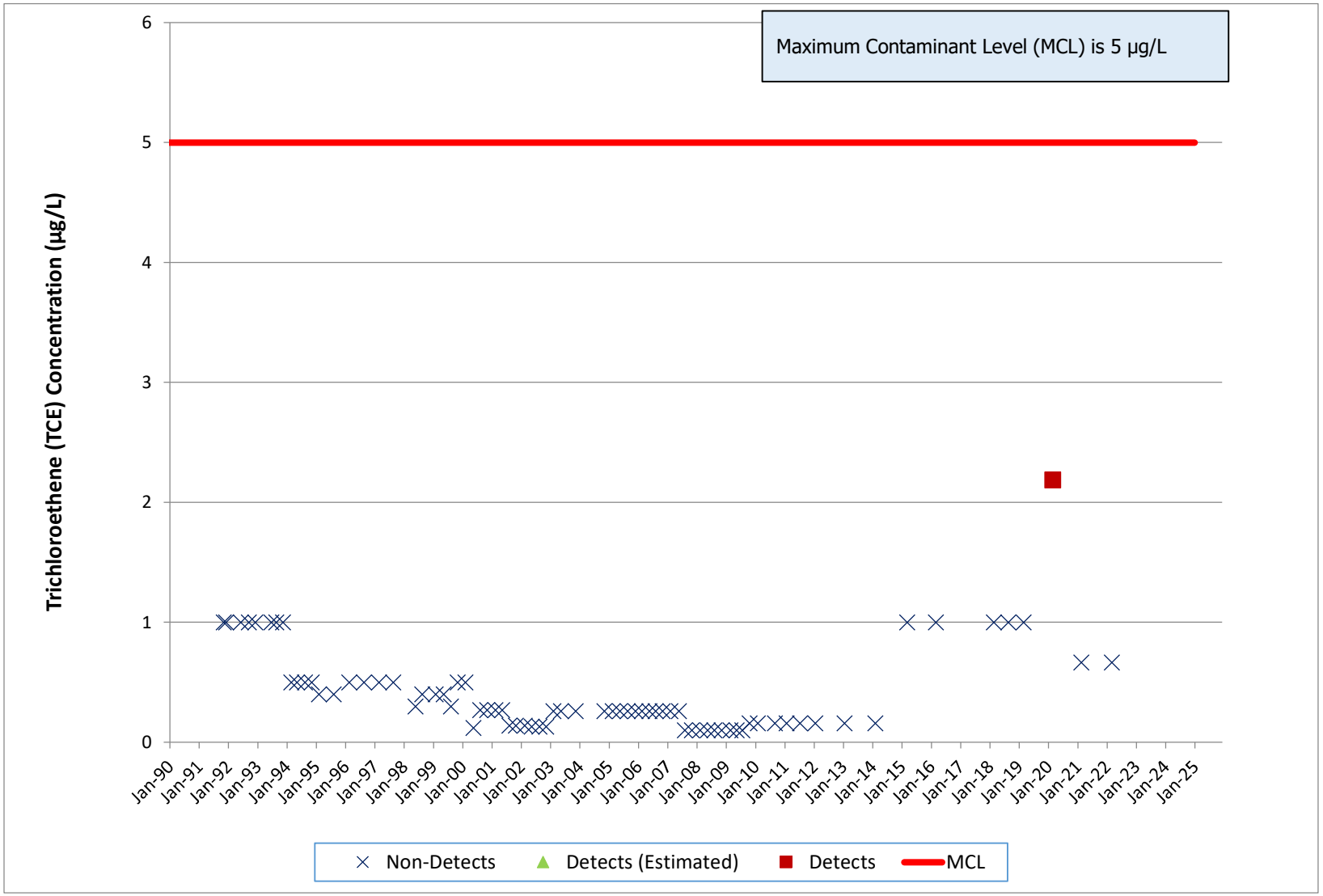
RD-33A, FSDF/ESADA
Trichloroethene



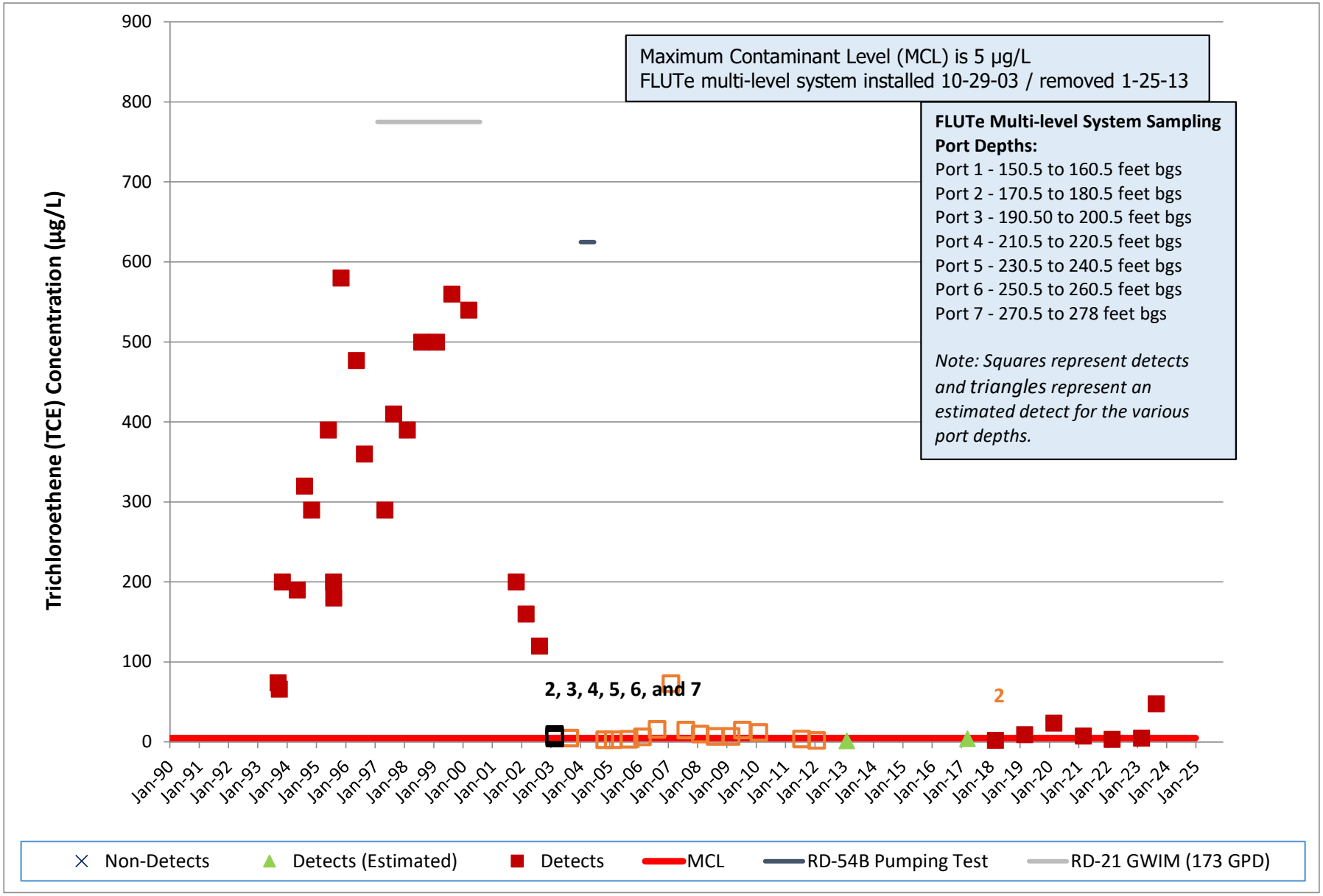
RD-33B, FSDF/ESADA
Trichloroethene



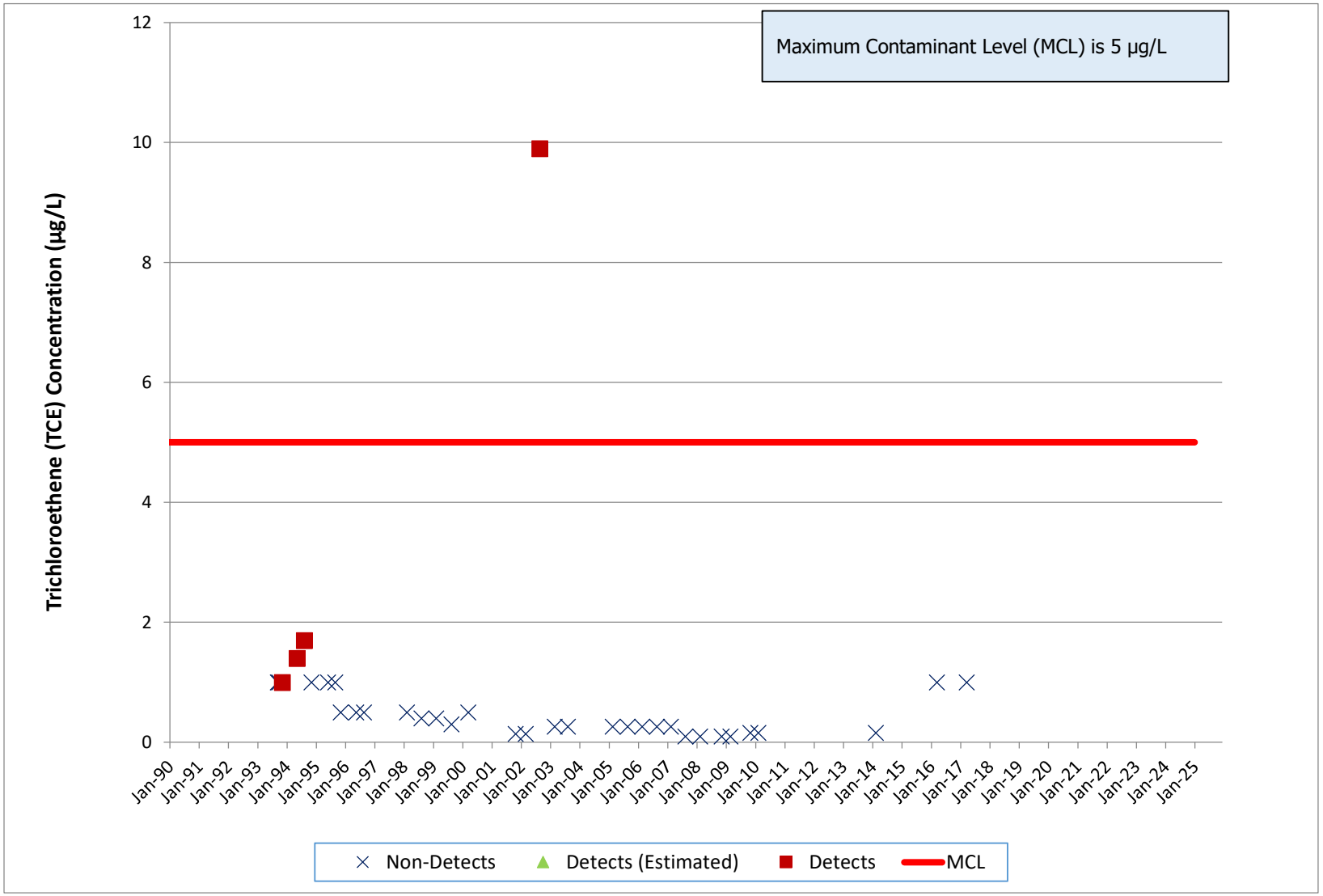
RD-33C, FSDF/ESADA
Trichloroethene



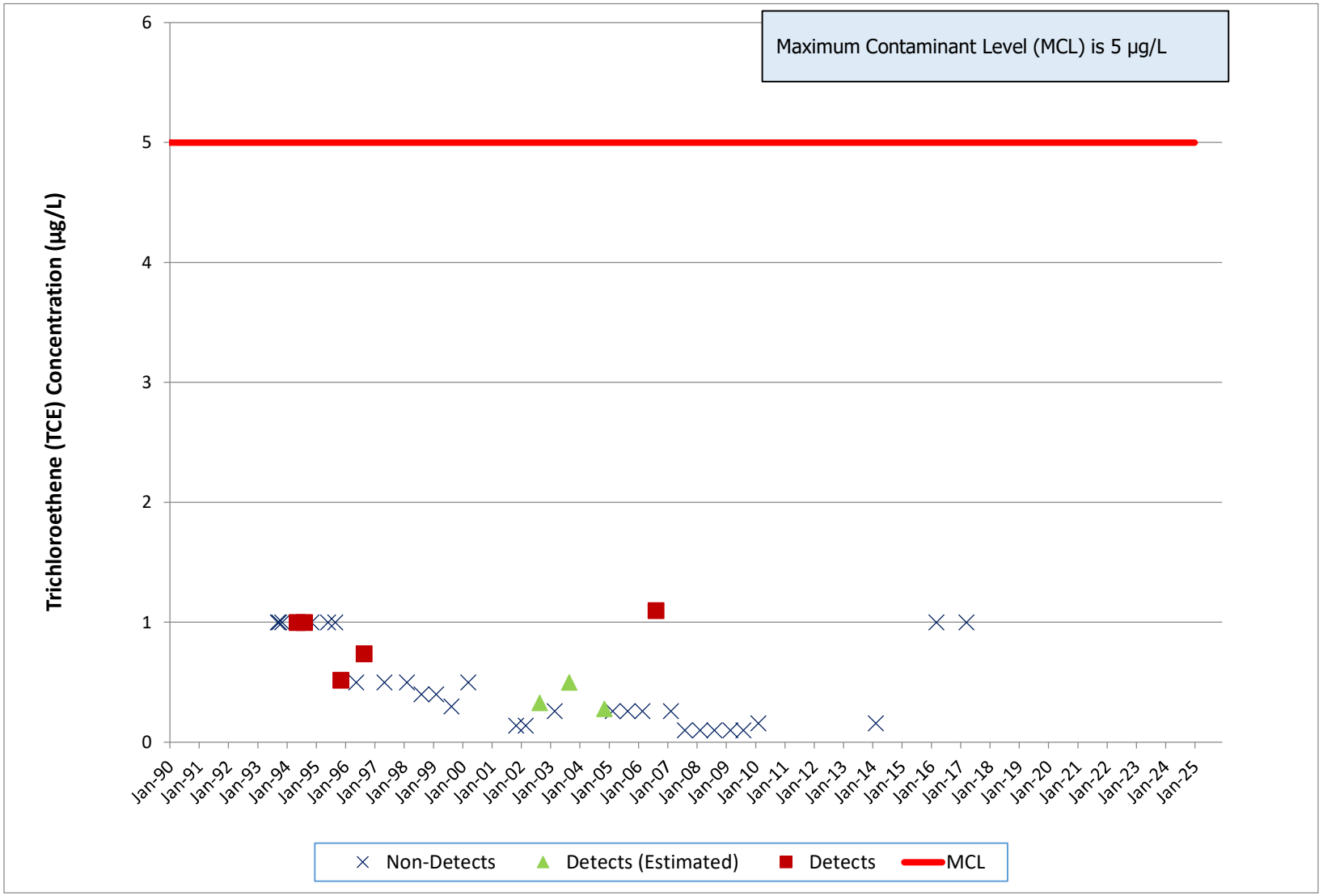
RD-54A FSDF/ESADA
Trichloroethene



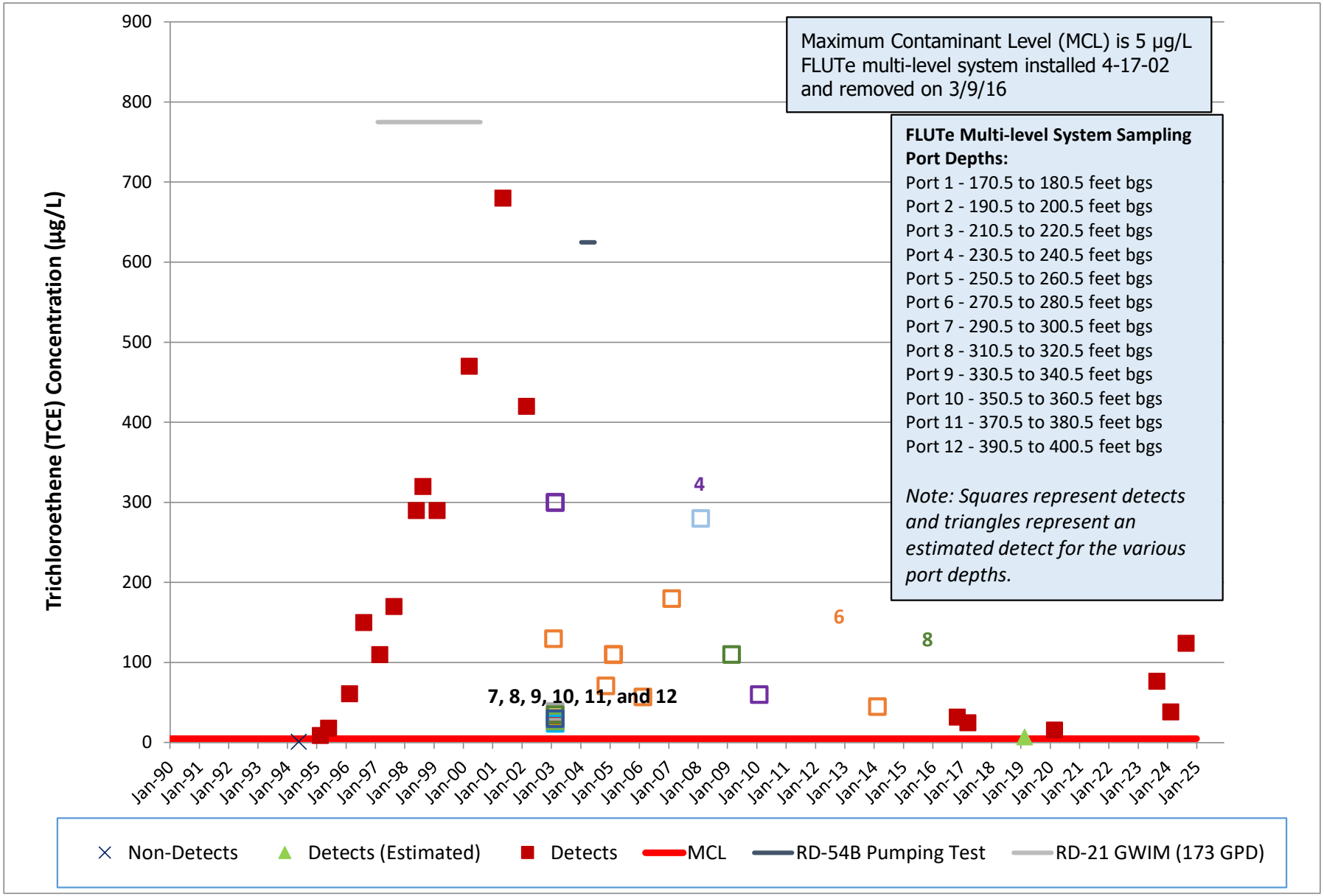
RD-54B, FSDF/ESADA
Trichloroethene



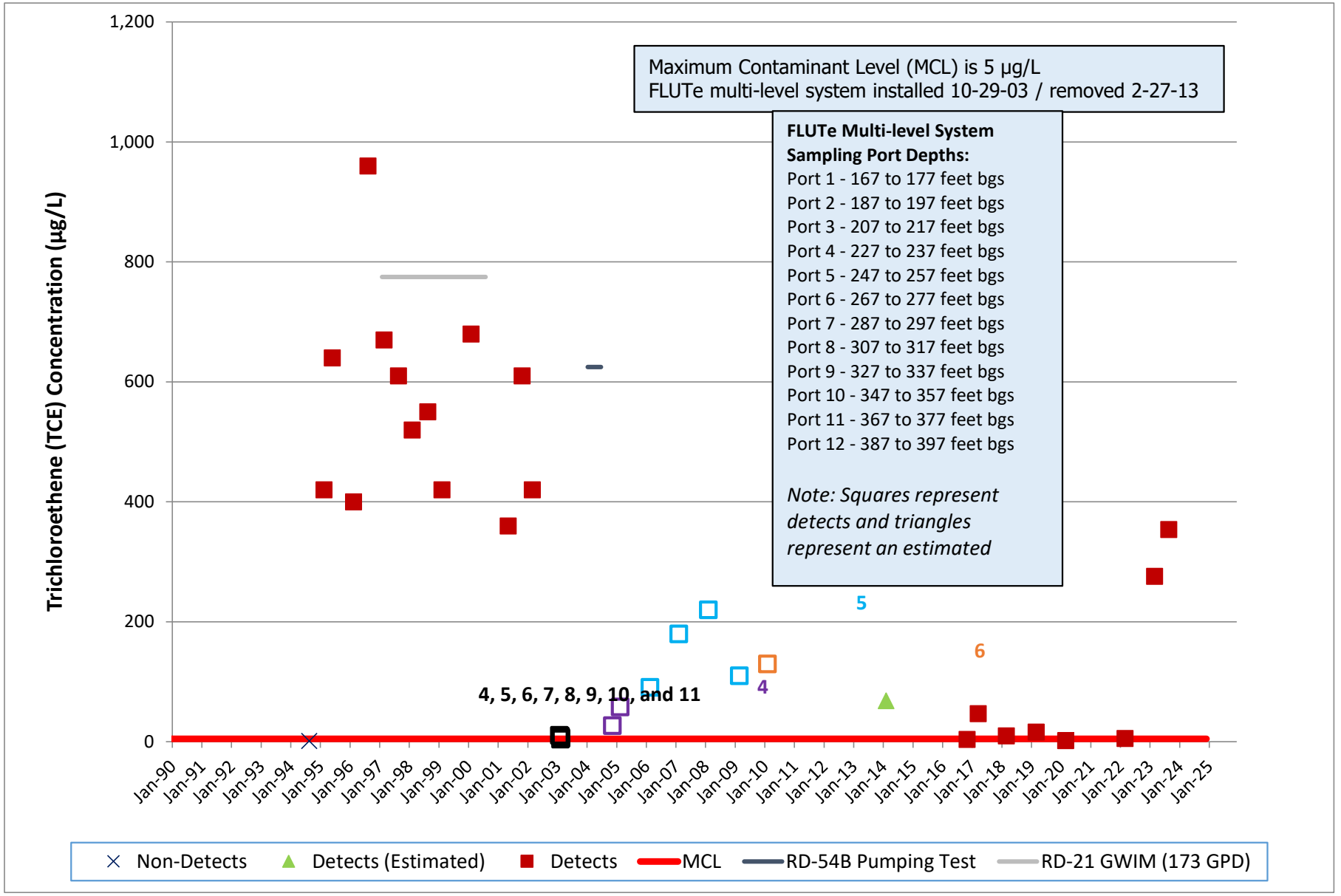
RD-54C, FSDF/ESADA
Trichloroethene



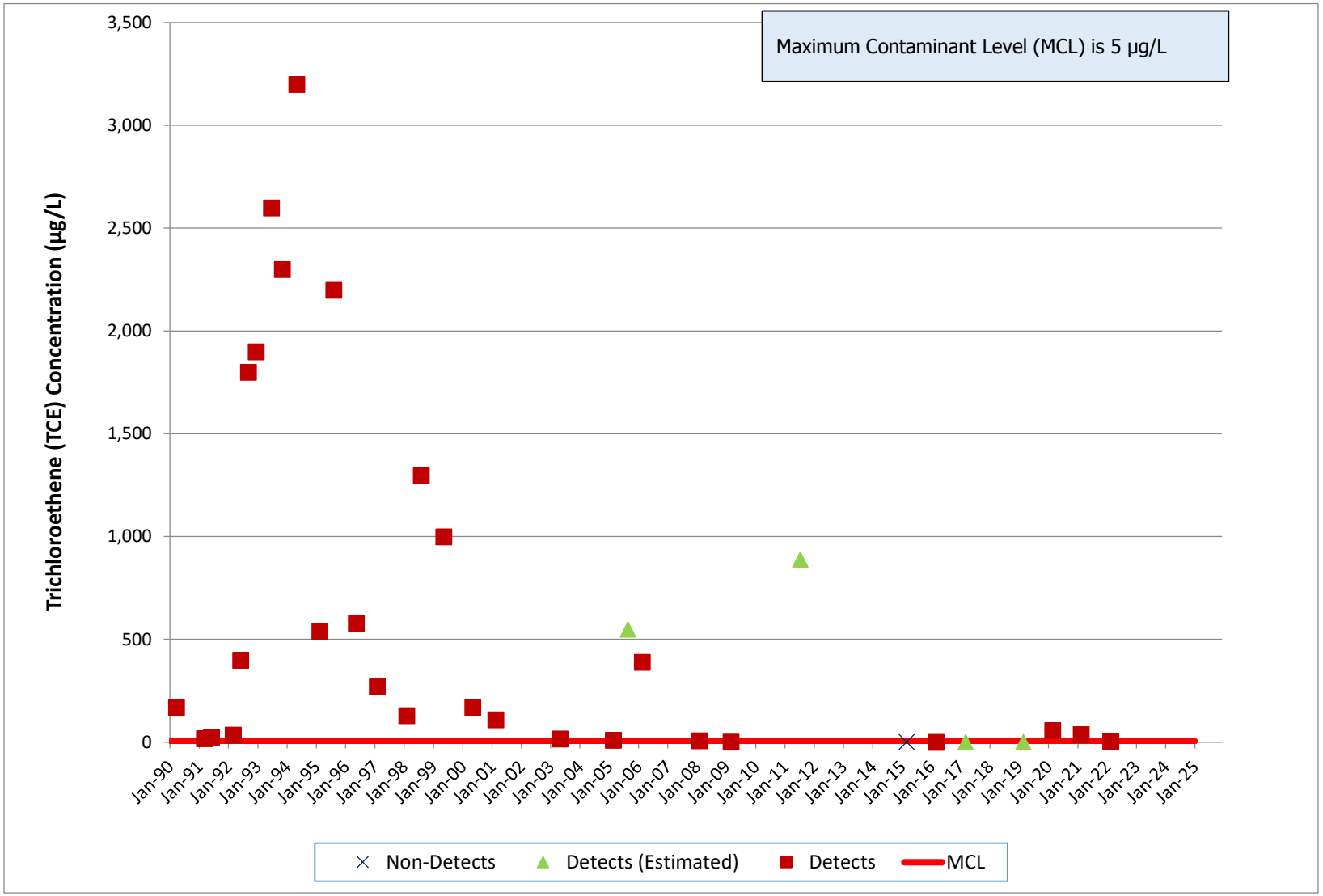
RD-64, FSDF/ESADA
Trichloroethene



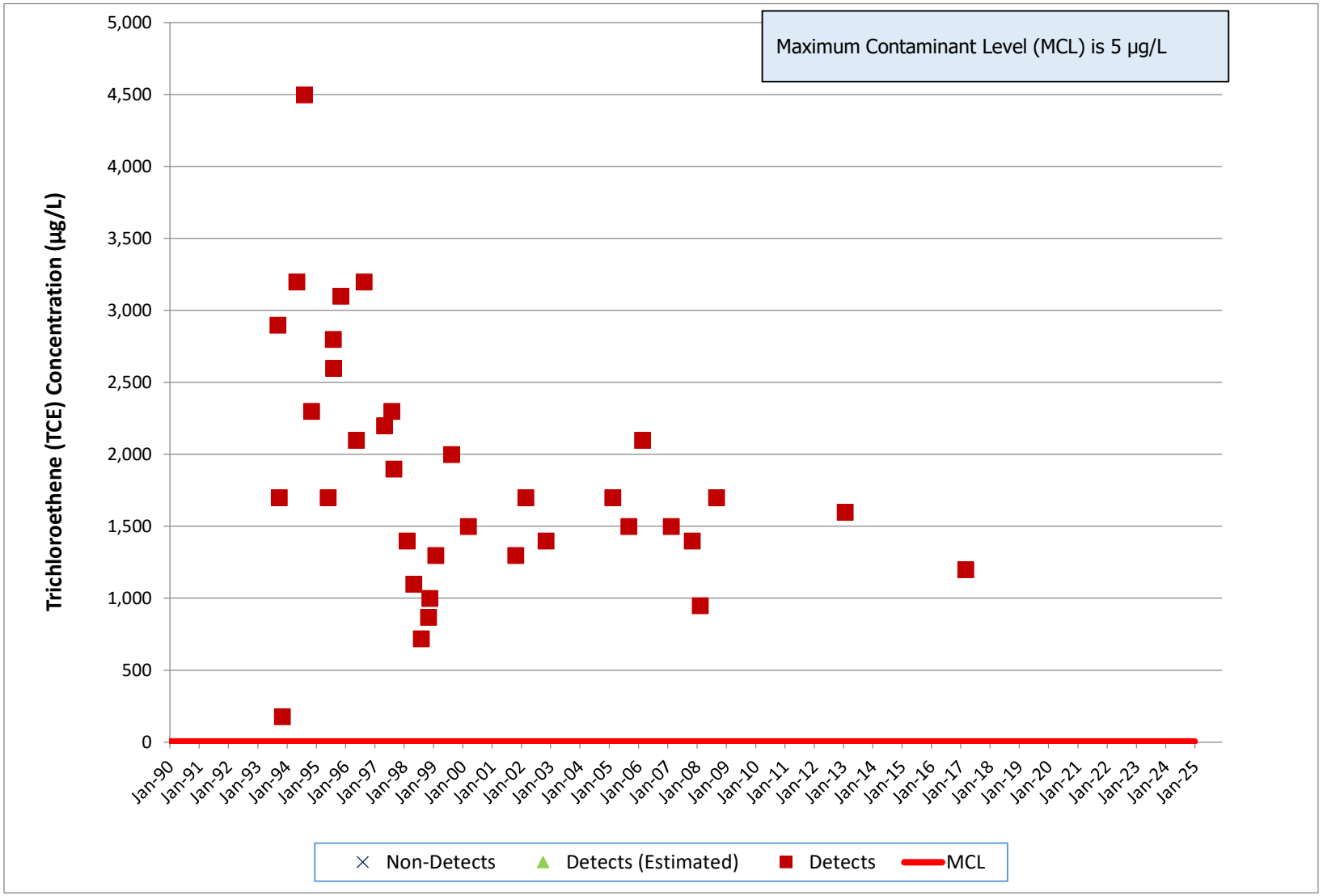
RD-65, FSDF/ESADA
Trichloroethene



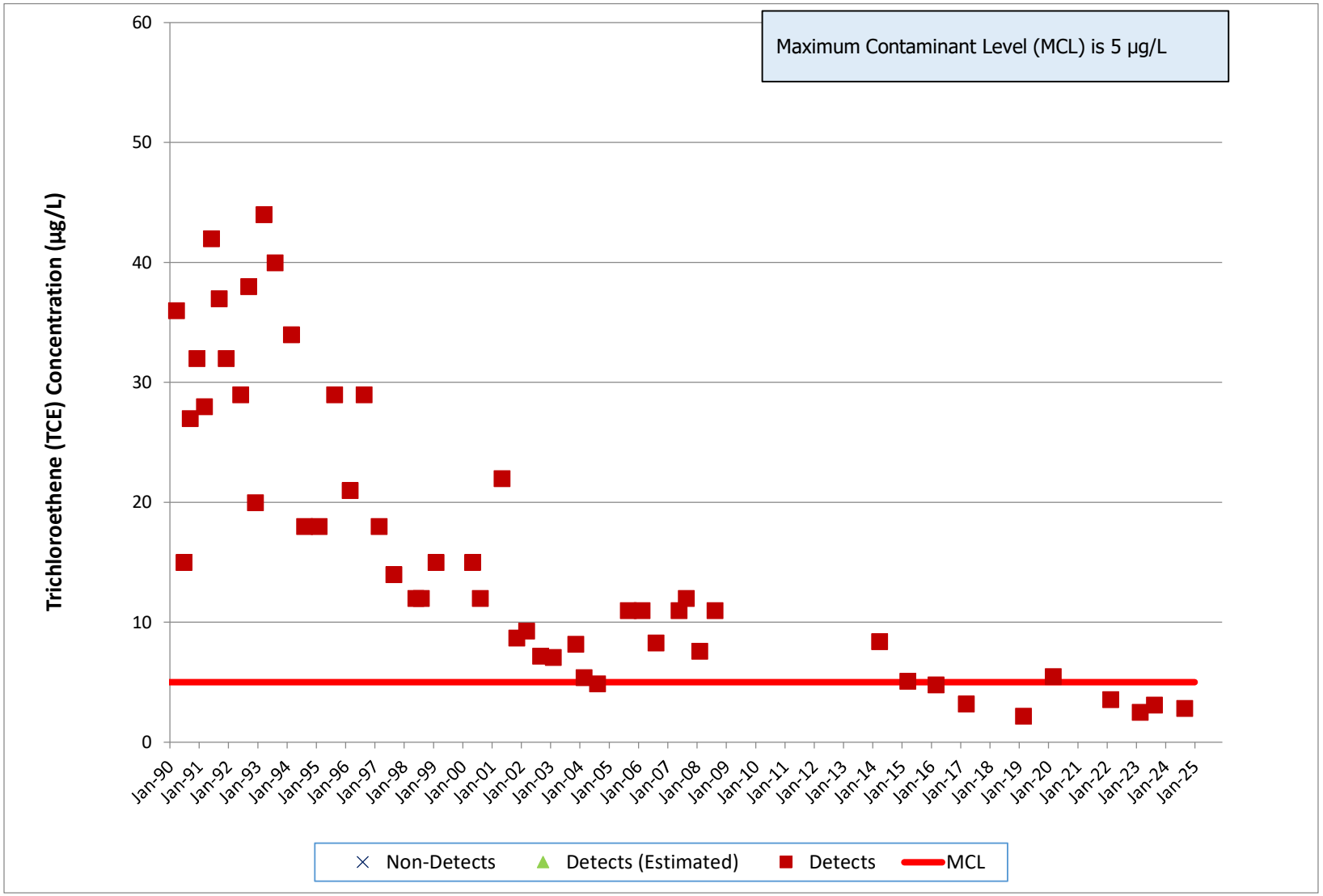
RS-18, FSDF/ESADA
Trichloroethene



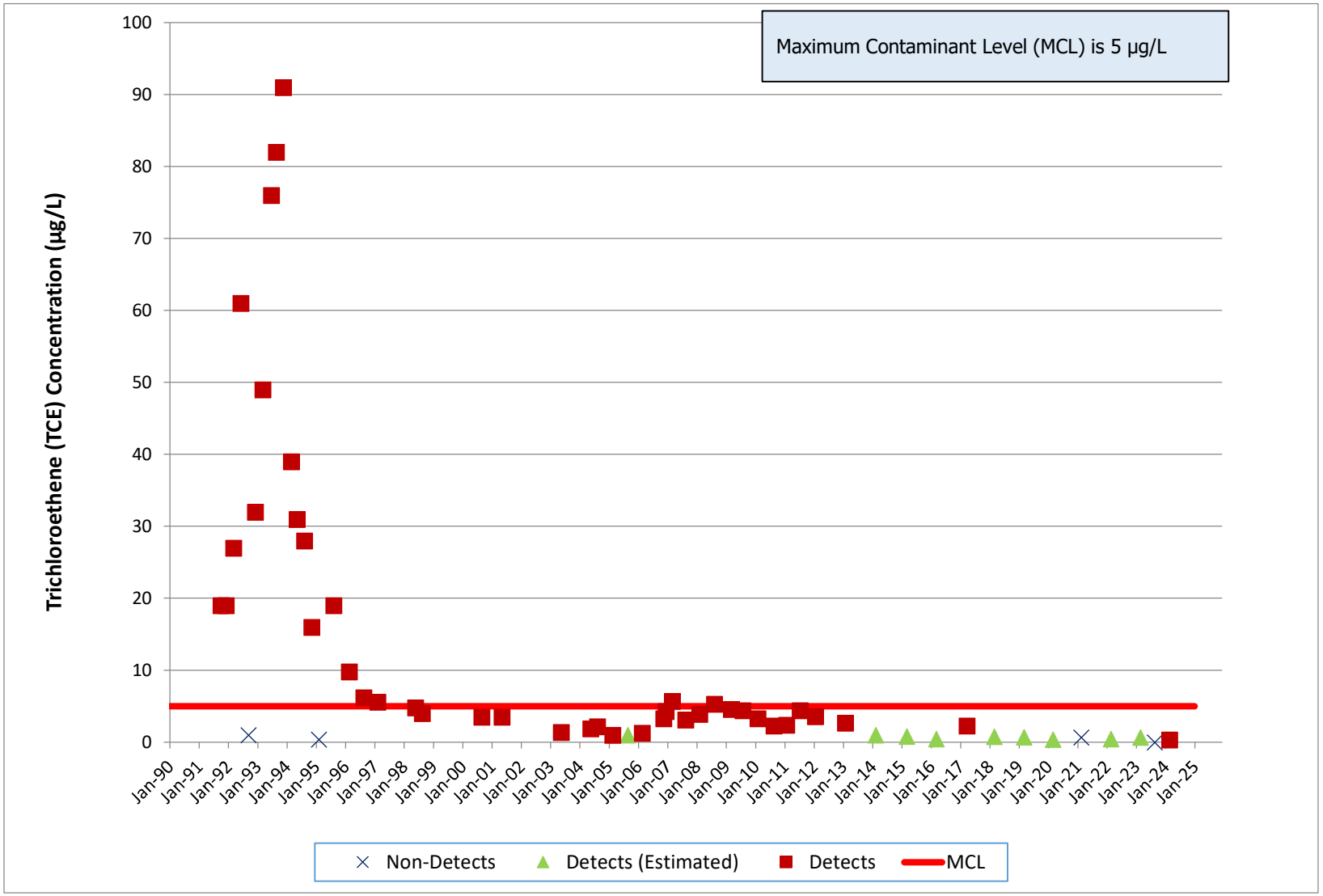
RS-54, FSDF/ESADA
Trichloroethene



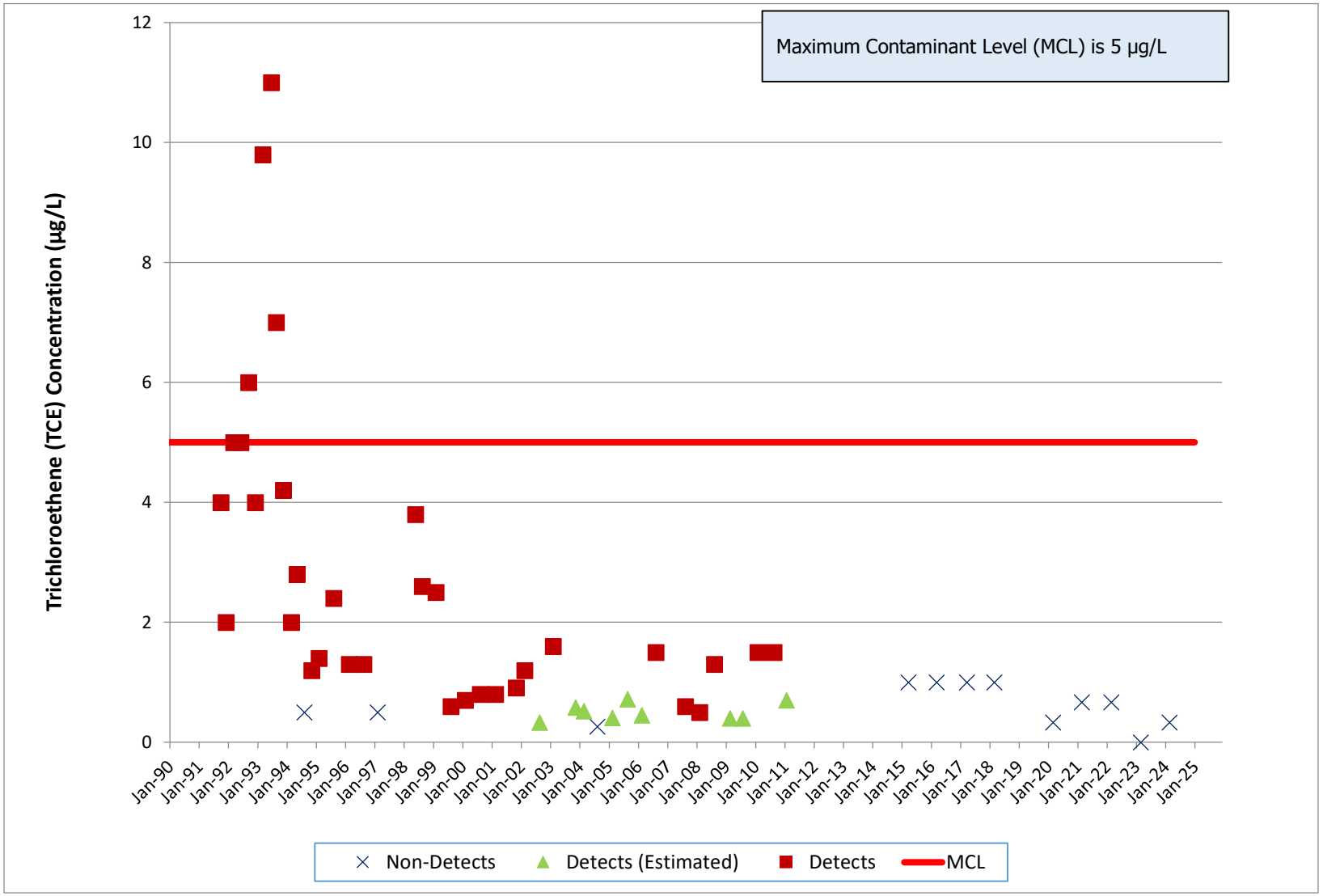
RD-30, RMHF
Trichloroethene



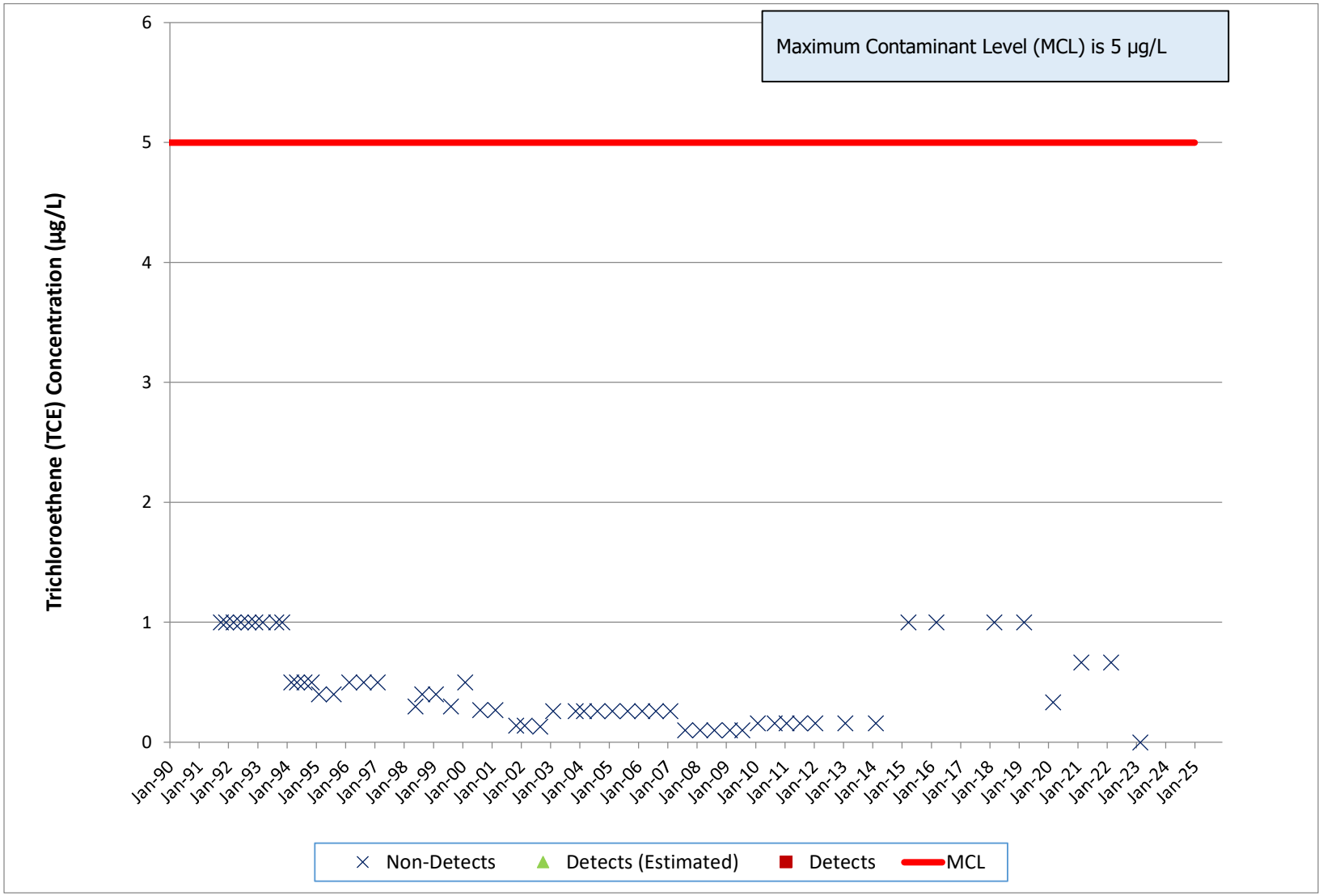
RD-34A, RMHF
Trichloroethene



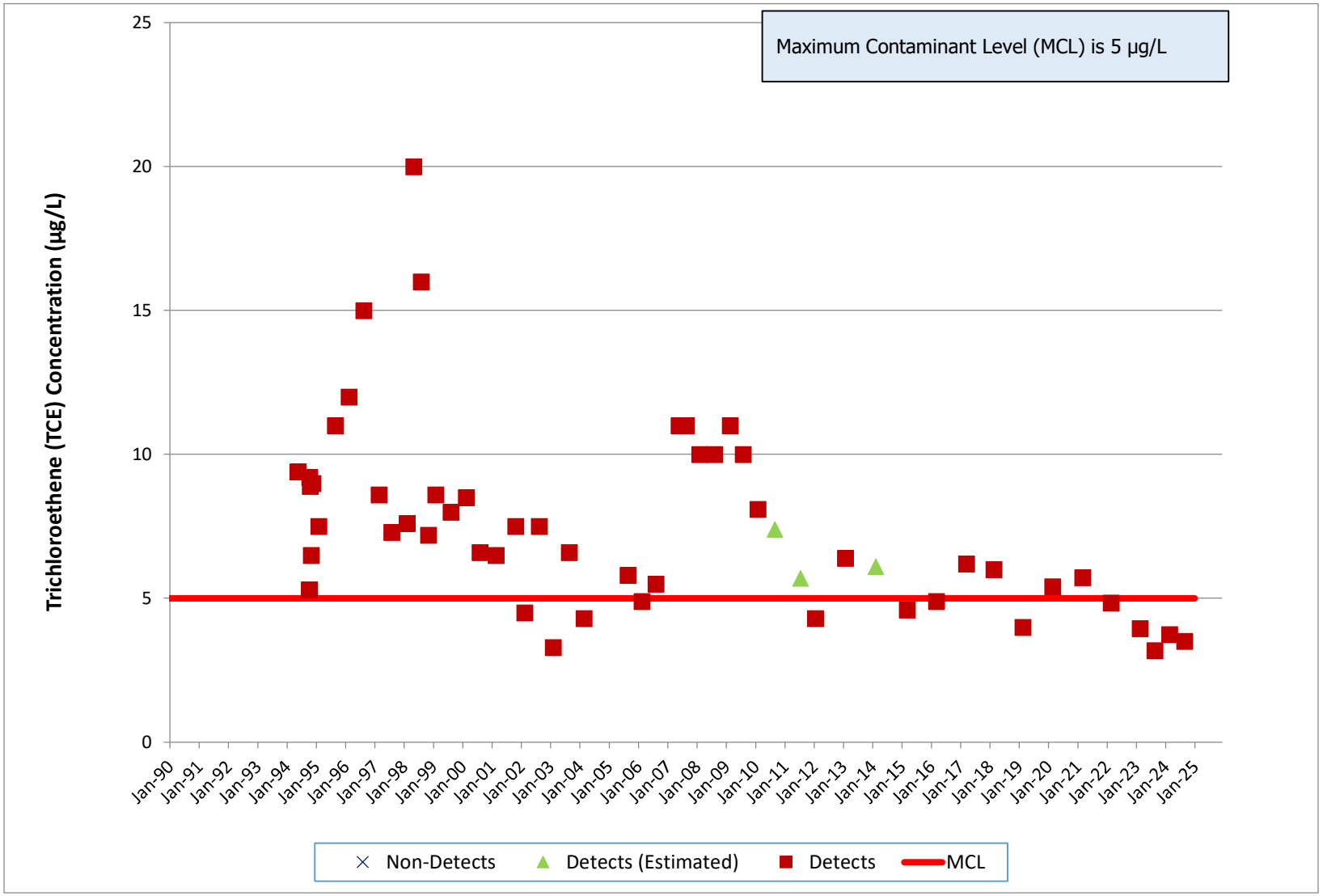
RD-34B, RMHF
Trichloroethene



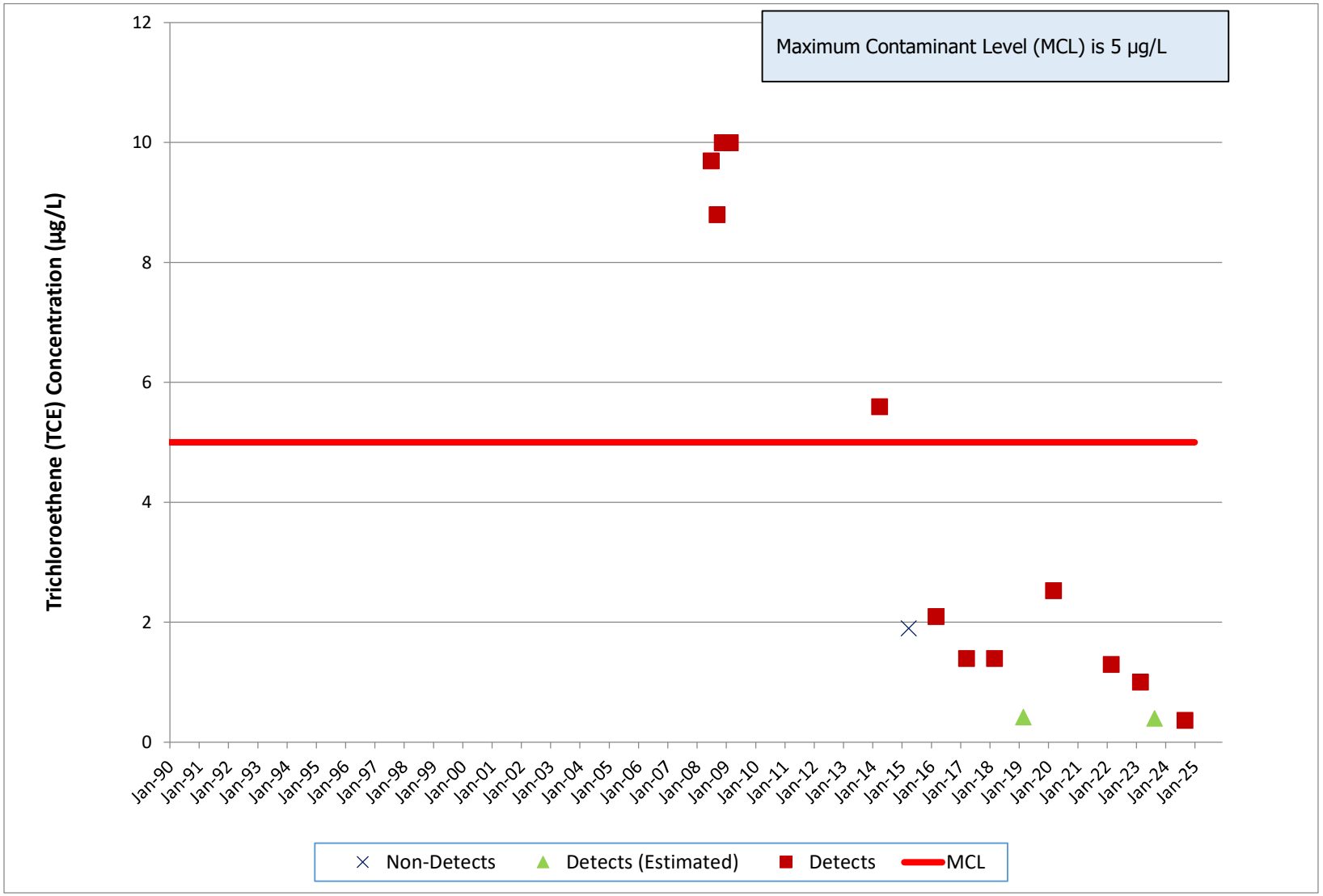
RD-34C, RMHF
Trichloroethene



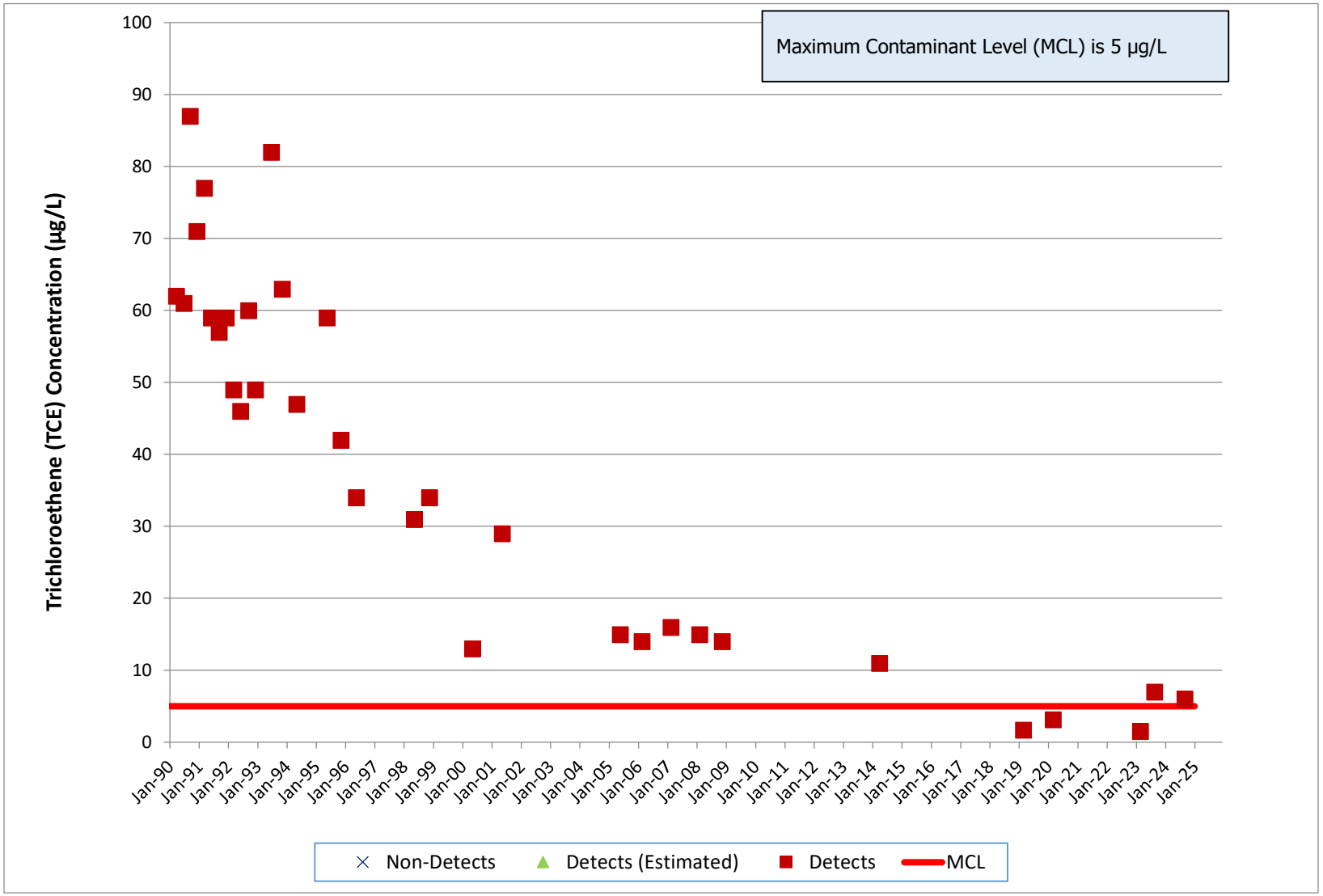
RD-63, RMHF
Trichloroethene



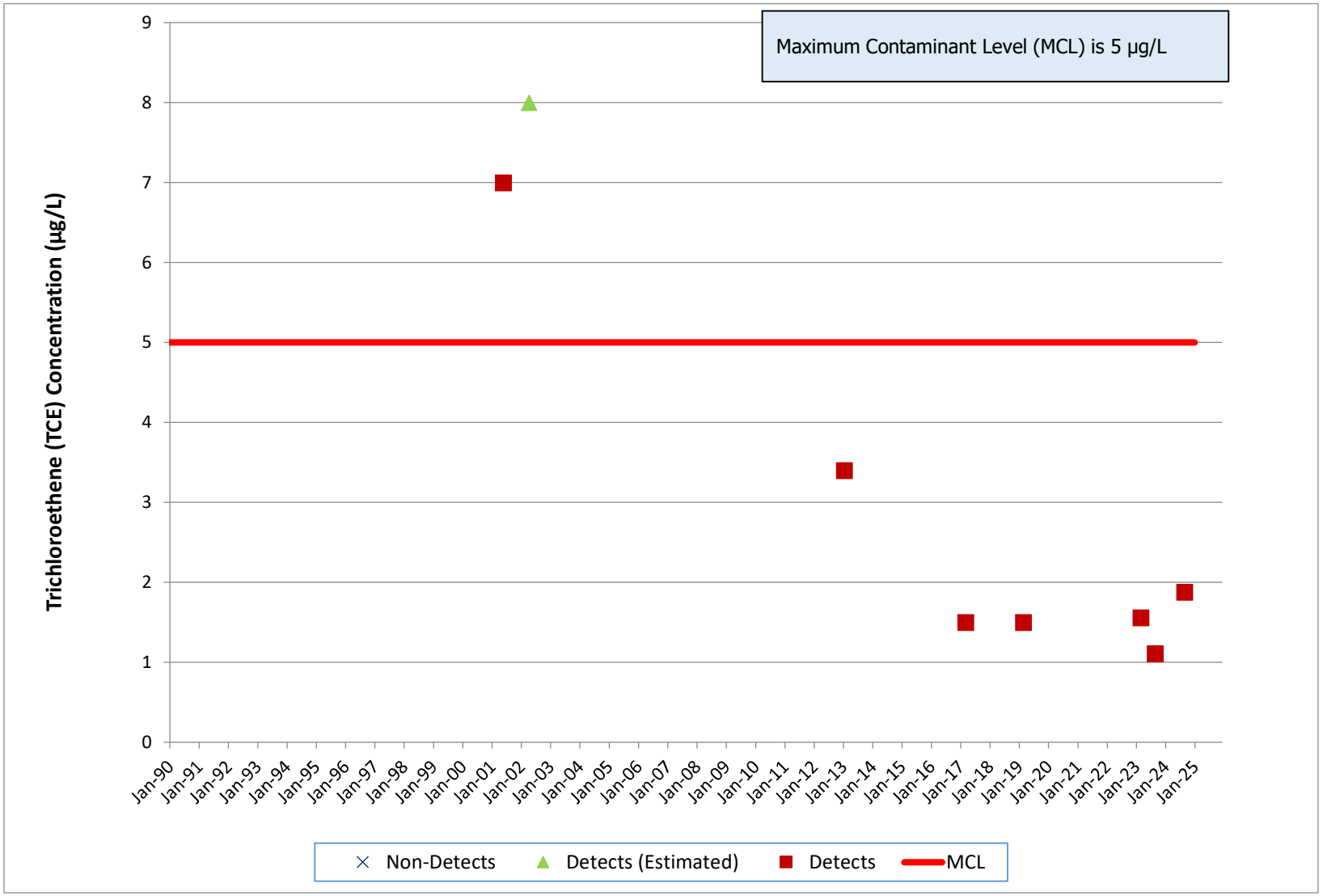
RD-98, RMHF
Trichloroethene



RS-28, RMHF
Trichloroethene



PZ-005, Bldg 65 Metals Clarifier
Trichloroethene



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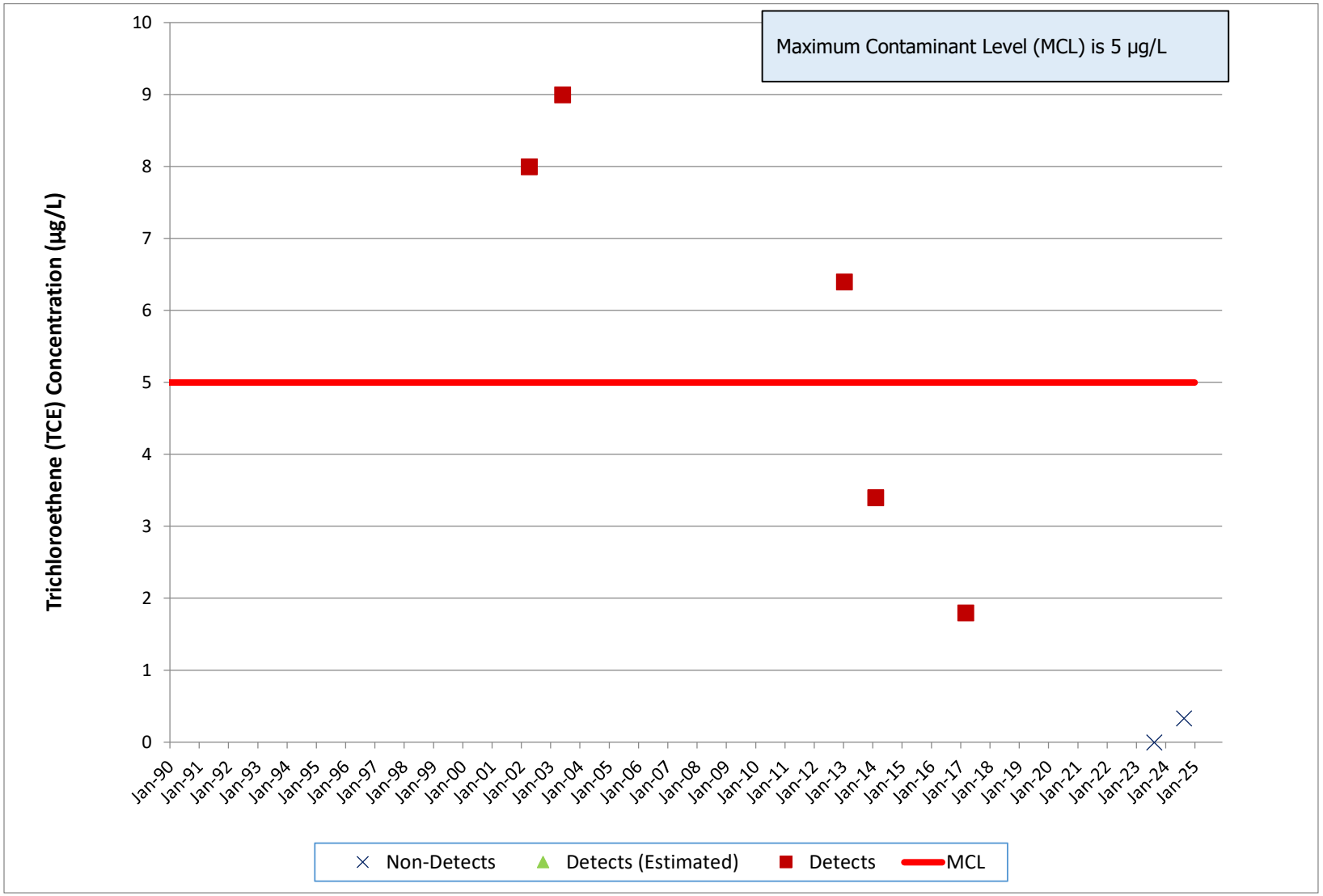

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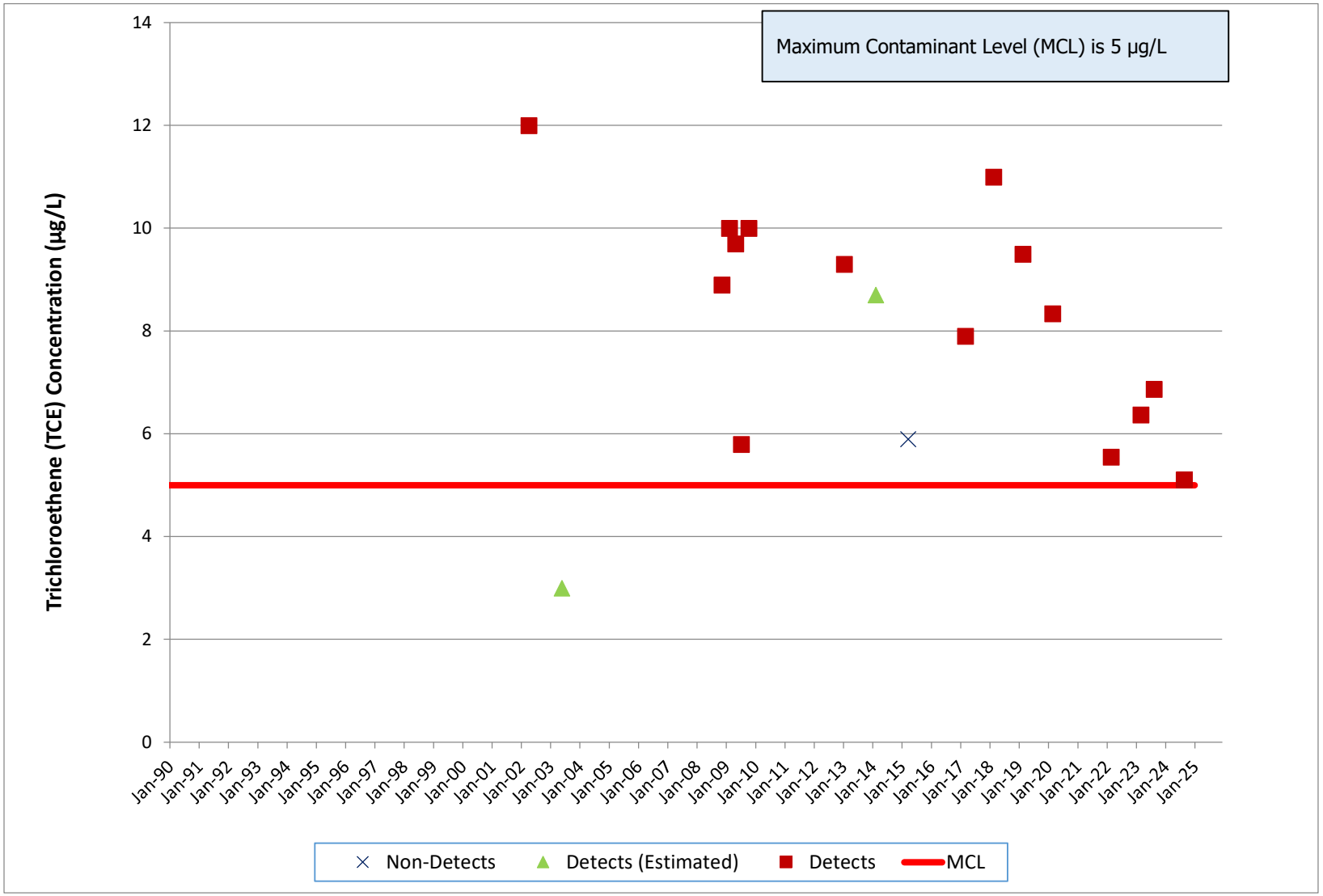
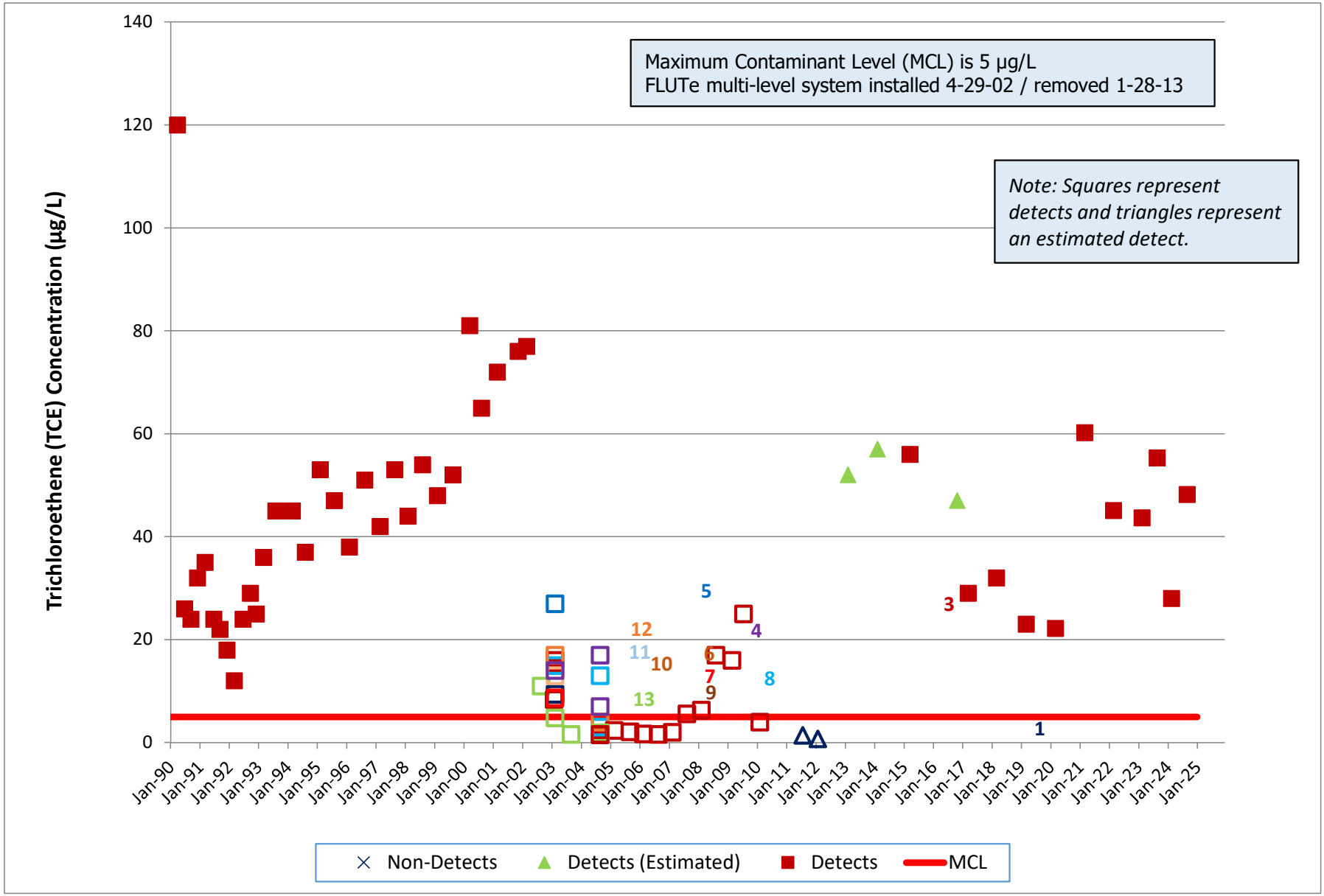
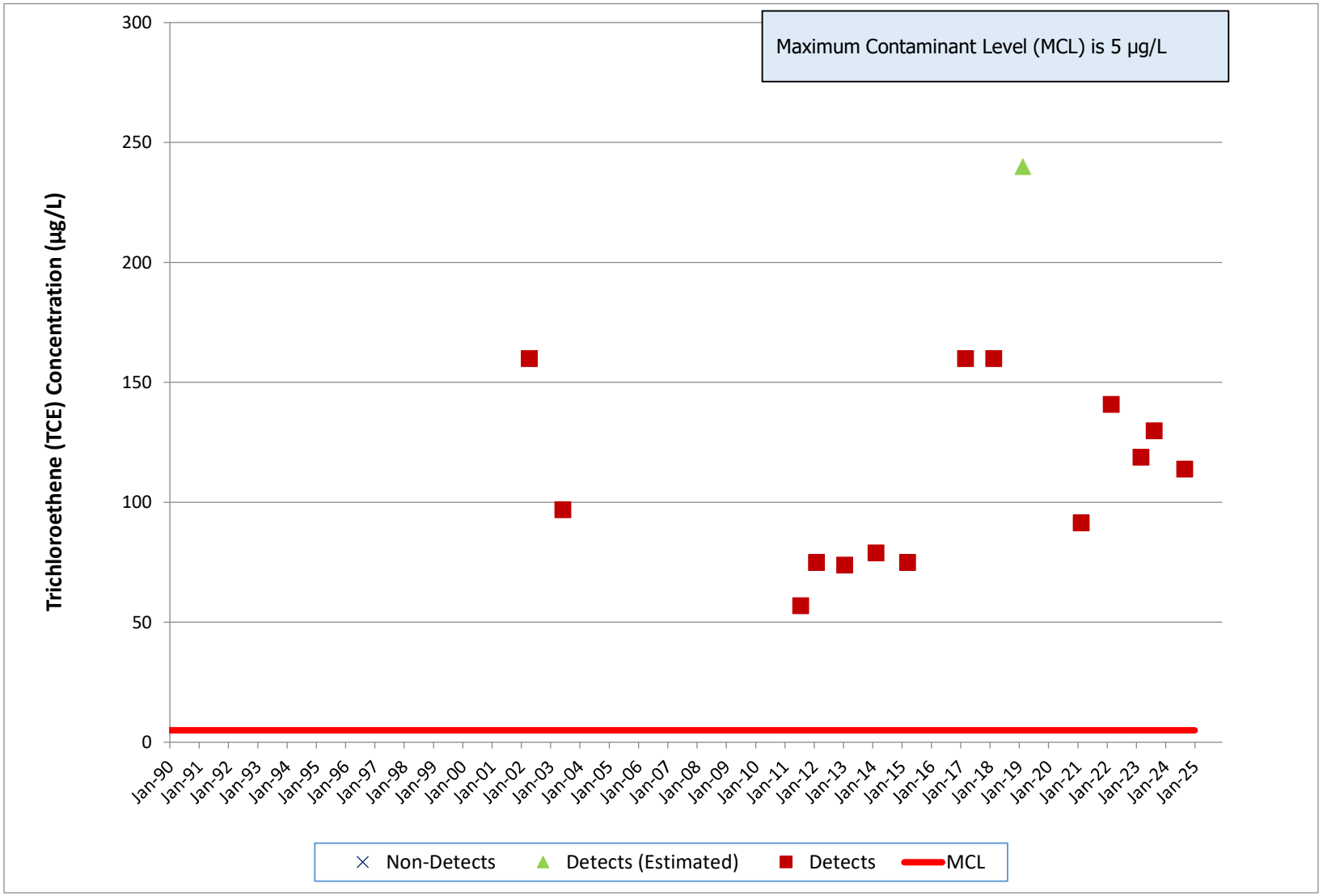


RD-07, Bldg 56 Landfill
Trichloroethene



PZ-108, HMSA/PDU
Trichloroethene



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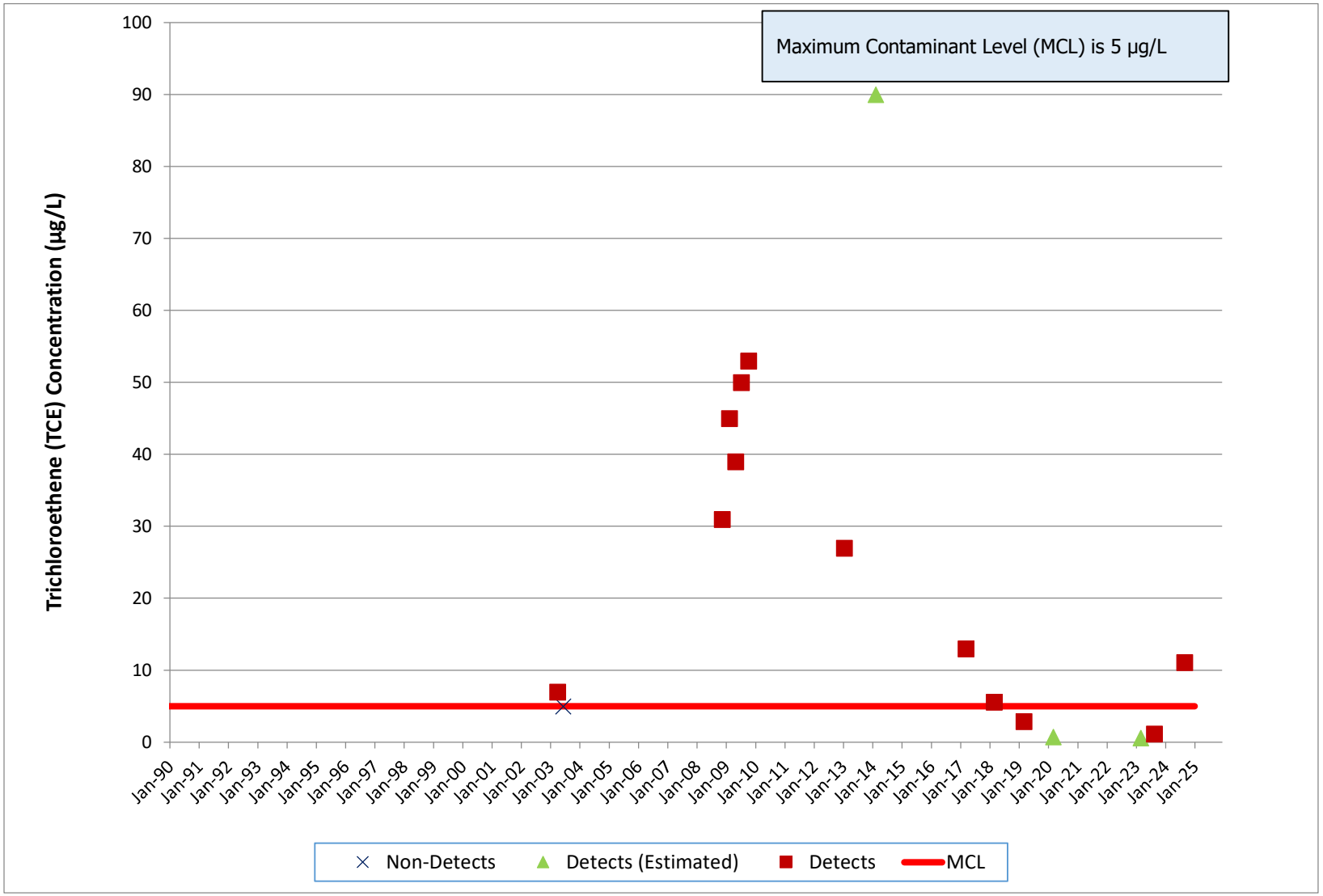
Trichloroethene



PZ-109, B4057/4059/4626
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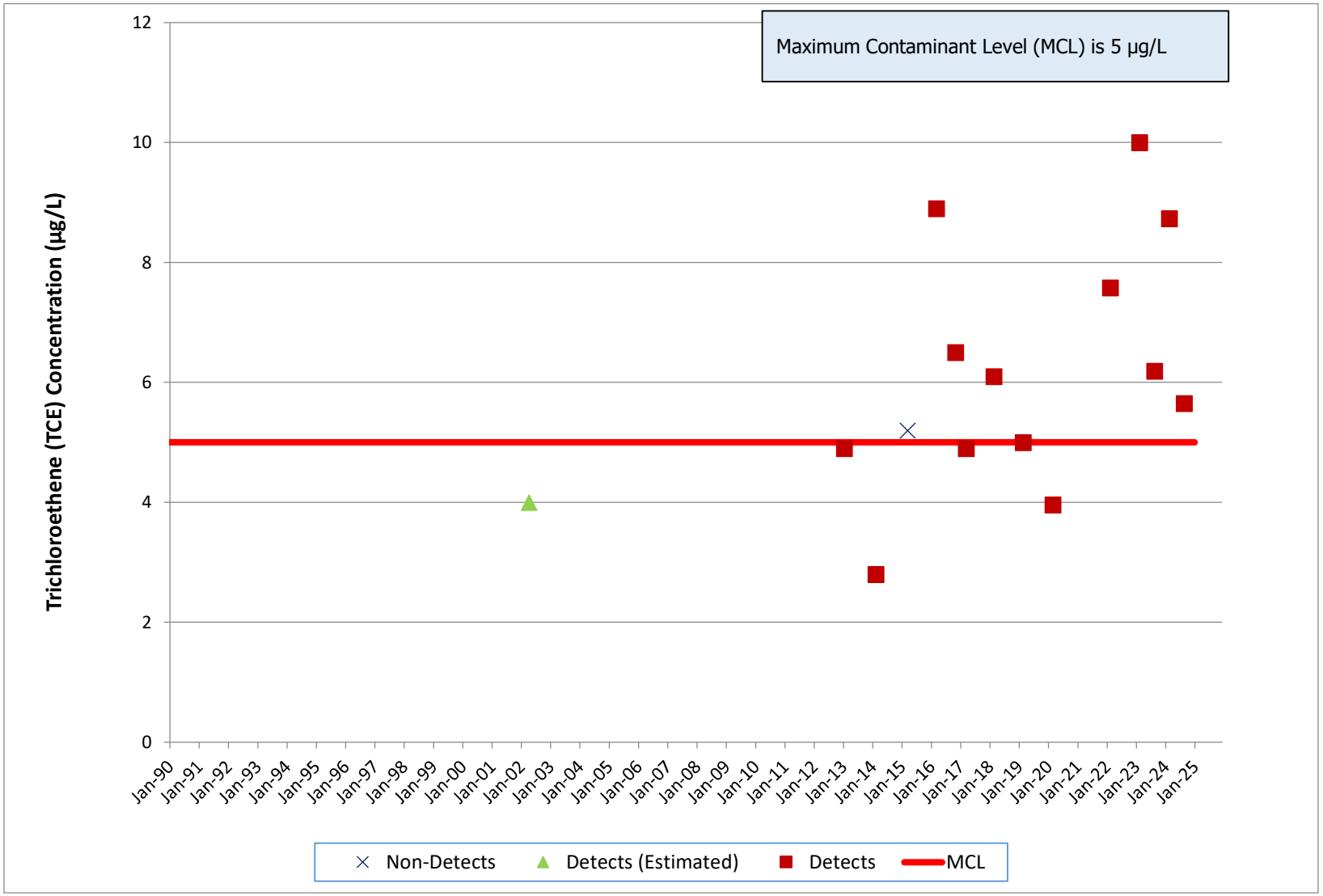

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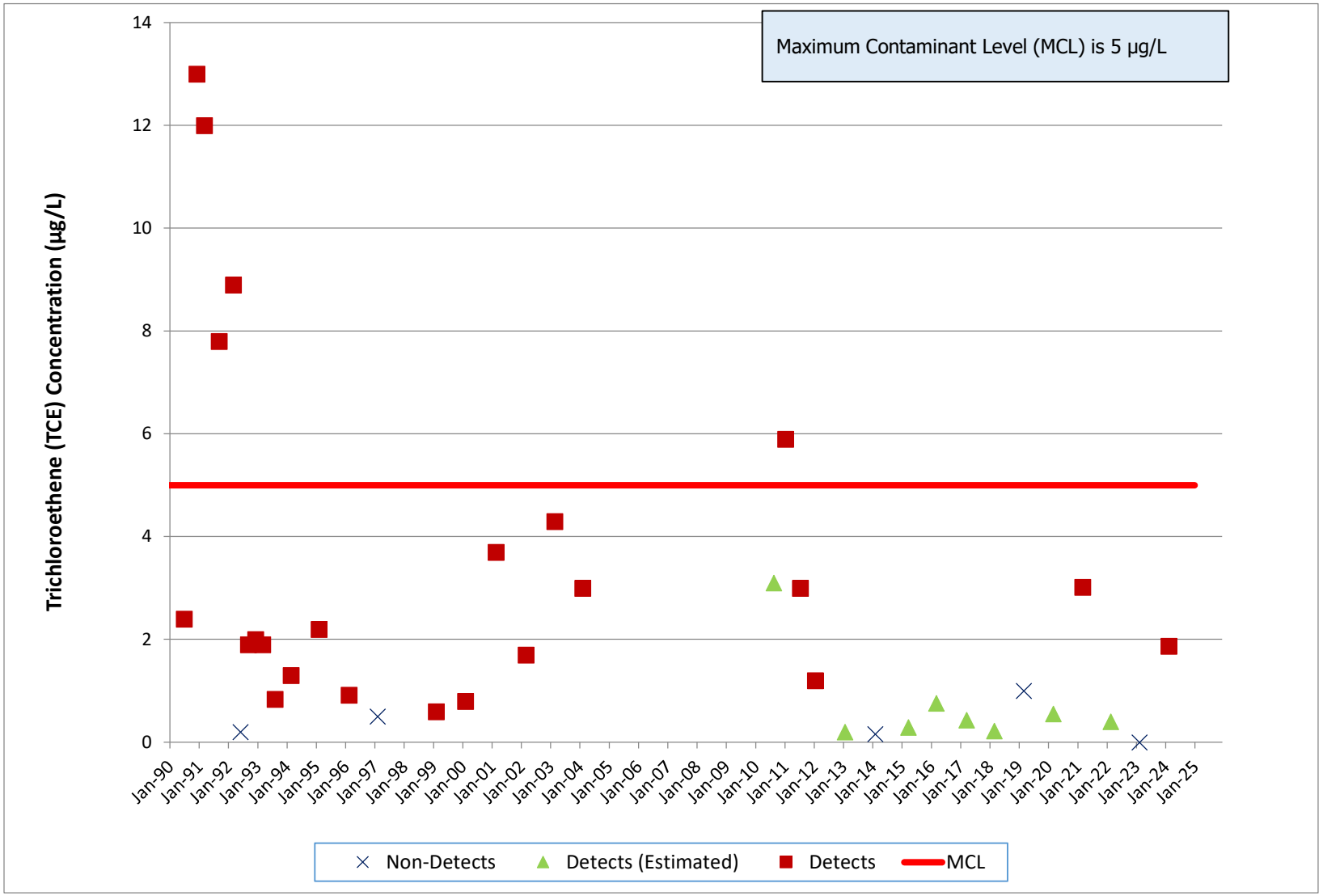
Trichloroethene



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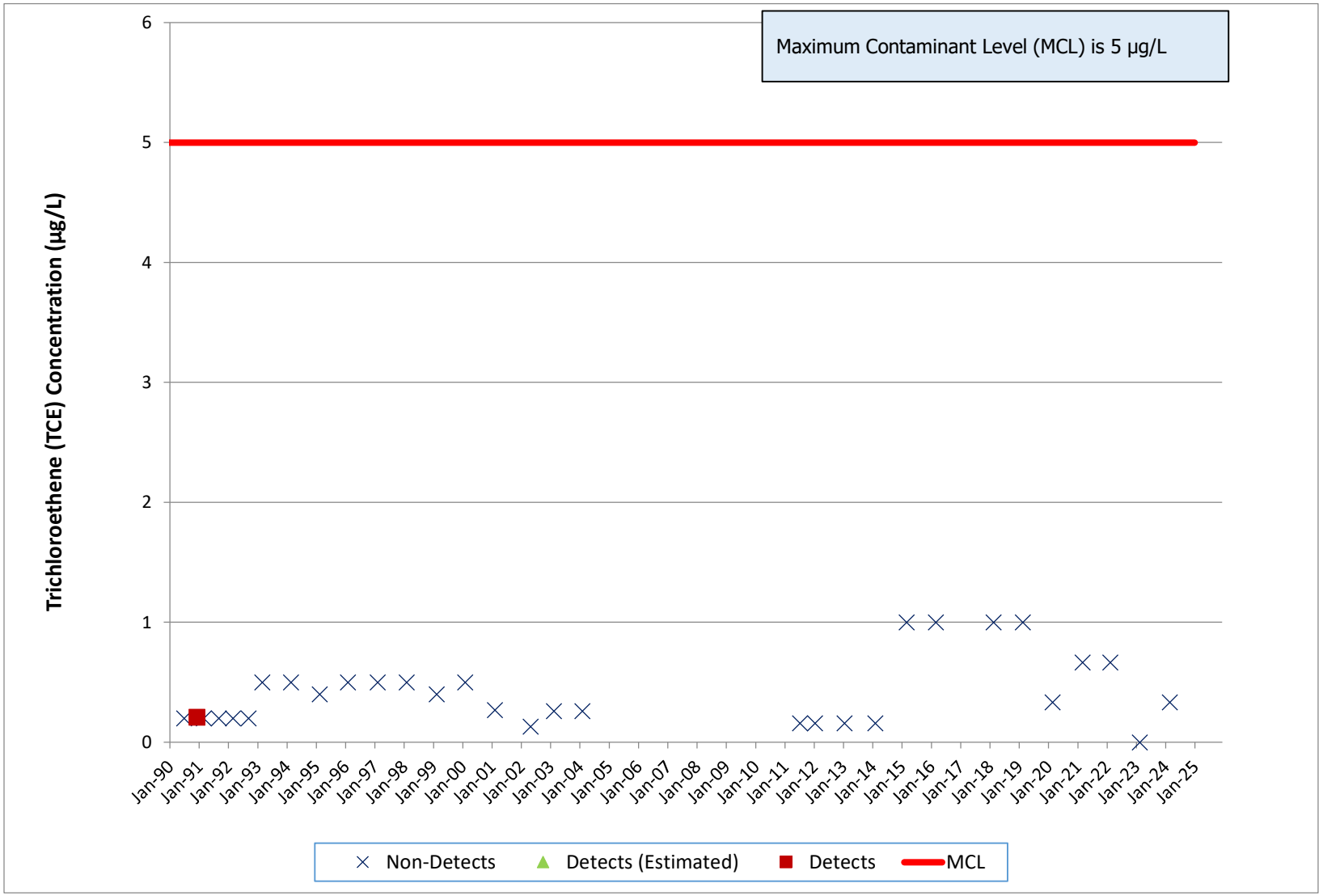
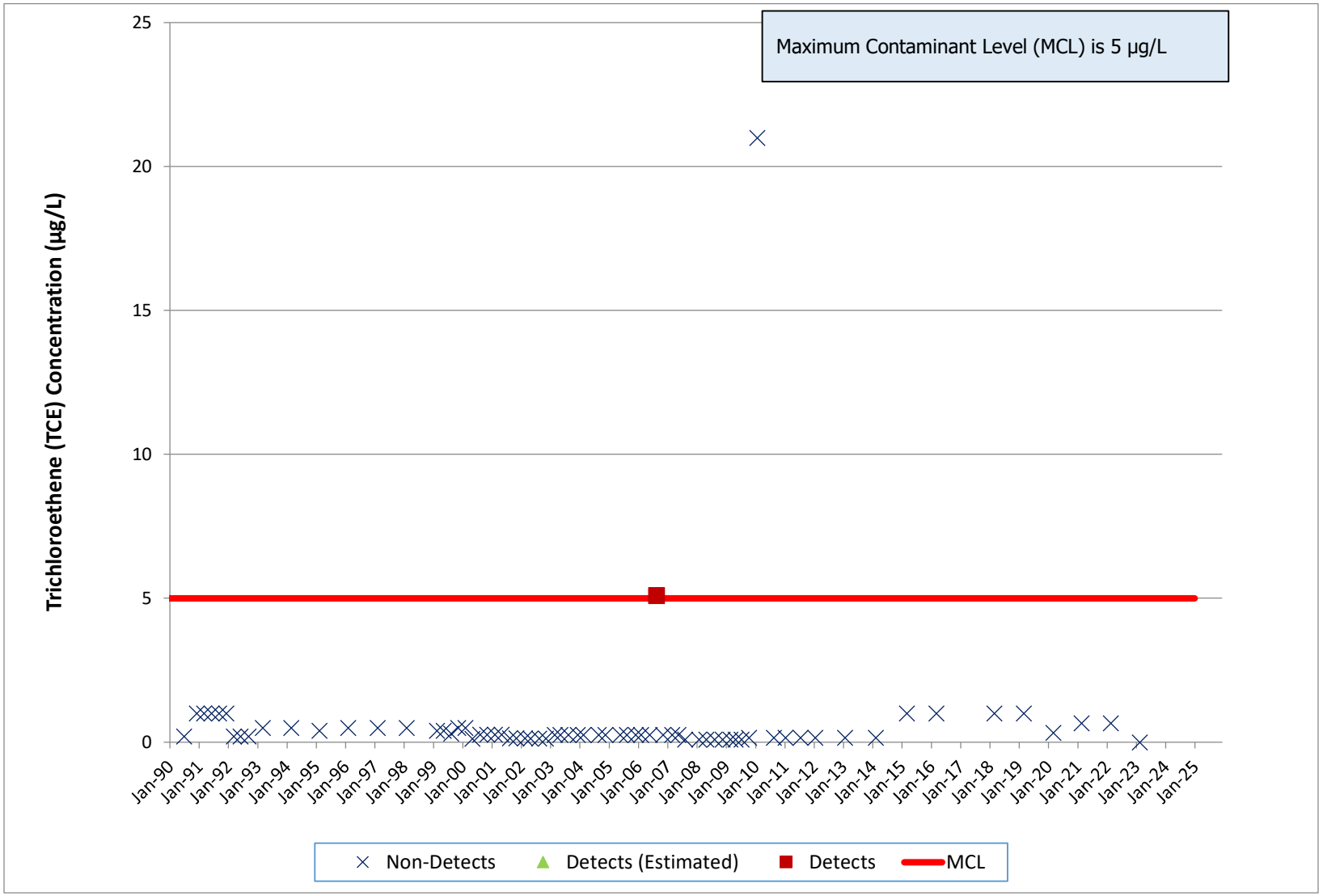
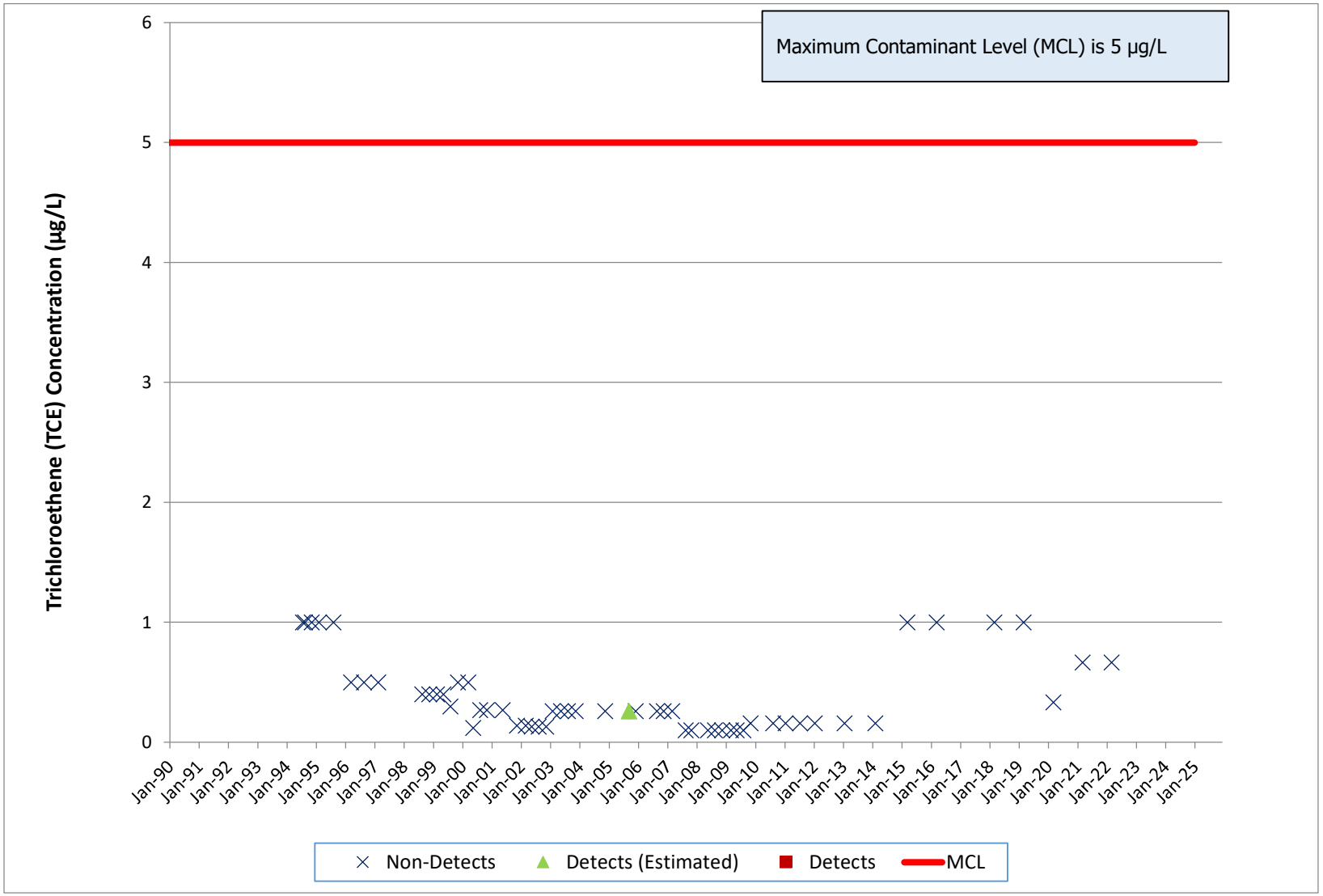
Trichloroethene



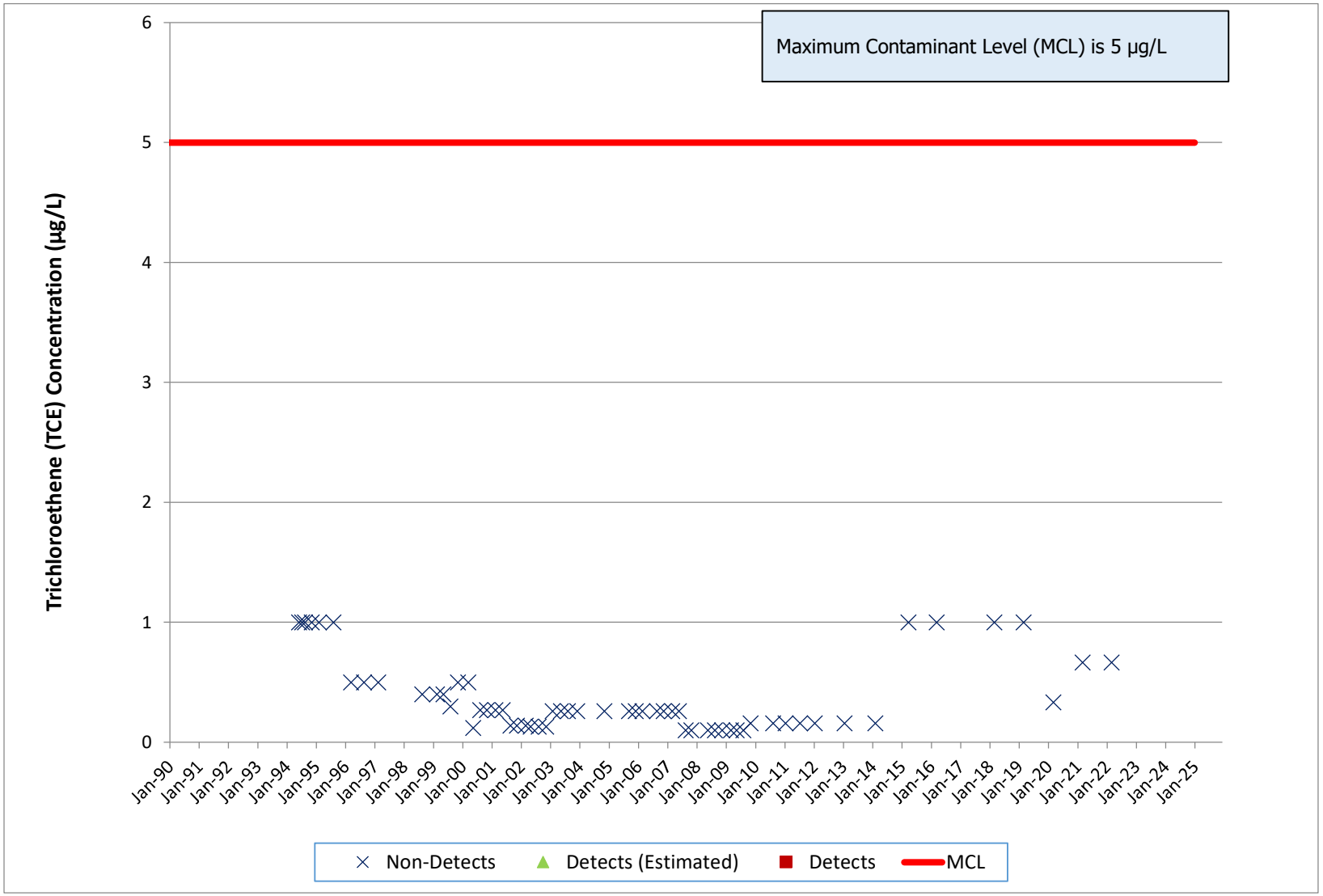
RD-19, B4133
Trichloroethene



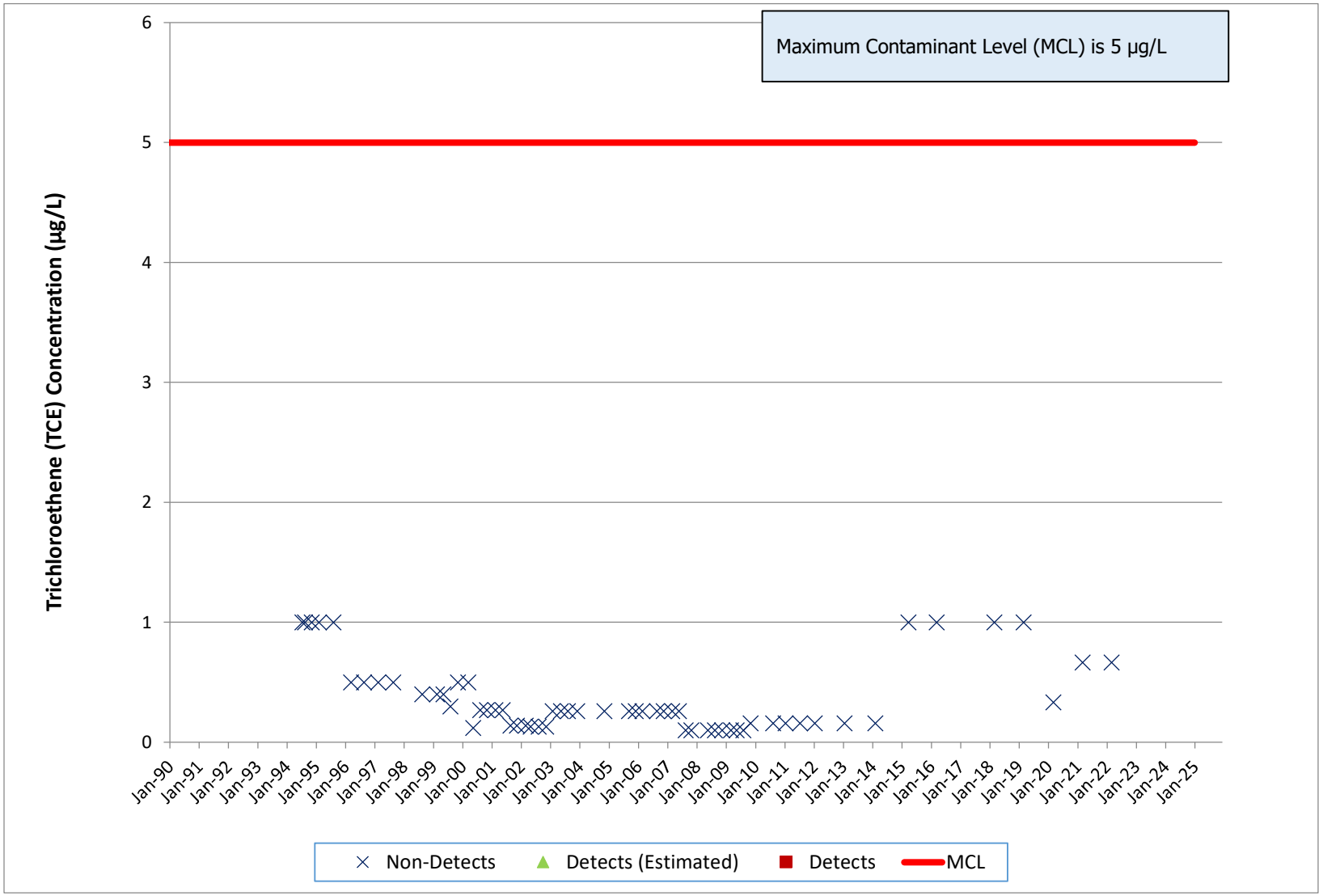
RD-59A, Offsite
Trichloroethene



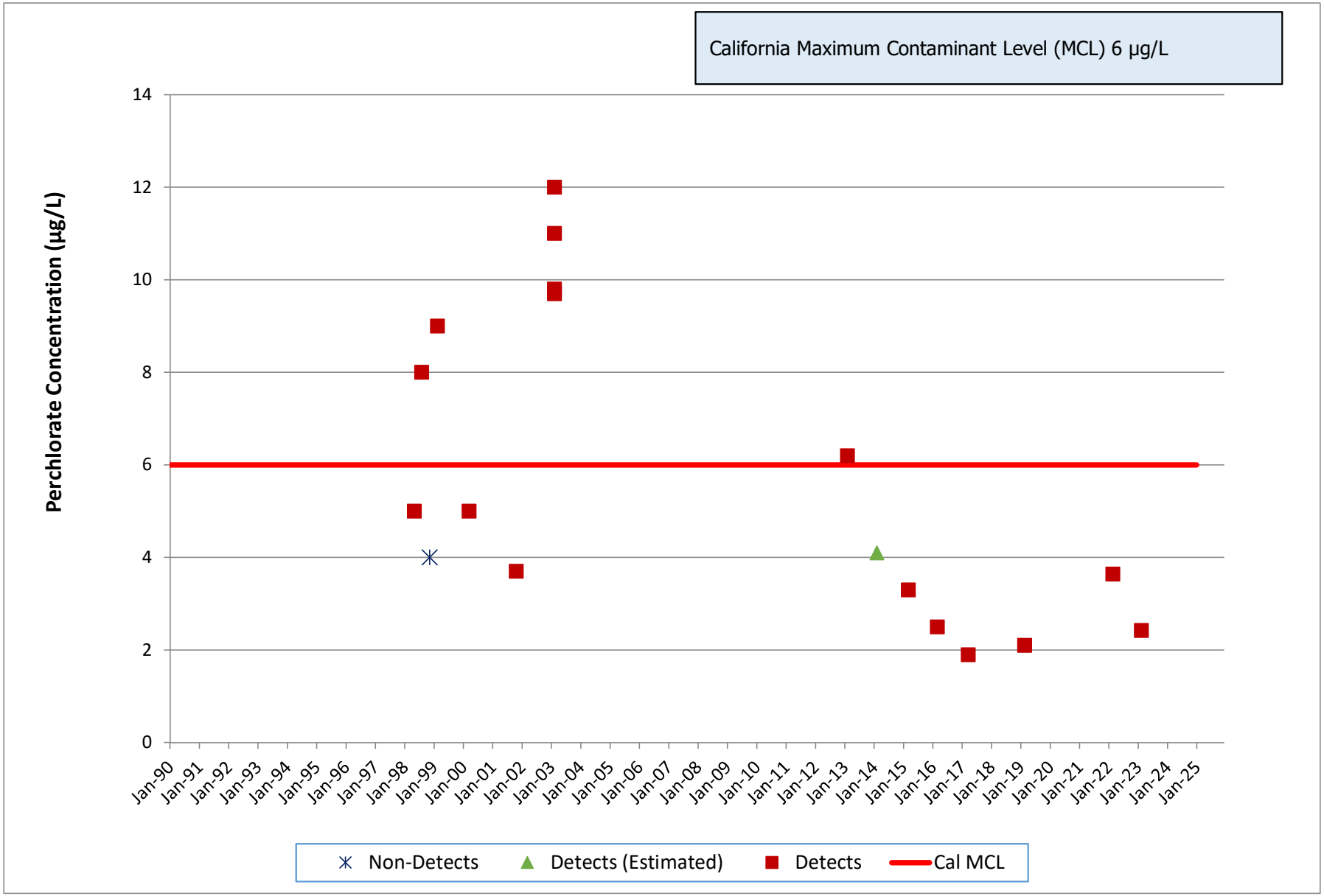
RD-59B, Offsite
Trichloroethene



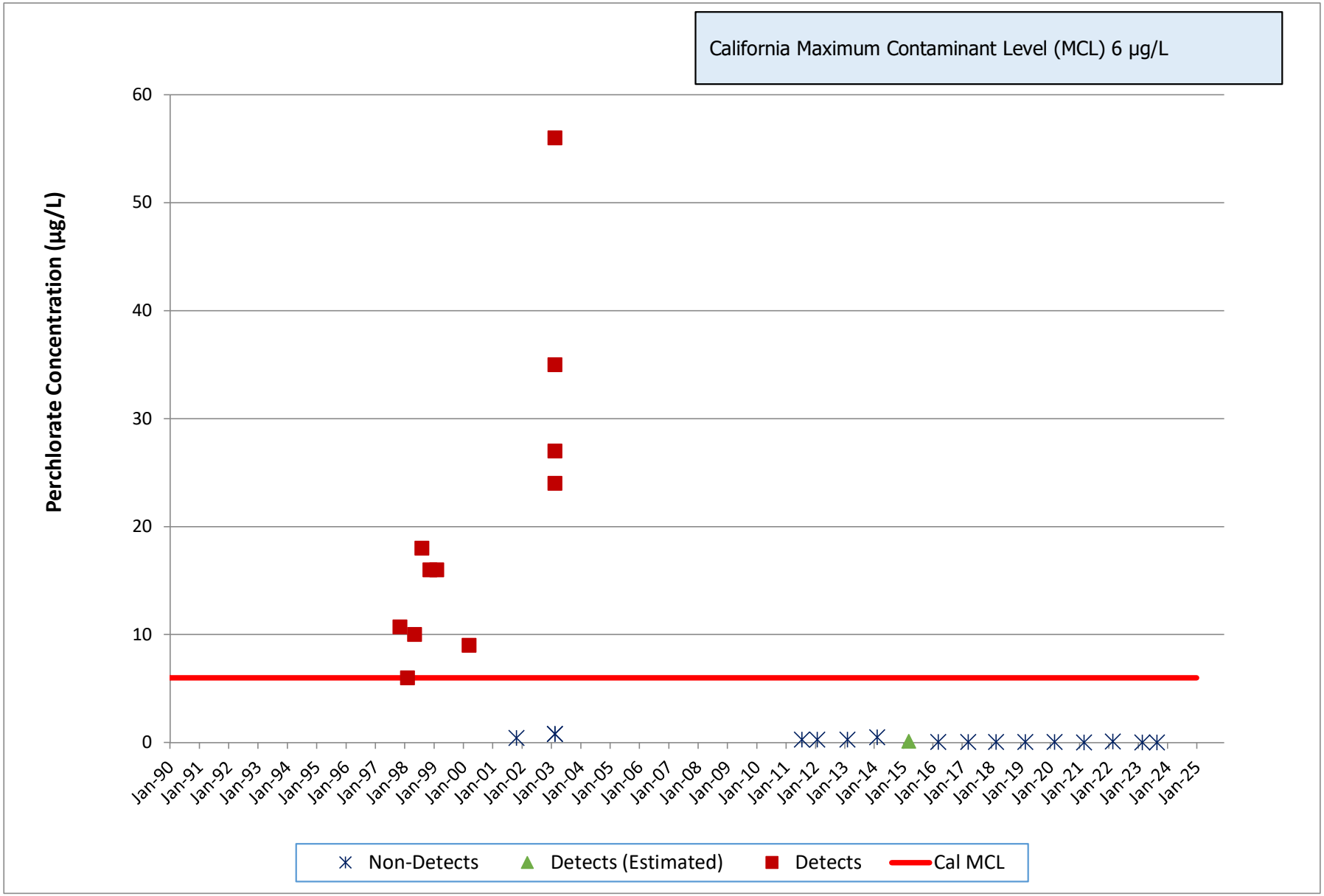
RD-59C, Offsite
Trichloroethene



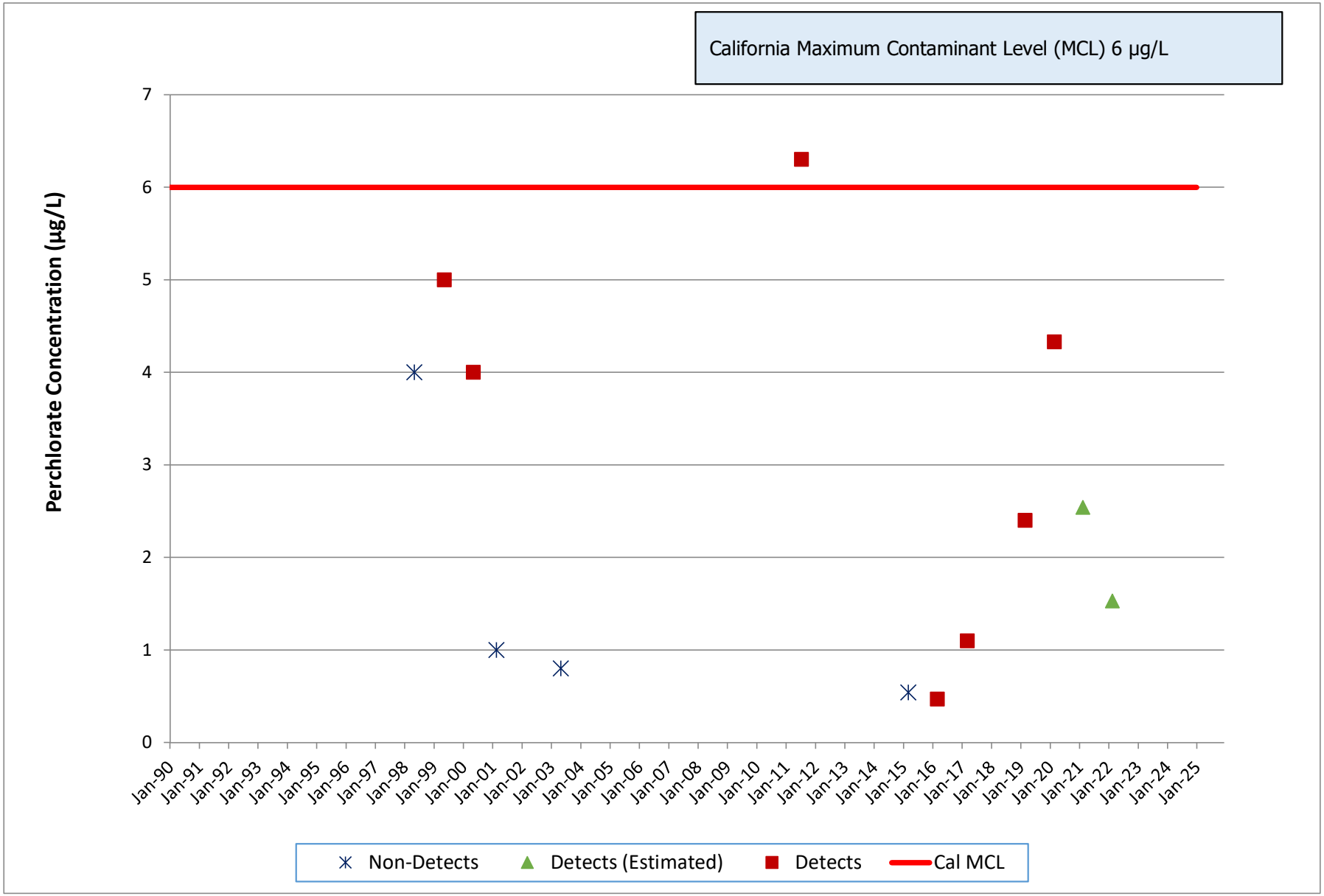
RD-21, FSDF/ESADA
Perchlorate



RS-54A, FSDF/ESADA
Perchlorate



RS-18, FSDF/ESADA
Perchlorate



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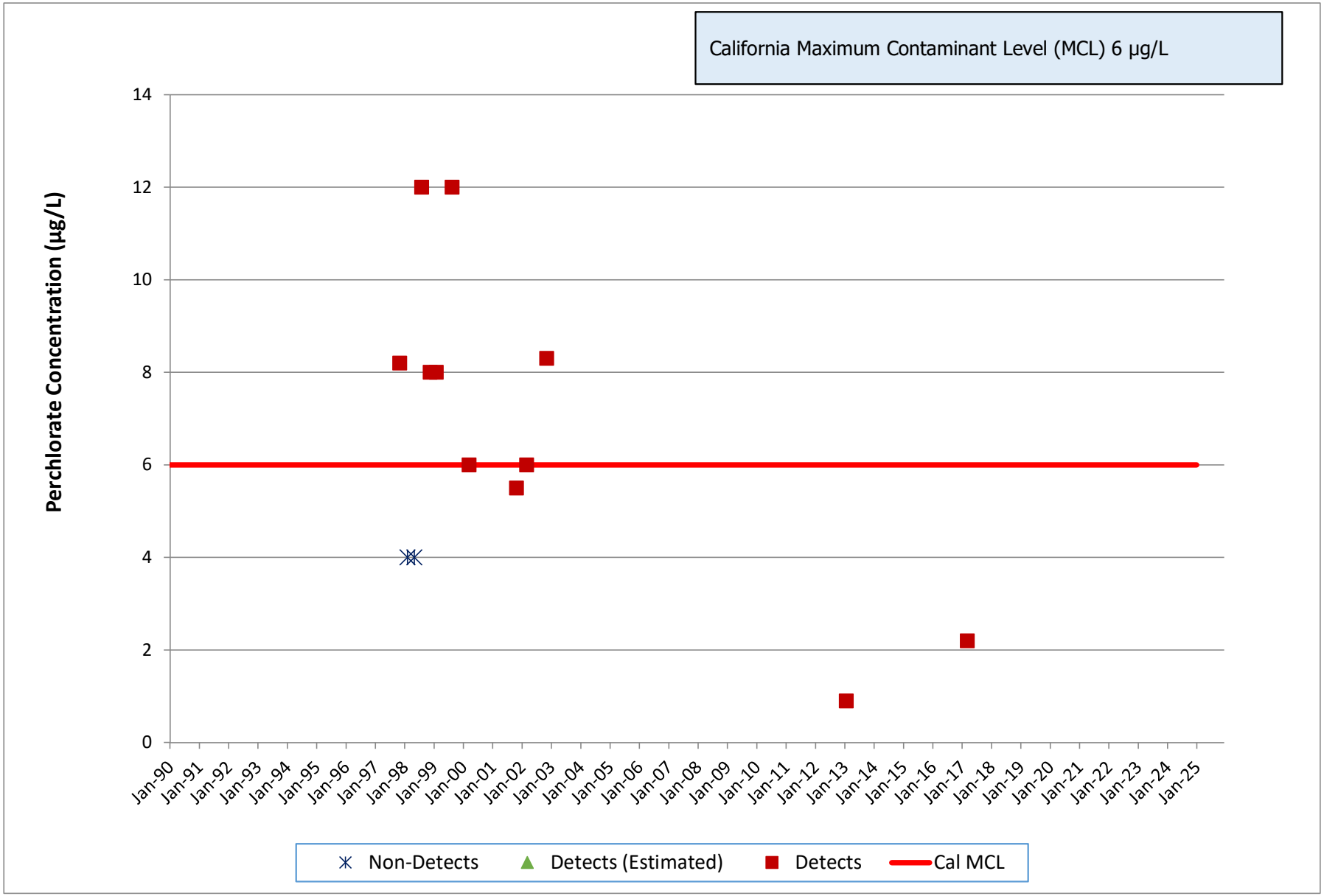
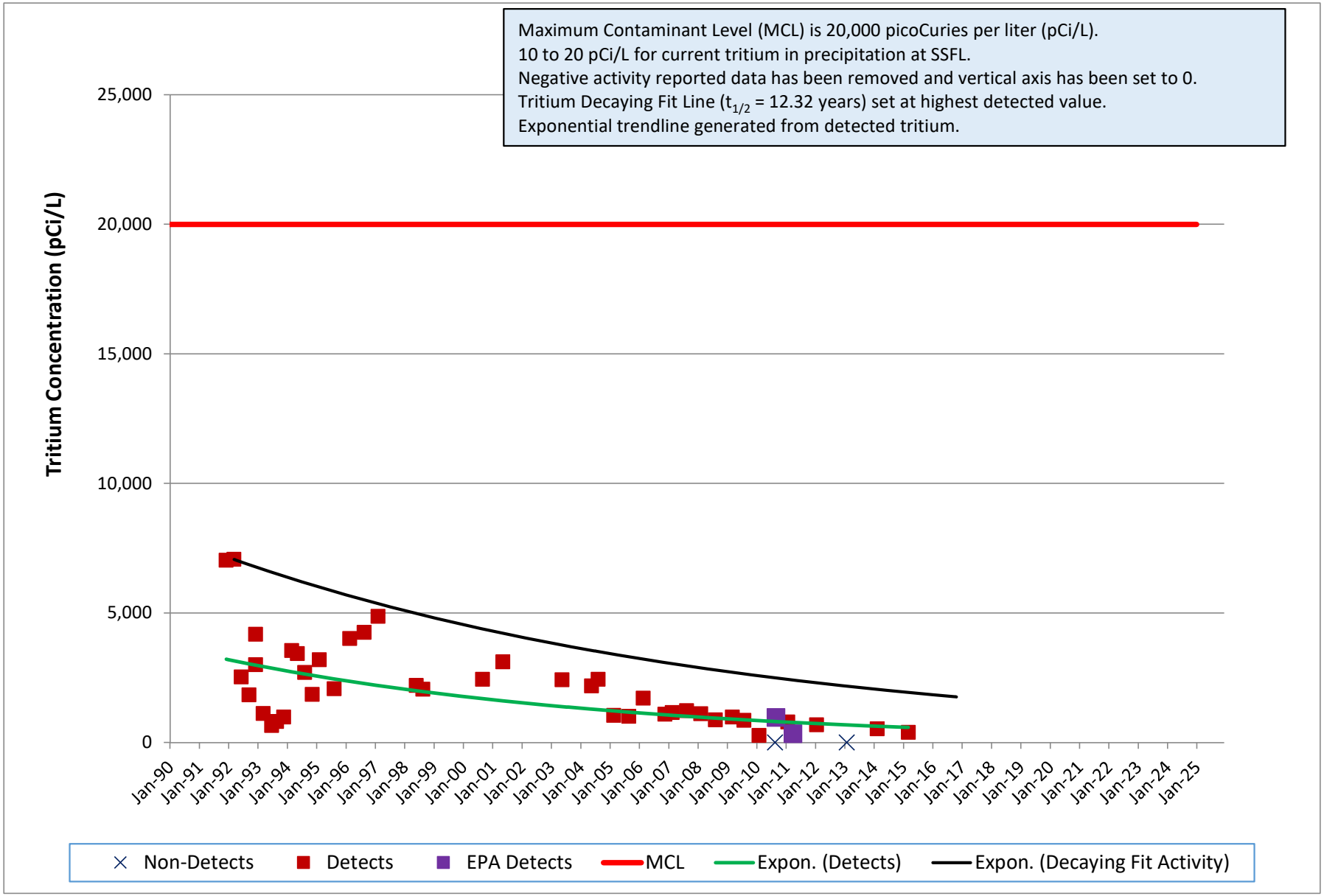
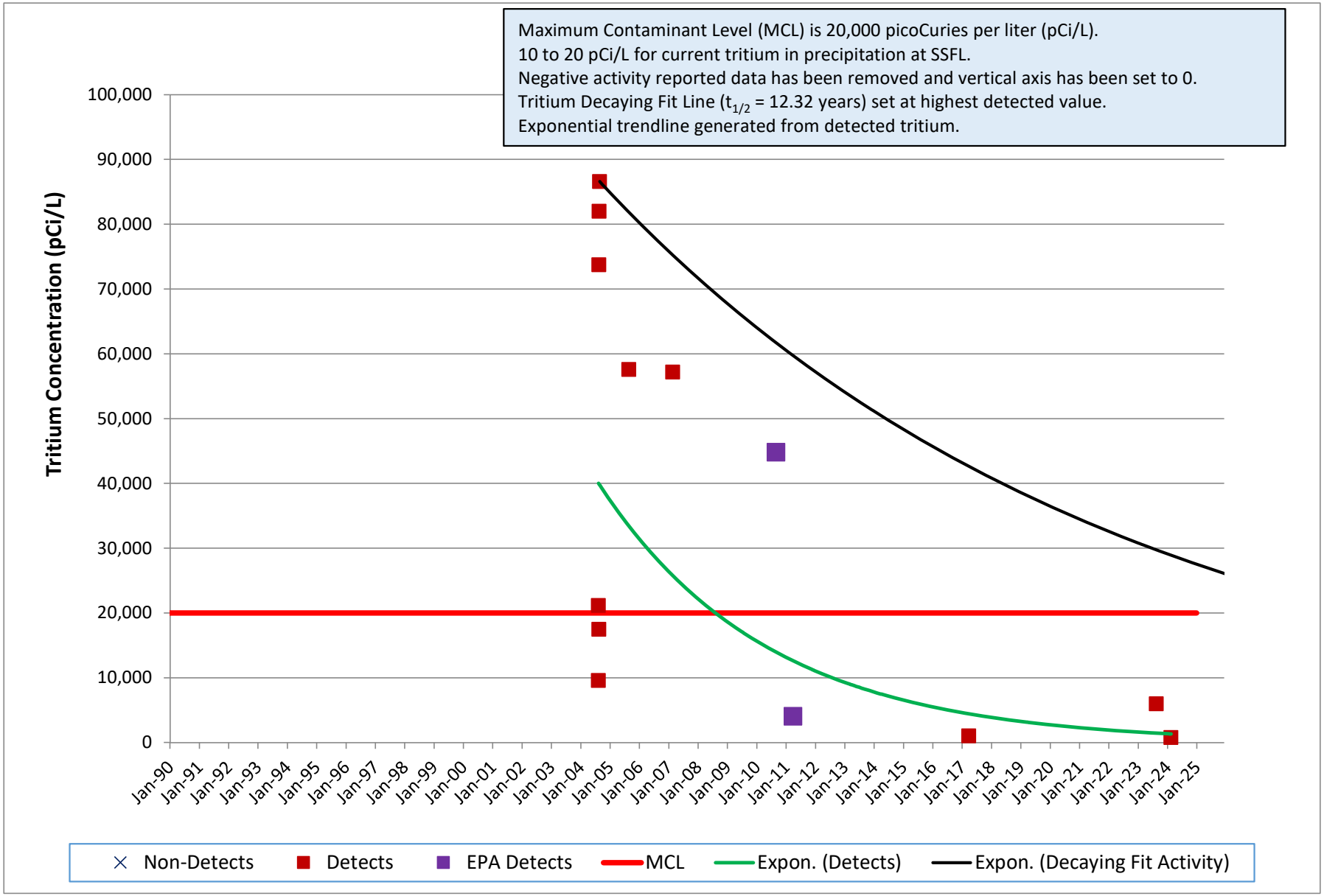
Perchlorate



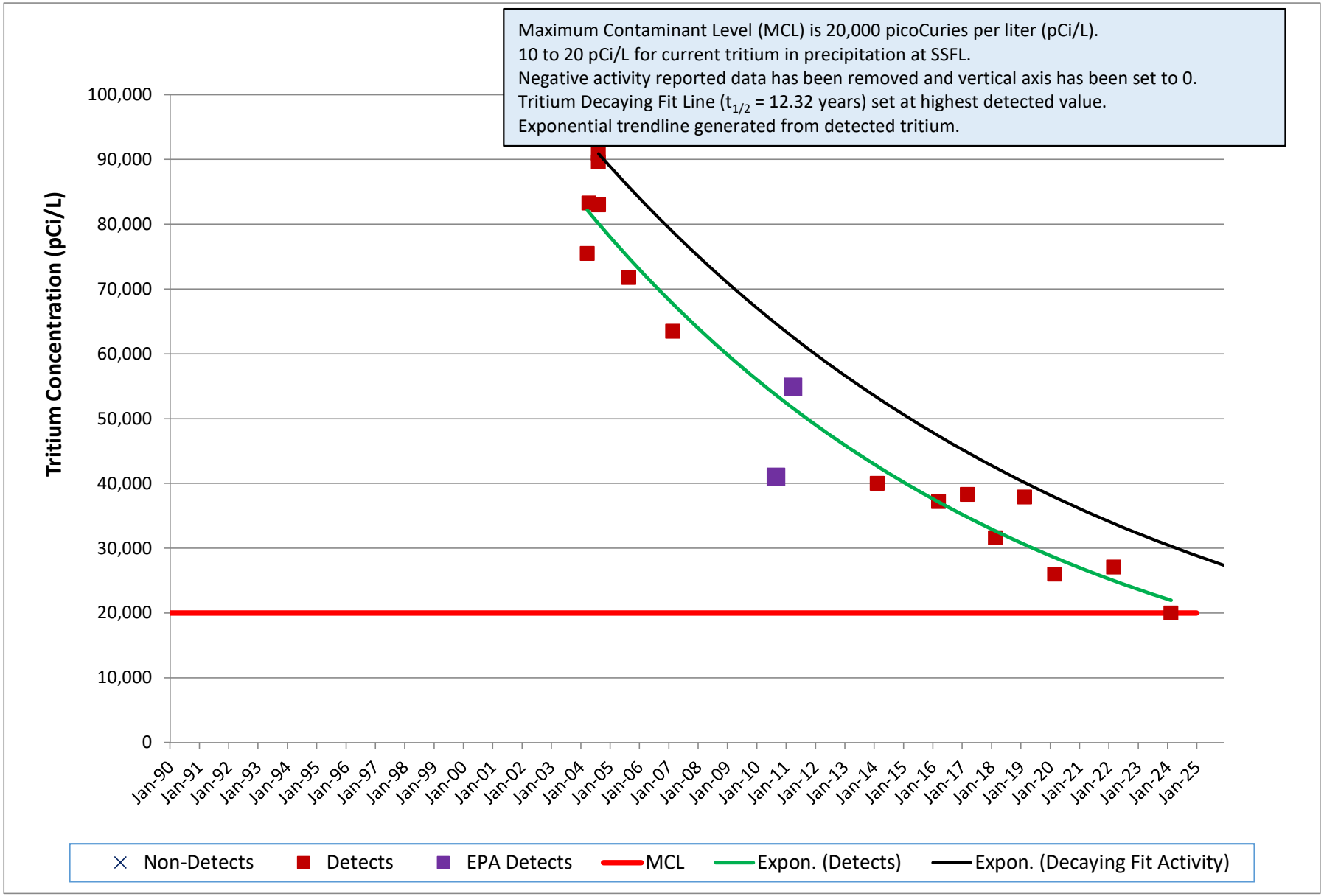
RD-34A, Tritium Plume
Tritium



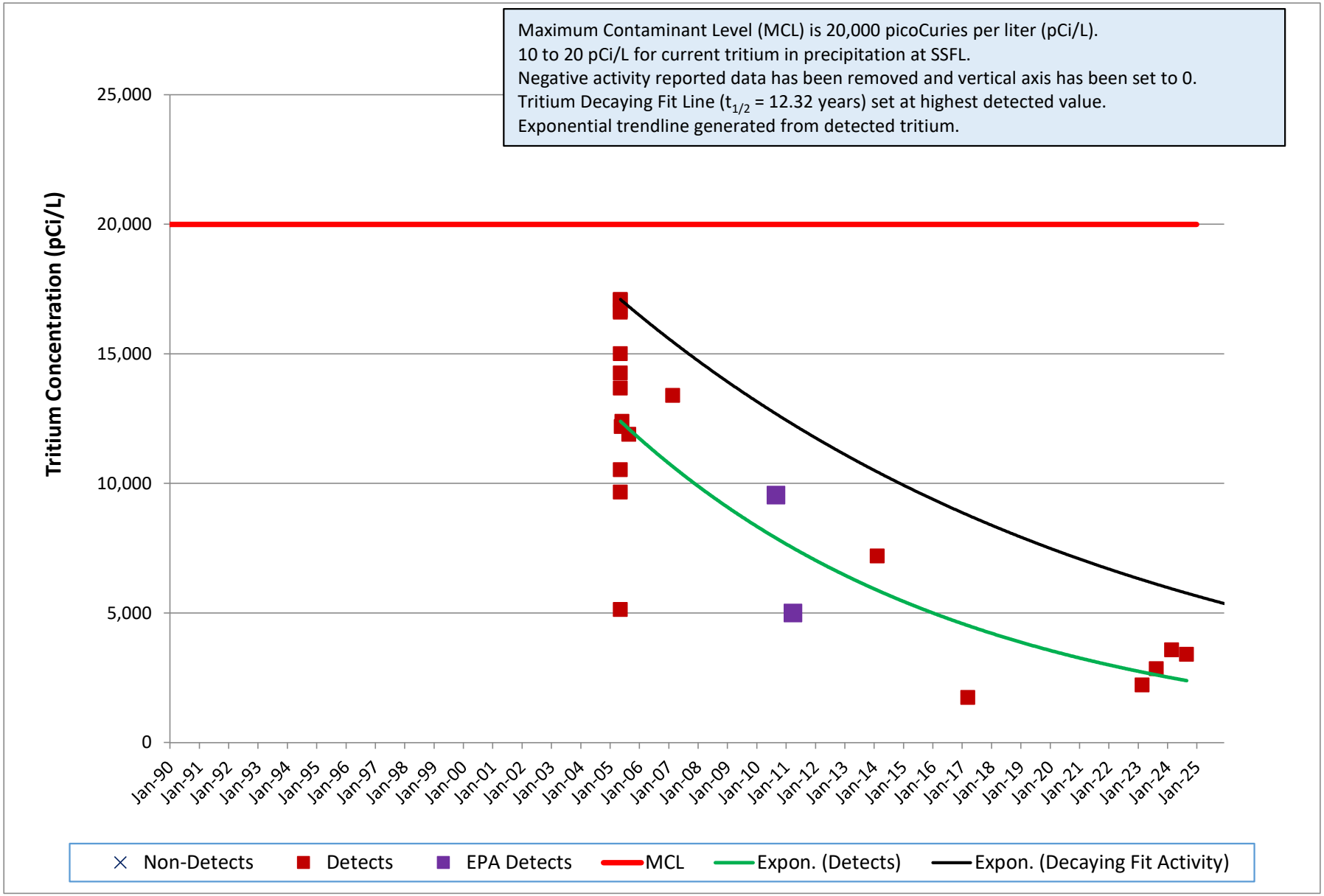
RD-88, Tritium Plume
Tritium



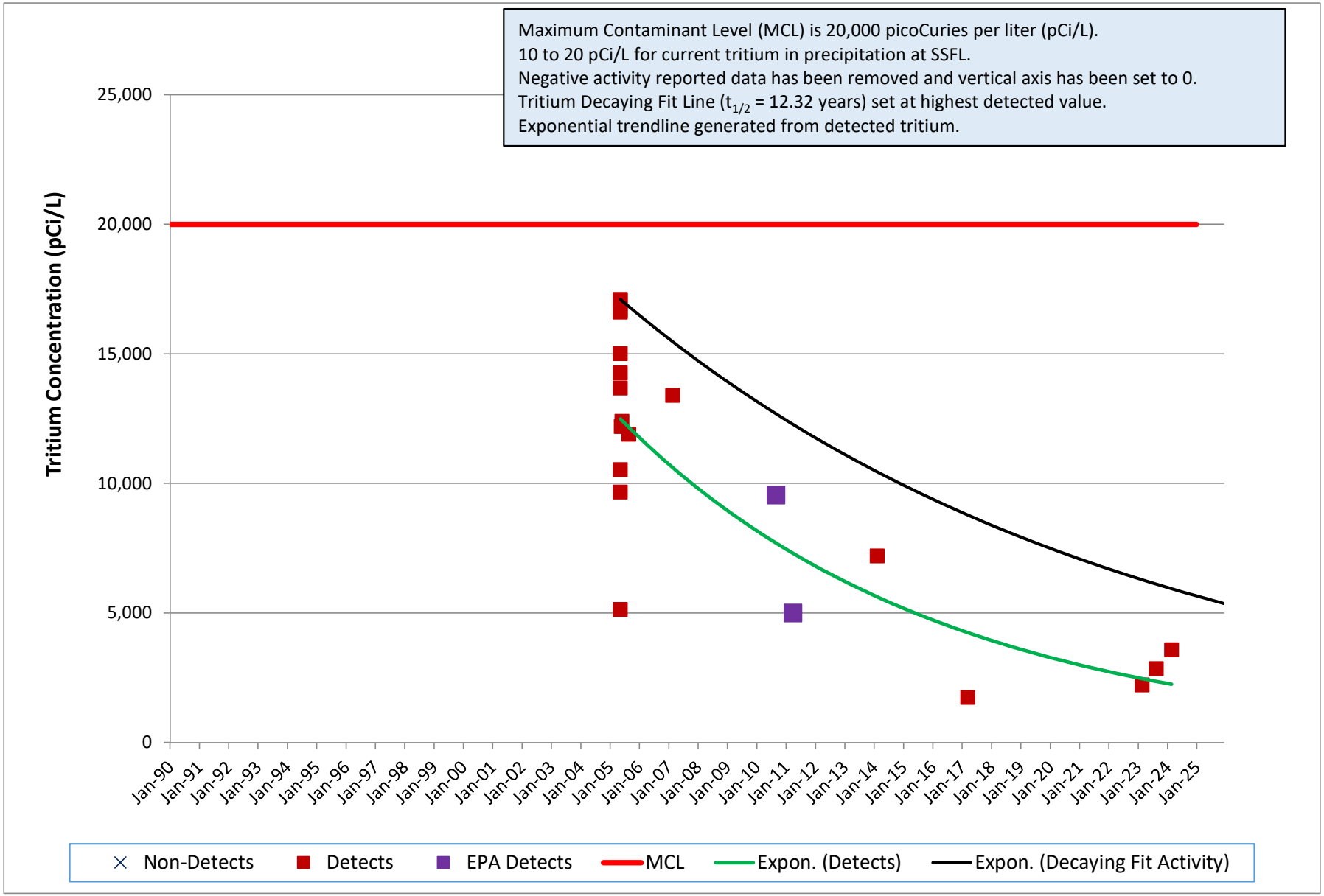
RD-90, Tritium Plume
Tritium



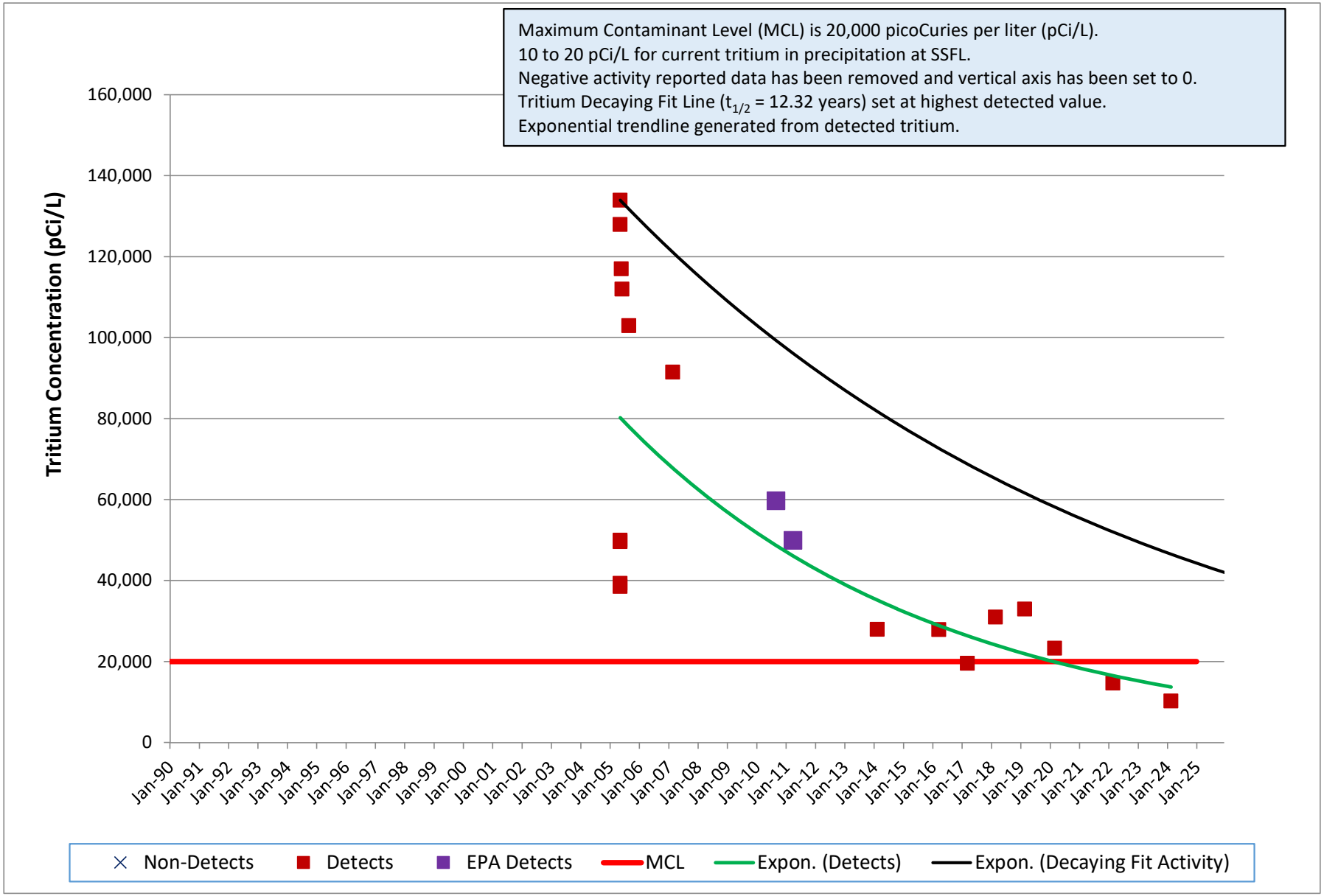
RD-94, Tritium Plume
Tritium



RD-94, Tritium Plume
Tritium



RD-95, Tritium Plume
Tritium



Appendix B

Glossary

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GLOSSARY

A

accuracy—The closeness of the result of a measurement to the true value of the quantity.

air effluent—A release of treated or untreated air from a pipe or a stack to the environment. Airborne effluent (also called emission) discharges into the atmosphere.

ambient—Existing in the surrounding area. Completely enveloping.

ambient air—The surrounding atmosphere as it exists around people, plants, and structures.

analyte—A constituent or parameter that is being analyzed.

B

best management practice—Sound engineering practice that is not required by regulation or by law.

biota—Plant and animal life.

C

categorical exclusion—Category of federal action that does not individually or cumulatively have a significant effect on the human environment and for which, therefore, neither an environmental assessment nor an environmental impact statement is required.

cleanup—Action taken to deal with the release or potential release of hazardous substances. This may mean complete removal of the substance; it also may mean stabilizing, containing, or otherwise treating the substance so that it does not affect human health or the environment.

closure—Controlling a hazardous waste management facility under Resource Conservation and Recovery Act (RCRA) requirements.

completeness—A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected under optimum conditions.

compliance—Fulfilling applicable requirements of a plan or schedule ordered or approved by government authority.

composite—A blend of more than one portion to be used as a sample for analysis.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)—This Act addresses the cleanup of hazardous substances and establishes a National Priority List of sites targeted for assessment and, if necessary, restoration (commonly known as “Superfund”).

concentration—The amount of a substance contained in a unit volume or mass of a sample.

contaminant—Any physical, chemical, biological, radiological substance, matter, or concentration that is in an unwanted location.

contaminant of concern—A contaminant in a given medium (usually soil or water) above a risk level that may result in harm to the public or the environment.

contamination—The state of being made impure or unsuitable by contact or mixture with something unclean, bad, etc.

D

data gap—A lack or inability to obtain information despite good faith efforts to gather desired information.

data validation—A systematic review of a data set to identify outliers or suspect values. More specifically, data validation refers to the systematic process of independently reviewing a body of analytical data against established criteria to provide assurance that the data are acceptable for their intended use. This process may use appropriate statistical techniques to screen out impossible or highly unlikely values.

deactivation—The process of placing a facility in a stable and known condition, including removing hazardous and radioactive materials to ensure adequate protection of the worker, public health and safety, and the environment, thereby limiting the long-term cost of surveillance and maintenance.

decay (radioactive)—Spontaneous transformation of one radionuclide into a different radioactive or nonradioactive nuclide, or into a different energy state of the same radionuclide.

decommissioning—The process that takes place after deactivation and includes surveillance and maintenance, decontamination, and dismantlement.

derived concentration standard (DCS)—The concentration of a radionuclide in air or water that, under conditions of continuous exposure for one year by one exposure mode (that is, ingestion of water, submersion in air, or inhalation), would result in an effective dose equivalent of 0.1 rem (1 mSv). Department of Energy (DOE) Order 458.1, "Radiation Protection of the Public and the Environment," (DOE 2013) establishes this limit, and DOE Standard DOE-STD-1196-2022, "Derived Concentration Technical Standard," (DOE 2022) provides the numerical values of DCSs.

direct radiation—External radiation from radioactive plumes or from radionuclides deposited on the ground or other surfaces.

dose—Energy imparted to matter by ionizing radiation. The unit of absorbed dose is the rad, equal to 0.01 joules per kilogram in any medium.

dosimeter—Portable detection device for measuring the total accumulated exposure to ionizing radiation.

duplicate—Result derived by taking a portion of a primary sample and performing the same analysis on that portion that is performed on the primary sample.

duplicate sample—A sample collected from the same sampling location using the same equipment and sampling technique and placed into an identically prepared and preserved container. Duplicate samples are analyzed independently as an indication of gross errors in sampling techniques.

E

effluent—Any gaseous or liquid discharge released to the environment, including storm water runoff at a site or facility.

effluent monitoring—The collection and analysis of samples or measurements of liquid and gaseous effluents to characterize and quantify the release of contaminants, assess radiation exposures to members of the public, and demonstrate compliance with applicable standards.

emission—A release of a gas (see also *air effluent*).

environment—Includes water, air, and land and the interrelationship that exists among and between water, air, and land and all living things.

environmental media—Includes air, groundwater, surface water, soil, flora, and fauna.

environmental monitoring—Vital role in determining health and safety issues for the purpose of public health or environmental health. Environmental monitoring at ETEC, Area IV, includes effluent monitoring and environmental surveillance with the dual purpose of (1) showing compliance with federal, state, and local regulations, as well as with U.S. DOE orders, and (2) monitoring any effects of Site operations on onsite and offsite natural resources and on human health.

environmental occurrence—Any sudden or sustained deviation from a regulated or planned performance at a DOE operation that has environmental protection and compliance significance.

environmental surveillance—The collection and analysis of samples of air, water, soil, foodstuffs, biota, and other media from DOE sites and their environs and the measurement of external radiation to demonstrate compliance with applicable standards, assess radiation exposures to members of the public, and assess effects, if any, on the local environment.

exposure (radiation)—The incidence of radiation on living or inanimate material by accident or intent. Background exposure is the exposure to natural background ionizing radiation or man-made radiation that is not specific to a person's occupation. Occupational exposure is the

exposure to ionizing radiation that takes place during a person's working hours. Population exposure is the exposure to the total number of persons who inhabit an area.

exposure pathway—The way that a person could be impacted from releases of radionuclides into the water and air.

external dose or exposure—The portion of the dose received from radiation sources outside the body (i.e., external sources).

F

field blank—A field blank is collected to assess the potential introduction of contaminants and the adequacy of field and laboratory protocols during sampling and laboratory analysis. In air sampling, a field blank is a clean, analyte-free filter that is carried to the sampling site, exposed to sampling conditions, returned to the laboratory, and treated as an environmental sample. In water sampling, field blanks are prepared at the field site where environmental water samples are collected. A sample of analyte-free water is poured into the container in the field where environmental water samples are collected, preserved, and shipped to the laboratory with field samples. Results include relevant ambient conditions during sampling and laboratory sources of contamination.

field duplicate—An independent sample collected as closely as possible to the same point in space and time as the original sample. The duplicate and original are two separate samples taken from the same source, stored in separate containers, and analyzed independently.

fission products—The nuclei (fission fragments) formed by the fission of heavy elements plus the nuclides formed by the subsequent decay products of the radioactive fission fragments.

G

gamma radiation—A form of electromagnetic radiation, such as radio waves or visible light but with a much shorter wavelength. It is more penetrating than alpha or beta radiation and capable of passing through dense materials, such as concrete.

gamma spectroscopy—An analysis technique that identifies specific radionuclides that emit gamma radiation. It measures the particular energy of a radionuclide's gamma radiation emissions. The energy of these emissions is unique for each radionuclide, acting as a fingerprint to identify a specific radionuclide.

grab sample—A sample collected instantaneously with a glass or plastic bottle placed below the water surface to collect surface water samples (also called dip samples).

graded approach (to sampling)—A decision process in which the requirements on the system vary with the risk of exposure to contaminants.

gross alpha activity—The total radioactivity due to alpha particle emission as inferred from measurements on a dry sample.

gross beta activity—The total radioactivity due to beta particle emission as inferred from measurements on a dry sample.

groundwater—Water found underground in cracks and spaces in soil, sand, and rocks.

H

half-life (radiological)—Time required for half of a given number of atoms of a specific radionuclide to decay. Each nuclide has a unique half-life.

hazardous material—Material considered dangerous to people or the environment.

hazardous waste—Any waste that is a toxic, corrosive, reactive, or ignitable material that could affect human health or the environment.

I

influent—Any raw or untreated gaseous or liquid stream entering a treatment system, process, or facility.

inorganic—Relating to or belonging to the class of compounds not having a carbon basis; hydrochloric and sulfuric acids, for example, are called inorganic substances.

isotope—Each of two or more forms of the same element that contain equal numbers of protons but different numbers of neutrons in their nuclei and, hence, differ in relative atomic mass but not in chemical properties; in particular, a radioactive form of an element.

L

laboratory control sample—A sample whose primary purpose (accuracy) is to demonstrate that the laboratory can perform the overall analytical approach in a matrix free of interferences (e.g., reagent water, clean sand, or another suitable reference matrix), and its analytical system is in control but does not reflect analytical performance on analyzing real-world samples.

M

matrix—The physical form (solid, liquid, or gas) or composition (soil, filter, groundwater, or air) of a sample.

maximally exposed individual (MEI)—Hypothetical individual who remains in an uncontrolled area and would, when all potential routes of exposure from a facility's operations are considered, receive the greatest possible radiation dose.

maximum contaminant level (MCL)—The maximum allowable concentration of a drinking water contaminant as legislated through the Safe Drinking Water Act.

mercury—Silver-white, liquid metal solidifying at -38.9°C to form a tin-white, ductile, malleable mass. It is widely distributed in the environment and biologically is a nonessential or nonbeneficial element. Human poisoning due to this highly toxic element has been clinically recognized.

millirem (mrem)—A unit of radiation dose that is equivalent to one one-thousandth of a rem.

millisievert (mSv)—The International System of Units (SI) for radiation dose and effective dose equivalent. The SI equivalent of the millirem (1 millisievert = 100 millirem).

mixed low-level waste —Waste that contains low-level radioactive waste and hazardous waste.

mixed waste—Waste that has both hazardous and radioactive components.

monitoring—The process whereby the quantity and quality of factors that can affect the environment or human health are measured periodically to regulate and control potential impacts.

N

nuclide—An atom specified by its atomic weight, atomic number, and energy state. A radionuclide is a radioactive nuclide.

O

optically stimulated luminescence dosimeter (OSLD)— A reusable passive device that measures the exposure from ionizing radiation.

organic—Of, relating to, or derived from living organisms (plant or animal).

outfall—A place where treated or untreated water flows out of a pipe to mix with water from a water body, such as a stream or lake.

P

parameter—Analytical constituent; chemical compound(s) or property for which an analytical request may be submitted.

person-rem—The collective dose to a population group. For example, a dose of 1 rem to 10 individuals results in a collective dose of 10 person-rem.

point source—Any defined source of emission to air or water such as a stack, air vent, pipe, channel, or passage to a water body.

precision—An estimate of the degree to which a set of observations or measurements of the property, usually obtained under similar conditions, agree. It is a data quality indicator.

purge—To remove water prior to sampling, generally by pumping or bailing.

Q

quality assurance (QA)—The planned and systematic actions necessary to provide adequate confidence that a facility, structure, system, or component will perform satisfactorily and safely in service. QA includes quality control. If quality is the degree to which an item or process meets or exceeds the user's requirements, then QA is the action that provides confidence that quality was in fact achieved.

quality control (QC)— Those actions necessary to control and verify the features and characteristics of a material, process, product, service, or activity to specified requirements. The aim of QC is to provide quality that is satisfactory, adequate, dependable, and economic.

R

radioactivity—Spontaneous emission of radiation, generally alpha or beta particles, or gamma rays, from the nucleus of an unstable isotope.

radioisotopes—Radioactive isotopes.

radionuclide—A type of atom that emits energy in the form of photons or particles (radiation) during transformation.

regulatory compliance—Actions taken in accordance with government laws, regulations, orders, etc., that apply to operations' effects on onsite and offsite natural resources and on human health.

release—Any discharge to the environment. Environment is broadly defined as any water, land, or ambient air.

rem—A unit of equivalent dose (absorbed dose in rads times the radiation weighting factor). Equivalent dose frequently is reported in units of millirem (mrem), which is one thousandth of a rem.

remediation—The assessment and cleanup of sites contaminated with waste due to historical activities.

Resource Conservation and Recovery Act (RCRA)—Federal legislation that regulates the transport, treatment, and disposal of solid and hazardous wastes. This act also requires corrective action for releases of hazardous waste at inactive waste units.

S

shielding—The material or process used to protect workers, the public, and the environment from exposure to radiation.

source—The point or object from which radiation or contamination emanates.

stack—A vertical pipe or flue designed to exhaust airborne gases and suspended particulate matter.

storm water—Water produced by the interaction of precipitation events and the physical environment (e.g., buildings, pavement, ground surface).

Superfund—See *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA).

surface water—Water that has not penetrated below the surface of the ground.

surveillance—Monitoring of parameters to observe trends but for which action is not required by a permit or regulation.

T

terrestrial—Living on or growing from the land.

thermoluminescent dosimeter—A device used to measure radiation dose to occupational workers or radiation levels in the environment. A dosimeter is made of one or more lithium fluoride chips that measure cumulative exposure to ionizing radiation. Lithium fluoride absorbs the energy of radiation and releases it as light when heated.

total effective dose—The sum of the effective dose (for external exposures) and the committed effective dose.

trip blank—A trip blank is a clean sample of matrix taken from the sample preparation area to the sampling site and returned to the analytical laboratory unopened. A trip blank is used to document contamination attributable to shipping and field handling procedures.

tritium—The elemental form of the radioactive isotope of hydrogen. Occurs as a gas.

V

vadose zone—The part of the subsurface between the ground surface and the water table.

volatile organic compounds (VOCs)—The broad range of organic compounds, commonly halogenated, that vaporize at ambient, or relatively low, temperatures (for example, acetone, benzene, chloroform, methyl alcohol).

W

waste management—DOE uses this term to refer to the safe, effective management of various kinds of nonhazardous, hazardous, and radioactive waste generated at DOE facilities.

waste stream—Waste material generated from a single process or from an activity that is similar in material, physical form, isotopic makeup, and hazardous constituents.