

**California Regional Water Quality Control Board
San Francisco Bay Region**

Fourth Five-Year Review

Intersil Inc./Siemens Components Superfund Site

10900 and 10950 North Tantau Road

Cupertino, Santa Clara County, California

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9/30/10
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ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
µg/m ³	micrograms per cubic meter
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
CV	coefficient of variation
DCE	dichloroethene
ERD	enhanced reductive dechlorination
ESL	Environmental Screening Level (San Francisco Bay Regional Water Quality Control Board)
gpm	gallons per minute
GWET	groundwater extraction and treatment
lbs	pounds
MCL	Maximum Contaminant Level
mg/day	milligrams per day
mg/kg	milligrams per kilogram
MIP	membrane interface probe
MNA	monitored natural attenuation
NBES	North Bayshore Extraction System
NPDES	National Pollutant Discharge Elimination System
ORP	oxidation-reduction potential
OSWER	EPA's Office of Solid Waste and Emergency Response
RAOs	Remedial Action Objectives
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
Regional Water Board	San Francisco Bay Regional Water Quality Control Board
SSES	Spring Street Extraction System
SVET	soil vapor extraction and treatment
TCE	trichloroethene
EPA	United States Environmental Protection Agency
VOC	volatile organic compound

EXECUTIVE SUMMARY

This is the fourth Five-Year Review of the Intersil Inc./Siemens Components Superfund Site (Site) in Cupertino, Santa Clara County, California. The purpose of this Five-Year Review is to review information from the previous five years to assess the nature of any contamination left on-site and determine whether or not the remedy remains protective of human health and the environment.

General Electric (GE) has continuously operated a groundwater extraction and treatment (GWET) system at the former Intersil property since 1987. During the most recent five years, GE's GWET system removed 51 pounds of volatile organic compounds (VOCs). GE operated a soil vapor extraction and treatment (SVET) system from 1988 to 1993 and removed 3,000 pounds of VOCs. SMI Holding Company (Siemens) has continuously operated a GWET system at the former Siemens property since 1987. During the most recent five years, Siemens's GWET system removed 331 pounds of VOCs. Siemens operated a SVET system from 1983 to 2004 and removed 17,310 pounds of VOCs.

GE and Siemens have continuously operated a GWET system in the Off-Property Study Area since 1990. During the most recent five-year review period, GE and Siemens's Off-Property GWET system removed 89 pounds of VOCs.

Groundwater concentrations continue to slowly decline. At the former Intersil property, the current maximum TCE level in the Lower A Zone is 99 micrograms per liter ($\mu\text{g/L}$) (well W12A). At the former Siemens property, the current maximum TCE level in the Upper Resaturated Interval is 1,300 $\mu\text{g/L}$. At the Off-Property Study Area, the current maximum TCE level is 61 $\mu\text{g/L}$.

During the most recent five years, GE and Siemens conducted high-resolution investigations on their sites to further optimize their remediation systems. The high-resolution investigations helped to identify specific intervals with elevated VOC concentrations. GE proposes to modify its GWET system by adding one groundwater extraction well screened in the groundwater interval with elevated concentrations in the north margin of the former Intersil property.

Siemens voluntarily pilot tested in-situ enhanced reductive dechlorination (ERD) remediation at the former Siemens property in 2007 and 2008. Initial results of this pilot test reportedly have shown that in-situ ERD may be effective at remediating the VOCs. The pilot study also reportedly indicates that a stall for cis-1,2-DCE reduction occurred in the Upper Resaturated Interval, and concludes that the treatment area will require bioaugmentation. However, declining groundwater levels in the Upper Resaturated Interval prevents further pilot testing at this time.

A protectiveness determination of the remedy at the Intersil/Siemens Site cannot be made until a vapor intrusion assessment is completed in the Off-Property Study Area. The elevated VOCs in the Resaturated Interval have not been fully defined which will require additional investigation. The downgradient extent of the A-Zone TCE contamination has not been fully defined. All other exposure pathways that could result in unacceptable risks are being controlled, and institutional controls are preventing exposure to, or the ingestion of, contaminated groundwater. However, EPA has not yet issued a decision document formally selecting institutional controls as part of the groundwater remedy.

In the Off-Property Study Area, the vapor intrusion exposure pathway will be reevaluated in approximately one year following the additional groundwater investigation, at which time a protectiveness determination will be made. In order to make a protectiveness determination, an addendum to the 2010 Five Year Review is required. The Five-Year Review addendum should be completed by October 30, 2012.

FIVE-YEAR REVIEW SUMMARY FORM		
SITE IDENTIFICATION		
Site Name: Intersil Inc./Siemens Components		
EPA ID: CAD041472341		
Region: 9	State: CA	City/County: Cupertino / Santa Clara
SITE STATUS		
NPL status: Final		
Remediation Status: Operating		
Multiple OUs? No	Construction completion date: 09/08/1992	
Has Site been put into reuse? Kaiser Permanente now occupies the single building that was used by Siemens. A new unoccupied building with a sub-slab vapor barrier was recently constructed at the former Intersil site.		
REVIEW STATUS		
Lead agency: State of California Regional Water Quality Control Board – San Francisco Region		
Author Name: Roger Papler		
Author title: Engineering Geologist	Author affiliation: San Francisco Bay Regional Water Quality Control Board (Lead Agency)	
Review period: October 2005 – August 2010		
Date(s) of Site inspection: 2/2/2010		
Type of Review: <input type="checkbox"/> Post-Sara <input type="checkbox"/> Pre-Sara <input type="checkbox"/> NPL-Removal only <input type="checkbox"/> Non-NPL Remedial Action Site <input checked="" type="checkbox"/> NPL State/Tribe-lead <input type="checkbox"/> Regional Discretion		
Review number: (in bold) <input type="checkbox"/> 1 (first) <input type="checkbox"/> 2 (second) <input type="checkbox"/> 3 (third) <input checked="" type="checkbox"/> Other (fourth)		
Triggering action: (in bold) <input type="checkbox"/> Actual RA Onsite Construction at OU#___ <input type="checkbox"/> Actual RA Start at OU#___ <input type="checkbox"/> Construction Completion <input checked="" type="checkbox"/> Previous Five-Year Review Report <input type="checkbox"/> Other (specify)		
Triggering action date (from CERCLIS): 9/29/2005		
Due Date: 9/29/2010		

Five-Year Review Summary Form

Issues:

The following three issues were identified during the review:

1. The Resaturated Intervals and A Zone have not been fully defined for the on-property and off-property areas. The on-property extent of elevated VOCs in the Upper and Lower Resaturated Intervals has not been completely defined on the north side of the former Siemens property. The Off-Property downgradient extent of the A Zone has not been fully defined. The extent of the A-Zone VOC plume in the Off-Property area has not been fully defined (i.e., down to MCLs).
2. The potential for Off-Property indoor air vapor intrusion cannot be evaluated until the downgradient extent of VOCs in the Upper Resaturated Interval is fully defined.
3. Although a restrictive covenant is currently in place at the Site, the remedy selected in the 1990 Record of Decision did not include institutional controls.

Recommendations and Follow-up Actions:

1. The groundwater monitoring program should be expanded to define the extent of contamination in the Resaturated Intervals and A Zone, both on- and off-property.
2. Evaluate the potential Off-Property indoor air vapor intrusion by defining the downgradient extent of the Upper Resaturated Interval.
3. Issue a decision document formally selecting the restrictive covenant that prohibits the use of on-site groundwater and restrict residential development until final clean-up standards are achieved.

Protectiveness Statement:

A protectiveness determination of the remedy at the Intersil/Siemens Site cannot be made until a vapor intrusion assessment is completed in the Off-Property Study Area. The elevated VOCs in the Resaturated Interval have not been defined which will require additional investigation. The downgradient extent of the A-Zone TCE contamination has not been fully defined; therefore, there is limited information to assess the potential for vapor intrusion. All other exposure pathways that could result in unacceptable risks are being controlled, and institutional controls are preventing exposure to, or the ingestion of, contaminated groundwater. However, EPA has not yet issued a decision document formally selecting institutional controls as part of the groundwater remedy. In the Off-Property Study Area, the vapor intrusion exposure pathway will be reevaluated following the additional groundwater investigation at which time a protectiveness determination will be made. The Five-Year Review addendum, which will include the protectiveness determination, will be completed by October 30, 2012.

**California Regional Water Quality Control Board
San Francisco Bay Region**

Third Five-Year Review

Intersil/Siemens Site

10900 and 10950 North Tantau Road

Cupertino, Santa Clara County, California

I. INTRODUCTION

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

The Agency is preparing this Five-Year Review report pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

The California Regional Water Quality Control Board, San Francisco Bay Region, conducted the five-year review of the remedy implemented at the Intersil/Siemens Superfund Site (Site) in Cupertino, Santa Clara County, California. This is the fourth five-year review. The triggering action for this review is the completion of the third five-year review on September 29, 2005. This policy five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

II. SITE CHRONOLOGY

Table 1. Site Chronology

Activity	Date
Former Intersil Facility	
Intersil used solvents during fabrication of integrated circuits, transistors, diodes, and other semiconductor devices at the former Intersil property	1967 – 1988
Intersil initiated investigations and removed in-ground waste handling units	1983 - 1986
Regional Water Board issued Waste Discharge Requirements/Site Cleanup Requirements (SCR), Order No. 86-49	June 1986
Regional Water Board issued Cleanup and Abatement Order No. 87-133	November 1987
Intersil started groundwater extraction and treatment (GWET) system	1987
Intersil removed in-ground waste handling units and ceased operation at facility and started oil vapor extraction and treatment (SVET) system	1988
Regional Water Board issued SCR Order No. 89-038	1989
Regional Water Board issued SCR Order No. 90-119 (Final SCR) and United States Environmental Protection Agency (EPA) included site on final listing on National Priorities List and issued the Record of Decision based on Final SCR	1990
General Electric (GE), parent company of Intersil, purchased the property from Vallco Park, Ltd	1992
GE decommissioned the Soil Vapor Extraction and Treatment (SVET) system with Regional Water Board approval	1993
Groundwater levels rose approximately 50 feet, reducing the vadose zone to the interval from surface level to 45 feet below ground surface (bgs)	1993-1998
Regional Water Board and EPA complete first Five-Year Review	1995
Manufacturing building was demolished	1997
Regional Water Board and EPA complete second Five-Year Review	2000
Regional Water Board and EPA complete third Five-Year Review	2005
Former Siemens Facility	
Litronix used solvents during fabrication of semiconductor devices	1970-1995
Litronix stopped using trichloroethene (TCE)	1980
Litronix removed underground storage tanks (USTs),, began soil and groundwater investigation, and discovered groundwater contamination. Siemens purchased property from Litronix	1982

Activity	Date
Siemens installed and started up SVET system with one SVE well	1983
Siemens expanded SVET with two additional SVE wells	1985
Siemens installed and started up GWET system with air stripping towers, expanded SVET system with one additional SVE well, and removed inactive neutralization system	1986
Siemens conducts soil vapor sampling and hydraulic testing of the three groundwater zones	1987
EPA listed the Site on the National Priorities List under the federal Superfund program Siemens performed additional soil-vapor sampling, vapor extraction testing, and soil investigation to 105 feet bgs	1989
Siemens starts remedial investigation	1990
Regional Water Board issued Site Cleanup Requirements Order No. 90-119 (Final SCR)	1990
Siemens removed approximately 182 cubic yards of soil with VOCs and semi-volatile organic compounds (SVOCs) from Areas 1 and 3, expanded SVET system with 16 SVE wells, and the GWET system was expanded to include 13 on-site extraction wells	1991
Groundwater levels rose approximately 50 feet, reducing the vadose zone to the interval from surface level to 45 feet bgs	1993-1998
Siemens curtailed groundwater extraction from well W21A with Regional Water Board approval	1999
Siemens sold property to Tantau Partners Siemens performed indoor air quality evaluation that did not reveal indoor-air vapor intrusion	2000
Tantau Partners sold the property to Inland Western Cupertino Tantau, LLC. Siemens shuts down SVET system and started rebound study	2005
Siemens initiated Enhanced Reductive Dechlorination (ERD) pilot test program, expands GWET system with two wells, and permanently shuts down SVET system after completing rebound study	2006
Current Siemens property occupant Kaiser Permanente conducted indoor air quality investigation and risk assessment indicating ambient and indoor levels of PCE slightly above - and TCE below - the Regional Water Board commercial/industrial Environmental Screening Level (ESL)	2007
Siemens conducted MIP investigation	2007
Siemens postpones supplemental ERD pilot study program due to decline in groundwater level elevations in Upper Resaturated/ of the Upper A Zone	2008

Activity	Date
Off-Property Study Area	
GE and Siemens began groundwater investigations	1986
GE and Siemens began groundwater extraction from two B-Zone wells	1990
GE and Siemens expanded GWETS from two wells to three B-Zone wells	1991
GE and Siemens curtailed one B-Zone well	2004

III. BACKGROUND

Physical Characteristics

The former Intersil facility was located at 10900 North Tantau Avenue and the former Siemens facility was located at 10950 North Tantau (presently 19000 Homestead Road), in Cupertino, California (see Figure 1). The former Intersil and Siemens properties are located on the southeast corner of Homestead Road and North Tantau Avenue. The Off-Property Study Area is located north of and hydraulically downgradient from the former Intersil and Siemens facilities. Cupertino has a population of approximately 56,000 and is located in west side of Silicon Valley in Santa Clara County and is part of the San Francisco Bay Metropolitan Region.

The building on the former Siemens property is now occupied by Kaiser Permanente. The building on the former Intersil property was demolished in the 1990s and has been replaced by an unoccupied two-story commercial building with a vapor barrier beneath the building foundation.

Land use above the plume in the Off-Property Study Area is residential.

Drinking water for Cupertino residents and businesses is supplied by either San Jose Water Company or California Water Service. Some of the off-property properties fall within the City of Sunnyvale; the City of Sunnyvale Department of Public Works supplies drinking water to its City residents and businesses. No private wells exist on the properties in the off-property area.

Calabazas Creek is approximately 1,100 feet east of the Site and flows north-northeast approximately 7 miles into San Francisco Bay.

Hydrogeology

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

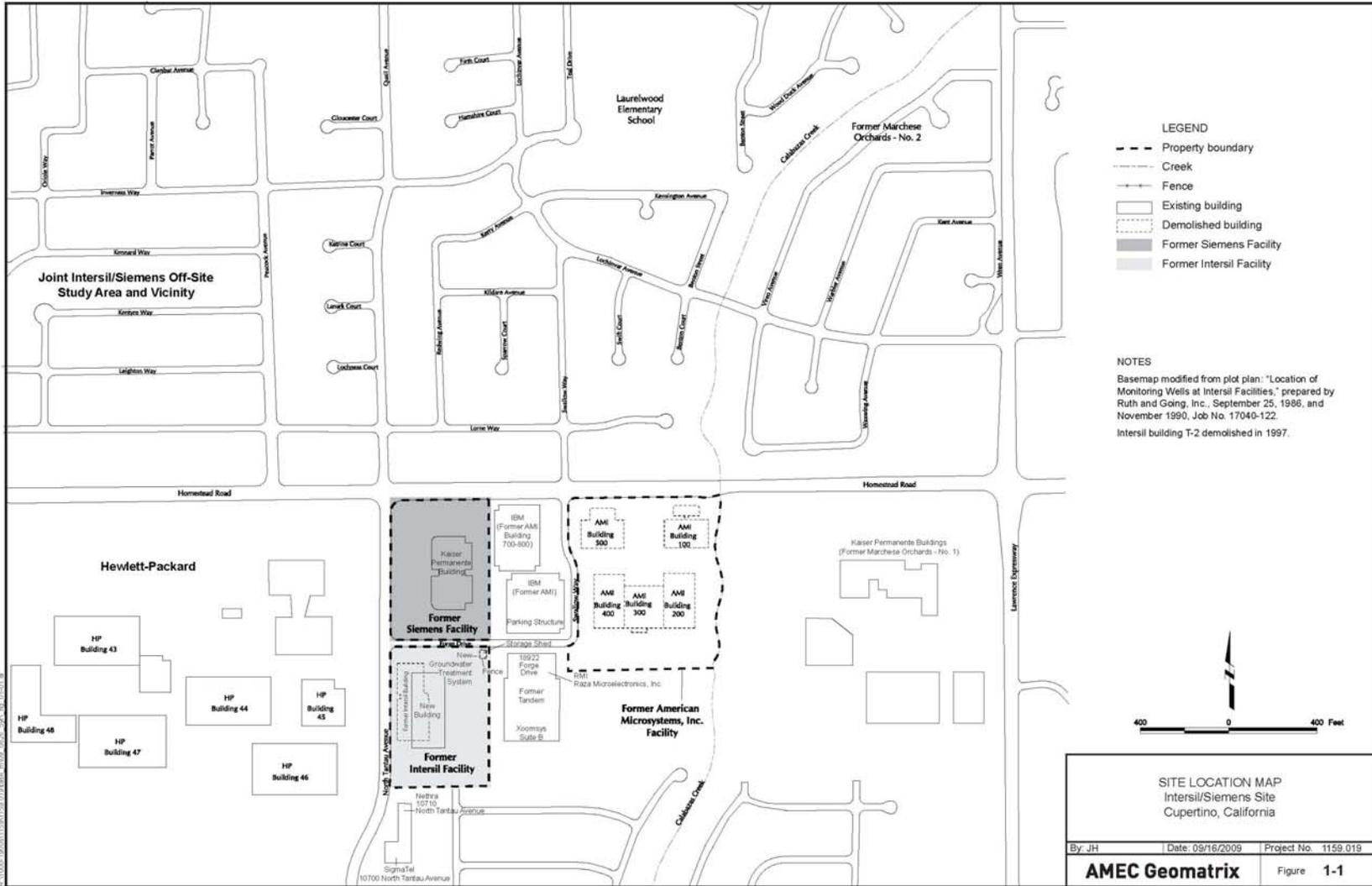


Figure 1. Site Map

The geologic setting at the Site consists of coarse-grained sand and gravel interbedded with fine-grained silt and clay sediments, representing alluvial stream channel and associated overbank deposits. The saturated sediments of concern at the Site are divided into three water-yielding zones: the A, B, and C Zones with the Upper A Zone subdivided into the Upper- and Lower-Resaturated Intervals.

The groundwater plume originating from the two sites is managed as one commingled plume by SMI Holding Company (Siemens) and General Electric (GE), the successor to Intersil. The groundwater plume in the A Zone extends approximately 200 feet downgradient, north of Lorne Way into the residential Off-Property Study Area. The groundwater plume in the B Zone extends approximately 1,600 feet downgradient to the north into the Off-Property Study Area.

Between 1993 and 1998, regional groundwater elevations rose approximately 50 to 55 feet through the vadose zone and thickening the A Zone to create the Resaturated Interval that now extends from 45 to 90 feet bgs. At the former Siemens property, the Resaturated Interval has been divided into two intervals: the Upper Resaturated Interval, which extends from approximately 45 to 60 feet bgs, and the Lower Resaturated Interval, which extends from approximately 60 to 90 feet bgs. The Lower A-Zone saturated sediments extend from approximately 90 to 125 feet bgs. At the former Intersil site, the A Zone is apparently hydraulically connected with the Resaturated Interval. The B Zone extends from approximately 130 to 150 feet bgs. The C zone extends between approximately 180 and 210 feet bgs.

The A-, B-, and C-Zone sediments are generally separated by fine-grained sediments with variable continuity that act as aquitards. A deep-zone regional confined aquifer (the regional aquifer) extends from approximately 300 to 500 feet bgs and is separated from the C Zone by an approximately 80- to 150-foot-thick aquitard interval of fine-grained sediments.

The groundwater flow direction in the A, B, and C Zones, and the regional aquifer is generally northward beneath the former Intersil and Siemens properties to the Off-Property Study Area and toward San Francisco Bay.

History of Contamination

Former Intersil Facility

From 1967 to 1988, Intersil operated its facility as a silicon wafer fabrication plant and office building. In connection with these activities, Intersil used inorganic etching solutions (such as acids) and large amounts of water (up to 100,000 gallons per day). Small amounts of TCE were used on a limited basis as a cleaning agent prior to 1979 and very small quantities of TCA were used until closure of the facility in 1988. Intersil's processes used more acid and water than VOCs; therefore, fabrication operations required the use of only one 250-gallon in-ground vaulted waste solvent tank. This tank was located within the vault of the east neutralization system and was visible for inspection on the bottom and all sides. Wastes in the tank were pumped out monthly by a recycling company. Acid and water-based process wastewater was directed through five in-ground wastewater neutralization systems and sumps before being discharged pursuant to a permit into the sanitary sewer.

Intersil initiated investigations of the property in 1983. The investigations conducted between 1983 and 1988 involved drilling soil borings and installing groundwater monitoring wells. These investigations revealed the presence of TCE in soil beneath the northern portion of the property and in the central portion near the former inactive east neutralization system and in groundwater beneath the northern portion of the property.

The impact of groundwater contaminants was limited to the upper two aquifers (A and B Zones). Groundwater samples collected from the deeper aquifer (C Zone) indicated that it had not been significantly impacted. The 50-foot rise in groundwater partially saturated the former vadose-zone and soil vapor monitoring wells installed in the vadose zone. Groundwater sampling performed in 2000 from the Resaturated Interval wells indicated that both the Upper and Lower Resaturated Intervals were also contaminated with VOCs.

Former Siemens Facility

From approximately 1970 to 1982, Litronix used the former facility for semiconductor manufacturing operations. From 1982 to 1995, Siemens used the former facility for semiconductor manufacturing operations. Until the mid-1980s, the semiconductor manufacturing operations involved the use of various organic solvents, primarily TCE and 1,1,1-TCA. Liquid wastes were stored in five USTs that were removed in 1982. From 1982 until closure of facility operations in 1986, liquid wastes were temporarily stored on-site for off-site disposal or recycling.

Investigations began in 1982 after the discovery of contaminants during the removal of the USTs. Investigations performed between 1982 and 1989 indicated that releases of mostly chlorinated VOCs and semivolatile organic compounds (SVOCs) had occurred and impacted soil and groundwater at levels that required remediation.

The impact of groundwater contaminants was limited to the upper two aquifers (A and B Zones). Groundwater samples collected from the deeper aquifer (C Zone) indicated that it had not been significantly impacted. The 50-foot rise in groundwater partially saturated the former vadose zone and soil vapor monitoring wells installed in the vadose zone. Groundwater sampling performed in 2000 from the Resaturated Interval wells indicated that both the Upper and Lower Resaturated Intervals were also contaminated with VOCs.

Off-Property Study Area

Intersil and Siemens initiated the investigation of the Off-Property Study Area in 1986. The Off-Property Study Area has no known history of manufacturing activities and is almost entirely developed for residential use. During the initial investigation, the A-Zone groundwater was not found to be impacted and no remediation of the A Zone was required by Regional Water Board Order 90-119 (Order). Off-Property investigation indicated that the B Zone was the most contaminated and that the C Zone was much less contaminated. No direct groundwater extraction from the C Zone was required because the low VOC concentrations in C-Zone were captured by increased pumping in the B zone. The VOC concentrations in C-Zone groundwater have been constantly below or near Maximum Contaminant Levels (MCLs) during this review period.

Initial Response

Former Intersil Facility

In 1986, interim remediation began with the removal of the inactive east neutralization system and vaulted 250-gallon waste solvent tank. In 1988, further interim remediation continued with the removal of the remaining wastewater treatment facilities in the north and east neutralization systems and the north and east scrubber sumps) and the former above-ground chemical and hazardous waste storage area.

In 1987, a groundwater extraction and treatment (GWET) system was installed consisting of four A-Zone groundwater extraction wells. In 1991, the GWET system was expanded as part of the final remedy with the addition of one A-Zone extraction well W9A and one B-Zone extraction well. In December 1993, one of the extraction wells was replaced because of accumulating silt that caused accelerated breakdown of pumps. Groundwater is treated using granular activated carbon and treated effluent is discharged to Calabazas Creek under a general NPDES permit.

In 1988, a soil vapor extraction and treatment (SVET) system was installed with two extraction well pairs along the northern boundary of the property. In mid-1991, the SVET system was expanded as part of the final remedial action to four well pairs.

Former Siemens Facility

In 1983, interim remedial actions for soil remediation began at the former Siemens facility with an on-site SVET system that included one SVE well. By 1991, the SVET system was expanded to 19 wells, and was then reduced to four wells in 1995.

In 1986, interim remedial actions for groundwater remediation began with a GWET system to provide hydraulic control and remediation of the affected groundwater in both the A and B Zones. In 1991, the GWET system was expanded to include 13 on-site extraction wells. Although not required by the Final Site Cleanup Requirements (SCR), Siemens has also periodically operated up to five groundwater extraction wells that are screened in the Lower Resaturated Interval. From 1986 through 2002, extracted groundwater was treated via two air strippers connected in series. In 2002, primary treatment of extracted groundwater was changed to granular activated carbon. Treated groundwater is discharged to Calabazas Creek under a general NPDES permit.

In 1991, soil excavation was performed in Areas 1 and 3, where former USTs were located.

Off-Property Study Area

Remedial action in the Off-Property Study Area began with an interim GWET system starting in 1990. The interim remedial program consisted of groundwater extraction from two B-Zone wells. In 1991, the GWET system was expanded as part of the final remedial action with the addition of one extraction well. In 2004, the Off-Property GWET system was reduced to two B-Zone wells. Treated groundwater is discharged to Calabazas Creek under a general NPDES permit.

Summary of Basis for Taking Action

The Site overlies the Santa Clara Valley groundwater basin. Groundwater from this basin provides up to 50 percent of the municipal drinking water for over 1.4 million residents of the Santa Clara Valley. The Site was listed on the National Priorities List (NPL) primarily because of the past chemical releases posed a potential threat to the groundwater resource.

IV. REMEDIAL ACTIONS

Remedy Selection

A Baseline Public Health Evaluation for the Site was prepared along with a Remedial Investigation/Feasibility Study. These documents form the basis of the remedial action plan. The Regional Water Board adopted Final SCR Board Order No. 90-115 on August 15, 1990. The selected final cleanup remedy, as stated for the Site in the Final SCR and the 1990 Record of Decision (ROD), consists of the following elements:

- 1) Soil-vapor extraction and treatment and soil excavation for soil cleanup;
- 2) Groundwater extraction and treatment for groundwater cleanup; and
- 3) Shallow zone and deeper aquifer groundwater monitoring.

The Remedial Action goal for this action was to restore groundwater to beneficial use.

The ROD and the SCRs did not include institutional control requirements. The soil cleanup standard for the former Intersil facility is one milligram per kilogram (1 mg/kg) total VOCs. The soil cleanup standards for the former Siemens facility are 1 mg/kg total VOCs and 10 mg/kg total SVOCs.

Table 2. Soil Cleanup Standards

Chemical	Cleanup Standard (mg/kg)
Total VOCs	1
Semi VOCs	10

The groundwater cleanup standards for the Site are federal and California MCLs (proposed or adopted) and California Department of Health Services Recommended Drinking Water Action Levels. These standards are specified in Findings 15 and 18 and Specification B.4. of the Final SCR, and included in the 1990 ROD and are summarized in the following table.

Table 3. Groundwater Cleanup Standards

Chemical	Cleanup Standard (micrograms/Liter)
Trichloroethene (TCE)	5
Tetrachloroethene (PCE)	5
1,1-dichloroethene (1,1-DCE)	6
cis-1,2-dichloroethene (cis-1,2-DCE)	6
trans-1,2-dichloroethene (trans-1,2-DCE)	10
1,1,1-Trichloroethane (1,1,1-TCA)	200
Freon 13	1,200
Toluene	150

Remedy Implementation

Former Intersil Facility

The SVET system operated from 1988 to 1993 when the system approached asymptotic conditions.

Since 1987, the GWET system has operated continuously, starting with four A-Zone extraction wells. At that time, the groundwater extraction rate was approximately 9 gallons per minute (gpm). In 1991, the GWET system was expanded by converting one A-Zone and one B-Zone monitoring well into two extraction wells, and the groundwater extraction rate was increased to approximately 55 gpm. In 1993, one of the A-Zone extraction wells was replaced due to silt accumulation issues. Between 1993 and 1998, regional groundwater levels rose about 50 to 55 feet and groundwater extraction rates were maintained at approximately 48 to 50 gpm. In 2002 and 2003, three A-Zone extraction wells were curtailed and the pumping rate was increased at well W12A to maintain hydraulic control with an extraction rate of about 45 gpm. In 2006, groundwater extraction from the one B-Zone well was curtailed and the extraction rate was decreased to the current rate of approximately 33 gpm.

In 2007, the GWET system was shut down for approximately one month to convert the system from air-stripping to carbon vessels. Because of these maintenance activities, the three active extraction wells E9AR, W4A, and W5A did not extract groundwater. The air stripper treatment compound was also demolished during the conversion and a new treatment system compound was constructed in the northeast corner of the site. Three groundwater extraction wells currently operate continuously except for periodic shut downs for maintenance.

The groundwater remedial system is currently extracting and treating approximately 16.6 million gallons per year. Effluent from the treatment system is discharged to Calabazas Creek under an NPDES general permit.

Former Siemens Facility

The SVET system operated from 1983 to 2005 when the system approached asymptotic conditions.

Since 1986, the GWET system has operated continuously, starting with two A-Zone extraction wells. In 1988, the GWET was expanded to include three A-Zone and three B-Zone wells. In 1991, the groundwater extraction rate was approximately 98 gpm when the GWET system was expanded by five A-Zone wells. Between 1991 and 2006, the GWET system was expanded with the addition of six Resaturated Interval wells. In 2002, the groundwater extraction rate was increased in 2002 to approximately 160 gpm after regional groundwater levels rose about 50 feet. Between 1992 and 2002, eleven A-Zone wells and one B-Zone well were curtailed.

Eight on-site groundwater extraction wells in the Upper Resaturated Interval, Lower Resaturated Interval, Lower A, and B Zones currently operate continuously except for periodic shut downs for maintenance. Since 2002, granular activated carbon replaced air stripping as the primary treatment method. Based on 2008 data, the current pumping rate is approximately 146 to 152 gpm.

The GWET system is currently extracting and treating approximately 57 million gallons per year. Effluent from the treatment system is discharged to Calabazas Creek under an NPDES general permit.

Off-Property Study Area

Since 1990, the GWET system has been continuously operating, starting with two B-Zone wells. In 1991, one B-Zone well was added and in 2004, one B-Zone well was curtailed. Prior to extraction, a downward gradient between the B and C Zones existed in the vicinity of the extraction wells. Groundwater extraction from the B Zone reversed the downward vertical gradient and VOC concentrations in the C Zone have been constantly below or near MCL levels during this review period.

Two Off-Property B-Zone extraction wells now operate continuously except for periodic shut downs for maintenance. Potentiometric surface and groundwater plume maps show that groundwater in the Off-Property Study Area has been hydraulically contained. Based on 2008 data, the current pumping rate is approximately 40 gpm.

The GWET system is currently extracting and treating approximately 22 million gallons per year. Groundwater extracted from the three wells in the Off-Property Study Area is treated in the Siemens' treatment system.

System Operation and Maintenance

Former Intersil Facility

Actual O&M, monitoring, NPDES, labor, and other expenses between January 2005 and June 2009 for the GWET system were approximately \$2,400,000.

Former Siemens Facility

Actual O&M, monitoring, NPDES, labor, and other expenses between January 2005 and June 2009 for the GWET system were approximately \$1,105,000.

Off-Property Study Area

Actual O&M, monitoring, NPDES, labor, and other expenses between January 2005 and June 2009 for the GWET system were approximately \$ 606,000.

Table 4. Total GWET System Operation and Maintenance Costs

From	To	Total Cost
1/1/1999	12/31/2004	\$2,294,000
1/1/2005	6/30/2009	\$4,111,000

V. PROGRESS SINCE LAST REVIEW

The 3rd five-year review concluded that:

“The remedy at Intersil/Siemens currently protects human health and the environment because exposure pathways that could result in unacceptable risks are either being controlled, such as the hydraulic control of plume migration and water supply through municipal utilities; or have been remediated including the soil source area; or are incomplete for the Former Intersil site through the vapor intrusion pathway. However, in order for the remedy to be protective in the long-term, a deed restriction for the Former Siemens site needs to be implemented to prohibit use of shallow groundwater and to investigate the potential for soil vapor intrusion if the property is redeveloped. The groundwater monitoring program in the Off-Property Study Area should continue and the vapor intrusion potential should be evaluated if groundwater-VOC concentrations increase.”

The issue identified and the actions taken since the last five-year review are summarized below in Table 5.

Table 5. Actions Taken Since the Last Five-Year Review

Issues from Previous Review	Recommendations Follow-up Actions	Action Taken and Outcome
Groundwater extraction and treatment is not likely to achieve cleanup goals	Evaluate feasibility of other active remedial options. Continue to operate existing groundwater extraction and treatment systems. Continue to monitor groundwater quality.	Siemens pilot studies show that ERD may be effective GE proposes one additional focused groundwater extraction well for Lower Resaturated Interval on former Intersil property
Present lack of institutional controls at the former Intersil property. Present lack of institutional controls at the former Siemens property.	The RP is required to incorporate deed restriction prohibiting on-property groundwater use and evaluating the potential for vapor intrusion. The RP is required to incorporate deed restriction prohibiting on-property groundwater use and evaluating the potential for vapor intrusion	Deed restriction recorded prohibiting on-site groundwater use and sensitive uses for former Intersil property. Deed restriction recorded prohibiting on-site groundwater use and sensitive uses for former Siemens property. Indoor air quality evaluation was performed by the property owner/tenant in 2000, 2002 and 2007 that did not indicate that indoor-air vapor intrusion was occurring.

Former Intersil - Proposed Focused GWET and Implemented Institutional Controls

GE proposed to install one groundwater extraction well that is screened in the elevated VOC interval within the Lower Resaturated Interval. GE plans to install the extraction well near well W18B where higher than average VOC concentrations have been detected. Subsequent discussion indicated that GE may install additional extraction wells later pending results of the first focused extraction well. GE may re-evaluate targeted enhanced reductive dechlorination (ERD) after the focused GWET well reaches its limit of effectiveness, or if the ERD technology advances such that it may have a greater probability to be effective at the Site.

To address the prior lack of institutional controls at the former Intersil property, the property owner recorded a deed restriction. The deed restriction prohibits sensitive uses and usage of on-property groundwater. Appendix A includes the title search results that successfully found the deed restrictions.

Former Siemens - ERD Pilot Study and Implemented Institutional Controls

To address the declining effectiveness of the GWET system on the former Siemens property, Siemens conducted a high-resolution investigation on its site to further optimize the remediation system. The high-resolution investigations helped to identify specific intervals with elevated VOC concentrations. Siemens voluntarily evaluated the effectiveness of enhanced reductive dechlorination (ERD) by conducting an ERD pilot study on the contaminated interval of the Upper Resaturated Interval. The ERD pilot study concluded that:

- The transformation of cis-1,2-DCE to vinyl chloride was stalling within the Upper Resaturated Interval. During a possible subsequent pilot study, Siemens plans to address the stall of cis-1,2-DCE transformation by bioaugmenting the Resaturated Interval with *dehalococcoides* bacteria.
- Preferential flow pathways exist in the Upper Resaturated Interval.

Siemens indicated that a supplemental ERD pilot study is needed to assess the effects of dechlorination using a slow release substrate in combination with bioaugmentation. However, the supplemental ERD pilot study is on hold due to declining groundwater levels in the Upper Resaturated Interval. Subsequent discussions also indicate that Siemens plans to implement full-scale ERD pending the results of the proposed focused GWET on the former Intersil property. Injecting carbon substrates on the south side of the former Siemens property during GWET on the former Intersil property could clog the groundwater extraction well screens.

To address the prior lack of institutional controls at the former Siemens property, the property owner recorded a deed restriction. The deed restriction prohibits sensitive uses and usage of on-property groundwater. Appendix A includes the title search that successfully found the deed restrictions.

VI. FIVE-YEAR REVIEW PROCESS

Community Notification

The Regional Water Board published a public notice in the Cupertino Courier on January 27, 2010. The public notice announced the beginning of the Five-Year Review process.

Document Review

This five-year review included a review of relevant documents including the November 20, 2009, *Five Year Status Review*; the January 2009 *Subsurface Investigation Report*; the February 22, 2008, *Membrane Interface Probe Investigation Report*; the March 2007, *Revised Soil Vapor Survey Results*; the September 29, 2005 Third Five-Year Review report; the September 28, 2000

Second Five-Year Review report; the September 28, 1995 Five-Year Review report; the September 27, 1990 Record of Decision for Intersil Inc./ Siemens Components; the August 15, 1990 SCR; and groundwater monitoring reports. Applicable groundwater cleanup standards contained in the Final Site Cleanup Requirements (SCRs) (and mirrored in the ROD) were reviewed.

Data Review

Soil Vapor Data

Between 1988 and 1993, the SVET system at the former Intersil property operated until the system approached asymptotic conditions. The SVET system removed approximately 3,000 pounds of VOCs. Based on soil cleanup confirmation data, the Regional Water Board approved curtailment of the system. In 2007, GE performed a soil vapor survey at the former Intersil property that indicated TCE levels in soil gas increased with depth up to 21,000 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) at 44 feet bgs (just above the water table). Between 1983 and 2005, the SVET system at the former Siemens property operated until the system approached asymptotic conditions. The SVET system removed approximately 17,100 pounds of VOCs. Based on soil cleanup confirmation data, the Regional Water Board approved curtailment of the system.

Soil Data

In 1988, remedial excavations at former Siemens removed approximately 1,500 pounds of VOCs and SVOCs.

Groundwater Data

Groundwater monitoring data collected from 2005 to 2009 are summarized in Appendix B (Tables B1 and B2) and were reviewed to evaluate progress in remediating the groundwater pollutant plume. VOC concentrations in monitoring wells on the Intersil and Siemens properties and in the Off-Property Study Area have remained stable or are declining and demonstrate that stability of the A- and B-Zone VOC plumes has been achieved. The Resaturated Interval is not fully defined and there are no plume maps for the Resaturated Intervals.

TCE concentrations within the Upper Resaturated Interval of the plume have decreased over the five-year period from a maximum concentration of 3,000 $\mu\text{g}/\text{L}$ to 1,400 $\mu\text{g}/\text{L}$. In the former Intersil property, former vent wells that monitor the Upper and Lower Resaturated Intervals of the Upper A Zone have screens that are 30 to more than 60 feet long. Based on the long screen lengths, the former vent wells that are now used to monitor the Upper and Lower Resaturated Interval may under-represent groundwater-VOC concentrations at the former Intersil property. To properly monitor the effectiveness of the focused GWE well, additional Upper and Lower Resaturated Zone monitoring wells should be installed in the north side of the former Intersil property.

On the north side of the former Siemens property, VOC levels in the on-property Upper Resaturated Interval (wells VM-2S and MW-1-RU) remain elevated. There are no Off-Property Resaturated Interval wells downgradient from the former Siemens property. To properly restore groundwater to beneficial use and properly evaluate potential Off-Property vapor intrusion, the

elevated VOC levels in the Upper Resaturated Interval on the north side of the former Siemens property should be defined.

Since groundwater monitoring began in the mid-1980s, maximum groundwater-TCE concentrations in the Lower A Zone of the former Intersil and Siemens properties have declined from 22,000 µg/L to 99 µg/L (well W12A) at the former Intersil property, and from 26,000 µg/L to 540 µg/L (well F-1A) at the former Siemens property. In the Off-Property Study Area, the downgradient extent of VOCs in the A Zone has not been completely defined to below their MCLs. The A Zone in the Off-Property Study Area should be defined down to below the MCLs. The A Zone plume has been defined on the lateral margins and appears to be stable.

The maximum TCE concentration within the B zone over the five-year period was 170 µg/L, approximately the same as in 2004. Based on groundwater monitoring results from prior and current five-year reviews, the C Zone is not impacted.

Since 1987, the GWET system at former Intersil removed 3,514 pounds of VOCs; and since 1986, the GWET system at former Siemens removed 3,198 pounds of VOCs. Tables 6a and 6b summarize site-wide and property-specific mass removal efficiency data.

The GWET systems have been reducing concentrations of VOCs in groundwater, and hydraulically controlling migration of the plume. However, the amount of VOC mass being removed has declined considerably and VOC concentrations in groundwater have stabilized. This observation of an initial significant reduction in VOC concentrations followed by a leveling off of the reduction in VOC concentrations has been occurring at many other sites in the area and around the country. Based on this trend, the GWET system may not be able to restore the groundwater to its beneficial use as a potential drinking water source. The feasibility of alternative remedies or improvements to the existing system needs to be evaluated to ensure that the long-term remedial objectives are achieved.

Table 6a. Groundwater Mass Removal Efficiency – Site-Wide

From	To	Volume Extracted (million gal)	VOC Mass Removed (lbs)	Mass Removal Efficiency (lbs per million gal)
1/1/1995	12/31/1999	422.6	922.7	2.2
1/1/2000	12/31/2004	463.1	590.7	1.3
1/1/2005	6/30/2009	430.6	470.7	1.1

Table 6b. Groundwater Mass Removal Efficiency – Area-Specific

From	To	Volume Extracted (million gal)	VOC Mass Removed (lbs)	Mass Removal Efficiency (lbs per million gal)
Former Intersil Facility				
1/1/1995	12/31/1999	128.6	221.7	1.72
1/1/2000	12/31/2004	122.9	101.7	0.83
1/1/2005	6/30/2009	86.9	50.7	0.58
Former Siemens Facility				
1/1/1995	12/31/1999	120	450	3.75
1/1/2000	12/31/2004	181.5	345	1.9
1/1/2005	6/30/2009	244	331	1.36
Off-Property Study Area				
1/1/1995	12/31/1999	174	251	1.44
1/1/2000	12/31/2004	158.7	144	0.91
1/1/2005	6/30/2009	99.7	89	0.89

No potentially toxic or mobile transformation products have been identified during sampling conducted during this evaluation period that were not already present at the time of the Record of Decision.

MIP Investigations

GE and Siemens conducted membrane interface probe (MIP) investigations on the respective former Intersil and Siemens properties to identify remnant areas of elevated VOC levels and to optimize alternative remedial technologies.

Along the northern margin of the former Intersil property, soil sampling adjacent to the MIP boreholes revealed the presence of elevated VOCs above the soil cleanup goal of 1 mg/kg within the Lower Resaturated Interval.

Along the southern margin of the former Siemens property, MIP results indicated elevated VOCs in the same depth interval as the northern margin of the former Intersil property.

Updated CSM

After GE and Siemens submitted the Five-Year Status report on November 20, 2009, the Regional Water Board discovered that the hydrogeologic model used to analyze the capture zone in the downgradient margin of the former Intersil property and the upgradient portion of the former Siemens property could not be calibrated. To address this issue, GE and Siemens plan to update the hydrogeologic model by running pump tests and determining the hydrogeologic response in monitoring wells within the radius of influence of extraction wells on the former Intersil property. Subsequent discussions also indicated that GE and Siemens intend to address issues of inconsistent hydrogeologic stratigraphy and zone designations between the former Intersil and Siemens properties. To address the above issues, GE and Siemens plan to use pump test data to update the conceptual site model that would include all high resolution data, an integrated site-wide geologic cross section with consistent water-bearing zone nomenclature, and a functional hydrogeologic model.

Site Inspection

The Regional Water Board and EPA conducted a site inspection on February 2, 2010. No activities that could interfere with cleanup of the Site were observed. The institutional controls that are in place include prohibitions on the use of groundwater until cleanup standards are achieved. No activities were observed that would have violated the institutional controls.

VII. TECHNICAL ASSESSMENT

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

Soil vapor extraction and treatment has been implemented and subsequently curtailed with Regional Water Board approval. The GWET system is still operating at the former Intersil property, the former Siemens property, and the Off-Property Study Area. The current groundwater monitoring program is insufficient to track the plume due to the data gaps in the Resaturated and A Zones and detect any migration beyond the current plume boundaries, as well as track the effectiveness of remedial actions. Down-gradient monitoring wells have remained near or below the cleanup standards. Based on groundwater data from deep aquifer wells as presented in Tables B1 and B2, contaminated groundwater is confined to the Resaturated, A and B Zones and has not impacted the deeper aquifer that is a drinking water resource. There is insufficient information to determine if the plume has expanded in size or migrated vertically. Groundwater-VOC concentrations and mass removal rates continue to slowly decline.

Institutional controls are in place that comply with California Civil Code Section 1471. These controls include prohibitions on sensitive uses and the use of groundwater until cleanup standards are achieved. No activities were observed that would have violated the institutional controls.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Physical Conditions of Site

Institutional controls prohibit the use of groundwater, and groundwater is not currently used at the source Properties. There have been no changes to the physical conditions of the Site that would affect protectiveness of the remedy. Land use at the Site is commercial and land use downgradient of the Site where the groundwater plume has migrated is residential.

Changes in Cleanup Standards

There have been no changes to Applicable or Relevant and Appropriate Requirements (ARARs) for the site and no new standards that would affect the protectiveness of the remedy. TCE and cis-1,2-DCE are the primary chemicals whose concentrations still routinely exceed the cleanup standards. Groundwater cleanup standards for these chemicals have not changed since the ROD was issued.

Changes in Toxicity

Several toxicity factors have changed since the original 1990 risk assessment. In 2009, EPA harmonized Region's 3, 6 and 9 similar risk-based screening levels into a single table: "Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites." The RSLs are developed using risk assessment guidance from the EPA Superfund program. They are risk-based concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data.

Table 7. ROD Groundwater Cleanup Standards vs Current Risk-based Levels

Chemical	Cleanup Standard in 1990 ROD (µg/L)	Current RSL for tap water (µg/L)	Risk Calculation in Excess of 10⁻⁶
1,1-dichloroethene (1,1-DCE)	6	340	-
Trichloroethene (TCE)	5	2	2.5
1,1-dichloroethane (1,1-DCA)	5	2.40	-
1,1,1-trichloroethane (1,1,1-TCA)	200	9100	-
cis-1,2-dichloroethene (cis-1,2-DCE)	6	370	-
trans-1,2-dichloroethene (trans-1,2-DCE)	10	110	-
Tetrachloroethene (PCE)	5	0.11	45.5
1,2-DCA	2	0.15	13.3
Toluene	100	2300	-

Three contaminants have had their toxicity value lowered since 1990: PCE, TCE, and 1,2-DCA. The current RSL values are associated with a 10^{-6} risk. The Record of Decision chose the California MCL of 5 $\mu\text{g/L}$ for the clean-up level for TCE. Based on the new toxicity numbers, this would result in a 2.5×10^{-6} risk, which is still within EPA's risk range. The same is true for PCE. The Record of Decision chose 5 $\mu\text{g/L}$, the MCL, for the PCE cleanup standard. Using the new toxicity value, this would result in a 4.55×10^{-5} risk, which is within EPA's risk range. The new toxicity value for 1,2-DCA would correspond to a 1.3×10^{-5} risk at the cleanup standard.

Although there have been changes to the toxicity values, the changes do not increase the site risk to unacceptable levels. The clean-up levels chosen in the Record of Decision are still protective.

Changes in Exposure Assessment

BPHE

A baseline public health evaluation (BPHE) for the Site was completed in 1990. This BPHE was incorporated into the Remedial Investigation Report and Final Remedial Action Plan, and was used in evaluating and selecting remedial options for the Site. The health evaluation focused on the potential for future exposure to contamination if the groundwater and its contaminant sources were left untreated (i.e., "no action" remedial alternative) under current- and possible future-use conditions. The BPHE evaluated the entire Site, which includes the former Intersil facility, the former Siemens facility, and the Off-Property Study Area. Under current-use conditions, the BPHE identified three potential exposure pathways:

1. Ingestion of water from an existing municipal water supply well located downgradient of the Site area;
2. Inhalation of VOCs volatilized from this same municipal water supply; and
3. Inhalation of chemicals volatilized from source area soils.

In addition, the BPHE considered these future exposure pathways:

4. Inhalation of VOCs volatilized from untreated groundwater from the A, B, and C zones;
5. Ingestion of untreated groundwater from the A, B, and C zones; and
6. Direct contact with soils by children and adults.

The City of Santa Clara well No. 24 is situated approximately 3,700 feet northeast (both cross- and downgradient) of the Former Siemens Site. There is not currently a complete pathway for scenario number five because the impacted zones in the study are not currently in use for water supply. Finally, the soils have been remediated to clean-up levels and therefore do not pose a threat from direct contact exposure.

Thus the only potentially complete pathway is the inhalation of VOCs that have migrated from the groundwater or source areas into indoor air.

The probability of vapor intrusion is site specific, and many factors such as geologic features, building construction and layout of utilities could affect vapor pathways and whether there is a risk of indoor air being contaminated by chemical contaminant migrating from groundwater.

Former Intersil Property

As shown in Table B3 of Appendix B, GE collected soil vapor samples in 2006 to evaluate the indoor air vapor intrusion pathway at the former Intersil property. The soil vapor samples were collected throughout the property. The detected VOCs included TCE, benzene, and 1,3-butadiene with maximum concentrations of 21,000, 330, and 110 $\mu\text{g}/\text{m}^3$, respectively. The TCE and benzene concentrations in soil gas exceeded their respective commercial ESLs for evaluation of potential vapor intrusion. The Regional Water Board has no ESL for 1,3-butadiene. GE conducted a site-specific risk assessment and concluded that the calculated cumulative cancer risk ranged from 2×10^{-6} to 7×10^{-6} , within EPA's acceptable risk range of 10^{-4} to 10^{-6} .

The new property owner, Tate Development, voluntarily installed a vapor barrier under the recently constructed building in accordance with a property transfer agreement with GE. Tate Development voluntarily conducted indoor air sampling in 2009 and the indoor air monitoring results indicated non-detectable levels of chlorinated VOCs.

Former Siemens Property

At the former Siemens property, three indoor air sampling events have been performed and indicated that there was no significant health risk from vapor intrusion. As summarized in Table 8, the property owner collected indoor air samples in 2002, and PCE was detected with a maximum concentration of 11.8 $\mu\text{g}/\text{m}^3$. In 2007, the present occupant, Kaiser Permanente, collected indoor air samples and detected PCE and TCE with respective maximum concentrations of 1.1 and 0.56 $\mu\text{g}/\text{m}^3$. The 2007 PCE concentration in indoor air slightly exceeded the Regional Water Board's commercial/industrial ESL of 0.68 $\mu\text{g}/\text{m}^3$. The 2007 PCE and TCE levels were below EPA's indoor air RSLs for commercial/industrial sites of 2.1 $\mu\text{g}/\text{m}^3$ for PCE and 6.1 $\mu\text{g}/\text{m}^3$ for TCE.

PCE is not considered a constituent of concern at the site because it is present at only trace levels in groundwater beneath the property. Based on the historical indoor air data, the detection of PCE is not consistent since periodic indoor air sampling began. Therefore, the PCE in indoor air most likely originated from an indoor source. TCE and its degradation products, including cis-1,2-dichloroethene (DCE), are constituents of concern because of their concentrations in groundwater. However, no degradation products were detected in the indoor air samples. Based on these results, the TCE in indoor air may not have originated from the groundwater beneath the property.

Table 8. Indoor and Ambient Air Concentrations at Former Siemens Facility

Date of Sampling	Location	PCE	TCE	cis-1,2-DCE	vinyl chloride
8/4/2000	Indoor Air Sample	ND<6.4	ND<5.1	ND<3.8	ND<2.4
8/29/2002		11.8	ND<2.2	ND<1.8	ND<1.0
3/14/2007		1.1	0.56	ND<0.14	ND<0.14
8/4/2000	Rooftop	ND<6.4	ND<5.1	ND<3.8	ND<2.4
8/29/2002		ND<3	ND<2.4	ND<1.8	ND<1.1
3/14/2007		0.16	0.19	ND<0.14	ND<0.14
ESL (commercial/industrial)		0.68	2.0	10	0.053
EPA RSL (industrial)		2.1	6.1	-	2.8

Notes:

Concentrations in micrograms per cubic meter

Bolded concentration = exceeding Regional Water Board ESL

ND< = Not detected less than detection limit

NA = Not analyzed

NS = Not sampled

Off-Property Study Area

Current TCE groundwater concentrations in the Off-Property A Zone range from less than 0.5 µg/L to 61µg/L. Based on these groundwater concentrations and depth to the A-zone, potential vapor intrusion in the Off-Property area was not a concern. However, the 50-foot rise in groundwater in the 1990s created an Upper and Lower Resaturated Intervals, and present groundwater levels are at approximately 60 feet bgs. There are no Off-Property Resaturated Interval wells. Using groundwater-TCE levels from the underlying A Zone to assess the Off-Property Study Area for vapor intrusion concerns is not as appropriate as using the levels from the Resaturated Interval. Elevated VOCs currently exist in on-property Resaturated Interval wells VM-2S and MW-1-RU, with no downgradient wells indicating whether the Resaturated Interval contamination attenuates before reaching the residential side of Homestead Road. The on-property and potentially off-property extent of elevated VOCs in the Upper Resaturated Interval should be defined with additional groundwater investigation. Based on the results of the additional groundwater investigation, potential Off-Property vapor intrusion will be re-evaluated. The groundwater monitoring program in the Off-Property Study Area should continue and the vapor intrusion potential should be re-evaluated if groundwater-VOC concentrations increase.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary

According to the data reviewed and the site inspection, there is insufficient information to determine if the remedy is controlling the groundwater contamination. There have been no changes in the physical condition or land use at the Site that would affect the protectiveness of the remedy. The groundwater monitoring program in the Off-Property Study Area should be expanded by the additional monitoring of wells in the Resaturated Interval and the vapor intrusion potential should be evaluated if that monitoring indicates a vapor intrusion assessment is warranted. There is no other information that calls into question the protectiveness of the remedy.

VIII. ISSUES

Protectiveness

The following three issues were identified during the review:

1. The Resaturated Intervals and A Zone have not been fully defined for the on-property and off-property areas. The on-property extent of elevated VOCs in the Upper and Lower Resaturated Intervals has not been completely defined on the north side of the former Siemens property. The Off-Property downgradient extent of the A Zone has not been fully defined. The extent of the A-Zone VOC plume in the Off-Property area has not been fully defined (i.e., down to MCLs).
2. The potential for Off-Property indoor air vapor intrusion cannot be evaluated until the downgradient extent of VOCs in the Upper Resaturated Interval is fully defined.
3. Although a restrictive covenant is currently in place at the Site, the remedy selected in the 1990 Record of Decision did not include institutional controls.

IX. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The issues, recommendations, follow-up actions and milestone dates are summarized below.

Table 9. Issues/Recommendations and Milestone Dates

Issue	Recommendations and Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
The Resaturated Intervals and A Zone have not been fully defined for the on-property and off-property areas. The on-property extent of elevated VOCs in the Upper and Lower Resaturated Intervals has not been completely defined on the north side of the former Siemens property. The Off-Property downgradient extent of the A Zone has not been fully defined. The extent of the A-Zone VOC plume in the Off-Property area has not been fully defined (i.e., down to MCLs).	The groundwater monitoring program should be expanded to define the extent of contamination in the Resaturated Intervals and A Zone, both on- and off-property	GE & Siemens	Regional Water Board	2011	Unknown	Unknown
The potential for Off-Property indoor air vapor intrusion cannot be evaluated until the downgradient extent of VOCs in the Upper Resaturated Interval is fully defined	Evaluate the potential Off-Property indoor air vapor intrusion by defining the downgradient extent of the Upper Resaturated Interval	GE & Siemens	Regional Water Board	2012	Unknown	Unknown

Although a restrictive covenant is currently in place at the Site, the remedy selected in the 1990 Record of Decision did not include institutional controls.	Issue a decision document formally selecting the restrictive covenant that prohibits the use of on-site groundwater and restrict residential development until final clean-up standards are achieved	EPA	n/a	2012	N	Y
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Non-Protectiveness Follow-up

Declining Effectiveness

The effectiveness of GWET is declining over time. GE plans to install one focused GWE well in the former Intersil property in an area of high concentration. The effectiveness of the new well will be evaluated. GE and Siemens should continue evaluating new emerging cleanup technologies and adding additional wells.

Plume Maps – Resaturated Intervals

The Five-Year Review Report and groundwater monitoring reports for the site display plume maps at a reduced scale that do not allow for proper evaluation of plume conditions in elevated VOC areas such as the Forge Drive area. There are no plume maps for the Upper and Lower Resaturated Intervals of the Upper A Zone. Expanded scale maps of the Upper and Lower Resaturated Intervals of the Resaturated Zone plume in the Forge Drive area should be included in future groundwater reports.

Update Conceptual Site Model

The conceptual site model (CSM) is outdated and does not allow for adequate optimization of the remedy. GE and Siemens should develop a new CSM that incorporates all high resolution data and includes an integrated geologic cross section with water-bearing zone nomenclature that is consistent across both properties.

X PROTECTIVENESS STATEMENT

A protectiveness determination of the remedy at the Intersil/Siemens Site cannot be made until a vapor intrusion assessment is completed in the Off-Property Study Area. The elevated VOCs in the Resaturated Interval have not been defined which will require additional investigation. The downgradient extent of the A-Zone TCE contamination has not been fully defined; therefore, there is limited information to assess the potential for vapor intrusion. All other exposure pathways that could result in unacceptable risks are being controlled, and

institutional controls are preventing exposure to, or the ingestion of, contaminated groundwater. However, EPA has not yet issued a decision document formally selecting institutional controls as part of the groundwater remedy. In the Off-Property Study Area, the vapor intrusion exposure pathway will be reevaluated following the additional groundwater investigation, at which time a protectiveness determination will be made. The Five-Year Review addendum, which will include the protectiveness determination, will be completed by October 30, 2012.

XI NEXT REVIEW

The next Five-Year Review for the Intersil/Siemens site is required within five years of the date of this report (i.e., in September 2015). GE and Siemens should submit their next five-year report to the Regional Water Board by December 31, 2014.

Figure 2. Estimated TCE Contour Map A Zone, October 2009

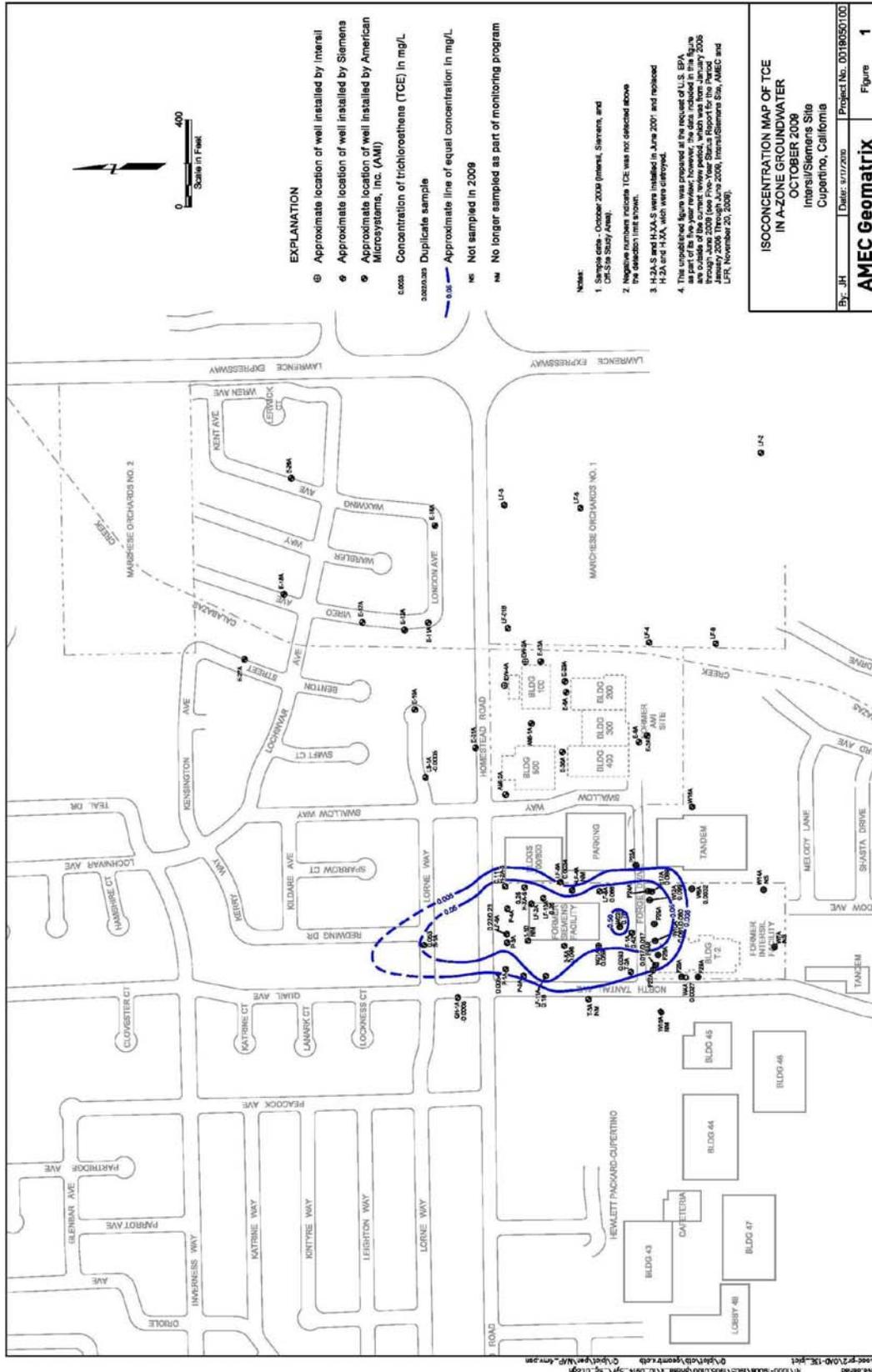
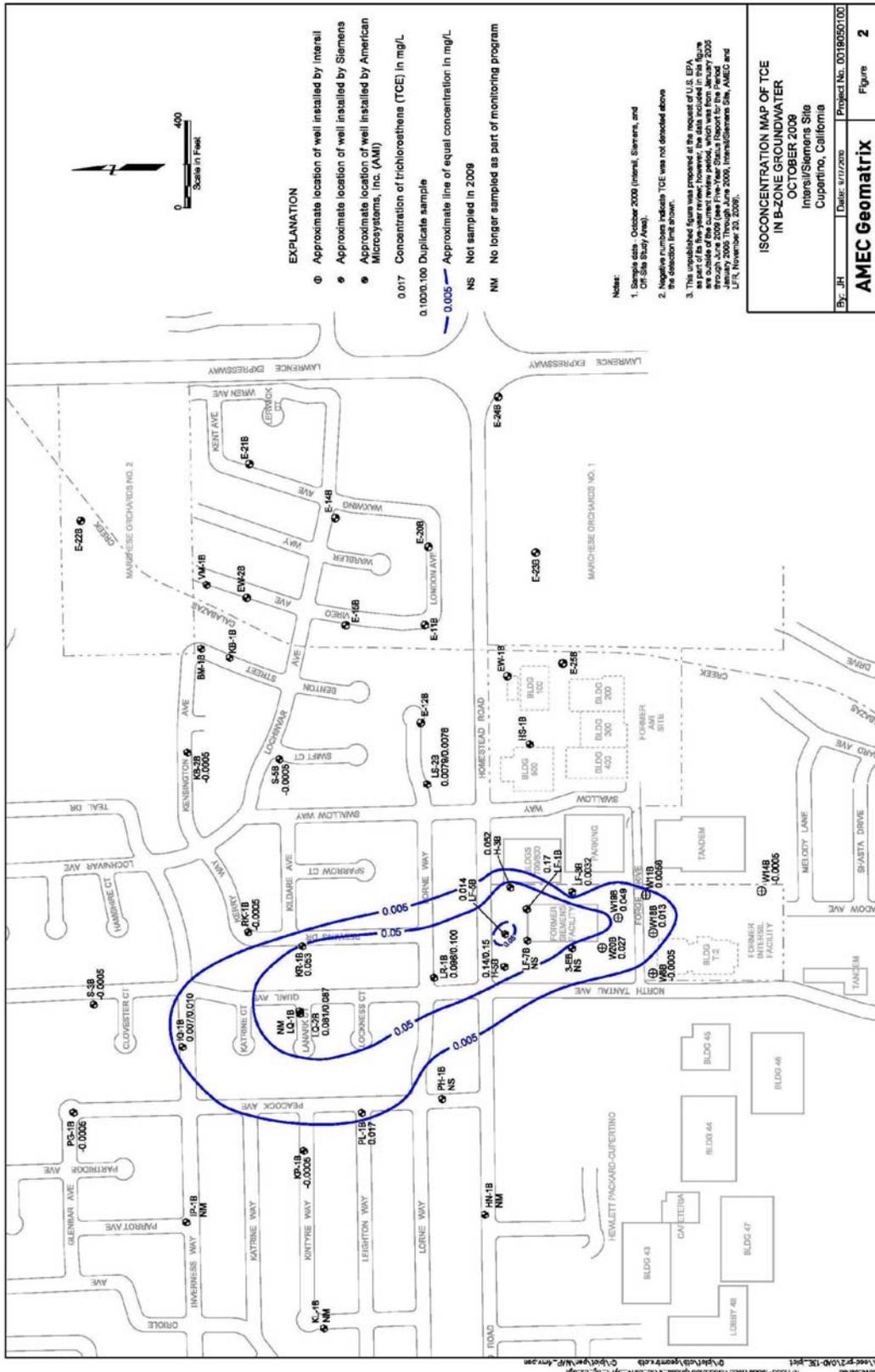


Figure 3. Estimated TCE Contour Map B Zone, October 2009



APPENDIX A –TITLE SEARCHES

Title Search: Former Intersil property:

Order Number: 4304-3365973
Page Number: 4

Defects, liens, encumbrances or other matters affecting the leasehold estate, whether or not shown by the public records.

(Affects Parcel Three)

11. Matters in a document entitled "Reciprocal Driveway Easement and Maintenance", executed by and between Mark Systems, Inc., a California corporation, Intersil Inc., a Delaware corporation and American-Micro Systems, Inc., a California corporation, recorded June 02, 1972 as Document No. 4270996 in Book 9862, Page 473 of Official Records, including but not limited to covenants, conditions, restrictions, easements, assessments, liens and charges.

(Affects Parcel Three)

12. An easement for water pipe lines and incidental purposes, recorded June 28, 1972 as Book 9901, Page 688 of Official Records.
In Favor of: California Water Service Company, a corporation
Affects: Parcels One, Three and other property
13. An easement for gas pipe line right of way and incidental purposes, recorded August 08, 1972 as Book 9962, Page 578 of Official Records.
In Favor of: Pacific Gas and Electric Company
Affects: Parcel Two and other property
14. An easement for overhead and/or underground electrical system and incidental purposes, recorded December 24, 1973 as Book 0699, Page 171 of Official Records.
In Favor of: City of Santa Clara
Affects: A portion of Parcel Two
15. A document entitled Covenant and Environmental Restriction on Property recorded October 07, 2005 as Document No. 18616497 of Official Records.
16. A document entitled Covenant & Environmental Restriction on Property Release & Covenant Not to Use recorded September 27, 2007 as Document No. 19599097 of Official Records.
17. The Terms, Provisions and Easement(s) contained in the document entitled Site Access and Use Agreement recorded September 27, 2007 as Document No. 19599098 of Official Records.
18. A deed of trust to secure an original indebtedness of \$32,412,000.00 recorded April 22, 2008 as Document No. 19821452 of Official Records.
Dated: April 02, 2008
Trustor: Tantau Investments, LLC, a California limited liability company
Trustee: Chicago Title Company
Beneficiary: Housing Capital Company, a Minnesota partnership

The above deed of trust states that it is a construction deed of trust.

Document(s) declaring modifications thereof recorded April 02, 2009 as Document No. 20194813 of Official Records.

First American Title

Title Search: Former Siemens property

Form No. 1068-2
ALTA Plain Language Commitment

Commitment No.: NCS-411581-NY
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10. An easement for gas pipeline and incidental purposes, recorded August 8, 1972 in Book 9962, Page 578 of Official Records.
In Favor of: Pacific Gas and Electric Company
Affects: as described therein

The location of the easement cannot be determined from record information.

11. Covenants, conditions, restrictions and easements in the document recorded April 17, 2000 as Instrument No. 15214021 of Official Records, but deleting any covenant, condition or restriction indicating a preference, limitation or discrimination based on race, color, religion, sex, handicap, familial status, national origin, sexual orientation, marital status, ancestry, source of income or disability, to the extent such covenants, conditions or restrictions violate Title 42, Section 3604(c), of the United States Codes. Lawful restrictions under state and federal law on the age of occupants in senior housing or housing for older persons shall not be construed as restrictions based on familial status.

As amended by that certain Corrective Grant Deed Stating Environmental Restriction recorded February 27, 2003 as Instrument No. 16849415, Official Records.

12. The terms and provisions contained in the document entitled "Memorandum of Agreement" recorded April 17, 2000 as Instrument No. 15214022 of Official Records.
13. The fact, as disclosed by that certain document or documents recorded April 17, 2000 as Instrument No. 15214022 of Official Records, that some violation of environmental protection laws may have occurred which may affect the land.
14. A Deed of Trust to secure an original indebtedness of \$32,670,000.00 recorded June 28, 2005 as Instrument No. 18443070 of Official Records.
Dated: June 27, 2005
Trustor: Inland Western Cupertino Tantau, L.L.C., a Delaware limited liability company
Trustee: First American Title Insurance Company
Beneficiary: Nomura Credit and Capital, Inc., a Delaware corporation, its successors and assigns

A document entitled "Assignment of Leases and Rents" recorded June 28, 2005 as Instrument No. 18443071 of Official Records, as additional security for the payment of the indebtedness secured by the deed of trust.

The interest of Nomura Credit & Capital, Inc under said Assignment of Assignment of Leases and Rents was purportedly assigned to Wells Fargo Bank, N.A., as trustee for the Registered Holders of J.P. Morgan Chase Commercial Mortgage Securities Corp., Commercial Mortgage Pass-Through Certificates, Series 2005-LDP3 by document recorded February 8, 2006 as Instrument No. 18800370 of Official Records.

According to the public records, the beneficial interest under the deed of trust was assigned to Wells Fargo Bank, N.A., as trustee of the Registered Holders of J.P. Morgan Chase Commercial Mortgage Securities Corp., Commercial Mortgage Pass-Through Certificates, Series 2005-LDP3 by assignment recorded February 8, 2006 as Instrument No. 18800371 of Official Records.

First American Title Insurance Company

APPENDIX B: DATA TABLES

Table B1 - TCE Concentrations in µg/L in Off-Property Down-gradient Wells

Well No.	10/2005	10/2006	10/2007	10/2008	10/2009 ²
A Zone					
LF-8A	14	7.9	9.1	3.8	3.4
LS-1A	<0.5	<0.5	<0.5	<0.5	<0.5
QH-1A	<0.5	<0.5	<0.5	<0.5	<0.5
S-1A	58	59	58	61	53
B Zone					
IQ-1B	28	1.6J/4J	8.9	10/12	10/7
KP-1B	<0.5	NS	NS	<0.5	<0.5
KR-1B	61	56	50	53	53
KB-2B	<0.5	NA	<0.5	NA	<0.5
LQ-1B	83	NS	NS	NS	NS
LQ-2B*	93	93	100	100	87
LR-1B*	120	110	100	110	100
LS-2B	12	5.3	8.4	10/9.7	7.9
PG-1B	<0.5	<0.5	<0.5	<0.5	<0.5
PH-1B	NA	NS	NS	<0.5	NA
PL-1B	5.9	9.5	13	16	17
RK-1B	<0.5	<0.5	<0.5	<0.5	<0.5
S-3B	<0.5	<0.5	<0.5	<0.5	<0.5
S-5B	<0.5	<0.5	<0.5	<0.5	<0.5
C Zone					
LH-1C	NS	NS	<0.5	NS	NS
PL-2C	NS	NS	<0.5	NS	NS
LR-3C	4.7	5.4	4.6	3.7	5.1
RK-2C	3.1	1.5	3.3	3.1	4
S-4C	1.5	1.1	1.3	1.3	1.1
S-6C	<0.5	NA	<0.5	NA	<0.5

Notes:

NA = Not analyzed

NS = Not sampled

* Extraction well

Table B2 - TCE Concentrations in Source Area Wells

Well No.	10/2005	10/2006	10/2007	10/2008	10/2009
Former Intersil Facility					
A Zone					
E9AR ¹	25	19	19	19/19	17
E17A	97	89	55	83	69
W2A	NS	<0.5	NS	NS	NS
W3A	NS	<0.5	NS	NS	NS
W4A	13	2.5	7.4/7.5	3.1	2.7
W5A	5.2	4	4.6	3.1	3.2
W7A	NS	<0.5	NS	NS	NS
W10A ¹	86	66	56	60	61
W12A ¹	120	100	97	98	99
W13A	NS	1.7	NS	NS	NS
W14A	NS	<0.5	NS	<0.5	NS
B Zone					
W6B	NS	<0.5	NS	NS	NS
W8B	2.7	0.99	2.9	1.3	<0.5
W11B	4	5.3	13	8.8	5.6
W14B	NS	<0.5	NS	<0.5	NS
W18B	12	8.2	12	13	13
Former Siemens Facility					
Upper Resaturated Interval (approximately 45 to 60 feet bgs)					
2-EP*	82	<0.5	6	2.3	550
4BP	230	290	200	490	530
4BP (dup)	NS	NS	210	NS	NS
LF-13A	<0.5	0.71	1.9	17	19
VM-2S	1200	200-3,000	<20-170	< 50-180	NS
VM-3S	NS	<5-1,000	<5	<5	NS
VM-4S	NS	25	22-170	690	NS
VM-5S	NS	6.1-55	59-190	NS	NS
VM-6S	NS	260	160	530	NS
MW-1-RU	NS	<4-1,400	<10-140	NS	1300
VM-8S	260	300	280	290	430
Lower Resaturated Interval (approximately 60 to 90 ft bgs)					
2-EPA*	240	230	190	180	180
EX-1-RL*	NS	320	320	260	260
EX-1-RL (dup)	NS	NS	NS	280	270
G-1A	470	470	580	680	610
H-1A*	94	89	89	64	58
H-1A* (dup)	NS	NS	76	NS	58

Well No.	10/2005	10/2006	10/2007	10/2008	10/2009
LF-12A*	18	15	12	9.4	7.9
SW-5S	96	95	56	53	52
SW-6S	1000	1300	820	550	940
SW-6S (dup)	NS	1200	840	NS	NS
SW-7*	NS	NS	80	72	62
VM-2D	30	NS	26	21	17
VM-2D (dup)	NS	NS	31	NS	NS
VM-8D	170	NS	170	NS	140
Lower A Zone (Approximately 90 to 120 ft bgs)					
3-XA	98	100	98	77	98
F-1A	190	340	530	540	420
H-2A-S	79	42	59	50	110
H-2A-S (dup)	NS	38	40	NS	NS
H-XA-S	260	250	220	210	250
LF-2A	NS	NS	ND	NS	NS
LF-6A*	260	230	220	220	230
LF-6A* (dup)	NS	NS	NS	220	220
LF-9A	59	28	20	33	66
LF-10A	11	NS	160	NS	260
LF-11A	220	NS	150	NS	160
P-1A	1.7	1.1	1	3.3	5.4
T-2A	6.3	NS	3.7	NS	9.3
W-21A	67	43	48	45	59
W-22A	1000	310	530	400	780
B Zone					
3-EB	NS	NS	57	NS	NS
H-3B	34	2.9	8.8	14	52
H-5B*	140	150	150	150	150
H-5B* (dup)	NS	NS	NS	150	140
LF-1B	42	NS	35	NS	170
LF-3B	5.2	4.5	4.1	4.7	3.2
LF-5B	2.9	4.1	5.3	9.5	14
LF-7B	NS	NS	43	NS	NS
W-19B	100	68	51	44	49
W-20B	73	73	41	27	27
C Zone					
H-4C	NS	NS	0.88	NS	NS

Notes:

Concentrations in µg/L

ND = Not detected

NS = Not sampled

* = Extraction well

Former Siemens UR Interval ERD Pilot Test Area Wells: VM-2S, VM-3S, VM-4S, VM-5S, and MW-1-RU

Table B3 - VOC Concentrations in Soil Gas Samples at Former Intersil Facility

Sample ID	Depth (feet bgs)	Sample Date	1,3- Butadiene	Benzene	Trichloroethene
SVS-1-6	6	06/27/06	5.2	70	56
SVS-1-16	16	06/27/06	25	20	1100
SVS-2-5	5	06/23/06	<5.3	22	<13
SVS-2-14	14	06/23/06	<2.5	13 J	91 J
SVS-44-15	14	06/23/06	<2.5	32 J	230 J
SVS-3-5	5	06/23/06	<2.7	5.9	25
SVS-3-15	15	06/23/06	<2.8	6.3	800
SVS-4-5	5	06/27/06	18	49	370
SVS-4-5	5	06/27/06	16	47	370
SVS-4-15	15	06/27/06	24	69	5000
SVS-5-5	5	06/26/06	<2.7	92	360
SVS-5-15	15	06/26/06	<11	130	7900
SVS-5-25	25	06/26/06	<6.1	220	190
SVS-5-31	31	06/26/06	<16	<23	11000
SVS-5-44	44	06/26/06	<2.8	19	220
SVS-6-5	5	06/28/06	30	18	100
SVS-6-15	15	06/28/06	20	9.9	12
SVS-7-5	5	06/23/06	<2.6	8	<6.4
SVS-7-13	13	06/23/06	38	28	<12
SVS-8-5	5	06/23/06	<2.8	5.2	260
SVS-8-5	5	06/23/06	<2.8	5.5	260
SVS-8-15	15	06/23/06	<13	20	11000
SVS-9-3	3	06/21/06	<2.9	15	9.3
SVS-9-13.5	13.5	06/21/06	8.2	14	3700
SVS-10-5	5	06/27/06	<5.1	30 J	18
SVS-46-5	5	06/27/06	<4.6	21 J	<11
SVS-10-15	15	06/27/06	33	20	2800
SVS-11-5	5	06/23/06	<7.5	20	<18
SVS-11-15	15	06/23/06	41	21	<28
SVS-12-5	5	06/22/06	<2.8	6	<6.8
SVS-12-5	5	06/22/06	<2.8	6.5	<6.8
SVS-12-13	13	06/22/06	<2.7	13	<6.6
SVS-13-3.5	3.5	06/21/06	13	40	14
SVS-13-15	15	06/21/06	8.4	15	2200
SVS-14-5	5	06/27/06	<18	95	61
SVS-14-15	15	06/27/06	50	16	1000
SVS-14-25	25	06/27/06	29	19	2000
SVS-14-35	35	06/27/06	<2.6	14	1800

Sample ID	Depth (feet bgs)	Sample Date	1,3- Butadiene	Benzene	Trichloroethene
SVS-14-44	44	06/27/06	<30	<43	21000
SVS-15-5	5	06/28/06	<11	32	<27
SVS-15-15	15	06/28/06	20	17	<6.9
SVS-16-5	5	06/22/06	<26	120	<64
SVS-16-15	15	06/22/06	<9.5	41	<23
SVS-17-4.5	4.5	06/21/06	<2.8	7.4	16
SVS-42-5	4.5	06/21/06	<2.8	7.7	<6.9
SVS-17-12.5	12.5	06/21/06	22	9.4	<6.6
SVS-18-2	2	06/21/06	13	25	<6.2
SVS-18-15	15	06/21/06	13	32	64
SVS-19-5	5	06/28/06	<10	83	<25
SVS-19-15	15	06/28/06	4.6	5.9	12
SVS-20-5	5	06/28/06	<7.5	30	<18
SVS-20-15	15	06/28/06	10	7	<6.4
SVS-21-5	5	06/22/06	<2.8	8.6	8.2
SVS-43-5	5	06/22/06	<2.9	8.8	<7.1
SVS-21-15	15	06/22/06	<2.8	42	<6.8
SVS-22-5	5	06/20/06	<4.4	230	<11
SVS-40-5	5	06/20/06	<4.5	180	<11
SVS-22-15	15	06/20/06	<20	91	<50
SVS-23-5	5	06/20/06	<5.6	52	<14
SVS-23-15	15	06/20/06	83	75	<13
SVS-24-5	5	06/20/06	<11	160	<27
SVS-24-15	15	06/20/06	<2.6	38	<6.3
SVS-25-5	5	06/21/06	<7.0	130	<17
SVS-41-5	5	06/21/06	<2.5	75	<6.2
SVS-25-5	5	06/21/06	<26	140	<64
SVS-25-15	15	06/21/06	110	48	<59
SVS-26-5	5	06/22/06	<2.7	16	<6.5
SVS-26-15	15	06/22/06	<2.8	<4.0	<6.8
SVS-27-7	7	06/26/06	<2.8	7.8	<6.8
SVS-27-16	16	06/26/06	<2.6	11	7.7
SVS-28-5	5	06/20/06	<7.3	330	<18
SVS-28-15	15	06/20/06	22	69	<5.7
SVS-29-5	5	06/20/06	120	230	<52
SVS-29-15	15	06/20/06	37	53	<6.0
SVS-30-5	5	06/20/06	<2.8	96	<6.8
SVS-30-15	15	06/20/06	<2.4	88	<5.9
SVS-31-4	4	06/19/06	<2.8	47	<6.9
SVS-31-15	15	06/19/06	30	66	<6.3
SVS-32-4	4	06/19/06	26	39	<14

Sample ID	Depth (feet bgs)	Sample Date	1,3- Butadiene	Benzene	Trichloroethene
SVS-32-14	14	06/19/06	28	13	<6.4
SVS-33-5	5	06/19/06	<2.5	39	<6.2
SVS-33-15	15	06/19/06	<2.6	56	<6.3
SVS-34-5	5	06/19/06	<2.8	32	<6.9
SVS-34-15	15	06/19/06	7.9	21	<6.3
SVS-35-5	5	06/19/06	<2.5	<3.6	<6.2
SVS-35-11.5	11.5	06/19/06	26	46	<5.9
Regional Water Board ESLs		Residential	14.3	85	1200
			Commercial/ Industrial	48.1	290
Cal EPA CHHSLs		Residential	15.9	85.4	1300
			Commercial/ Industrial	60.1	284

Notes:

ESL = Environmental Screening level

CHHSL = California Human Health Screening Levels

Concentrations in $\mu\text{g}/\text{m}^3$

ND< = Not detected less than detection limit