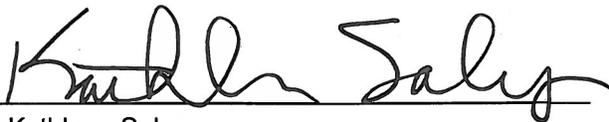


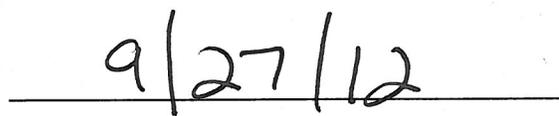
Fourth Five-Year Review Report
for
Synertek, Inc. (Building 1) Superfund Site
3050 Coronado Drive
Santa Clara, California



Approved by:

Date:





Kathleen Salyer
Assistant Director, Superfund Division
California Site Cleanup Branch
U.S. EPA Region IX

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Executive Summary

This is the fourth Five-Year Review of the Synertek, Inc. (Building 1) Superfund Site (Site) in Santa Clara, 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. The triggering action for this fourth Five-Year Review (FYR) was the signing of the previous FYR on September 28, 2007.

The source location for the site is located at 3050 Coronado Drive in the city of Santa Clara, California. The groundwater plume in the A aquifer extends approximately 900 feet north and downgradient to approximately Scott Boulevard (see Figure 1). The groundwater contaminant plume has been regularly monitored, and remains generally stable. Groundwater contamination is present in the two shallowest water bearing zones at the site, which have been designated the A-zone (shallowest water bearing zone) and B-zone (next encountered water bearing zone).

The contaminants found in groundwater at the site during the initial investigation included trichloroethene (TCE), 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethene (1,1-DCE), 1,1-dichloroethane (1,1-DCA), 1,2-DCA, vinyl chloride, and Freon 113. Currently 1,1,1-TCA and Freon 113 are below cleanup standards in all wells. TCE is considered the driver at the Synertek site and groundwater TCE concentrations continue to remain stable or slowly decline. At the former Synertek property, the current maximum TCE level in the A aquifer is 120 micrograms per liter ($\mu\text{g/L}$) (well MW12A). The groundwater plume in the B Aquifer zone is localized to the west of the former Synertek building and does not extend off property (see Figure 2). The current maximum TCE level in the B aquifer is 44 $\mu\text{g/L}$ (well MW4B).

In 1991, the California Regional Water Quality Control Board (RWQCB), San Francisco Bay Region and the U.S. EPA Region IX (EPA) selected a remedy that included groundwater extraction and treatment (GWET), groundwater monitoring, and institutional controls. The site achieved construction completion with the signing of the Preliminary Closeout Report on March 25, 1992. Honeywell International Inc. (Honeywell) operated a GWET system at the former Synertek property from 1987 to 2001. During that period, Honeywell's GWET system removed approximately 84 pounds of volatile organic compounds (VOCs). The GWET system has remained shut down since 2001. Contaminant concentrations have fluctuated somewhat but in general remain stable or continue to slowly decline due largely to natural attenuation. There has been a slight increase in 1,1-DCE in monitoring well MW29 at the down gradient edge of the plume. A pilot test of enhanced in-situ bioremediation (EISB) was implemented in the source area in 2011. The objective is to reduce the residual mass of VOCs in the source area and thereby decrease the amount of time it will take for VOC concentrations to attenuate below the cleanup standards throughout the plume. The initial results have been positive. Monitoring data show that TCE concentrations decreased for wells MW-7A (from 84 $\mu\text{g/L}$ in 2010 to 2.3 $\mu\text{g/L}$ in 2012) and MW-37A (from 98 $\mu\text{g/L}$ in 2010 to 0.3 $\mu\text{g/L}$ in 2012); however, further monitoring needs to be done to ensure there is not rebound of TCE concentrations.

Current information indicates that monitored natural attenuation will likely not be able to restore the groundwater to its beneficial use as a potential drinking water source. The deed restriction for the property that prevents the drilling of groundwater wells was recorded in December 1991. However, a restrictive covenant should be recorded for the Site that is consistent with current California law.

A protectiveness determination of the remedy at the Synertek Site cannot be made until after a vapor intrusion assessment is completed in the former Synertek building. There currently is limited information at the Synertek building to assess the potential for vapor intrusion. The groundwater monitoring program should be expanded to determine the cause of the slight 1,1-DCE increase at the downgradient edge of the plume. 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. At the Synertek building, the vapor intrusion exposure pathway will be evaluated within a few months of the signing of this document. In order to make a protectiveness determination, an addendum to the 2012 Five-Year Review is required. The Five-Year Review addendum should be completed by June 30, 2013.

The next Five-Year Review for the Site will be conducted in 2017.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Synertek, Inc. (Building 1)		
EPA ID: CAD0990832735		
Region: 9	State: CA	City/County: Santa Clara/Santa Clara
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: State (CA Regional Water Quality Control Board) If "Other Federal Agency" was selected above, enter Agency name:		
Author name (Federal or State Project Manager): David Barr, Water Resource Control Engineer		
Author affiliation: CA Regional Water Quality Control Board (Lead Agency)		
Review period: September 2007 – September 2012		
Date of site inspection: 04/24/2012		
Type of review: Policy		
Review number: 4		
Triggering action date: 9/28/07		
Due date (five years after triggering action date): 9/28/12		

Five-Year Review Summary Form (continued)

Issues/Recommendations				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 1	<p>Issue Category: Remedy Performance</p> <p>Issue: The potential for indoor air vapor intrusion in the former Synertek building should be evaluated.</p> <p>Recommendation: Conduct indoor air and sub-slab testing to determine if there is current or potential future exposure of building occupants to site contaminants through vapor intrusion.</p>			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
Yes	Yes	PRP	EPA/State	3/30/13
OU(s): 1	<p>Issue Category: Remedy Performance</p> <p>Issue: The SCR and ROD specify the final remedial action plan for the site to be a GWET system, which has not operated since 2001.</p> <p>Recommendation: Currently pilot testing of an alternative remedy, EISB, is underway. A feasibility study is needed to evaluate alternative remedies to GWET and provided the basis for amending the ROD.</p>			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	PRP	EPA/State	12/31/14

OU(s): 1	Issue Category: Remedy Performance			
	Issue: The existing restrictive covenant is not consistent with current state law (California Civil Code section 1471) which establishes the framework for environmental covenants in California.			
	Recommendation: A restrictive covenant should be recorded for the Site that is consistent with current California law.			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	State	EPA	3/30/13
OU(s): 1	Issue Category: Monitoring			
	Issue: There has been a slight increase in 1,1-DCE in monitoring well MW29			
	Recommendation: The groundwater monitoring program should be expanded to determine the cause of this slight increase.			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	PRP	EPA/State	10/31/2013

Protectiveness Statement(s)		
<i>Operable Unit:</i>	<i>Protectiveness Determination:</i>	<i>Addendum Due Date (if applicable):</i>
1		6/30/13
<i>Protectiveness Statement:</i>		
<p>A protectiveness determination of the remedy at the Synertek Site cannot be made until after a vapor intrusion assessment is completed in the former Synertek building. 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. The Five-Year Review addendum, which will include the protectiveness determination, will be completed by June 30, 2013.</p>		

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List of Abbreviations

$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
ARARs	Applicable or Relevant and Appropriate Requirements
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DCE	dichloroethene
DCA	dichloroethane
EISB	enhanced in-situ bioremediation
GWET	groundwater extraction and treatment
MCL	Maximum Contaminant Level
mg/day	milligrams per day
MNA	monitored natural attenuation
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OSWER	EPA's Office of Solid Waste and Emergency Response
RAOs	Remedial Action Objectives
RAP	Remedial Action Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
Regional Water Board	San Francisco Bay Regional Water Quality Control Board
SCRs	Site Cleanup Requirements
SVET	soil vapor extraction and treatment
TCA	trichloroethane
TCE	trichloroethene
EPA	United States Environmental Protection Agency
VOC	volatile organic compound

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Fourth Five-Year Review Report for Synertek, Inc. (Building 1) Superfund Site

1. Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. The methods, findings, and conclusions of FYRs are documented in five-year review reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them. This report is the fourth Five-Year Review for the Synertek, Inc. (Building 1) Superfund Site (Site). The California Regional Water Quality Control Board (RWQCB), San Francisco Bay Region, conducted this review of the remedy implemented at the Synertek, Inc. (Building 1) Superfund Site (Site) in Santa Clara, Santa Clara County, California. The purpose of a Five-Year Review is to ensure that a remedial action remains protective of human health and the environment and is functioning as designed. This Five-Year Review Report is prepared pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (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.

EPA 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.

This Five-Year Review is required because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. Specifically, contaminants in groundwater are present at levels exceeding the drinking water maximum contaminant levels. The triggering action for this review is EPA's signature date of the third Five-Year Review on September 28, 2007.

2. Site Chronology

The following table lists the dates of important events for the Synertek Superfund Site.

Table 1. Chronology of Site Events

Event	Date
Site developed from agricultural land to a business park	1974
A 200 gallon solvent tank and three neutralization tanks are installed at Synertek	1974 - 1982
Synertek submits completed Water Board Facility Questionnaire	1982
Groundwater contamination discovered at the Synertek Site	1982
The 200 gallon solvent tank and three neutralization tanks are determined to be a source of contamination on the site and are removed	1985
Groundwater extraction and treatment begins from three onsite extraction wells	1987
Regional Board adopts NPDES Permit No. CA0029211 (Order No. 87-050) for the discharge of treated extracted groundwater at the site	1987
Initial Site Cleanup Requirements adopted	1987
Synertek Site is added to the NPL	1989
Two offsite groundwater extraction wells are added	1989
Revised Site Cleanup Requirements adopted	1989
Regional Board adopts Order No. 91-051, the final Site Cleanup Requirements specifying the final RAP for the site	1991
Record of Decision signed by EPA	1991
Public Health Assessment completed by the Agency for Toxic Substances and Disease Registry (ATSDR), and the California Department of Health Services (CDHS)	1992
Regional Board issues coverage under Order No. 94-087, General NPDES Permit No. CAG912003, general permit for the discharge or reuse of extracted, treated groundwater resulting from the cleanup of groundwater from volatile organic compounds	1994

Event	Date
First Five-Year Review completed	1996
Regional Board issues coverage under Order No. 99-051, General NPDES Permit No. CAG912003, general permit for the discharge or reuse of extracted, treated groundwater resulting from the cleanup of groundwater from volatile organic compounds	1999
Regional Board allows the GWET system to be shut down in response to a significant decline in contaminant removal rates and monitored natural attenuation begins	2001
Second Five-Year Review completed	2002
Third Five-Year Review completed	2007
EISB Pilot Test begins to reduce the residual mass of VOCs in the source area	2011
Vapor Intrusion Assessment Work Plan submitted to the Agencies	2012

3. Background

The Site is approximately 1.5 acres in size, and the source is located at 3050 Coronado Drive in the City of Santa Clara, California (see Figure 1). The property consists of a low rise building and landscaping and parking areas. The City of Santa Clara has a population of 95,200, and is part of the San Francisco Bay Metropolitan Region, which has a population of about six million. The Site is located in a light industrial and commercial area that is dominated by the electronics industry. It is in the area known as Silicon Valley, home to numerous computer related companies. Most buildings in the area are low rise developments containing office space and research and development facilities. The nearest residential area is about 3600 feet south and is upgradient of the site with respect to groundwater flow direction. Other residential areas are located 6000 feet north-northeast of the site. None of these residential areas are within the area impacted by the groundwater pollutant plume originating at the Site property.

The groundwater plume in the A aquifer extends approximately 900 feet north from the source area, slightly east and downgradient to approximately Scott Boulevard (see Figure 1). Groundwater concentrations continue to slowly decline. At the former Synertek property, the current maximum TCE level in the A aquifer is 120 micrograms per liter ($\mu\text{g/L}$) (well MW12A). The groundwater plume in the B Aquifer zone is approximately 50 feet across and localized on the west side of the former Synertek building and does not extend off property (see Figure 2). The current maximum TCE level in the B aquifer is 44 $\mu\text{g/L}$ (well MW4B).

The building located at 3050 Coronado Drive is owned by Jim Lindsey and Kalil Jenab and is leased to Crystal Solar. Crystal Solar currently uses the southern two-thirds of the building (approximately 16,000 square feet) as office space and for research and development of solar panels. In addition, Crystal Solar is expanding, and the remaining northern third of the building is under construction.

3.1. Hydrology

Groundwater flows to the northeast towards San Francisco Bay. The Site is located in the Santa Clara Valley, a structural basin filled with marine and alluvial sediments. The coarser deposits are probably the result of deposition in or near stream channels that drain the highlands that surround the basin. Finer grain deposits result from a variety of conditions with the eventual result of a complex heterogeneous sequence of interbedded sands, silts, and clays. Municipal water supply wells tap an extensive deep regional confined aquifer that lies generally greater than 200 to 300 feet below ground surface (bgs). A thick, relatively impermeable aquitard separates this deep confined aquifer from a complex series of discontinuous aquifers and aquitards that can extend up to within a few feet of the ground surface. Three distinct water bearing zones have been investigated at this site. They are 1) the first encountered water bearing zone, called the A zone, found from 10 feet bgs to 20 feet bgs; 2) the next encountered water bearing zone, called the B zone, found from about 30 to 40 feet bgs; and 3) a third water bearing zone, called the B1 zone, found between 100 and 108 feet bgs.. The A and B zones are

separated by a two to ten foot thick aquitard composed of clay to silty sand. There could be some hydraulic connection between the two zones due to the discontinuous nature of the sediment types. Contamination is confined to the A zone and B zone. The groundwater contaminant plume in the A zone is approximately 900 feet long. The B zone contaminant plume is about 50 feet long. The nearest municipal water supply well downgradient of the Site is the City of Santa Clara Well No. 33, located 1.6 miles north of the Site.

3.2. Land and Resource Use

The land in the Synertek area was in agricultural use until 1974. The on-property building was constructed in 1974 and beginning in 1978 was used for performing quality control of chemicals and electrical testing of semiconductors. Currently the building is used for solar photovoltaic research and development. The site and surrounding area were mainly agricultural until the 1960s and 1970s at which time the area began a transformation to commercial/industrial use. There are no projected land use changes for the Site. The surrounding area is light industrial and commercial. There are no projected land use changes for the area around the Site.

3.3. History of Contamination

Historical operations at the Site included the use of a 200-gallon solvent tank and three neutralization tanks. These tanks were located east of the buildings and stored a variety of chemicals including solvents. Groundwater contamination was first discovered in 1982 when groundwater samples were collected at the Site as part of a leak detection program for underground tanks initiated by the Regional Board in the South Bay Area. Following detection of groundwater contamination at the site, a remedial investigation was initiated which determined the source of contamination to be leaks from onsite solvent and neutralization tanks. These tanks and the surrounding impacted soil were removed in 1985. The contaminants found in groundwater at the site during the initial investigation included TCE, 1,1,1-TCA, 1,1-DCE, 1,1-DCA, 1,2-DCA, and Freon 113. Currently 1,1,1-TCA and Freon 113 are below cleanup standards. TCE is considered the driver at the Synertek site. The impact of groundwater contaminants was limited to the upper two aquifers (A and B aquifers).

3.4. Initial Response

Following the discovery of groundwater contamination at the site, the Regional Water Quality Control Board required Synertek to perform a soil and groundwater investigation. Interim remedial actions began at the site in 1985 with the excavation and removal of the solvent tank and the neutralization tanks. Three groundwater extraction wells were installed and brought online to remove contaminated groundwater in 1987. Two off-property extraction wells were added in 1989. In 1990, the potentially responsible parties submitted a Remedial Investigation/Feasibility Study (RI/FS) Report. The report evaluated the results of the subsurface investigations, the effectiveness of the interim groundwater cleanup actions, and evaluated remedial alternatives.

3.5. Basis for Taking Action

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

4. Remedial Actions

4.1. *Remedy Selection*

The RI/FS was submitted as two separate reports, an RI dated September 28, 1990 and an FS dated November 30, 1990. The RI/FS reports were the basis for the final Remedial Action Plan as set forth in Regional Water Quality Control Board Order No. 91-051, the Final Site Cleanup Requirements (SCRs), adopted on March 20, 1991.

The remedial action objectives consisted of:

- prevention of the near-term and future exposure of human receptors to contaminated groundwater;
- restoration of the contaminated groundwater for future use as potential drinking water;
- control of contaminant migration; and
- monitoring of contaminant concentrations in the groundwater.

The Final SCRs contain the approved remedy for cleanup at the site. The alternative that was selected in the SCRs as the final cleanup plan consisted of:

- 1) a deed restriction prohibiting the use of shallow groundwater;
- 2) groundwater monitoring;
- 3) groundwater pumping from onsite and offsite extraction wells; and
- 4) treatment of extracted groundwater with air stripping and discharge of the treated groundwater to the storm drain under an NPDES permit.

The EPA signed the Record of Decision for the Synertek Site on June 28, 1991.

The SCRs set cleanup standards at California Maximum Contaminant Levels (MCLs), or EPA proposed MCLs, with the exception of cleanup levels for acetone (risk-based), toluene (CA Action Level) and xylenes (risk-based). These cleanup levels are listed in Table 2.

Table 2. Groundwater Cleanup Standards

Chemical	Cleanup Standard (µg/L)
acetone	350
benzene	1
Bis(2-ethylexyl)phthalate	4
1,1-dichloroethane (1,1-DCA)	5
1,1-dichloroethene (1,1-DCE)	6
cis-1,2-dichloroethene (cis-1,2-DCE)	6
ethylbenzene	680
Freon 113	1,200
styrene	5
toluene	100
1,1,1-trichloroethane (1,1,1-TCA)	200
trichloroethene (TCE)	5
vinyl chloride	0.5
xylene	175

4.2. Remedy Implementation

The groundwater extraction and treatment (GWET) system and groundwater monitoring program were already implemented at the time SCRs were adopted. The deed restriction that prevents the drilling of groundwater wells was recorded in December 1991. However, a restrictive covenant should be recorded for the Site that is consistent with current California law. Groundwater was extracted and treated until January 2001, at which time the Regional Board approved the shutdown of the GWET system with continued groundwater monitoring in accordance with an approved monitored natural attenuation (MNA) study. Synertek met with the Water Board in 2000, and it was agreed that the GWET system was no longer removing significant amounts of contaminant mass and that groundwater contaminant concentrations were approaching asymptotic levels, the point at which continued groundwater extraction will no longer significantly reduce contaminant concentrations. Since then, the Site has been under a monitored natural attenuation program.

During the period of groundwater extraction, approximately 72 million gallons of groundwater were extracted and treated, and approximately 84 pounds of volatile organic compounds (VOCs) were removed between January 1991 and December 1999. The institutional controls that are in place include prohibitions on the use of groundwater until cleanup levels are achieved on the former Synertek property.

4.3. Operation and Maintenance (O&M)

The GWET system was shut down in 2001. The system has not been operated since then. There is a semi-annual groundwater monitoring program wherein groundwater elevations and flow direction are determined and monitoring wells are sampled for VOCs. In addition, some MNA parameters in groundwater are measured. Semi-annual reports are submitted to the Regional Water Quality Control Board. A feasibility study and pilot test of enhanced in-situ bioremediation (EISB) were carried out during the review period.

The cost incurred during the period of January 2007 through December 2011 for all activities related to groundwater cleanup at the site was \$602,000. The following table provides details of the costs.

Table 3. O&M Costs

Cost Component	Cost January 2007 to December 2011
Feasibility Study	\$20,000
Monitoring/Reporting	\$336,000
Pilot Test	\$146,000
Regulatory Oversight	\$100,000
Total Costs	\$602,000

5. Progress Since the Last Five-Year Review

5.1. Previous Five-Year Review Protectiveness Statement and Issues

The protectiveness statement from the 2007 FYR for the Synertek Site stated the following:

“The remedy at the Synertek Site is protective of human health and the environment because exposure pathways that could result in unacceptable risk are being controlled.”

The 2007 FYR included three issues and recommendations. Each recommendation and the current status are discussed below.

Table 4. Status of Recommendations from the 2007 FYR

Issues from previous FYR	Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Because asymptotic levels had been reached at the Site, active groundwater extraction ceased.	A ROD amendment will be necessary to document this modification and any other changes that affect the selected remedy.	Water Board and EPA	9/2011	The ROD will be amended after the evaluation of alternative remedies to MNA is made.	N/A
Confirmation samples for vapor intrusion may be needed if land use changes.	Re-assess potential vapor intrusion if zoning changes	Water Board	On-going	Honeywell will evaluate the current and future potential for vapor intrusion. The work plan for conducting a VI assessment was submitted to the Agencies on 6/22/12.	6/22/2012
Covenant needs to be revised and recorded.	The covenants need to be recorded consistent with current California law.	Water Board and EPA	12/2009	None	N/A

Issues from previous FYR	Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Because asymptotic levels had been reached at the Site, active groundwater extraction ceased.	A ROD amendment will be necessary to document this modification and any other changes that affect the selected remedy.	Water Board and EPA	9/2011	The ROD will be amended after the evaluation of alternative remedies to MNA is made.	N/A

Recommendation 1

The ROD has not been amended. Currently pilot testing of an alternative remedy, EISB, is underway. The ROD will be amended after the evaluation of alternative remedies to GWET is made.

Recommendation 2

Based on indoor air testing results from nearby Superfund sites, the RWQCB and EPA recommended indoor air testing in the former Synertek building at 3050 Coronado Drive. A work plan was submitted on behalf of Honeywell to address the vapor intrusion potential in the building by collecting and analyzing indoor air and subslab samples. A pre-testing walk through of the building was conducted by representatives of Honeywell and RWQCB and EPA staff on April 24, 2012. A final report addressing the potential for vapor intrusion at the Synertek Site will be available by March 30, 2013.

Recommendation 3

The covenant has not been revised. There is a deed restriction on the property currently; however, the Agencies have determined it needs to be slightly revised to incorporate current California law references. The Regional Water Board and EPA expect to have an updated covenant recorded by March 30, 2013.

5.2. Work Completed at the Site During the Review Period

When the GWET system was shut down, it was recognized that it was no longer removing significant amounts of VOCs. Monitored natural attenuation was allowed at this site to see what effect this would have on the pollutant plume. The pollutant plume has stayed stable, and since shutdown of the treatment system, VOC levels have generally been stable or slowly decreasing.

In general, reduction in pollutant concentrations in the plume appears to be proceeding quite slowly. A pilot test of EISB was implemented at the site in the source area in December 2011 to see if this treatment method could be effective in reducing VOC levels further. The preliminary results show significant reductions in VOC concentrations in the source area.

Groundwater monitoring and remediation wells were installed in January 2011 by hollow-stem auger drilling with a 10-inch-diameter drill bit. Six new A-aquifer injection wells (IW-2 to IW-7), one new B-aquifer injection well (IW-1B), and one new A-aquifer monitoring well (MW-37A) were installed at the locations shown on Figure 1. The remediation wells were constructed with 4-inch-diameter, 0.020-inch continuous-wrapped polyvinyl chloride (PVC) screen, and the monitoring well was constructed with 4-inch-diameter, 0.010 slotted PVC screen.

The injection of substrates and other amendments at the Site occurred on May 16, 2011, through May 18, 2011. In the A-aquifer, amendments were injected into new injection wells (IW-2, IW-3, IW-4, IW-5, IW-6, and IW-7) and existing extraction well PW-1.

In the B-aquifer, amendments were injected into new injection well IW-1B and existing extraction well PW-3, while groundwater was extracted temporarily from MW-4B. A long-lasting carbohydrate product called 3DME was one of the substrates injected at the Site. An additional substrate, HRC PRIMER, which is a lactic-acid-based product that is designed to degrade quickly, was also injected at the Site. Approximately 90 pounds of 3DME and 17 pounds of HRC PRIMER were injected per injection location in the A-aquifer at concentrations of approximately 30 to 45 pounds of 3DME per 100 gallons and 5.75 to 8.5 pounds of HRC PRIMER per 100 gallons. Approximately 630 pounds of 3DME and 189 pounds of HRC PRIMER were injected per injection location in the B-aquifer at concentrations of approximately 30 pounds of 3DME per 100 gallons and 9 pounds of HRC PRIMER per 100 gallons.

6. Five-Year Review Process

6.1. Administrative Components

The RWQCB has been the lead agency for the Site. The RWQCB initiated the FYR in January 2012 and scheduled its completion for August 2012. The RWQCB effort was led by David Barr, Remedial Project Manager (RPM) for the Synertek Site. The EPA team for the site was led by Matt Salazar, Remedial Project Manager (RPM) and also included the EPA site attorney, Thanne Cox, and hydrogeologist Herb Levine. On January 30, 2012, the RWQCB and EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. A review schedule was established that consisted of the following:

- Community notification;
- Document review;
- Data collection and review;
- Site inspection; and
- Five-Year Review Report development and review.

6.2. Community Involvement

A public notice was placed in the *Santa Clara Weekly* on August 22, 2012, announcing that the Five-Year Review was being conducted, and to contact the Water Board or EPA if the public had any questions, concerns, or information to share about the remedy being conducted at the Site.

The Five-Year Review report will be made available to the public once it has been finalized. Copies of this document will be placed on the Regional Water Boards website at http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=SL721241222 and EPA's website at www.epa.gov/region9/Synertek. Upon completion of the FYR, a public notice will be placed in the *Santa Clara Weekly* to announce the availability of the final FYR report in the Site document repository.

6.3. Document Review

This FYR included a review of relevant, site-related documents including the ROD, remedial action reports, and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

ARARs Review

Section 121(d)(2)(A) of CERCLA specifies that Superfund remedial actions (RAs) must meet any federal standards, requirements, criteria, or limitations that are determined to be legally applicable or

relevant and appropriate requirements (ARARs). ARARs are those standards, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, RA, location, or other circumstance at a CERCLA site.

The regulations selected as ARARs and all cleanup goals listed in the ROD have remained unchanged from the date of the original ROD (June 1991). An evaluation of ARARs and a summary of chemical-specific ARAR changes are provided in Tables 5 and 6.

Table 5. Summary of Ground Water Chemical-Specific ARAR Changes

Contaminants of Concern	1991 ROD		Current Regulations		Standard Changed Since ROD?
	Ground water Clean-up Level (µg/L)	Basis for Clean-up Level	Federal MCL (µg/L)	State MCL (µg/L)	
acetone	350	Risk based	NA ¹	NA	No
benzene	1	CA MCL	5	1	No
Bis(2-ethylhexyl)phthalate [Di(2-ethylhexyl)phthalate]	4	CA MCL	6	4	No
1,1-Dichloroethane (1,1-DCA)	5	CA MCL	NA	5	No
1,1-Dichloroethene (1,1-DCE)	6	CA MCL	7	6	No
Cis-1,2-Dichloroethene (cis-1,2-DCE)	6	CA MCL	70	6	No
ethylbenzene	680	CA MCL	700	300	Yes
Freon 113	1,200	CA MCL	NA	1,200	No
styrene	5	EPA MCL (Proposed)	100	100	No
toluene	100	CA Action Level	1,000	150	No
1,1,1-Trichloroethane (1,1,1-TCA)	200	CA MCL	200	200	No
Trichloroethene (TCE)	5	CA MCL	5	5	No
vinyl chloride	0.5	CA MCL	2	0.5	No
xylenes	175	Risk based	10,000	1,750	No

1. NA - no level promulgated

Table 6. Applicable or Relevant and Appropriate Requirements Evaluation

Medium/Authority	ARAR	Requirement	Effect on Protectiveness
Contaminant-Specific ARAR	Citation		
Groundwater - Federal Drinking Water Standards	Federal SDWA ¹ Section 1412, 42 USC §300f-1 and 40 CFR Part 141.11-141.6 National Primary Drinking Water Regulations	Standards have been adopted as enforceable standards for public drinking water systems.	There have been no changes to the federal MCLs since the last FYR. Protectiveness is not affected.
Groundwater - State Drinking Water Standards	CA SDWA Health and Safety Code, Div 5, Part 1, Chapter 7, 4020 et seq., California Domestic Water Quality Monitoring Regulations, CAC Title 22, Division 4, Chapter 15, § 64401 et seq.	Establishes state MCL used to establish groundwater cleanup levels if more stringent than the federal MCL.	There have been changes to the state MCLs since the last FYR. Protectiveness is not affected
Action Specific ARAR	Citation		
Groundwater – Porter - Cologne Water Quality Control Act	California Water Code Division 7, Chapter 4, Article 4 §13263	Establishes authority for State and Regional Water Boards to determine site-specific discharge requirements.	The groundwater extraction and treatment system was shut off and has not been in operation since 2001.
Groundwater discharge - Federal Clean Water Act (CWA)	33 USC 1251 et seq. Section 402 NPDES and California Water Code Division 7, Chapter 3 Article 4, §13160	Establishes authority for State to be the water pollution control agency for all purposes stated in the CWA NPDES requirements (Section 402 of CWA).	The groundwater extraction and treatment system was shut off and has not been in operation since 2001.

Medium/Authority	ARAR	Requirement	Effect on Protectiveness
Treatment by carbon adsorption system	Solid Waste Hazardous Waste Control as amended by Resource Conservation and Recovery Act 42 USC §6901 and California Hazardous Waste Control Health and Safety Code Division 20, Chapter 6.5, Articles 2, 4, 4.5, 5, 6, 6.5, and 7.7	Remedial activities involving on-site management of hazardous wastes from spent carbon disposal, storage, and handling.	The groundwater extraction and treatment system was shut off and has not been in operation since 2001.
Underground Injection Control – Safe Drinking water Act	Safe Drinking Water Act 40CFR 144.13(4)(C)	Treatment requirements for water if it is re-injected into the groundwater	The groundwater extraction and treatment system was shut off and no injection is occurring

Risk Assessment Review

A public health assessment (PHA) for the Site was completed in 1992 by Agency for Toxic Substances and Disease Registry (ATSDR). 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 PHA evaluated the entire Site.

Under current-use conditions, the PHA ruled out the soil pathway: “Remediation has removed contaminated soils. No exposure pathways involving soil are identified.”

For the groundwater pathway: “Exposure to groundwater contaminants in the future will not occur if: 1) the groundwater extraction and treatment system reduces concentrations of contaminants to a point below levels of health concern, and 2) no future drinking water wells are placed in areas of known contamination until remediation has reduced contaminant concentrations to a point below levels of concern. The RWQCB's Final Remedial Action Plan for Synertek #1 contains a task that requires Honeywell to obtain a deed restriction prohibiting the use of A and B aquifer groundwater as a source of drinking water.”

For the air indoor air pathway, the PHA stated “The potential exists for organic contaminants transported via soil gas to accumulate within confined areas in Synertek Building #1, and possibly in other buildings overlying the plume. Although subsurface soil contamination appears to have been remediated, high levels of VOCs in the shallow aquifer have volatilized and will continue to volatilize and migrate to the surface. A soil gas survey conducted in an off-site industrial area in 1986 indicated that soil gases contained VOCs. No soil gas or air samples have been taken near the source or in Synertek Building#1.”

At the time the PHA for Synertek was written, Building #1 was vacant. The PHA concluded that “If the site of the former Synertek Building #1 is used in the future for commercial purposes, potential exists for inhalation of VOCs, especially in enclosed spaces.” The PHA recommended that institutional controls be implemented to prevent occupation of Synertek Building #1 unless monitoring shows that humans would not be exposed to VOCs at levels of public health concern. Currently the Synertek Building is used by a solar panel manufacturing company

Vapor Intrusion: EPA’s understanding of contaminant migration from soil gas and/or groundwater into buildings has evolved over the past few years, leading to the conclusion that vapor intrusion may have a greater potential for posing risk to human health than assumed when the ROD was prepared. In September 2002, EPA released an external review draft version of its vapor intrusion guidance titled “Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils” (EPA 2002).

The potential for vapor intrusion is evaluated following a “multiple lines of evidence” approach. TCE is a concern because of its volatile properties and the recent toxicological assessment by EPA.

- Concentrations of TCE in the groundwater make vapor intrusion a potential concern for building occupants of the former Synertek building.
- The depth to groundwater can be as low as ten feet. TCE vapors often follow preferential pathways.
- The former Synertek building lies above the highest concentrations of TCE contamination.
- Preferential pathways for subsurface to indoor air movement (e.g., subsurface fractures) and/or conduits for vapor migration into adjacent areas (e.g., utility lines, sumps) likely exist due to the age of the building

Toxicity values: Since the 1991 health evaluation, there have been a number of changes to the toxicity values for certain contaminants of concern at the Site. Revisions to the toxicity values for 1,1-DCE and vinyl chloride indicate a lower risk from exposure to these chemicals than previously considered.

Groundwater results are compared to U.S. EPA Regional Screening Levels (RSLs) as a first step in determining whether response actions may be needed to address potential human health exposures. The RSLs are chemical-specific concentrations that correspond to an excess cancer risk level of 1×10^{-6} (or a Hazard Quotient (HQ) of 1 for noncarcinogens) developed for standard exposure scenarios (e.g., residential and commercial/industrial). RSLs are not de facto cleanup standards for a Superfund site, but they do provide a good indication of whether actions may be needed. In September 2011, EPA completed a review of the TCE toxicity literature and posted on IRIS both cancer and non-cancer toxicity values which resulted in lower RSLs for TCE (see Table 7). The screening level for chronic exposure for cancer excess risk level of 1×10^{-6} is 0.44 $\mu\text{g/L}$. EPA uses an excess cancer risk range between 10^{-4} and 10^{-6} for assessing potential exposures, which means a TCE concentration between 0.44 and 44 $\mu\text{g/L}$. The current MCL for TCE of 5 $\mu\text{g/L}$ is within the revised protective carcinogenic risk range. EPA's 2011 Toxicological Review for TCE also developed safe levels that include at least a 10 fold margin of safety for health effects other than cancer. Any concentration below the non-cancer RSL indicates that no adverse non-cancer health effect from exposure is expected. Concentrations significantly above the RSL may indicate an increased potential of non-cancer effects. The non-cancer screening level for TCE is 2.6 $\mu\text{g/L}$. EPA considers the TCE MCL of 5 $\mu\text{g/L}$ protective for both cancer and non-cancer effects.

Table 7. Summary of Drinking Water RSLs for Contaminant of Concern

Contaminant of Concern	RSL for cancer excess risk level of 1×10^{-6} ($\mu\text{g/L}$)	RSL for non-cancer hazard ($\mu\text{g/L}$)
TCE	0.44	2.6

6.4. Data Review

This Five-Year Review consisted of a review of relevant documents including:

Public Health Assessment, ATSDR, April 29, 1992

Annual groundwater monitoring and progress reports (2007 – 2012)

Final Site Cleanup Requirements Order No. 91-051, March 20, 1991

EPA Record of Decision, June 28, 1991

Third Five-Year Review Report, September 28, 2007

Groundwater Remediation Work Plan, June 2010 (Appendix E, 2009 Ground Water Monitoring Report, June 2010)

Enhanced In Situ Bioremediation Implementation, January 18, 2012 (Appendix E of the 2011 Groundwater Monitoring and Progress Report)

Vapor Intrusion Assessment Work Plan, June 22, 2012

Applicable groundwater cleanup standards contained in the Final Site Cleanup Requirements (SCRs) (and mirrored in the ROD) were reviewed.

Ground Water

The Regional Water Board and EPA reviewed the historical groundwater monitoring data to evaluate the groundwater pollutant plume. Data were reviewed for the periods of GWET system operation, the MNA study, and the EISB pilot test begun in December 2011. Data collected from 2007 to 2012 were reviewed to evaluate the groundwater pollutant plume and how the plume has behaved under the no pumping conditions that have been in place since 2001. The GWET system that came online in 1987 and expanded with the addition of two off property extraction wells in 1989 was successful in removing VOC mass and significantly reducing concentrations of VOCs in A and B zone aquifers.

Groundwater monitoring data collected from 2007 to 2012 are summarized in Table 8 and were reviewed to evaluate progress in remediating the groundwater pollutant plume. TCE concentrations in monitoring wells on the Synertek property and in the off-property area have remained relatively stable or are declining and demonstrate that stability of the A- and B- Aquifer TCE plumes has been achieved.

A zone: Since groundwater monitoring began in the mid-1980s, maximum groundwater-TCE concentrations in the A aquifer of the former Synertek properties have declined from 800 µg/L to 120 µg/L (well MW12A). However, TCE concentrations in most of the A aquifer wells monitored have remained generally stable since shutdown of the GWET system. The maximum TCE concentrations in the A aquifer are adjacent to the Synertek building and have stayed stable in the range of 130 µg/l to 120 µg/l (MW 12A). The highest concentration in the off property portion of the plume is monitoring well PW 4 located south east of the intersection of Montgomery Drive and Scott Blvd. TCE levels in May 2012 were 18 µg/L; however, they have been as high as 62 µg/L during the five-year period.

Table 8. TCE Concentrations in Monitoring Wells

Well ID	Aquifer Zone	Date	TCE (µg/L)
MW-01A	A	6/25/2008	<0.1
MW-01A	A	6/3/2009	<0.1
MW-01A	A	6/22/2011	<0.1
MW-01A	A	5/15/2012	<0.5
MW-02A	A	12/2/2009	8.6
MW-03B1	B	6/27/2008	<0.1
MW-03B1	B	6/3/2009	<0.1
MW-03B1	B	6/22/2010	<0.1
MW-03B1	B	6/22/2011	<0.1
MW-03B1	B	5/16/2012	<0.5
MW-04B	B	6/25/2008	700
MW-04B	B	6/3/2009	440
MW-04B	B	6/22/2010	230
MW-04B	B	12/2/2010	180
MW-04B	B	6/23/2011	3.5
MW-04B	B	8/15/2011	7.8
MW-04B	B	11/4/2011	8.1
MW-04B	B	2/23/2012	36
MW-04B	B	5/16/2012	44
MW-07A	A	6/25/2008	99
MW-07A	A	6/3/2009	89
MW-07A	A	12/2/2009	95
MW-07A	A	6/22/2010	84
MW-07A	A	12/2/2010	63
MW-07A	A	6/23/2011	62
MW-07A	A	8/15/2011	0.8
MW-07A	A	11/4/2011	0.5
MW-07A	A	2/23/2012	2.4
MW-07A	A	5/16/2012	2.3
MW-08A	A	12/2/2009	2.2
MW-10B	B	6/25/2008	<0.1
MW-10B	B	6/2/2009	<0.1
MW-10B	B	6/22/2010	0.1 j

Well ID	Aquifer Zone	Date	TCE (µg/L)
MW-10B	B	6/24/2011	<0.1
MW-10B	B	5/14/2012	<0.5
MW-11A	A	5/15/2012	4.1
MW-12A	A	6/25/2008	120
MW-12A	A	6/3/2009	130
MW-12A	A	12/3/2009	120
MW-12A	A	6/22/2010	120
MW-12A	A	6/23/2011	120
MW-12A	A	5/15/2012	120
MW-12B	B	11/8/2007	<0.31
MW-12B	B	6/25/2008	<0.1
MW-12B	B	11/20/2008	<0.1
MW-12B	B	6/3/2009	<0.1
MW-12B	B	12/3/2009	<0.1
MW-12B	B	6/22/2010	<0.1
MW-12B	B	12/1/2010	<0.1
MW-12B	B	6/23/2011	<0.1
MW-12B	B	11/3/2011	<0.1
MW-12B	B	5/15/2012	<0.5
MW-15A	A	5/15/2012	<0.5
MW-17A	A	12/3/2009	7
MW-17A	A	5/16/2012	11
MW-18A	A	5/16/2012	0.9
MW-19A	A	12/3/2009	10
MW-19A	A	12/3/2009	10
MW-19A	A	5/16/2012	16
MW-20B	B	6/27/2008	<0.1
MW-20B	B	6/3/2009	<0.1
MW-20B	B	6/22/2010	<0.1
MW-20B	B	6/23/2011	<0.1
MW-20B	B	5/15/2012	<0.5
MW-21A	A	12/2/2009	<0.1
MW-25A	A	6/27/2008	<0.1
MW-25A	A	6/2/2009	<0.1

Well ID	Aquifer Zone	Date	TCE (µg/L)
MW-25A	A	6/21/2010	<0.1
MW-25A	A	6/22/2011	<0.1
MW-25A	A	5/16/2012	<0.5
MW-25B	B	6/27/2008	<0.1
MW-25B	B	6/3/2009	<0.1
MW-25B	B	6/21/2010	<0.1
MW-25B	B	6/22/2011	<0.1
MW-25B	B	5/16/2012	<0.5
MW-29A	A	11/8/2007	<0.31
MW-29A	A	6/27/2008	<0.1
MW-29A	A	11/20/2008	<0.1
MW-29A	A	6/2/2009	<0.1
MW-29A	A	12/2/2009	<0.1
MW-29A	A	6/21/2010	0.5
MW-29A	A	12/1/2010	<0.1
MW-29A	A	6/22/2011	0.2 j
MW-29A	A	11/3/2011	<0.1
MW-29A	A	5/17/2012	1.9
MW-30A	A	6/27/2008	<0.1
MW-30A	A	6/2/2009	<0.1
MW-30A	A	6/21/2010	0.4 j
MW-30A	A	6/23/2011	0.2 j
MW-30A	A	5/17/2012	<0.5
MW-33A	A	11/8/2007	0.51 j
MW-33A	A	6/27/2008	<0.1
MW-33A	A	11/20/2008	0.8
MW-33A	A	6/2/2009	<0.1
MW-33A	A	12/2/2009	0.5
MW-33A	A	6/21/2010	0.6
MW-33A	A	12/1/2010	0.5 j
MW-33A	A	6/23/2011	0.4 j
MW-33A	A	11/3/2011	0.5 j
MW-33A	A	5/17/2012	0.4 j
MW-34A	A	6/27/2008	<0.1
MW-34A	A	6/2/2009	<0.1

Well ID	Aquifer Zone	Date	TCE (µg/L)
MW-34A	A	6/21/2010	<0.1
MW-34A	A	6/22/2011	<0.1
MW-34A	A	5/17/2012	<0.5
MW-37A	A	3/24/2011	98
MW-37A	A	6/23/2011	2.1
MW-37A	A	8/15/2011	0.5 j
MW-37A	A	11/4/2011	0.3 j
MW-37A	A	2/23/2012	0.5 j
MW-37A	A	5/16/2012	0.3 j
PW-11	A	12/3/2009	2.2
PW-12	A	6/24/2011	0.5 j
PW-12	A	12/2/2010	1.7
PW-13	A	11/4/2011	<0.1
PW-13	A	8/15/2011	0.1 j
PW-3	B	6/25/2008	<0.1
PW-3	B	6/2/2009	<0.1
PW-3	B	6/22/2010	1.2
PW-3	B	12/2/2010	0.9
PW-3	B	6/24/2011	44
PW-3	B	8/15/2011	57
PW-3	B	11/4/2011	<0.1
PW-3	B	5/15/2012	0.5
PW-4	A	11/8/2007	38
PW-4	A	6/27/2008	23
PW-4	A	11/20/2008	55
PW-4	A	6/2/2009	24
PW-4	A	12/2/2009	62
PW-4	A	6/21/2010	21
PW-4	A	12/1/2010	58
PW-4	A	6/22/2011	17
PW-4	A	11/3/2011	32
PW-4	A	5/17/2012	18

Notes:

j = estimated concentration

µg/L = micrograms per liter

<1 = not detected above listed reporting limit

There has been a slight increase in 1,1-DCE in monitoring well MW29 at the down gradient edge of the plume. The plume extent does not extend to MW-34A and 33A, which have historically always been non-detect for TCE; however, well MW-29A had a TCE concentration of 1.9 µg/L in 2012 after being below 1 µg/L for the rest of the FYR monitoring period, and a 1,1-DCE concentration of 9.8 µg/L in 2012, which shows a slow rise from 4.2 µg/L in 2007. Monitoring wells MW-36A, MW-35A, and PW -5 have not been sampling since 2000. The groundwater monitoring program should be expanded to determine the cause of this slight increase.

B-Zone: B-zone contamination has not migrated down gradient to the extent that A-zone contamination has. At the start of groundwater remediation, B-zone contamination was mainly in the source area centered in the area of wells MW-4B and PW-3, with much lower contaminant levels in down gradient well MW-12B and a couple of detections in further down gradient well MW-25B. Wells MW-4B and PW-3 had high concentrations of TCE (up to 33,000 µg/L) when groundwater remediation started. Concentrations in these wells had declined about 99 percent to about 95 µg/L when GWET ceased. Since shutdown of GWET, the B-zone source area wells have remained stable overall, but concentrations have fluctuated considerably. The maximum TCE concentration within the B zone in 2012 was 44 µg/L in monitoring well MW 04B, but the levels have varied from 700 µg/L to 3.5 µg/L during the five year period. There does not appear to be a seasonal pattern to the fluctuation in concentrations. The appearance of elevated concentrations appears to trend with periods when the hydrostatic heads in the A and B zones are similar. Based on groundwater monitoring results from prior and current five-year reviews, the B1 Zone is not impacted. The B-zone plume is stable and not migrating.

By the late 1990's, the amount of VOC mass being removed had declined considerably, and VOC concentrations in groundwater seemed to be stabilizing. This phenomenon of an initial significant reduction in VOC concentrations followed by a leveling off of the reduction in VOC concentrations has been found to occur at many other sites in the area and around the country. In 2001, the Regional Board approved a request by the Potentially Responsible Party to leave the GWET system shut down to see whether the pollutant plume would remain stable and if monitored natural attenuation could be an effective method of remediation. The GWET system has remained shut down since then, and the site has been monitored to ensure the plume is contained and to determine the effectiveness of natural attenuation. Based on this trend, MNA will likely 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 former system needs to be evaluated to ensure that the long-term remedial objectives are achieved.

Additional Groundwater Remediation

Monitored Natural Attenuation: The RWQCB has been assessing the effectiveness of MNA at Synertek Site since the GWET was discontinued in 2001.

First, it has been observed that the daughter products of the primary pollutants present in groundwater at the site are present. TCE, 1,1,1-TCA, and Freon 113 are considered parent compounds released at the site. Cis-1,2-DCE and vinyl chloride are sequential breakdown products of TCE. 1,1-DCE and 1,1-DCA are breakdown products of 1,1,1-TCA. Vinyl chloride is a breakdown

product of the DCE isomers. The presence of breakdown products indicates that some biodegradation of the VOCs is occurring under natural conditions in the plume. The rate of this breakdown is slow. It was expected that the plume concentrations would slowly decrease through the processes of natural attenuation. This has proven to be a slow process, and VOC concentrations in most of the wells sampled have been generally stable.

Biodegradation parameters, such as dissolved oxygen, oxygen reduction potential and pH, have been monitored at the site since the GWET system was shut down in 2001. The biodegradation parameters did not significantly increase or decrease during this time. Based on the results of the monitoring program, the primary natural attenuation processes are believed to be adsorption, dilution, and dispersion, with conditions conducive to intrinsic biodegradation of VOCs present in some areas of the site. Conditions have not changed during the last five years except in the EISB pilot test area discussed below.

EISB Pilot Test: A pilot test of EISB was begun in 2011 in the contaminant source area. The objective is to reduce the residual mass of VOCs in the source area and thereby decrease the amount of time it will take for VOC concentrations to attenuate below the cleanup standards throughout the plume. Seven four-inch diameter injection wells were installed in the contaminant source area and in May 2011, two substrates, 3DME and HRC Primer, were mixed with water and injected into the subsurface in the target area. Six of the wells were designed to deliver substrate to the A zone and one well to deliver substrate to the B zone. In addition, a new A zone monitoring well (MW-37A) was installed in the injection area. Three groundwater monitoring wells were then monitored quarterly to determine the effect the injections were having on VOC concentrations. Monitoring data show that TCE concentrations decreased for wells MW-7A (from 84 µg/L in 2010 to 2.3 µg/L in 2012) and MW-37A (from 98 µg/L in 2010 to 0.3 µg/L in 2012). However, further monitoring needs to be done to ensure there is not rebound of TCE concentrations.

The monitoring results show that TCE is being sequentially dechlorinated as expected. TCE concentrations have gone down, while cis-1,2-DCE concentrations have risen and then declined followed by a rise in vinyl chloride concentrations. This process is still underway. The increase in vinyl chloride will need to be monitored closely to ensure that the breakdown process is not stalling at vinyl chloride. An additional injection or injections may be necessary.

Soil Gas/Indoor Air

On June 22, 2012, Honeywell submitted a Vapor Intrusion Pathway Work Plan. The Regional Water Board and the EPA have reviewed and commented on the Work Plan. By the Spring 2013, Honeywell is expected to collect, analyze and report indoor air and sub-slab samples to ensure the building occupants are protected from potential vapors migrating from the contaminated groundwater.

6.5. Site Inspection

Site Inspection

A site inspection was conducted on April 24, 2012 by Regional Board and EPA staff, and staff of CH2M-HILL, the consultant for Honeywell. The purpose of the inspection was to assess the conditions of the site and to select locations for sub-slab vapor and indoor air sampling in the Site building. 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 levels are achieved. No activities were observed that would have violated the institutional controls. The site consists of single story office buildings, parking lots, and landscaping.

6.6. Interviews

There were no interviews conducted during this FYR.

6.7. Institutional Controls

The Regional Board Order 91-051 requires the owners of the source property at 3050 Coronado Drive in Santa Clara, California to implement a deed restriction prohibiting the use of A and B zone groundwater as a source of drinking water and for controlling onsite activities that could endanger public health or the environment due to exposure to VOCs.

- The deed restriction for the source property was signed and implemented by the Regional Water Board in December 1991; however, the Agencies have determined it needs to be slightly revised to incorporate current California law references.
- The Regional Water Board and EPA expect to have an updated covenant recorded by March 30, 2013.

The following table lists the ICs associated with the 3050 Coronado Drive property at the Site.

Table 9. Institutional Controls Summary Table

Media	ICs Called for in the Decision Documents	IC Objective	Instrument in Place	Notes
Ground Water	Yes	Restrict installation of ground water wells, ground water use, and onsite activities that could endanger public health	Deed restriction	Will be updated by 3/30/13
Sediment	No	No IC necessary as only ground water was found at unacceptable risk levels in the 1991 ROD	None	None
Surface Water	No	No IC necessary as only ground water was found at unacceptable risk levels in the 1991 ROD	None	None
Soil	No	No IC necessary as only ground water was found at unacceptable risk levels in the 1991 ROD	None	None

7. Technical Assessment

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

No. The 1991 decision documents intended that GWET would be capable of reducing pollutant concentrations throughout the plume to the cleanup levels in 25 years. As discussed previously, the GWET system was shut down at this site in 2001. The reason for the shutdown is because the efficiency of VOC removal through groundwater extraction had declined considerably and pollutant concentrations had apparently reached asymptotic concentrations. The Regional Board approved a request by Honeywell Corporation to shut down the GWET system and begin a groundwater monitoring program to determine if natural attenuation could successfully contain and remediate the contaminated groundwater plume.

Downgradient A-zone monitoring wells past the downgradient boundary of the pollutant plume have remained at non-detect or below the cleanup level. Down gradient B-zone monitoring wells have remained at non-detect. There has been a slight increase in 1,1-DCE in monitoring well MW29 at the down gradient edge of the plume. The B-zone plume has not migrated vertically. Contamination remains confined to the two shallowest groundwater bearing zones (A zone and B zone). TCE concentrations have overall been stable or slowly declining since the GWET system was shut down, with some fluctuations up and down in various areas of the plume.

The groundwater monitoring program in the A zone should be expanded to determine the cause of the slight 1,1-DCE increase. The existing monitoring well network provides sufficient data to assess the progress of natural attenuation in the B zone. The current groundwater monitoring program is sufficient to track the B zone plume and detect any migration beyond the current plume boundaries, as well as track the effectiveness of monitored natural attenuation in remediating the VOC plume. In 2011, Honeywell began a pilot test of EISB in the source area to see if pollutant concentrations and residual mass can be further reduced. With less residual mass of VOCs in the source area, the less mass is available to diffuse downgradient along the plume and the less time it will take for VOC concentrations to attenuate below the cleanup standards throughout the plume. In-situ groundwater treatment through injection of compounds enhances biological activity and speeds the breakdown of TCE or directly breakdown TCE.

The institutional controls in place include prohibitions on the drilling of groundwater wells until cleanup levels are achieved. The deed restriction does not comply with current California requirements for institutional controls. No activities were observed that would have violated the institutional controls

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

There have been no changes to the physical conditions of the site that would affect the protectiveness of the remedy. The current tenant uses the site for office space and research and development of solar technology.

There have been no changes to applicable or relevant and appropriate requirements (ARARs) for the site, and there are no new standards that would affect the protectiveness of the remedy.

The exposure assumptions used to develop the Human Health Risk Assessment were for potential future exposure if untreated groundwater were to be used for drinking water and if residential uses were to occur on the site. If the site is to be redeveloped into residential use, a comprehensive risk assessment will need to be conducted in order to assess the potential vapor intrusion pathway. The changes to the toxicity factors that were used in the baseline risk assessment for the contaminants of concern do not affect protectiveness. Institutional controls prohibit the use of groundwater; however, the deed restriction does not comply with current California requirements. The land use of the site is commercial/industrial. Vapor intrusion is currently being assessed.

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

No new information has been identified that could affect the protectiveness of the remedy other than the potential for vapor intrusion. However, as discussed above, vapor intrusion will be evaluated after sub-slab soil gas and indoor air samples are collected and analyzed.

7.4. Technical Assessment Summary

The remedy has not been operated since 2001. There are indications that the remedy may not achieve restoration of groundwater to its beneficial use as a potential drinking water supply source in a reasonable timeframe. A pilot EISB program has been implemented. There have no been changes in the physical condition or land use at the Site that would affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy, other than potential vapor intrusion, discussed above.

8. Issues

Table 10 summarizes the current issues for the Synertek Site.

Table 10. Current Issues for the Synertek Site

Issue	Affects Current Protectiveness (Yes or No)	Affects Future Protectiveness (Yes or No)
The potential for indoor air vapor intrusion in the former Synertek building should be evaluated.	Yes	Yes
The SCR and ROD specify the final remedial action plan for the site to be a GWET system, which has not operated since 2001.	No	Yes
The existing restrictive covenant is not consistent with current state law (California Civil Code section 1471) which establishes the framework for environmental covenants in California.	No	Yes

9. Recommendations and Follow-up Actions

Table 11 provides recommendations to address the current issues at the Synertek Site.

Table 11. Recommendations to Address Current Issues at the Synertek Site

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Yes or No)	
					Current	Future
The potential for indoor air vapor intrusion in the former Synertek building should be evaluated.	Conduct indoor air and sub-slab testing to determine if there is current or potential future exposure of building occupants to site contaminants through vapor intrusion.	PRP	EPA/ Regional Water Board	03/2013	Yes	Yes
The SCR and ROD specify the final remedial action plan for the site to be a GWET system, which has not operated since 2001.	Currently pilot testing of an alternative remedy, EISB, is underway. The ROD will be amended after the evaluation of alternative remedies to GWET is completed.	PRP	EPA/ Regional Water Board	12/2014	No	Yes
The existing restrictive covenant is not consistent with current state law (California Civil Code section 1471) which establishes the framework for environmental covenants in California.	A restrictive covenant should be recorded for the Site that is consistent with current California law.	EPA/ Regional Water Board		3/2013	No	Yes
There has been a slight increase in 1,1-DCE in monitoring well MW29	The groundwater monitoring program should be expanded to determine the cause of this slight increase.	PRP	EPA/ Regional Water Board	10/2013	No	Yes

10. Protectiveness Statements

A protectiveness determination of the remedy at the Synertek Site cannot be made until after a vapor intrusion assessment is completed in the former Synertek building. 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. The Five-Year Review addendum, which will include the protectiveness determination, will be completed by June 30, 2013.

11. Next Review

This is a policy Five-Year Review that requires ongoing FYRs as long as waste is left on site that does not allow for unrestricted use and unlimited exposure. The next FYR will be due within five years of the signature date of this FYR.

Figure 1. Estimated TCE Contour Map A Zone, 2007 and 2011

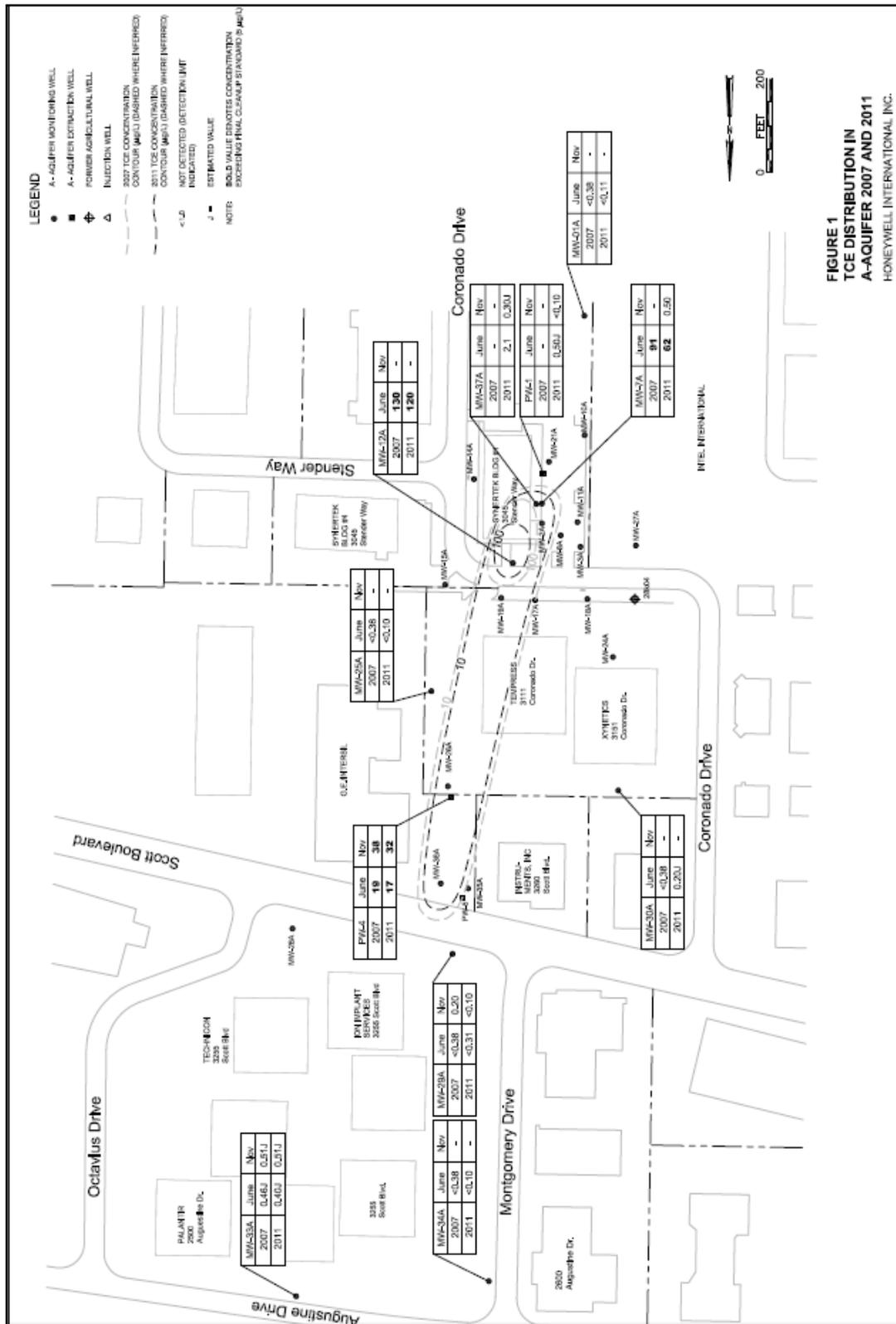
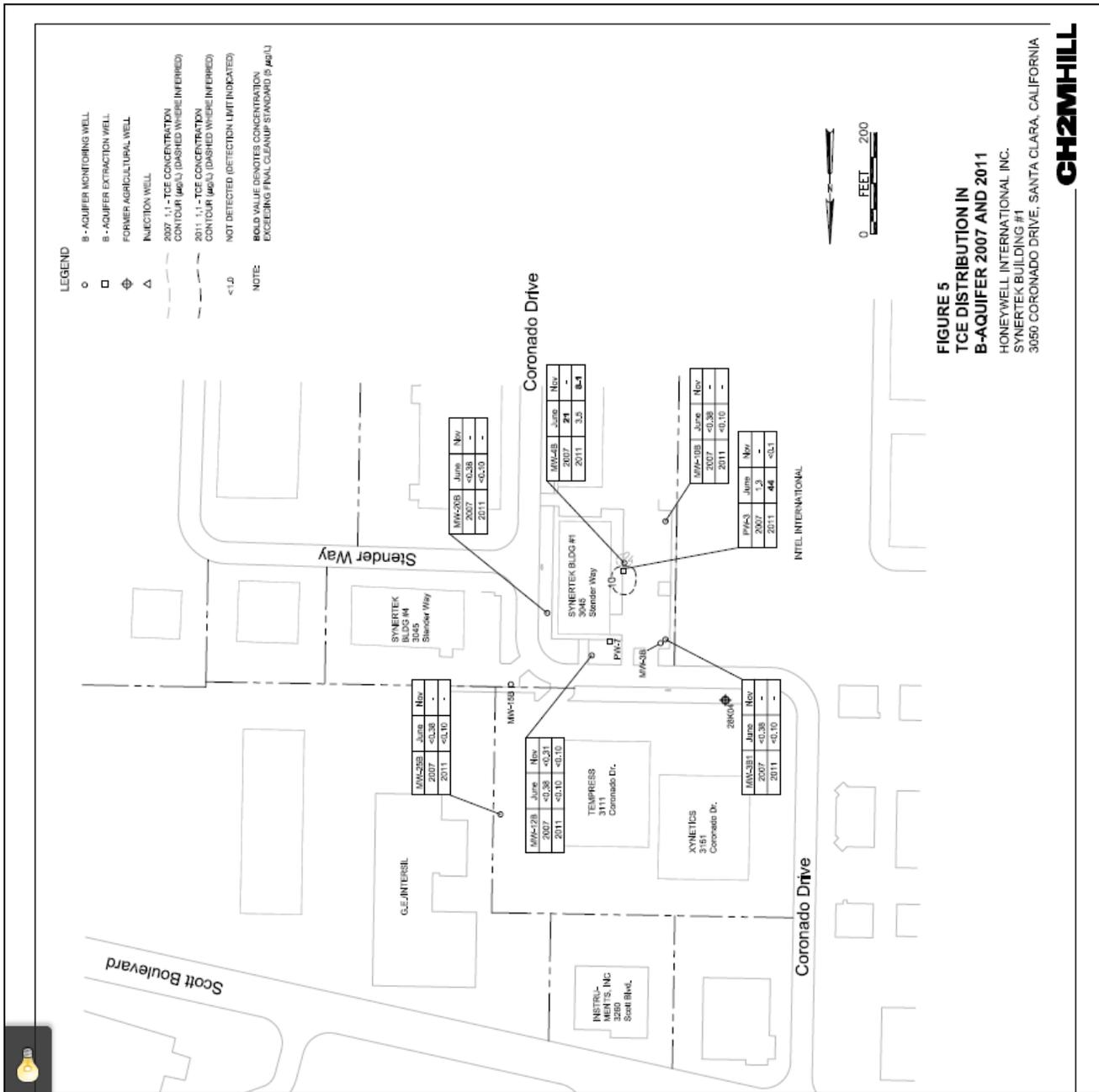


Figure 2. Estimated TCE Contour Map B Zone, 2007 and 2011



Appendix A: List of Documents Reviewed

Public Health Assessment, Synertek (Building 1), ATSDR, April 29, 1992

Annual groundwater monitoring and progress reports (2007 – 2012)

Final Site Cleanup Requirements Order No. 91-051, March 20, 1991

EPA Record of Decision, Synertek, Inc. (Building 1), June 28, 1991

Third Five-Year Review Report, Synertek Building 1 Site, California Regional Water Quality Control Board – San Francisco Region, September 28, 2007

Groundwater Remediation Work Plan, June 2010 (Appendix E, 2009 Ground Water Monitoring Report, June 2010)

Enhanced In Situ Bioremediation Implementation, January 18, 2012 (Appendix E of the 2011 Groundwater Monitoring and Progress Report)

Vapor Intrusion Assessment Work Plan, June 22, 2012

Covenant to Restrict Use of Property at 3050 Coronado Drive, Santa Clara, California, December 30, 1991

Appendix B: Public Notices

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Public Notices

Public notice that appeared in the Santa Clara Weekly

14 August 22, 2012 - August 28, 2012

Notices

CITY OF SANTA CLARA
NOTICE OF CANDIDATE ACCEPTANCE OF
VOLUNTARY CAMPAIGN EXPENDITURE LIMIT

NOTICE IS HEREBY GIVEN that the following candidates have accepted the City of Santa Clara's voluntary expenditure limit of \$36,800 for the General Municipal Election to be held in the City of Santa Clara on Tuesday, the 6th day of November, 2012.

For City Council Seat 3:
Debi Davis
Mohammed Nadeem

For City Council Seat 4:
Alma Jimenez
Jerry Marsalli

For City Council Seat 6:
Lisa M. Gillmor

For City Council Seat 7:
Bill Collins
John Minarik
Teresa O'Neill

For Chief of Police:
Michael J. Sellers

For City Clerk:
Rod Diridon, Jr.

Date:
Rod Diridon, Jr.,
City Clerk, City of Santa Clara,
City Elections Official
Pub.: 8/22/2012

NOMINEES FOR PUBLIC OFFICE

NOTICE IS HEREBY GIVEN that the following persons have been nominated for the offices designated to be filled at the General Municipal Election to be held in the City of Santa Clara on Tuesday, the 6th day of November, 2012.

For City Council Seat 3:
Debi Davis
Mohammed Nadeem

For City Council Seat 4:
Alma Jimenez
Jerry Marsalli

For City Council Seat 6:
Lisa M. Gillmor

For City Council Seat 7:
Bill Collins
John Minarik
Teresa O'Neill

For Chief of Police:
Michael J. Sellers

PUBLIC NOTICE
REGIONAL WATER BOARD BEGINS FOURTH FIVE-YEAR REVIEW OF
CLEANUP AT THE SYNERTEK BUILDING ONE SUPERFUND SITE,
3050 Cortado Drive
Santa Clara, Santa Clara County

The California Regional Water Quality Control Board, San Francisco Bay Region (Regional Water Board) and the U.S. Environmental Protection Agency have begun the fourth five-year review of cleanup actions undertaken at the Synertek Building One Site (Site) in Santa Clara. The review will evaluate whether the cleanup actions for the Site remain protective of human health and the environment.

FIVE-YEAR REVIEW PROCESS

When the cleanup remedies leave some waste in place or the remedy will take longer than five years to complete, the Superfund law requires an evaluation of the protectiveness of remedial systems every five years, until the Site has been cleaned up sufficiently to allow unrestricted access. The purpose of the five-year review is to understand how the constructed remedy is operating and to measure the progress towards achieving the Site's cleanup standards.

The Regional Water Board will look at the movement and/or breakdown of the Site's remaining contaminants, the progress of monitored natural attenuation since shut down of the groundwater extraction system, the effectiveness of the pilot test of enhanced in-situ bioremediation, the application and monitoring of the deed restriction, and changes in scientific knowledge about site contaminants and exposure pathways. The Regional Water Board project manager will talk with company representatives, other regulatory authorities, and interested members of the public. The review will be completed by September 30, 2012.

CLEANUP PLAN

To achieve Site cleanup, Honeywell, the responsible party because they acquired Synertek and are the successor in interest to Synertek, was required to implement the following remedies:

- 1) Groundwater extraction and treatment
- 2) Discharge of treated water under NPDES permit
- 3) Deed restriction prohibiting the use of shallow groundwater for drinking water
- 4) Long-term groundwater monitoring

COMMUNITY INVOLVEMENT

The Regional Water Board is always interested in hearing from the public. If you have any issues or concerns about the Synertek cleanup plan, the Regional Water Board would like to talk with you. Please contact the project manager at the number below. Also contact the project manager if you would like to be included on our mailing list and receive future fact sheets.

FOR MORE INFORMATION

You may review the file for the Synertek Site at the Regional Water Board offices at 1515 Clay Street, Suite 1400, Oakland, CA 94612 - phone (510) 622-2430. Some site documents are available on the Regional Water Board's website at: <https://geotracker.waterboards.ca.gov>. Enter the unique Case/Global ID number for this Site property, which is 4350124. Then click on "Report" and then on "Site Maps / Documents." The Five Year Review Report will be available on the Regional Water Board's website when it is completed.

CONTACT INFORMATION

For additional information: contact Regional Water Board project manager David Barr at (510) 622-2313, or dbarr@waterboards.ca.gov.
Pub.: 8/22/2012

(see next page for clean copy of text)

Text of the public notice:

**PUBLIC NOTICE
REGIONAL WATER BOARD BEGINS FOURTH FIVE-YEAR REVIEW OF CLEANUP
AT THE
SYNERTEK BUILDING ONE SUPERFUND SITE
3050 Coronado Drive
Santa Clara, Santa Clara County**

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