UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

MEMORANDUM

SUBJECT: Five-Year Review for the Fairchild Semiconductor Superfund Site, San Jose, CA

FROM: Tom Kremer, Superfund Policy Advisor
Site Cleanup Branch

TA Kremer 7/13/99

THRU: John Kemmerer, Chief
Site Cleanup Branch

TO: Keith Takata, Director
Superfund Division

I. INTRODUCTION

Attached, please find a copy of the second Fairchild Five-Year Review prepared by the California Regional Water Quality Control Board, San Francisco Bay Region. EPA has reviewed their Five-Year Review and adopts their recommendations as written. The Board's Five-Year Review is summarized below.

Because contaminant levels will allow for unlimited use and unrestricted exposure upon achieving ROD cleanup goals, this Five-Year Review is not required by CERCLA (Section 121©) or by Section 300.430(f)(4)(ii) of the NCP. However, because cleanup will take five years or more to attain, this Five-Year Review must be conducted as a matter of Agency policy (OSWER Directive 9355.7-02, "Structure and Components of Five-Year Reviews", 5/31/91. This review (Type 1) is applicable to a site at which construction is complete (OSWER Directive 9355.7-02A, "Supplemental Five-Year Review Guidance", 7/26/94.

II. FIVE-YEAR REVIEW SUMMARY

The Fairchild Semiconductor site is located at 101 Bernal Road in San Jose. In 1981, Fairchild discovered that an underground waste solvent storage tank had failed and released chlorinated and non-chlorinated solvents. VOCs from this release were found in a downgradient municipal water supply well, which was shut down and subsequently destroyed. Subsequent investigations indicated contamination by solvents, primarily TCA and 1,1-DCE, of three shallow water bearing zones (A, B, C zones) and extending about one mile northwest of the source in the B zone. EPA proposed listing the site on the National Priority List in 1984 and finalized the listing in 1989.

Prior to the Board's Site Cleanup Requirements (SCR) and EPA's ROD, Fairchild took a number of interim remedial actions, including removal of the failed tank, excavation and removal of 3400 cubic yards of contaminated soil, construction of a slurry wall to contain contamination

near the source area, and the initiation of groundwater extraction and treatment. The 1989 SCR and ROD set groundwater cleanup standards for the site, required operation of a soil vapor extraction system in dewatered soils and required Fairchild to record a deed restriction to prohibit the use of on-site groundwater for drinking water supply and to prohibit activities which could adversely affect the slurry wall.

Fairchild has implemented the remedial actions, operating on- and off- site groundwater extraction and treatment and on-site soil vapor extraction systems. SVE systems reached asymptotic levels and closure was approved by the Board in 1995. Groundwater systems have been effective in reducing the extent and concentration of contamination. Institutional controls are in place. No exposure to contaminated groundwater is occurring or expected. Full achievement of cleanup standards remains years away.

With the Board's approval, off-site groundwater extraction was curtailed in 1994 and on-site extraction in 1998. Extraction will be resumed if monitoring shows migration occurring. Monitoring of off-site groundwater has shown contaminant levels meeting drinking water standards but exceeding the cleanup standard (hazard index max of 0.5 vs 0.25 standard), with no indication of migration. Fairchild has predicted that on-site VOCs will not migrate across the slurry wall, and have applied for a "containment zone" under provisions of State regulations. Board action on that application is expected prior to-the next Five-Year Review. Board approval would not automatically lead to EPA approval of a ROD amendment. EPA would need to consider its authorities under CERCLA and the National Contingency Plan.

III CONCLUSION

I certify that the remedy selected for this site remains protective of human health and the environment. Based on the expected continuing presence of contamination at this site at levels which preclude unlimited use and unrestricted exposure, the next Five-Year Review will be written within five years from the signature date of this review.

Approved by: _____ **Date:** 7/14/99
Keith Takata, Director
Superfund Division

Attachment: California Regional Water Quality control Board 5-Year Review for Fairchild Semiconductor

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

Five-Year Review (Type I)

Fairchild Semiconductor
101 Bernal Road
San Jose, California

I. Introduction

Authority Statement and Purpose. The California Regional Water Quality Control Board, San Francisco Bay Region (Board) conducted this review pursuant to the Multi-Site Cooperative Agreement (MSCA) between EPA Region IX and the Board, CERCLA section 121(c), NCP section 300.400(f)(4)(ii), and OSWER Directives 9355.7-02 (May 23, 1991) and 9355.7-02 (July 26, 1994). It is a policy review. The purpose of a five-year review is to ensure that a remedial action remains protective of public health and the environment and is functioning as designed. This document will become a part of the Site File. This review (Type I) is applicable to a site at which response is ongoing.

Site Characteristics. The former Fairchild site is located at 101 Bernal Road in south San Jose. Fairchild operated a semiconductor fabrication plant at the 24-acre site from 1977 to 1983. In late 1981, Fairchild discovered that an underground waste solvent tank had failed, releasing a mixture of chlorinated and non-chlorinated solvents. A municipal water supplier, Great Oaks Water Company, found VOCs from this release in a down-gradient municipal well, which was immediately shut down and later destroyed. Fairchild's subsequent investigation found significant soil and groundwater pollution by TCA, 1,1-DCE, and other chlorinated solvents, as well as non-chlorinated solvents such as acetone. Dense non-aqueous phase liquid (DNAPL) is probably present in soil and groundwater on-site. Groundwater pollutants impacted three shallow water-bearing zones (A, B, and C zones) and extended about one mile northwest of the site in the B-zone. Off-site groundwater pollution is limited to TCA and 1,1-DCE.

The Fairchild site is located in a recharge zone where pollutants can migrate to deeper groundwater below regional aquitards. It is also near a number of municipal and agricultural supply wells.

USEPA proposed listing the site as a Superfund site on the National Priority List in 1984 and formally designated it as a Superfund site in 1989.

Fairchild undertook a number of interim remedial actions prior to Board and USEPA approval of

remedial action objectives and a remedial action plan. It removed the failed tank in 1982, excavated about 3,400 cubic yards of soil near the tank, and started groundwater extraction to control VOC migration. Groundwater extraction rates increased rapidly, peaking in 1984 at 3,300 million gallons per year. Fairchild identified and closed all supply wells in the area impacted by its groundwater pollution. In 1986, Fairchild constructed a slurry wall around the site to further contain VOC "hot spots". The slurry wall extended through the first two water-bearing zones (A and B zone). Groundwater extraction and treatment continued, both inside and down-gradient of the slurry wall.

II. Discussion of Remedial Objectives

Remedial objectives were established in the Board's 1989 site cleanup requirements (SCR), Order No. 89-016, adopted on January 18, 1989, and amended on May 16, 1990. EPA Region IX concurred with the SCR in a February, 1989, record of decision (ROD). The SCR set several groundwater remediation standards:

Groundwater zone	Remediation standard
On-site aquifers	Chemical-specific drinking water standards
Off-site aquifers	0.25 hazard index

The hazard index is calculated by summing the hazard associated with each constituent of concern; chemical-specific hazards are computed by dividing the measured concentration by the "safe" concentration (often a drinking water standard).

The Board's 1989 SCR approved Fairchild's remedial action plan, which proposed continued groundwater extraction and treatment, both onsite and off-site. The SCR did not set a soil cleanup goal but required Fairchild to operate a soil vapor extraction (SVE) system in temporarily-dewatered soils in and above the B-zone. The SCR also required Fairchild to record a deed restriction for the site, to prohibit use of on-site groundwater for drinking water supply and to prohibit activities which could undermine the slurry wall's integrity. The SCR also required Fairchild to maximize its reuse of extracted, treated groundwater, in order to conserve water and to maintain groundwater elevations necessary for effective remediation.

III. ARARs Review

There have been no changes in drinking water standards or hazard-index denominators for any of the constituents of concern since the last five-year review was prepared in 1993.

Between 1988 and 1993 there were several changes in drinking water standards and hazard-index denominators for constituents of concern, none of which had significance for the scope or duration of remedial actions. Drinking water standards did not change for the two key constituents: TCA and 1,1-DCE.

IV. Prior Five-Year Reviews

Fairchild submitted its first five-year review in 1994, for the period 1989-93, as required by the Board's 1989 SCR. The report documented implementation of remedial actions proposed in the RAP and approved in the 1989 SCR: recording in 1989 of a deed restriction, implementation of the on-site dewatering/SVE project, continuation of on-site and off-site groundwater extraction and treatment, and some reuse of treated groundwater for nearby agriculture. Significant pollutant mass was removed from both soil and groundwater. Source-area pollutant concentrations declined substantially in groundwater, and the remedial actions were successful in preventing any further migration of pollutants in groundwater. Fairchild was able to end C-zone extraction after meeting off-site groundwater standards in this zone. Fairchild temporarily suspended off-site B-zone groundwater extraction in 1991, based on modeling that predicted no change in cleanup time with the pumps off. Board staff extended the temporary suspension in 1994 after subsequent monitoring confirmed the model's predictions and showed no significant plume migration. Board staff and USEPA agreed that the remedy was protective of human health and the environment.

V. Effectiveness Evaluation

General. Fairchild submitted its second five-year review in February 1999, for the period 1994-98. Fairchild's remedial actions continue to be effective in reducing groundwater pollutant concentrations and preventing groundwater plume migration. The remedy remains protective of human health and the environment. No existing receptors are exposed to excessive risk attributable to constituents released at the former Fairchild site. No domestic wells are in operation in or near areas exceeding groundwater remediation standards. Site redevelopment for commercial use is in progress; additional risk assessment by Fairchild demonstrates that the remedy is protective of this new land use. At the same time, VOC concentrations in groundwater are declining slowly and are not expected to reach remediation standards for many years, particularly in the on-site area.

Remedial Actions. Soil remediation activities, including dewatering/SVE operations, were completed prior to this five-year review period. In March 1995, to accommodate site redevelopment, Fairchild requested approval to remove SVE facilities, which were being kept on standby status pursuant to the SCR. Fairchild documented that the SVE system had reached

asymptotic levels and that residual VOC concentrations in soils did not pose excessive risk to site users, regardless of land use. In April 1995, the Board amended the SCR to allow full curtailment of the SVE system (Order No. 95-085). The system was removed shortly thereafter.

During the period 1994-98, Fairchild continued to operate on-site groundwater extraction and treatment facilities. Two on-site B-zone wells operated at a combined rate of 50 to 100 gallons per minute, removing about 300 pounds of VOC and assuring an inward gradient across the slurry wall. In 1994, Fairchild relocated and upgraded its treatment system, to accommodate site redevelopment activities. In 1995, Fairchild installed a reinjection well just outside the slurry wall, allowing 100% reuse of extracted/treated groundwater. As of late 1998, the maximum total VOC concentration in on-site groundwater was about 1.5 mg/l.

In 1998, Fairchild submitted an application for a containment zone consisting of the on-site area. Containment zones are allowed pursuant to State Water Resources Control Board Resolution No. 92-49 as amended, provided that eligibility criteria and procedural requirements are met. Pending review of this application and following a public comment period, Board staff in July 1998 approved temporary curtailment of on-site groundwater extraction. The purpose of temporary curtailment is to verify Fairchild's modeling predictions of no VOC migration from on-site across the slurry wall. Board staff have postponed processing of the containment zone application pending results of the temporary curtailment. Board action on the application is expected before the next five-year review. Board approval of a containment zone would not automatically lead to a ROD amendment by EPA Region IX. Prior to approving any change in the remedy, EPA Region IX would need to consider its authorities under CERCLA and the National Contingency Plan.

During the 1994-98 period, the off-site groundwater extraction system did not operate but remained on standby status. Fairchild complied with special monitoring requirements that were a condition of temporary curtailment. VOC concentrations in the off-site B-zone remained stable, consistent with prior modeling predictions. The non-compliant groundwater plume (where the hazard index exceeds 0.25) extends about 1,700 feet off-site in the B-zone. Concentrations of 1,1-DCE define the plume, due to the way that the hazard index is computed. As of late 1998, the maximum hazard-index result was 0.5, or about twice the cleanup goal.

The table below shows VOC mass removal since remediation began in 1982 and includes all remediation technologies (soil extraction, SVE, and groundwater extraction). It illustrates declining mass removal rates over time, due to declining VOC concentrations and temporary curtailment of groundwater extraction in late 1991 (off-site) and mid-1998 (on-site).

	Total Mass Removed	Cumulative Mass Removal

Year	(lb)	(lb)
1982	96,000	96,000
1983	25,000	121,000
1984	4,000	125,000
1985	2,000	127,000
1986	600	127,600
1987	800	128,400
1988	1,750	130,150
1989	14,901	145,051
1990	1,086	146,137
1991	144	146,281
1992	135	146,416
1993	133	146,549
1994*	90	146,639
1995*	75	146,714
1996*	63	146,777
1997*	56	146,833
1998*	28	146,861

* current- five-year review period

The table below shows the relative effectiveness of the different remediation methods used at the Fairchild site since 1982. Groundwater extraction accounts for an unusually large portion of the total, due to (i) the relatively short elapsed time between the VOC release and the initiation of groundwater remediation and (ii) the extremely large volumes of groundwater extracted in the early years of remediation.

Method	Period of Operation	Mass Removal (lb)
Soil excavation	1982	38,000
Soil vapor extraction	1987-1990	15,576
Groundwater extraction	1982-1998	93,285

Total		146,861

Fairchild requested and received approval to reduce groundwater monitoring - both the number

of wells and monitoring frequency. During the five-year review period, Fairchild closed 69 on-site wells and 54 off-site wells, generally to accommodate development or redevelopment activities. The remaining groundwater monitoring network includes about 30 on-site and 21 off-site wells, and is adequate to promptly identify any significant plume migration during temporary curtailment of groundwater extraction.

Remediation Cost and Cost Effectiveness. Fairchild incurred costs of about $1.7 million to conduct remediation and monitoring during the five-year review period (1994-98). This includes capital costs (relocation and upgrade of groundwater treatment facilities, installation of reinjection well, and other modifications related to site redevelopment) and annual operation/maintenance costs. By contrast, Fairchild incurred costs of about $33.8 million for the period 1981-88 and about $8.2 million for the period 1989-93, for a cumulative total of $43.7 million through 1998.

Fairchild has removed a cumulative total of about 147,000 pounds of chemicals from soils and groundwater at the site since 1981, of which about 300 pounds were removed during the five-year review period. The unit cost for mass removal (groundwater extraction) was about $5,700/lb over the five-year review period, down from a unit cost of $9,000/lb in the previous five-year review. This reflects the higher removal efficiency following temporary curtailment of off-site extraction in 1991. Both unit costs are substantially higher than the unit cost for SVE in the previous five-year review ($260/lb).

Future Remediation. Fairchild proposes to evaluate VOC concentration trends in the B-zone (both on-site and off-site groundwater), to confirm plume stability and justify continuation of the temporary curtailment of groundwater extraction. Fairchild concludes (and the Board agrees) that the time needed to attain groundwater remediation standards is significant, whether groundwater extraction continues or not. Fairchild will continue groundwater monitoring and will re-start groundwater remediation in the event that plume migration occurs. The Board will act on Fairchild's application for a containment zone once sufficient empirical data is available to support or reject this designation.

VII. Summary of Site Visit

Board staff inspected the site most recently on February 2, 1999. The on-site remediation system and reinjection well were not operating but were on standby status, consistent with prior Board approvals. Several on-site monitoring wells were in the process of being relocated or closed to accommodate site redevelopment. Construction was nearly complete at the time of the inspection. A significant portion of the 24-acre site was sold to American Stores, which opened a supermarket there in mid-February 1999.

VIII. Comments by Interested Persons

Board staff notified interested persons of the five-year review for this site. The notice summarized results of the five-year review and provided them with an opportunity to submit comments. Board staff used a site-specific interested-persons mailing list that included USEPA, state and local agencies, local water suppliers, and community groups. No comments were received following a 30-day comment period.

VIII. Areas of Noncompliance

The discharger has fully implemented the approved remedial action, consistent with the remedial objectives, and is in compliance.

IX. Recommendations

The discharger should continue implementation of the approved remedial actions.

X. Statement of Protectiveness

We certify that the remedy selected for this site remains protective of human health and the environment.

XI. Next Five-Year Review

The next five-year review will be conducted by January 2004.