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Review of 2024 Annual Reports for the Middlefield Ellis Whisman (MEW) Superfund Study Area Mountain View, California

August 14, 2025

The area in Mountain View, California roughly bounded by Middlefield Road, Ellis Street, and Whisman Road was the original home of the semiconductor companies that made Silicon Valley famous, and it remains host to the pollution released by those firms into the local environment. In the early 1980s, significant groundwater contamination was detected, emanating from the industrial area. I have been participating in the community oversight of the cleanup response since the beginning, managing U.S. EPA Technical Assistance Grants (TAGs), first for the Silicon Valley Toxics Coalition and now for the Center of Public Environmental Oversight, a project of the Pacific Studies Center. In the late 1980s, the cleanup contamination at Moffett Field, just to the north, was added to the project.

A great deal of investigation and remediation has been accomplished, and the combined site has become a national model for public participation in cleanup oversight. Yet a great deal remains to be done. To recap that progress and develop recommendations for the path forward, I asked TAG consultant Peter Strauss to review the 2024 annual reports submitted by the multiple responsible parties to EPA.

This document contains his findings and recommendations for finishing the job. Please note the list of acronyms at the end of the memorandum.

Lenny Siegel
Executive Director, CPEO

PM STRAUSS & ASSOCIATES
Energy and Environmental Consulting

MEMORANDUM

TO: Lenny Siegel
FROM: Peter Strauss
DATE: August 14, 2025
SUBJ: **Review of 2024 Annual Reports for the Middlefield Ellis Whisman (MEW) Superfund Study Area**

The MEW Study Area, located in Mountain View, California, encompasses an approximately one-square-mile area bisected by United States Highway 101. South of 101 the MEW Study Area includes three private National Priority List (Superfund) sites: Fairchild Semiconductor, for which Schlumberger is the Responsible Party; Intel Corporation; and Raytheon Company, as well as several sites not on the National Priority List within an approximately100-acre area bounded by East Middlefield Road on the south, Ellis Street on the east, and North Whisman Road on the west. North of Highway 101, the MEW Study Area extends across portions of the former Moffett Naval Air Station and the NASA Ames Research Center and includes much of the Moffett Field Superfund Site.

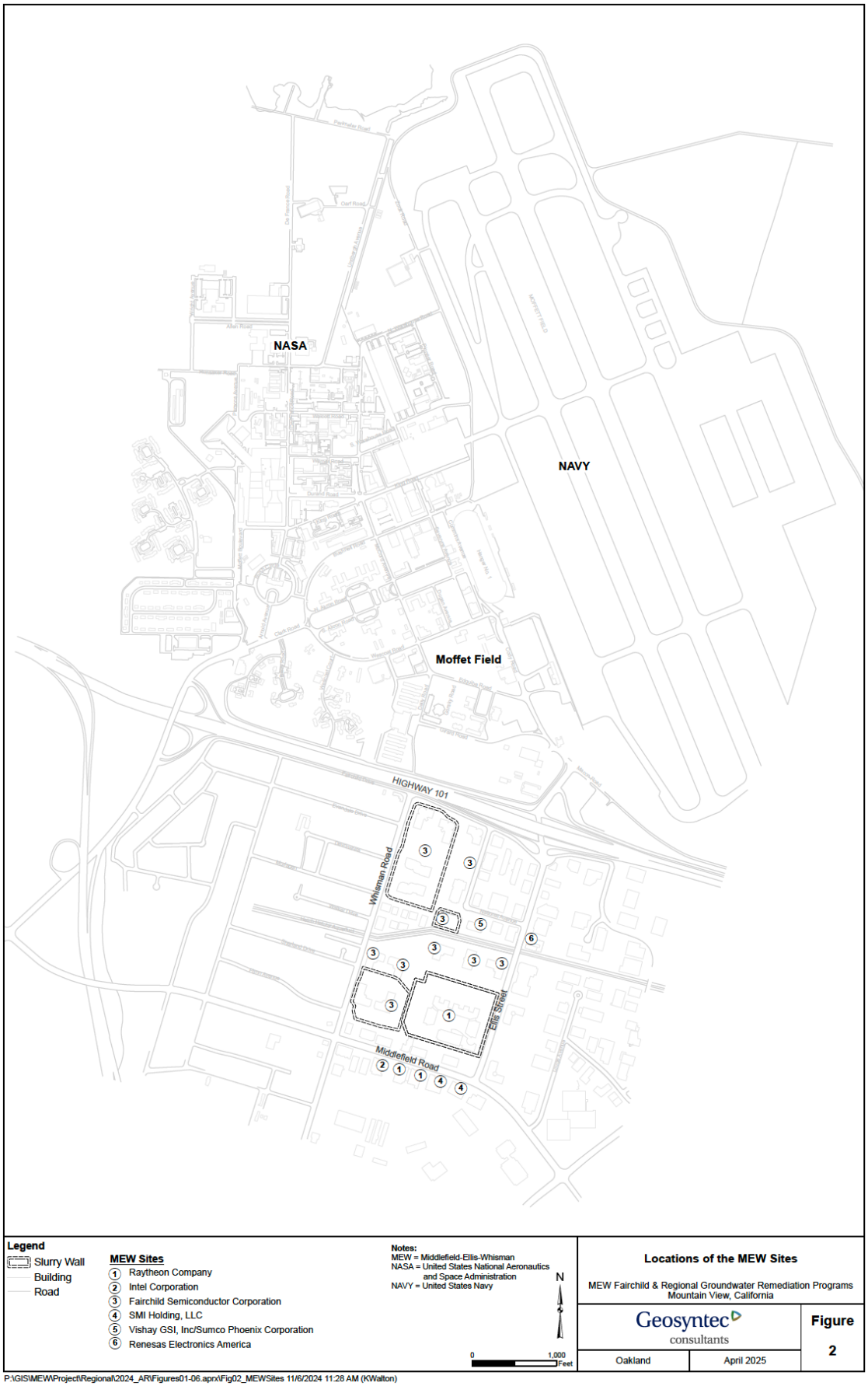
The primary constituents of concern at the MEW Study Area are highly toxic volatile organic compounds (VOCs) trichloroethylene (TCE) and its reductive dechlorination breakdown products cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC).

Below, I have reviewed and summarized all of the 2024 Annual Reports. These are:

- Renesas Electronics at 501 Ellis St.
- Raytheon at 350 Ellis
- SMI Holdings at 455 and 485/87 East Middlefield
- Intel at 365 East Middlefield
- NASA Site 28, formerly managed by the U.S. Navy
- 620 National Ave. (formerly 405 National)
- Regional Groundwater Remediation Program and Fairchild
- Vapor Intrusion (VI) (regional buildings)

Renesas Electronics at 501 Ellis St.

From 1968 to 1978, Electronic Arrays Corporation operated at this address and manufactured semiconductor devices and related components. Nippon Electric (NEC) acquired the company in 1978, continuing operations until April 1984. The 501 Ellis Street building is currently used for office and meeting space.


NASA
NAVY
Moffet Field
HIGHWAY 101
Whisman Road
Ellis Street
Middlefield Road
Legend
Slurry Wall
Building
Road
MEW Sites
1 Raytheon Company
2 Intel Corporation
3 Fairchild Semiconductor Corporation
4 SMI Holding, LLC
5 Vishay GSI, Inc/Sumco Phoenix Corporation
6 Renesas Electronics America
Notes:
MEW = Middlefield-Ellis-Whisman
NASA = United States National Aeronautics and Space Administration
NAVY = United States Navy
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Locations of the MEW Sites
MEW Fairchild & Regional Groundwater Remediation Programs
Mountain View, California
Geosyntec consultants
Figure 2
Oakland
April 2025
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Remediation

In October 1997, NEC began operating the Source Control Groundwater Remediation (SCGWR) system at the Site. The SCGWR system is a groundwater extraction and treatment system (GWETS) designed to contain and extract VOCs at the Site and to complement the regional groundwater remediation program (RGRP) for the MEW Study Area. The SCGWR system has operated continuously since startup in October 1997 with few disruptions.

As originally designed, the SCGWR system extracted groundwater from three A (upper) aquifer recovery wells at the Site for treatment with granular activated carbon (GAC) prior to discharge to the storm drain. In 2009, the SCGWR system was optimized. Operation of the modified SCGWR system includes discharge of extracted groundwater to the Palo Alto Regional Water Quality Control Plant (RWQCP) in accordance with City of Mountain View Wastewater Discharge Permit. That is, the SCGRW system directly discharged to the Palo Alto RWQCP **without** treatment. In 2021, EPA requested resumption of groundwater treatment at the SCGWR prior to discharge to the Palo Alto RWQCP. In response, four 55-gallon GAC drums were installed at the SCGRW.

VOC Removal

TCE was reduced from its highest level 2,400 micrograms per liter (µg/L, or parts per billion) to 18 µg/L. In 2024, the system removed 1.6 pounds (lbs.) of VOCs. Since remediation began, this system has removed about 65 lbs. of VOCs.

VI

501 Ellis is classified as Tier 3B (i.e., lower than cleanup levels, lower than outside air). The building was sampled in February 2024.

Per- and Polyfluoroalkyl Substances (PFAS)

There is no mention of PFAS in this report

Raytheon at 350 Ellis St.

This is an 18-acre Site located in the MEW Study Area. The former facilities at 350 Ellis Street were constructed circa 1959. Raytheon occupied the Site from 1961 until it sold the property to Fairchild Semiconductor Corporation in 1997. In 2000, Veritas purchased the property, demolished the buildings, and constructed five new buildings and a multi-level parking garage. In 2005, Symantec acquired Veritas. Broadcom acquired Symantec in 2019. TMG Partners acquired the property in 2021. In 2024 the property was transferred to “350 Ellis Owner, LLC” and is managed by TMG. Note that this property is different than the Raytheon/Intel Facility at 365 E. Middlefield.

Remediation

In 1987, Raytheon installed a slurry wall around the Site to physically contain VOCs on Site. Raytheon began groundwater extraction activities in 1982. The current system includes eight extraction wells, and an advanced oxidation process (HiPOx) for primary water treatment, and GAC treatment as a polishing step (1,000 lb. and 3,000 lb. vessels). Groundwater is pumped from the extraction wells and filtered at the treatment system. Five extraction wells are located within the slurry wall and three extraction wells are located immediately outside of the slurry wall enclosure.

Raytheon installed a soil vapor extraction (SVE) system in 1996 that operated until 2000, when it was shut down and decommissioned.

VOC Removal

The SVE system removed approximately 3,000 pounds of volatile organic compounds (VOCs) from the vadose zone (the soil above the water table). In 2024, the treatment system treated approximately 9.1 million gallons of water and removed 221 pounds of VOCs. As of December 2024, Raytheon had removed approximately 20,640 pounds of VOCs from the groundwater.

VOC concentrations have been reduced by one order of magnitude or more in many wells at the Site. Currently. The average VOC concentration in groundwater in the combined extraction wells is below 5 µg/L, down from a high of 21 micrograms per liter (µg/L, equivalent to parts per billion). However, TCE concentrations in monitoring wells remained much higher, at one location as high as 9,700 µg/L.

VI

There is a sub-slab depressurization system beneath the five buildings to mitigate against VI. The system uses vapor-phase granular activated carbon (GAC) to comply with Bay Area Air Quality Management District (BAAQMD) emission standards.

PFAS

There is no mention of PFAS in this report.

SMI Holdings at 455 and 485/87 East Middlefield

This property contains two buildings, 455 and 485/487 East Middlefield that have *potentiall*y been impacted with volatile organic compounds (VOCs), such as trichloroethene (TCE) and cis-1,2-dichloroethene (DCE), a degradation product of TCE.

Remediation

Remedial activities began in 1995. An air sparging/soil vapor extraction (AS/SVE) pilot test was conducted, and in 1997 a full-scale AS/SVE system was installed. The AS/SVE system operated for only a short time, as rising groundwater levels forced closure of the vertical AS/SVE wells.

Also in 1997, four groundwater source control recovery wells (SCRWs) were installed in the A aquifer. Extracted groundwater was initially treated by two 300-pound GAC vessels in series, but in 2018 three in-series 1,000-pound GAC vessels were installed to replace them.

In June 2019 both buildings were vacant. SMI stopped operation of the groundwater extraction and treatment system and began a Pilot Test using In-Situ Chemical Reduction using zero-valent iron (ZVI). This process uses micron-sized sulfidated ZVI to break down TCE-affected groundwater at the property. Since implementation in 2019, vinyl chloride (VC) was detected in more wells as a transient degradation product of cis-1,2-DCE following in-situ injection activities. The system was supplemented by injecting liquid activated carbon (PlumeStop®) and additional sulfidated ZVI. The goal of the ZVI/PlumeStop® remediation is to reduce the VOCs identified in groundwater to maximum contaminant levels (MCLs). The Pilot Test was designed to be the final groundwater remediation phase at this property.

VOC Removal

Extraction wells, treatment zone monitoring wells, and downgradient monitoring wells were sampled during 2024. The highest concentration of TCE in any of the wells was 68 µg/L. In the treatment zone, these were reduced to below cleanup targets. However, as expected, concentrations of cis-1,2- DCE and VC are above their respective MCLs in some wells.

VI

This Building is classified as 3B (no engineered remedy nor long-term monitoring required with implemented governmental institutional controls).

PFAS

A site-wide issue identified in the EPA Fifth Five-Year Review was that PFAS groundwater concentrations exceeding 2024 EPA MCLs were detected in the influent of the MEW Regional Groundwater Remediation Program North of 101Treatment System, as well as in extraction and groundwater monitoring wells in the Moffett Field area. EPA recommended, “Conduct additional influent and effluent sampling at all the groundwater extraction and treatment systems within the MEW Site.” This is noted in the Annual Report.

Former Intel Property at 365 E. Middlefield

Beginning 1965 Union Carbide occupied this site for manufacturing semiconductor products. The site consisted of at least four lots. As part of the manufacturing process, trichloroethene (TCE) was used. Union Carbide constructed an acid neutralization vault (ANV) to manage some of the waste streams. In 1968, Union Carbide’s complex was divided into two parcels that were operated by two companies. Raytheon occupied 415 East Middlefield Road and its adjacent lot, while Intel occupied 365 East Middlefield Road. Both manufactured semiconductors and both used TCE in the process. The two companies also shared the ANV. In late 1972, Intel installed an acid waste neutralization (AWN) system on the southeast side of 365 East Middlefield Road, while Raytheon continued to use the ANV until 1983.

In 1989/early 1990s, Intel and Raytheon vacated the properties and in the mid-1990s, Renault & Handley redeveloped some lots, now 401 and 415 East Middlefield Road. Various tenants have occupied these facilities since that time.

Remediation

Intel was one of the first parties to investigate its facility, in 1981 discovering chemical contamination of soil and groundwater adjacent to an underground concrete storage vault that contained solvent waste storage tanks. In 1984, Intel conducted a source area removal program to address impacted soils in the area surrounding the former AWN system. Intel extracted and treated VOC-impacted groundwater from the Site from 1982 through August 2005. In 2005 pumping was discontinued and replaced by the enhanced in-situ bioremediation (EBR) pilot test, conducted by both Intel and Raytheon, to accelerate groundwater cleanup. It is being conducted in phases to systematically assess some of the site-specific applicability concerns such as plume mobility and containment, bioaugmentation, delivery methodology, geochemical limitations, and concentration rebound. Since that time, the companies have carried out multiple rounds of carbon substrate injection, both with and without bioaugmentation and the addition of other amendments.

As part of plans to redevelop properties along East Middlefield Road as residential properties by SummerHill Homes LLC, additional electron donor injection was done where TCE exceeded 100 µg/L. However, in June 2020, SummerHill informed Intel and Raytheon that it was not moving forward with the redevelopment.

VOC Removal

Since remediation began at the Site in 1981, more than 95 percent of the VOC mass is estimated to have been removed from the subsurface. TCE concentrations in the B1 (medium depth) zone are low with concentrations ranging from non-detect to 90 µg/L. In the B2 zone TCE is measured at 0.32 µg/L.

Between 1982 and 1984 the groundwater extraction system removed a total of 1,623 lbs. of VOCs from one extraction well. In 1985, Intel installed a GWETS consisting of four extraction wells. Between 1986 and 2005 an additional 364 lbs. were removed. Since 2005 the in-situ pilot test has destroyed many of the remaining VOCs. As of October 2024, TCE concentrations in one guard well had decreased to 29 µg/L. In the treatment area TCE concentrations went from 170 µg/L to 11 µg/L. By-products (cis-1,2-DCE and vinyl chloride) were also reduced.

After the 2005 EBR pilot test injections, no notable TCE degradation was detected in the guard well. Following nutrients injections in July 2009, TCE concentrations decreased drastically from 530 to 0.8 µg/L, with a concomitant increase in degradation by-products. After TCE levels increased again, additional injections were administered.

VI

The Site-Wide Vapor Intrusion Response Action Tiering Work Plan confirmed the classification of the 355/365 East Middlefield Road commercial building as Tier 3A (indoor air concentrations below indoor air cleanup levels and above outdoor concentrations) and indicates that the building at 401 East Middlefield Road is classified as Tier 3B (indoor air concentrations below indoor air cleanup levels and at/below outdoor concentrations).

PFAS

There is no mention of PFAS.

Vishay/SUMCO/Schlumberger Technology Corporation [STC] at 620 National Ave.

The Site is located approximately 1,200 feet south of U.S. Highway 101, midway between Ellis Street and Whisman Road. Formerly known as 405 National Ave., a one-story industrial building, it was constructed in the mid-1960s. It was occupied by the Elmat Corporation from 1967 to 1969; General Instrument Corporation (now Vishay) between 1969 and 1978; Siltec Corporation (now SUMCO) from 1978 to 1987; and UniSil Corporation (UniSil) between 1989 and 1999 when UniSil ceased operations.

Located at a curve in the road, the original building was bordered to the east by what is now 425 National Avenue (formerly 423 National Avenue) and to the west by 620 National Avenue. The former two buildings were redeveloped in 2001. The redevelopment activities included demolition of existing buildings and construction of a new two-story commercial building, along with associated parking. In 2015, the 401, 620, 630, and 640 National Avenue parcels were redeveloped and are now collectively referred to as 620 National Avenue.

Remediation

A soil vapor extraction system included five vapor extraction wells. In 1999 this system was shut down as soil cleanup levels were met. Four of the five vapor extraction wells were later converted to groundwater extraction wells to operate as part of the GWETS. The GWETS includes nine extraction wells. Five of these extraction wells are maintained by Vishay/SUMCO as source control measures for the former 405 National Avenue property. Four extraction wells are located downgradient from the former 401 and 405 National Avenue buildings, also as source control measures. These are referred to as the "shared wells," and they are jointly operated by Vishay/SUMCO and STC. The GWETS was relocated to its current location between December 2015 and February 2016.

Before 2016, the GWETS used UV-H_2O_2 (ultraviolet-hydrogen peroxide) oxidation for pre-treatment and a shallow-tray air stripper for final treatment. When the GWETS was relocated, the UV-H_2O_2 oxidation unit was replaced with an advanced oxidation treatment system which uses hydrogen peroxide and ozone (HiPOx). A shallow-tray air stripper remains the final treatment step prior to discharge. Treated groundwater is discharged into Stevens Creek, which flows to the San Francisco Bay. The GWETS is operating under a BAAQMD Permit.

VOC Removal

In 2024, total mass of VOCs removed was 196 lbs. The total mass of VOCs removed since 1996 has been 9,617 lbs. During 2024, the highest TCE concentration in GWETS influent was 3,700 µg/L. However, the discharge was non-detect.

VI

2023 indoor air samples at 425 National and 615 National were below action levels and indicate that the SSDS in 615 is working as planned.

PFAS

PFAS was not mentioned in this report.

National Aeronautics and Space Administration (NASA) Site 28 and Northern Treatment

NASA Ames Research Center prepared an Annual Report that details its responsibilities for Site 28 (West-Side Aquifer Treatment System, or WATS), which was previously managed by the Navy, as well as the MEW plume that is not part of the North 101 Treatment System described in the Regional Groundwater Remediation Program (RGRP). A commingled groundwater plume exists in the central area of NASA Ames. The plume resulted primarily from off-site upgradient sources (i.e., MEW) and previous Navy operations. Also, within this Annual Report there is a discussion of the Orion Park "plume," the Navy remediation effort at the Traffic Island Area (contaminated by a dry cleaner as well as TCE), and Site 26 (the East-Side Aquifer Treatment System, or EATS). The Orion Park plume is located at the western edge of the NASA property. Although several investigations of this plume have been performed, no source has been identified. EATS is not discussed in this memo as it is outside the purview of the Technical Assistance Grant.

Remediation

The WATS began treatment in 1998. WATS treats water from 12 extraction wells. Extracted groundwater is first treated by an advanced oxidation process (AOP), using both ozone and hydrogen peroxide. It then flows through two 2,000-pound GAC vessels before it is discharged to a storm drain that ultimately flows to the Eastern Diked Marsh, which discharges to NASA's Stormwater Retention Pond, formerly managed by the Navy as Site 25.

In the northern portion of NASA's property, NASA's GWETS treats groundwater pumped from two extraction wells. The extracted groundwater flows through two 5,000-pound GAC vessels before being discharged to Stevens Creek.

The Navy remains responsible for the Traffic Island area that addresses contamination from the former Building 88 dry cleaners. In 2021 a combined enhanced anaerobic bioremediation/in-situ chemical reduction injection was tested, but it was not found be effective as the final remedy for this area. This system continues to operate because it has demonstrated evidence of

dechlorination. In 2024, three extraction wells pumped groundwater to the Site 28 remediation system. An additional extraction well is pumped to maintain hydraulic control. Also note that in May 2024, the Navy submitted a draft Monitored Natural Attenuation Assessment workplan to EPA. A summary of its findings will be summarized in next year's Annual Report.

Additionally, three areas have been identified outside of the groundwater capture areas. These include the eastern edge of the Site 28 plume northeast of Hangar One, as well as the leading edges of NASA's A1 and A2/B1 plumes.

VOC Removal

In 2024, WATS removed approximately 160 lbs. of VOCs. Since 1998, it has removed approximately 7,245 lbs. of VOCs. In the A1 aquifer, core concentrations of VOCs were reduced from 3,436 µg/L to 668 µg/L. In the A2/B1 aquifer, concentrations were reduced from 7,120 µg/L to 1,176 µg/L.

In 2024, northern portion of NASA's GWETS removed only 1 pound of VOCs; since 2001 when pumping began, it has removed close to 90 lbs. of VOCs.

NASA installed an AS/SVE system in 2008 to remove VOCs from groundwater and soil at the northern border of the Orion Park Housing Area. Because of a decline in VOCs in groundwater, it ceased operation of this system in 2019. In 2024, the highest TCE reading at a boundary monitoring well was 110 µg/L.

VI

Two buildings were sampled in 2024. Both are classified as Tier 3A (lower than cleanup levels, higher than ambient air).

PFAS

PFAS was found in numerous places during NASA's Site Inspection of PFAS in 2023. This will be followed up in the coming years. However, the Annual Report does not mention PFAS.

MEW Fairchild and Regional Groundwater Remediation Program

This *2024 Annual Progress Report* was prepared for the groundwater remediation programs associated with the MEW Superfund Study Area at former Fairchild Semiconductor Corporation facilities and the MEW Regional Groundwater Remediation Program. This report was prepared by Geosyntec Consultants, Inc., with assistance from Weiss Associates, for Schlumberger Technology Corporation, the responsible party for the former Fairchild facilities and the Project Coordinator for the MEW RGRP.

The Annual Report states (p. 5):

> Groundwater cleanup goals are 5 micrograms per liter (µg/L) for TCE in shallow groundwater (A and B Zones) and 0.8 µg/L for TCE in deep groundwater (C and Deep Zones). The ROD states that the ratio of TCE to other chemicals present within the MEW Study Area is such that achieving the cleanup goal for TCE will result in cleanup of the other chemicals to at least their respective federal maximum contaminant levels (MCLs). The 1996 ESD [Explanation of Significant Differences] for the MEW ROD [Record of Decision] subsequently clarified that the ratio of TCE to other chemicals may change over time and the site cleanup must therefore remediate all constituents of concern to their respective applicable or relevant and appropriate requirements (ARARs).

Responsibility for VOCs in groundwater north of Highway 101 is allocated among the MEW RGRP, United States Navy (Navy), and NASA. The Navy and NASA are regulated by EPA under separate Federal Facilities Agreements (FFAs).

South of 101 Treatment System

Remediation

This section is divided into two subsections. The first describes the remediation of the former Fairchild properties, which is the responsibility of STC. The second describes the remainder of the RGRP remediation. Because Fairchild shares some of the RGRP treatment facilities, it has been combined the two into one Annual Report. Groundwater extracted by the Fairchild and RGRP recovery well networks is treated at Treatment System 19, the Consolidated South 101 Treatment System, and the North 101 Treatment System. Treated groundwater discharges to Stevens Creek.

Fairchild Remediation. The former Fairchild sites are all located above slurry walls. Each building has been redeveloped. Soil-bentonite slurry walls were built from the ground surface to about 40 feet bgs at Buildings 1-4, 9, and 19 between 1985 and 1986. These walls were designed to limit potential VOC migration from the sites. Extracted groundwater from the Building 19 site extraction network is conveyed to Treatment System 19. Additionally, a source control remedy shared with the former Vishay/SUMCO facility located at 405 National Avenue was installed to address the area outside the slurry wall at the Building 9 site.

The Fairchild systems are made up of 25 SCRWs. Extracted water from eleven of these are transported to the Consolidated South 101 Treatment System at 331 Fairchild Drive (formerly 644 National Avenue). After treatment, the water is released into Stevens Creek through the City of Mountain View storm drain network. Fourteen SCRWs associated with the Building 19 site discharge into Treatment System 19, located at 389 North Whisman Road.

Outside the Building 9 slurry wall, there are four off-site SCRWs associated with Building 9. These wells provide containment of groundwater for areas of Building 9 outside and below the slurry wall. These wells are operated jointly Schlumberger and Vishay/SUMCO as part of the source control measures for the Building 9 and the adjacent 405 National Avenue property. These wells are connected to the Vishay/SUMCO treatment facility) located at Building 9.

Additionally, one active SCRW and three regional recovery wells (RRW) associated with Building 18 discharge into the Consolidated South 101 Treatment System.

RGRP. The regional plume north of Highway 101 is addressed by 15 RRWs that discharge into the North 101 Treatment System hear Hangar One at Moffett Field. The regional plume south of Highway 101 is addressed by 14 active RRWs that discharge into the Consolidated South 101 Treatment System and one active RRW that discharges into Treatment System 19.

The treated water is discharged to Stevens Creek either directly (i.e., North 101 Treatment System) or the storm drain network (Treatment System 19 and Consolidated South 101 Treatment System). The North 101 Treatment System was constructed with bypass valves that allow treated groundwater to be diverted for reuse by NASA at two locations.

An additional extraction well (Evandale recovery well) was installed in 2018. It is designed to extract groundwater immediately downgradient of an area of elevated VOC concentrations that was identified along Evandale Avenue west of the MEW Study Area. The MEW parties believe that groundwater samples collected since 2012 demonstrate that VOCs in in this location, referred to as Operable Unit 3 (OU3) "are from a separate source or sources distinct from the MEW groundwater plume." That's splitting hairs. EPA concluded that the contamination came from leaks in an old sewer line emanating from the MEW area. That is, the flow of TCE bypassed the main MEW plume. Still, neither Schlumberger, Raytheon, nor the MEW RGRP assume responsibility for VOCs within OU3. However, the companies installed the extraction well located at 277 Fairchild Drive, as this property was undergoing redevelopment. Extracted groundwater discharges to the Consolidated South 101 Treatment System.

VOC Removal

Major conclusions were that the remedy is functioning as intended, capture zones are adequate, and VOCs have been decreasing over time (i.e., 95% of monitoring wells had stable, non-detect, or decreasing TCE trends in 2024. The "core" of the plume has historically decreased by an order of magnitude, while the perimeter of the plume has "largely stabilized".

During 2024, the Fairchild System removed 175 lbs. of VOCs; the Consolidated South 101 Treatment System removed 519 lbs.; and the North 101 Treatment System removed 225 lbs. Since 1988, the Fairchild System removed 16,000 lbs. of VOCs. Since 1998 the Consolidated System removed 18,000 lbs. Since 1999, the North 101 Treatment System remove approximately 14,500 pounds of VOCs.

TCE concentrations in the treatment system influent ranged from 510 to 890 µg/L in the North, and 560 to 2,100 µg/L in the South. Other VOCs were significantly less.

PFAS

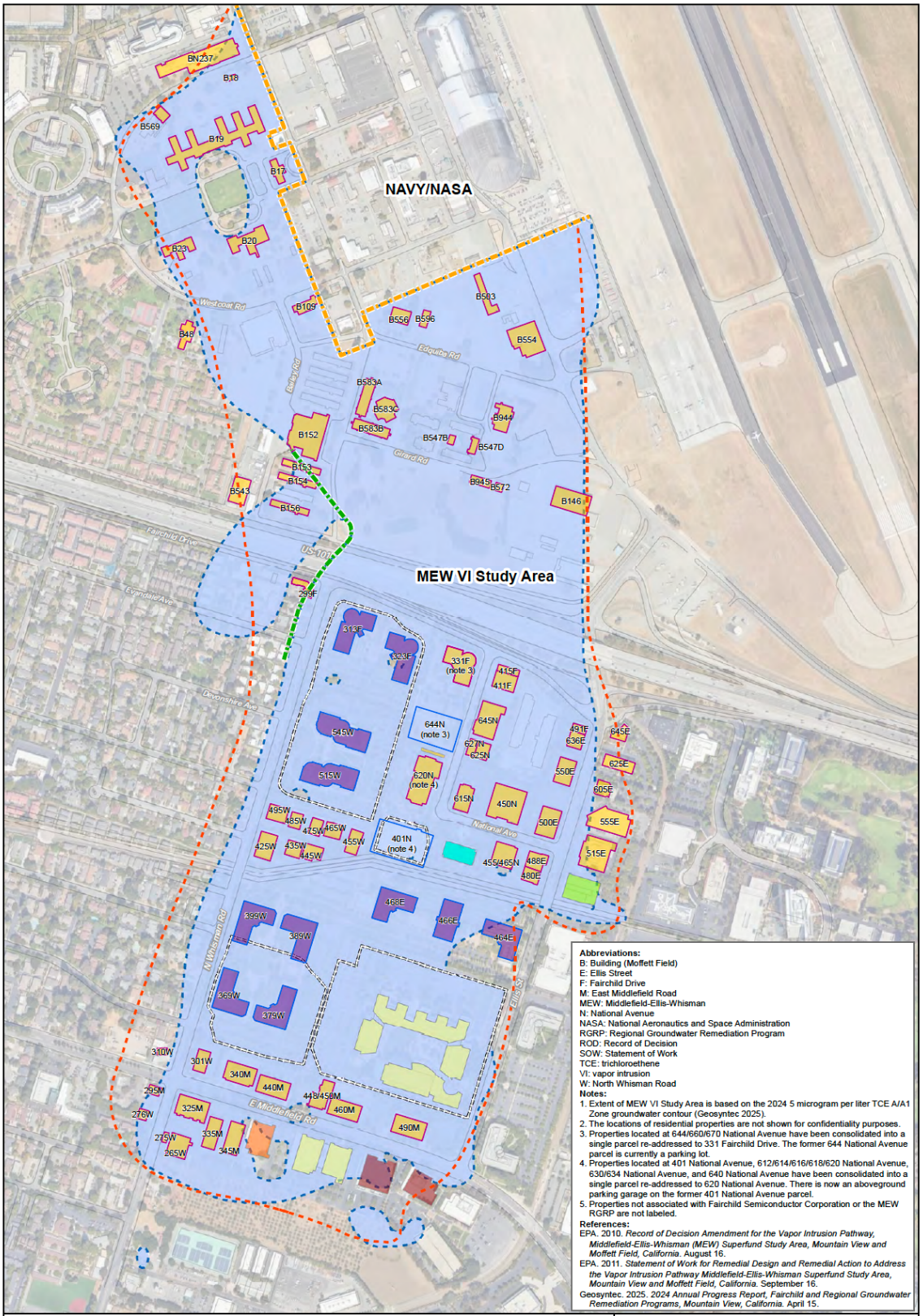
NASA's 2023 Site Inspection (SI) found numerous detections of PFAS in the northern part of the MEW Study Area. Originally, NASA named the MEW parties as potentially responsible for some of this contamination. The semiconductor industry has used PFAS at many stages of production for decades, but there is no proof (yet?) to hold the companies responsible for any of the PFAS found at Moffett Field. By and large, Navy operations were the largest source of PFAS contamination at Moffett Field. The EPA's 2024 Five-Year Review for MEW has indicated that it will require sampling both the influent and effluent of GWETS within the next year. However, it is unlikely that all PFAS potentially used by the MEW companies will be detected due to limitations on analytical methods.

Vapor Intrusion Annual Report

This separate Annual Report covers the buildings (both commercial and residential) on the former Fairchild properties and the buildings over the regional plume.

During 2024, approximately 37 Building-Specific Vapor Intrusion Sampling and Evaluation Reports (BSVISERs) were submitted to EPA. No VI control measures and no remedial designs were submitted during the reporting year.

South of 101, 18 buildings have VI mitigation measures in place. These are active sub-slab depressurization systems (SSDS) and passive sub-slab ventilation (SSV) systems. Of these systems, there were ten active SSDS. Seven were passive—that is, they had vents with no blower fan. These were constructed to allow for the installation of a blower if required. One building also had VI mitigation through several HVAC systems. It should be noted that 10 of these systems were installed voluntarily. Some inspections of these properties revealed minor problems that were repaired. Three of these addresses are residential, the largest being the Waverly Development on Evandale, formerly known as 277 Fairchild Drive.


NAVY/NASA
MEW VI Study Area
Westcoast Rd
Edgelite Rd
Bulla Rd
Girard Rd
Fairchild Drive
Cypress Ave
Devonshire Ave
National Ave
E Middlefield Rd
N Whisman Rd
Ellis St
US-101
BN237
B18
B569
B19
B17
B20
B33
B109
B48
B556
B596
B583
B554
B583A
B583C
B583B
B944
B547B
B547D
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B153
B154
B543
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B945
B572
B146
299F
313F
323F
331F (note 3)
415F
411F
644N (note 3)
645N
627N
625N
620N (note 4)
615N
450N
401N (note 4)
455/465N
491E
636E
645E
625E
550E
605E
500E
555E
515E
488E
480E
545W
515W
495W
485W
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455W
425W
435W
445W
468E
466E
464E
399W
389W
369W
379W
310W
301W
340M
440M
449/458M
460M
490M
295M
276W
325M
275W
335M
265W
345M
Abbreviations:
B: Building (Moffett Field)
E: Ellis Street
F: Fairchild Drive
M: East Middlefield Road
MEW: Middlefield-Ellis-Whisman
N: National Avenue
NASA: National Aeronautics and Space Administration
RGRP: Regional Groundwater Remediation Program
ROD: Record of Decision
SOW: Statement of Work
TCE: trichloroethene
VI: vapor intrusion
W: North Whisman Road
Notes:
1. Extent of MEW VI Study Area is based on the 2024 5 microgram per liter TCE A/A1 Zone groundwater contour (Geosyntec 2025).
2. The locations of residential properties are not shown for confidentiality purposes.
3. Properties located at 644/660/670 National Avenue have been consolidated into a single parcel re-addressed to 331 Fairchild Drive. The former 644 National Avenue parcel is currently a parking lot.
4. Properties located at 401 National Avenue, 612/614/616/618/620 National Avenue, 630/634 National Avenue, and 640 National Avenue have been consolidated into a single parcel re-addressed to 620 National Avenue. There is now an aboveground parking garage on the former 401 National Avenue parcel.
5. Properties not associated with Fairchild Semiconductor Corporation or the MEW RGRP are not labeled.
References:
EPA. 2010. Record of Decision Amendment for the Vapor Intrusion Pathway, Middlefield-Ellis-Whisman (MEW) Superfund Study Area, Mountain View and Moffett Field, California. August 16.
EPA. 2011. Statement of Work for Remedial Design and Remedial Action to Address the Vapor Intrusion Pathway Middlefield-Ellis-Whisman Superfund Study Area, Mountain View and Moffett Field, California. September 16.
Geosyntec. 2025. 2024 Annual Progress Report, Fairchild and Regional Groundwater Remediation Programs, Mountain View, California. April 15.
Legend
MEW Vapor Intrusion Study Area - 2024
MEW Vapor Intrusion Study Area - 2010 (ROD, EPA 2010)
Boundary of MEW RGRP Area of Responsibility on Moffett Field (SOW, EPA 2011)
Estimated edge of MEW plume, commingled to the west with TCE from non-MEW sources
Potentially Responsible Party
RGRP
Fairchild Semiconductor Corporation
Intel Corporation
RTX Corporation
Renesas Electronics America
SMI Holding, LLC
Vishay GSI, Inc/Sumco Phoenix Corporation
Regional Program Property
Former Fairchild Property
Slurry Wall
Building Footprint
Road
N
0
520
Feet
Locations of Former Fairchild and Regional Groundwater Remediation Program Properties
Mountain View and Moffett Field, California
Geosyntec consultants
Figure 2
WR1128M
April 2025
P:\GIS\MEW\Project\Regional\VI\2024_AR\Fig02_FormerFairchildRGRPFacilities_.mxd 3/28/2025 11:37:54 AM (Author: Howie.Chen)

For Moffett Field, only two building have mitigation controls: one an active basement ventilation system and another with air filtration "if" the building is occupied.

The 2010 VI ROD has a remedial action objective (RAO) that requires the parties "to accelerate the reduction of the source of vapor intrusion (i.e., Site contaminants in shallow groundwater and soil gas) to levels that are protective of current and future building occupants, such that the need for a vapor intrusion remedy would be minimized or no longer be necessary." CPEO was instrumental in developing this RAO. However, the EPA has yet to fulfill its promise to conduct a Focused Feasibility Study (FFS) on shallow groundwater remedies for the site. A few of the Annual Reports have noted that the parties are attempting to address this. While this is a very large task for EPA, 15 years have passed since that RAO was established.

Please refer to memorandum of September 2022, "The MEW/Moffett Field Superfund Site: A Guide to Vapor Intrusion Progress" by Peter Strauss for a full description of the VI Remedy and progress. See http://www.cpeo.org/pubs/MEW-VI-Progress.pdf

CONCLUSIONS AND RECOMMENDATIONS

1. Significant reduction in VOC mass has occurred since 1982. (See **Table below**)
2. The MEW companies operating south of Highway 101 should investigate whichwhat PFAS were used at the site, even if they are difficult to identify or measure. In our own research, we found a somewhat random 1993 Hazardous Materials Management Plan [HMMP] inventory developed by Raytheon that lists three containers of Fluorinert FC, a heat transfer fluid containing PFAS. We recommend that either EPA or the companies look at all the HMMPs for each of the companies to establish a list of PFAS that were used at MEW south of Highway 101.
3. Pilot studies on in-situ remediation, both EBR and ZVI, have shown promising reductions in VOCs and should be expanded where applicable.
4. The EPA should complete the FFS for shallow groundwater, as required by the 2010 ROD Amendment for Vapor Intrusion. Previously, CPEO and its Community Advisory Board proposed that the introduction of new remedial technologies "be focused on addressing the problems that led us all to initiate the cleanup decades ago, those portions of the plume that pose the greatest risk to human health and the environment." Specifically, we suggested that the new technologies focus on the following.

   (See "Accelerating Groundwater Remediation at the Moffett-MEW Regional Plume," May 2014, http://www.cpeo.org/brownfields/reports/I-M/MEWAcceleration.pdf .)

   - Areas with high mass
   - Areas that continue to act as a source
   - Areas that reduce the need for long-term Vapor Intrusion mitigation
   - Where the detectable plume encroaches on residential areas, schools, and other sensitive uses
   - To enable reasonable future use of the property.
5. In addition to the Community Criteria cited above, we developed the following criteria for application of alternative technologies. (See "Focused Feasibility Study for the MEW-Moffett Regional Plume: Community Criteria and Suggested Strategy," by Peter

Strauss, April, 2011, http://www.cpeo.org/brownfields/reports/I-M/MEW-MoffettStrategy.pdf). These were:

- Alternatives that replace current systems must speed up remediation (increasing progress towards remediation goals), remove or destroy contaminants that are not being addressed by the current system, and/or increase mass removal rates.
- The remedy selection process should evaluate hot spot removal.
- The remedy selection process should evaluate, where appropriate, the effectiveness of existing institutional controls (e.g., restrictions on drilling wells) as well as the need to establish new institutional controls (e.g., establish requirements to restrict use).
- The remedy selection should consider energy use and natural resource use/re-evaluate treated water recycling.
- The remedy selection process should evaluate the need for additional extraction wells and/or increasing extraction rates, particularly upstream from the slurry walls.
- Long-term monitoring and a contingency plan (e.g., failure of slurry walls) should be part of the scope of the FFS. We note that in 2008, the Northgate efficiency evaluation found that the slurry walls were "leaky," yet we know of little that has been done to address this problem.
- Remedy selection is complicated by the fact that property owners must give consent to the Responsible Party to conduct pilot tests and implement new technologies. The FFS should account for this complication.

6. Many innovative pilot studies have shown positive results. These should be expanded upon to determine if they are suitable for other areas of the plume. We described most of these in the 2011 report.

- *Injecting sulfidated ZVI and liquid carbon.* (**455 and 485/87 East Middlefield)**
- *Treating extracted groundwater with advanced oxidation process (HiPOx) for primary water treatment*. This process partially destroys the contaminants with GAC for polishing. (**350 Ellis St. and 620 National Ave., WATS**)
- *Enhanced In-situ Bioremediation (EBR)*. **(365 E. Middlefield)**
- *Combining enhanced anaerobic bioremediation and in-situ chemical reduction injection.* This system continues to operate because it has demonstrated evidence of dechlorination, although it is not recommended as the final remedy for this site. (**Navy at Building 88**)
- *Permeable Reactive Barriers (PRBs)***.** PRBs may be appropriate in the shallow groundwater zones, and as a potential replacement for portions of the slurry walls. (Both the upstream and downstream sides of the slurry walls could be retained as a funnel-and-gate system, so only a relatively small portion of the slurry walls would have to be removed). It was noted in the Raytheon Optimization Study (Locus) that it might be possible to modify the existing slurry wall to install elements of a PRB, although access may be difficult due to presence of buildings. A pilot-project PRB filled with zero-valent iron (ZVI) was installed in the WATS area at Moffett Field in 1996. Results

showed that zero valent iron reduced VOCs below their MCLs or reporting limits within the first 2 to 3 feet of the 6-foot iron cell. Hydraulic studies showed that there was some contaminated flow under and around the hanging wall. (**WATS**)

- *In-situ chemical oxidation (ISCO)*. This in-situ technology has been used to knock down VOC concentrations by injecting the chemical, often sodium permanganate, to reduce the VOCs in the groundwater. It has varied success. (**OU3**)
- *Monitored Natural Attenuation.* This technology uses monitoring of natural degradation and dispersion of contaminants as an alternative to active remediation. In some cases, it may be warranted, since contamination has decreased to an extent where it is no longer effective to use active techniques. It does require a comprehensive monitoring network. In CPEO's opinion, this technology should be limited to areas where concentrations are below 100 ug/L, there are no overlying buildings, and where there is conclusive evidence that matrix diffusion has caused contaminants to become sorbed to the less-transmissive zones of the aquifer. (**Traffic Island and Building 88**)
- *Phytoremediation.* Phytoremediation uses vegetation to remediate contaminated groundwater through several mechanisms. Some plants destroy organic pollutants by degrading them directly, while others aid in degradation indirectly by supporting microbial communities. NASA and its contractor have developed an innovation to this basic technology by injecting the plant with a compound that aids in the breakdown of VOCs.

  In addition, plants can also be used to take up water in large amounts and thus help to contain contaminants in subsurface environments. Phytoremediation is best suited for wide areas where contaminants are in low to medium concentrations. The key element in the design of a phytoremediation project is that the roots of the selected plant must be in contact or in very close proximity to the target contaminant. This technology is readily implementable over portions of the site, with the exception of paved areas (roads and airplane parking areas), structures, which are not amenable to tree planting and maintenance. The subsurface lithology (layered fine-grained soil) should not represent a significant barrier to root transport. (**NASA**)
- *Pulsed Extraction.* Cyclic operation of the systems may allow matrix diffusion process to temporarily regenerate higher concentrations and thereby improve the mass removal efficiency of the source control remedy. Pulsed extraction includes modifying the operational mode of the pumping systems from continuous operation to cyclic operation, with monitoring of the influent VOC concentrations to assess potential increases in concentration from the end of one cycle to the start of the next (i.e., "rebound" in concentrations). This technology could be readily implemented because the extraction systems are already in place.

Table: Annual and Cumulative Removal of VOCs From Groundwater (in pounds)

Site	2024 Removal (lbs)	Cumulative Removal (lbs)	Start Date	TCE Reduction in concentration (µg/L)		Other Factors
501Ellis	1.6	65	1997	2,400 to 18		
350 Ellis	221	20,640 groundwater 3,000 vadose zone	1982	Extraction 21.7 to 2.5 Monitoring 9,700 in 2024 (no reduction given)		
455,485/487 Middlefield	N/A	N/A	1997	60,000 to 68		This report focused on in-situ remediation
365 E. Middlefield	NA	364	1986	203 to 73		This report focused on in-situ remediation
620 National	196	9,617	1996	4,119 in 2024 (no reduction given)		
NASA						
GWTS	1	90	2001			
WATS	160	7,245	1998	A1: 3,436 to 668	A2/B1: 7,120 to 1,176	Does not include Orion Park and Traffic Island
RGRP						
Fairchild	175	16,000	1988	N/A		
S. 101	519	18,000	1998	N/A		
N. 101	225	14,500	1999	N/A		
Total	**1,499**	**89,521**				Does not include in-situ remediation

Acronyms Found in this Memorandum

ANV	acid neutralization vault
AOP	advanced oxidation process
ARARs	applicable or relevant and appropriate requirements
AS/SVE	air sparging/soil vapor extraction
AWN	acid waste neutralization
BAAQMD	Bay Area Air Quality Management District
BSVISERs	Building-Specific Vapor Intrusion Sampling and Evaluation Reports
cis-1,2-DCE	cis-1,2-dichloroethene
CPEO	Center for Public Environmental Oversight
EATS	East-Side Aquifer Treatment System
EBR	enhanced in-situ bioremediation
EPA	Environmental Protection Agency (U.S.)
ESD	Explanation of Significant Differences
FFAs	Federal Facilities Agreements
FFS	Focused Feasibility Study
GAC	granular activated carbon
GWETS	groundwater extraction and treatment system
HMMP	Hazardous Materials Management Plan
HVAC	heating, ventilation, & air conditioning
ISCO	in-situ chemical oxidation
MCLs	maximum contaminant levels
MEW	Middlefield Ellis Whisman
NASA	National Aeronautics and Space Administration
NEC	Nippon Electric Company
PFAS	per- and polyfluoroalkyl substances
PRB	Permeable Reactive Barrier
RAO	remedial action objective
RGRP	regional groundwater remediation program
ROD	Record of Decision
RRW	regional recovery wells
RWQCP	Regional Water Quality Control Plant (Palo Alto)
SCGWR	source control groundwater remediation
SCRW	source control recovery well
SI	Site Inspection
SSDS	sub-slab depressurization system
SSV	sub-slab ventilation
STC	Schlumberger Technology Corporation
SVE	soil vapor extraction
TCE	trichloroethylene
VC	vinyl chloride
VI	vapor intrusion
VOCs	volatile organic compounds
WATS	West-Side Aquifer Treatment System
ZVI	zero-valent iron