

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
SAN FRANCISCO BAY REGION

ORDER NO. R2-2008-0104

ADOPTION OF FINAL SITE CLEANUP REQUIREMENTS and RESCISSION OF ORDER  
NO. 95-222 FOR:

ADVALLOY, INC.  
EAST CHARLESTON, INC., AND  
FAIRCHILD SEMICONDUCTOR CORPORATION

for the property located at

844 EAST CHARLESTON ROAD  
PALO ALTO  
SANTA CLARA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter  
Water Board), finds that:

- 1. Site Location:** The Site is located at 844 East Charleston Road in Palo Alto (Figure 1). The Site is 0.55 acres and is bounded by East Charleston Road to the north, Fabian Way to the south and existing structures to the east and west. The current two-story Building at the Site occupies approximately 14,600 square feet. Areas surrounding the Building are paved. Land use in the surrounding area is commercial, light industrial and proposed residential.
- 2. Site History:** The Building at the Site was constructed in 1957 and was occupied by Fairchild Semiconductor Corporation (Fairchild) until 1967. From 1957 through 1961, Fairchild conducted research and small-scale production of integrated circuits at the Site; from 1961 through 1962, it conducted research and development; and from 1962 through 1967, it conducted instrumentation manufacturing. Fairchild used chlorinated solvents such as trichloroethylene (TCE) and acids in its industrial processes and discharged these chemicals to the Building's northern sanitary sewer.

Advalloy, Inc. (Advalloy) leased the Site in 1968 and purchased the property in 1971. Advalloy occupied the Site until 1989. Advalloy's industrial activities at the Site involved precision metal stamping for the semi-conductor industry. These activities required the use of chemicals such as degreasers, paint thinners, acids, and detergents. The activities generated a variety of hazardous wastes. Solvents were introduced to the subsurface soils through disposal into the sanitary sewer lines, and possibly a former water drain, that discharged into a sump in the rear of the Building. The sump then discharged into the sanitary sewer along the centerline of Fabian Way to the south of the Site. The depth of the sanitary sewer and sump varies from about three to five feet below the ground surface. Additional information on Site history is contained in the December

3, 2008, staff report, which the Board hereby incorporates by this reference.

Advalloy declared bankruptcy in 1994. East Charleston, Inc., (East Charleston) acquired the property in bankruptcy in 1994.

3. **Named Dischargers:** Fairchild is named as a discharger because of substantial evidence that it discharged pollutants to soil and groundwater at the Site, including its use of chlorinated solvents and acids in research and small-scale production of integrated circuits and instrumentation, its discharge of waste solvents and acids to the northern sewer line, and the presence of these chlorinated solvents in groundwater in the immediate vicinity and downgradient of the northern sewer line. The rationale for naming Fairchild is contained in the December 3, 2008, staff report, which the Board hereby incorporates by this reference.

Advalloy is named as a discharger because of substantial evidence that it discharged pollutants to soil and groundwater at the Site and because it owned the property during or after the time of the activity that resulted in the discharge, had knowledge of the discharge or the activities that caused the discharge, and had the legal ability to prevent the discharge.

East Charleston is named as a discharger because it owned the property during or after the time of the activity that resulted in the discharge, has knowledge of the discharge or the activities that caused the discharge, and has the legal ability to control the discharge.

If additional information is submitted indicating that other parties caused or permitted any waste to be discharged on the Site where it entered or could have entered waters of the State, the Water Board will consider adding that party's name to this Order.

4. **Regulatory Status:** This Site has been subject to the following Orders:
- Site Cleanup Requirements (Order No. 95-222) adopted on November 15, 1995.
  - Site Cleanup Requirements (Order No. 90-016) adopted on January 17, 1990, and rescinded on November 15, 1995, by Order No. 95-222.
5. **Site Hydrogeology:** The Site is located on a series of overlapping distal alluvial fans deposited by east-flowing streams descending from the Santa Cruz Mountains. The distal fan/basin environment of deposition generally contains fine-grained, clay-rich sediments except for former channel deposits that contain coarser deposits. The regional topography slopes north-northeast toward San Francisco Bay. The regional groundwater direction is northeast towards San Francisco Bay. The groundwater gradient varies between 0.0025 and 0.005. A water bearing zone (A-aquifer) is found between 6 to 30 feet bgs (below ground surface). A deeper water bearing zone (B-aquifer) is found between 38 to 55 bgs. The C-aquifer has been encountered between 80 and 90 feet bgs. The shallow groundwater (found approximately between 6 and 55 feet bgs) generally occurs and migrates through a complex network of buried stream channels in a northerly direction.

6. **Remedial Investigation:** VOCs have been detected in soil and shallow groundwater at the Site and in shallow groundwater downgradient of the Site. The primary VOCs detected are trichloroethylene (TCE) and its associated degradation products cis-1,2 dichloroethylene (DCE) and vinyl chloride (VC). In September 2008, TCE, DCE and VC were detected in the onsite A-aquifer at the respective groundwater concentrations of 440 µg/L (ppb), 96 ppb and 1,400 ppb. In October 2008, TCE, DCE and VC were detected in the onsite B-aquifer at the respective groundwater concentrations of 42,000 ppb, 4,300 ppb and 45,000 ppb. The bulk of the contamination is found in the B-aquifer downgradient of the Building. TCE groundwater detections as high as 110,000 ppb were recorded in February 2008 in the B-aquifer north across East Charleston Road directly downgradient of the Site. TCE detections were recorded off-site at concentrations exceeding 1,000 ppb at least 400 feet downgradient and at lower concentrations at least 1,000 feet downgradient of the Site.

Seventeen monitoring, extraction, and injection wells have been installed at the Site (Figure 1). Two monitoring wells clusters (MW-01 and MW-02) have been installed on the 901 San Antonio Road property downgradient of the Site by the owners. Monitoring well clusters (F25-1 through F25-4, PB1-2 and PB2-1) installed at 3963/3977 Fabian Way have reported TCE and related TCE breakdown products. One A-aquifer well (MW-8) was installed on the 860 East Charleston Road property. Two A-aquifer monitoring wells (MW-4 and MW-5) have been installed upgradient of the Site. The full extent of the groundwater VOC contamination downgradient and cross gradient of the Site in the A- and B- aquifers has not been fully determined. Further investigation is needed to complete the definition of the extent of groundwater pollution at the Site and downgradient of the Site. To the maximum extent possible, proposed remedial actions shall be designed to avoid interference with land uses and operations at downgradient properties.

Petroleum hydrocarbons have been detected in soil at concentrations up to 21,000 ppm at shallow depths (0.5 - 1.0 feet bgs). Lead, chromium and copper have been detected in soils at respective concentrations up to 2,400 ppm, 150 ppm and 97 ppm. The source of the petroleum hydrocarbons and lead is considered to be blow-down from a compressor, and possibly its hydraulic or cooling fluid. Further investigation is needed to accurately determine the extent of contamination in soils in various work areas at the Site.

The vapor intrusion pathway to indoor air has not been evaluated at the Site or at properties downgradient of the Site that are not the subject of a Risk Management Plan approved by the Water Board. Soil gas sampling is needed to evaluate this pathway.

7. **Adjacent Sites:** Several other sources of VOC pollution exist in the vicinity of the Site (see Figure 1). These sites include:

North of the Site

Space Systems/Loral, Inc., occupies two buildings (Buildings 7 and 8) and is located at 3963-3977 Fabian Way. This property is owned by Far Western Land & Investment, Inc., which leased the property from 1959 to 1990 to the former Ford Aerospace Corporation

(FAC). FAC operated a research and development facility on this property. Operations included the use of chlorinated solvents in and around Buildings 7 and 8. Ford Motor Company (in coordination with Space Systems/Loral, Inc.) has investigated and remediated PCE discharges at the site and currently conducts groundwater and soil gas monitoring on this property. Groundwater and soil gas below this property is impacted by VOCs. The Water Board regulates the investigation and remedial activities at this property under Site Cleanup Requirements Order No. R2-2007-0022.

East of the Site

TCE has been respectively detected in groundwater in the A- and B- aquifers at concentrations of 9,500 ppb and 16,000 ppb at the former Fairchild and Advalloy Machine Shop, located at 4055-4057 Fabian Way.

8. **Prior Remedial Measures:** East Charleston operated a groundwater extraction and treatment system from 1999 to 2002. Four extraction wells (RW-1A/B, RW-2A/B) were installed on the downgradient (north) side of the Building. Groundwater was initially extracted using the four extraction wells and then augmented with extraction from well IW-1B. Six injection wells (IW-1A/B, IW-2A/B, and IW-3A/B) were installed south of the Building near the upgradient property boundary. The groundwater was treated through two activated carbon vessels. The treated groundwater was then pumped into the injection wells. The cumulative amount of VOCs removed by the treatment system was 489 pounds over this time period, representing a total of 13,863,000 gallons of treated groundwater. Groundwater extraction was discontinued in 2002 due to stabilization and in some cases increases of TCE concentrations in the groundwater.

East Charleston implemented an enhanced bioremediation program in 2002 by injecting diluted cheese whey in the A- and B- aquifers to promote breakdown of VOCs by naturally occurring bacteria. The cheese whey injection promotes anaerobic reductive dechlorination (ARD) of VOCs in groundwater. ARD is a micro-biologically mediated process occurring in oxygen poor environments. VOCs are degraded into a succession of by-products ultimately leading to the production of chloride and ethene/ethane gases. Nine different injection events have occurred since 2002. The average estimated removal for the chlorinated hydrocarbons between 2002 and 2007 are: 93% for TCE, 83.9% for DCE and 74.7% for VC. VOCs concentrations remain high at some B-aquifer locations as monitored in September 2007.

Soil remediation has not been completed at the Site. Additional soil and groundwater remediation is needed to meet cleanup standards at the Site, and the need for additional remediation downgradient of the Site must be evaluated as set forth in this Order.

9. **Environmental Risk Assessment:** East Charleston conducted a human health risk assessment (HHRA) for the Site in 2000. The HHRA was based on VOC concentrations collected in the A-aquifer between 1999 and 2000. Based on current and likely potential future uses of the Site, the following hypothetical human receptors were evaluated in the HHRA:

- Outdoor Commercial/Construction Worker;
- Indoor Commercial Worker

Because zoning designations prohibit residential use at the Site, a resident receptor was not included in the risk assessment. The HHRA did not calculate cumulative hazard indices for non-carcinogens. Excess cancer risks from assumed exposure to constituents of concern at the Site were reported in the HHRA as follows:

#### HHRA Exposure Pathways and Health Risks

Exposure Pathway	Carcinogenic Risk (1)
Inhalation in outdoor air (outdoor commercial worker)	4E-8
Inhalation in outdoor air (outdoor construction worker)	2E-07 to 3E-05
Inhalation in indoor air (indoor commercial worker)	4E-06

Table Note:

(1) The constituents of concern in groundwater include Tetrachloroethylene (PCE), TCE, 1,1 DCE, cis-1,2-DCE, 1,2 dichloropropane, 1,2-dichloroethane, 1,1,2-trichloro-1,2,3-trifluoroethane, VC and benzene.

For comparison, the Water Board considers the following risks to be acceptable at remediation sites: a cumulative hazard index of 1.0 or less for non-carcinogens, and a cumulative excess cancer risk of 10-E4 to 10E-6 or less for carcinogens.

Due to excessive risk that will be present at the Site pending full remediation, institutional constraints are appropriate to limit onsite exposure to acceptable levels. Institutional constraints include a deed restriction that notifies future owners of subsurface contamination, prohibits the use of shallow groundwater beneath the Site as a source of drinking water until cleanup standards are met, and prohibits sensitive uses of the Site such as residences and daycare centers.

- 10. Remedial Action Plan:** East Charleston submitted its remedial action plan on August 1, 2000, entitled "Proposed Final Remedial Actions and Cleanup Standards." The proposed remedial action at that time was groundwater extraction and treatment. The Remedial Action Plan does not fully address impacts of VOCs discharges from the Site on downgradient properties. After conducting groundwater extraction and treatment for three years, East Charleston submitted an amended remedial action plan in the April 22, 2002, quarterly report entitled "Quarterly Technical Status and Groundwater Self-Monitoring Calendar Quarter January – March 2002." The new proposed remedial action is enhanced bioremediation with injections of carbohydrate solutions such as cheese whey in the A- and B- aquifers. East Charleston proposes to conduct an additional injection event in 2008 utilizing four B-aquifer and three A-aquifer injection points along the front of the Site. Additional groundwater remediation in accordance with the terms of

this Order is needed downgradient of the Site.

East Charleston submitted a contaminated soil removal action plan on June 22, 2004, entitled "Removal Action for Mitigation of Subsurface Concerns, 844 East Charleston Road, Palo Alto, California." The proposed removal action estimates that nine cubic feet of contaminated soil needs to be removed from the Site. An "Addendum to Removal Action for Mitigation of Subsurface Concerns and Request for Subsurface Hazardous Materials Closure" report, dated March 23, 2005, was submitted to the Palo Alto Fire Department. This report documents additional investigations and includes a request for subsurface closure issued by the Palo Alto Fire Department to East Charleston issued on September 16, 2003.

## 11. Basis for Cleanup Standards

- a. **General:** State Water Resources Control Board (State Board) Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," applies to this groundwater impact and requires attainment of background levels of water quality, or the highest level of water quality which is reasonable if background levels of water quality cannot be restored. Cleanup levels other than background shall be consistent with the maximum benefit to the people of the State, not unreasonably affect present and anticipated beneficial uses of such water, and not result in exceedance of applicable water quality objectives. The previously-cited remedial action plan confirms the Water Board's initial conclusion that background levels of water quality cannot be restored. This Order and its requirements are consistent with Resolution No. 68-16.

State Board Resolution No. 92-49, "Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under Water Code Section 13304," applies to this discharge. This Order and its requirements are consistent with the provisions of Resolution No. 92-49, as amended.

- b. **Beneficial Uses:** The Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) is the Water Board's master water quality control planning document. It designates beneficial uses and water quality objectives for waters of the State, including surface waters and groundwater. It also includes programs of implementation to achieve water quality objectives. The Basin Plan was duly adopted by the Water Board and approved by the State Board, the United States Environmental Protection Agency, and the Office of Administrative Law where required.

State Board Resolution No. 89-39, "Sources of Drinking Water," defines potential sources of drinking water to include all groundwater in the region, with limited exceptions for areas of high TDS, low yield, or naturally-high contaminant levels. Groundwater underlying and adjacent to the Site qualifies as a potential source of drinking water.

The Basin Plan designates the following potential beneficial uses of groundwater underlying and adjacent to the site:

- Municipal and domestic water supply
- Industrial process water supply
- Industrial service water supply
- Agricultural water supply

At present, there is no known use of groundwater underlying the Site for the above purposes.

- c. **Basis for Groundwater Cleanup Standards:** The groundwater cleanup standards for the Site are based on applicable water quality objectives and are the California maximum contaminant levels (CA MCLs). Cleanup to this level will protect beneficial uses of groundwater and will result in acceptable residual risk to humans. Groundwater cleanup standards are shown in section B.2 below.
- d. **Basis for Soil Cleanup Standards:** The soil cleanup standards for the Site are based on the protection of ecological receptors, prevention of nuisance conditions, prevention of leaching of contaminants to groundwater, and protection of human health under a commercial/industrial indoor air or direct exposure scenario. The most restrictive of the above factors will apply on a chemical-by-chemical basis. Cleanup to this level will protect beneficial uses of groundwater and will result in acceptable residual risk to human and ecological receptors in a commercial/industrial use scenario. Soil cleanup standards are shown in section B.3 below.
- e. **Basis for Soil Gas Cleanup Standards:** The soil gas cleanup standards for the Site are based on the protection of human health under a commercial/industrial indoor air exposure scenario. Soil gas cleanup standards are shown in section B.4 below.
12. **Future Changes to Cleanup Standards:** The goal of this remedial action is to restore the beneficial uses of groundwater underlying and adjacent to the Site. Results from other sites suggest that full restoration of beneficial uses to groundwater as a result of active remediation at this Site may not be possible. If full restoration of beneficial uses is not technologically or economically achievable within a reasonable period of time, then the dischargers may request modification to the cleanup standards or establishment of a containment zone, a limited groundwater pollution zone where water quality objectives are exceeded. Conversely, if new technical information indicates that cleanup standards can be surpassed, the Water Board may decide that further cleanup actions shall be taken.
13. **Reuse or Disposal of Extracted Groundwater:** Water Board Resolution No. 88-160 allows discharges of extracted, treated groundwater from site cleanups to surface waters only if it has been demonstrated that neither reclamation nor discharge to the sanitary sewer is technically and economically feasible.

14. **Basis for 13304 Order:** California Water Code Section 13304 authorizes the Water Board to issue orders requiring dischargers to cleanup and abate waste where the dischargers have caused or permitted waste to be discharged or deposited where it is or probably will be discharged into waters of the State and creates or threatens to create a condition of pollution or nuisance.
15. **Cost Recovery:** Pursuant to California Water Code Section 13304, the dischargers are hereby notified that the Water Board is entitled to, and may seek reimbursement for, all reasonable costs actually incurred by the Water Board to investigate unauthorized discharges of waste and to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action, required by this Order.
16. **CEQA:** This action is an Order to enforce the laws and regulations administered by the Water Board. As such, this action is categorically exempt from the provisions of the California Environmental Quality Act (CEQA) pursuant to Section 15321 of the Resources Agency Guidelines.
17. **Notification:** The Water Board has notified the dischargers and all interested agencies and persons of its intent under California Water Code Section 13304 to prescribe site cleanup requirements for the discharge, and has provided them with an opportunity to submit their written comments.
18. **Public Hearing:** The Water Board, at a public meeting, heard and considered all comments pertaining to this discharge.

**IT IS HEREBY ORDERED**, pursuant to Section 13304 of the California Water Code, that the dischargers (or their agents, successors, or assigns) shall cleanup and abate the effects described in the above findings as follows:

**A. PROHIBITIONS**

1. The discharge of wastes or hazardous substances in a manner that will degrade water quality or adversely affect beneficial uses of waters of the State is prohibited.
2. Further significant migration of wastes or hazardous substances through subsurface transport to waters of the State is prohibited.
3. Activities associated with the subsurface investigation and cleanup which will cause significant adverse migration of wastes or hazardous substances are prohibited.

## B. REMEDIAL ACTION PLAN AND CLEANUP STANDARDS

- 1. Implement Remedial Action Plan (RAP):** The dischargers shall continue to implement the 2002 amendment to the RAP related to onsite matters described in finding 10. The dischargers shall propose additional remedial actions in accordance with this Order for areas downgradient of the Site that are affected by discharges from the Site.
- 2. Groundwater Cleanup Standards:** The following groundwater cleanup standards shall be met throughout the area of impacted groundwater and in all groundwater monitoring wells identified in the Self-Monitoring Program.

### Groundwater Cleanup Standards

Constituent	Groundwater Cleanup Standard ( $\mu\text{g/L}$ )	Basis
PCE	5.0	CA MCL
TCE	5.0	CA MCL
DCE	6.0	CA MCL
trans-1,2-dichloroethene (trans-1,2-DCE)	10	CA MCL
VC	0.5	CA MCL
1,2-dichlorobenzene (1,2-DCB)	600	CA MCL
1,4-dichlorobenzene (1,4-DCB)	5.0	CA MCL
TPH-g (gasoline)	210	Drinking Water (1)
TPH-m (middle distillates)	210	Drinking Water (1)

#### Table Notes:

(1) Drinking water standards based on non-Carcinogenic effects. Values from Water Board Interim Final Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Volume 2, Table F-3 (November 2007).

CA MCL= California Maximum Contaminant Level

$\mu\text{g/L}$  = micrograms per liter

TPH = Total Petroleum Hydrocarbons

- 3. Soil Cleanup Standards:** The following soil cleanup standards shall be met throughout the unsaturated zone at the Site. For the purposes of this Order, the unsaturated zone is defined as the zone above the water table's lowest historical or seasonal levels, as documented or anticipated. The cleanup levels shall be confirmed with confirmatory soil samples.

### Soil Cleanup Standards

Constituent	Soil Cleanup Standard (mg/kg)	Basis
PCE	0.34	Direct Exposure
TCE	0.46	Leaching
DCE	0.19	Leaching
Trans-1,2-DCE	0.67	Leaching
1,1-Dichloroethane (1,1-DCA)	0.2	Direct Exposure
VC	0.021	Leaching
Gasoline	83	Leaching
middle distillates	83	Leaching
Toluene	2.9	Leaching
Cadmium	1.7	Direct Exposure
Copper	230	Urban Area Toxicity
Cyanide	0.54	Leaching
Lead	260	Direct Exposure
Mercury	1	Direct Exposure
Nickel	150	Urban Area Toxicity
Total Chromium	2,500	Gross Contamination
Zinc	600	Urban Area Toxicity

Table Notes:

Values based on screening for potable groundwater, shallow soils (less than 3 meters bgs) and commercial/industrial land use. Values from the Water Board Interim Final Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Volume 2, Table A-2 (November 2007).  
mg/kg = milligrams per kilogram

- 4. Soil Gas Cleanup Standards:** Except with respect to those downgradient properties that are the subject of a Risk Management Plan approved by the Water Board, the following soil gas cleanup standards shall be met at the Site and at properties impacted by discharges at the Site, with the applicable standard based on the land use of the parcel.

### Soil Gas Cleanup Standards

Constituent	Commercial Soil Gas Cleanup Standard ( $\mu\text{g}/\text{m}^3$ )	Residential Soil Gas Cleanup Standard ( $\mu\text{g}/\text{m}^3$ )
PCE	1,400	410
TCE	4,100	1,200
VC	100	31
DCE	20,000	7,300
1,1-DCE	160	49
1,1-DCA	5,100	1,500
1,1,1-Trichloroethane	1,300,000	460,000
Gasoline	29,000	10,000
middle distillates	29,000	10,000
Benzene	280	84
Toluene	180,000	63,000
Ethylbenzene	580,000	210,000
Xylenes	58,000	21,000

**Table Notes:**

Values based on vapor intrusion into a building. Values from the Water Board Interim Final Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Volume 2, Table E-2 (November 2007).  $\mu\text{g}/\text{m}^3$  = micrograms per cubic meter

#### **C. TASKS**

##### **1. SUPPLEMENTAL REMEDIAL INVESTIGATION WORKPLAN**

COMPLIANCE DATE: January 30, 2009

Submit a workplan acceptable to the Executive Officer to complete the definition of the vertical and lateral extent of groundwater and soil gas pollution both at the Site and at properties downgradient of the Site that have been impacted by discharges at the Site. The workplan should specify investigation methods and a proposed time schedule. For soil gas, the workplan should include depth profiling of soil gas concentrations to further identify pollution sources. Work may be

phased to allow the investigation to proceed efficiently, provided that this does not delay compliance. The workplan should include a completion schedule for the construction of the replacement to monitoring well MW-07. To the maximum extent possible, interference with land uses and operations at offsite locations shall be avoided. The workplan shall not propose any investigative activities that could breach or compromise the integrity or functioning of installed or planned remedial or risk management measures at downgradient properties or otherwise alter or interfere with the implementation and function of measures required by Risk Management Plans approved by the Water Board for these downgradient properties.

**2. COMPLETION OF SUPPLEMENTAL REMEDIAL INVESTIGATION**

COMPLIANCE DATE: June 30, 2009

Submit a technical report acceptable to the Executive Officer documenting completion of necessary tasks identified in the Task 1 workplan. The technical report should address the data gaps in defining the vertical and lateral extent of pollution down to concentrations at or below applicable cleanup standards for soil gas and groundwater.

**3. COMPLETION OF SOIL REMEDIAL ACTIONS**

COMPLIANCE DATE: July 14, 2009

Submit a technical report acceptable to the Executive Officer documenting the completion of remedial actions identified in the 2004 "Removal Action for Mitigation of Subsurface Concerns." The report should document:

- a. Removal of all contaminated soils at the Site including the former industrial work areas where soil cleanup standards (see B.3. above) are exceeded such as the former compressor and cladding areas.
- b. Abandonment of the floor sump located in the southeast corner of the former hazardous materials storage room, including sealing of the piping leading to and from the sump.

**4. FIVE-YEAR STATUS REPORT**

COMPLIANCE DATE: August 31, 2009, and every five years thereafter

Submit a technical report acceptable to the Executive Officer evaluating the effectiveness of the approved cleanup plan. The report shall include:

- a. Summary of effectiveness in controlling contaminant migration and protecting human health and the environment.
- b. Comparison of contaminant concentration trends with cleanup standards.

- c. Comparison of anticipated versus actual costs of cleanup activities.
- d. Remediation performance data (e.g., groundwater volume treated, contaminant mass removed or destroyed per million gallons treated, mass flux reduction).
- e. Cost effectiveness data (e.g., cost per unit mass of contaminant of concern removed or destroyed, cost per unit mass flux reduction).
- f. Summary of additional investigations (including results) and significant modifications to remediation systems.
- g. Additional remedial actions proposed to meet applicable cleanup standards at the Site and areas downgradient of the Site that are impacted by Site discharges (see B.2. above) including a time schedule. Include the projected removal rate (mass of contaminant/time) of the contaminant of concern in the media of interest with the proposed remedial action. For groundwater, separately determine these removal rates for all impacted groundwater zones. Provide the time (t) at which the cleanup standards will be achieved at the Site and offsite for the contaminant(s) of concern exceeding cleanup standards using the proposed remedial action. To the maximum extent possible, proposed remedial actions shall be designed to avoid interference with land uses and operations at downgradient properties. In no event shall such proposed remedial actions include any actions that could breach or compromise the integrity or functioning of installed or planned remedial or risk management measures at offsite properties, or otherwise alter or interfere with the implementation and function of measures required by Risk Management Plans approved by the Water Board for downgradient properties.

If cleanup standards have not been met and are not projected to be met within a reasonable time, the report shall assess the technical practicability of meeting cleanup standards and may propose an alternative cleanup strategy.

## **5. PROPOSED INSTITUTIONAL CONSTRAINTS**

COMPLIANCE DATE: August 31, 2009

Submit a technical report acceptable to the Executive Officer documenting procedures to be used by the dischargers to prevent or minimize human exposure to soil, soil gas and groundwater contamination prior to meeting cleanup standards. Such procedures shall include a deed restriction applicable to the Site that notifies future owners of subsurface contamination, prohibits the use of shallow groundwater beneath the Site as a source of drinking water until cleanup standards are met, and prohibits sensitive uses of the Site such as residences and daycare centers.

## **6. IMPLEMENTATION OF INSTITUTIONAL CONSTRAINTS**

COMPLIANCE DATE: December 31, 2009

Submit a technical report acceptable to the Executive Officer documenting that the proposed institutional constraints have been implemented.

**7. PROPOSED CURTAILMENT**

COMPLIANCE DATE: 60 days prior to proposed curtailment

Submit a technical report acceptable to the Executive Officer containing a proposal to curtail remediation. Curtailment includes system closure (e.g., well abandonment), system suspension (e.g., cease enhanced bioremediation but wells retained), and significant system modification (e.g., major reduction of injection of biostimulative whey mixtures, closure of individual injection wells within injection network). The report should include the rationale for curtailment. Proposals for final closure should demonstrate that cleanup standards have been met, contaminant concentrations are stable, and contaminant migration potential is minimal.

**8. IMPLEMENTATION OF CURTAILMENT**

COMPLIANCE DATE: 60 days after Executive Officer approval of Task 7 workplan

Submit a technical report acceptable to the Executive Officer documenting completion of the tasks identified in the Task 7 workplan.

**9. WORKPLAN FOR ALTERNATE REMEDIAL ACTION PLAN**

COMPLIANCE DATE: 90 days after required by Executive Officer

Submit a workplan acceptable to the Executive Officer for implementation of an alternate remedial action plan in the event that the remedial activities specified in the Order are not effective in achieving cleanup standards.

**10. IMPLEMENTATION OF ALTERNATE REMEDIAL ACTION PLAN**

COMPLIANCE DATE: 180 days after Executive Officer approval of Task 9 workplan.

Submit a technical report acceptable to the Executive Officer documenting completion of necessary tasks identified in the Task 9 workplan.

**11. EVALUATION OF NEW HEALTH CRITERIA**

COMPLIANCE DATE: 90 days after required by Executive Officer

Submit a technical report acceptable to the Executive Officer evaluating the effect on the approved cleanup plan of revising one or more cleanup standards in response to revision of drinking water standards, maximum contaminant levels, or other health-based criteria.

**12. EVALUATION OF NEW TECHNICAL INFORMATION**

COMPLIANCE DATE: 90 days after required by Executive Officer

Submit a technical report acceptable to the Executive Officer evaluating new technical information bearing on the approved cleanup plan and cleanup standards for this Site. In the case of a new cleanup technology, the report shall evaluate the technology using the same criteria used in the feasibility study. Such technical reports shall not be requested unless the Executive Officer determines that the new information is reasonably likely to warrant a revision in the approved cleanup plan or cleanup standards.

**13. DELAYED COMPLIANCE:**

If the dischargers are delayed, interrupted, or prevented from meeting one or more of the completion dates specified for the above tasks, the dischargers shall promptly notify the Executive Officer and the Water Board may consider revision to this Order.

**D. PROVISIONS**

1. **No Nuisance:** The storage, handling, treatment, or disposal of polluted soil or groundwater shall not create a nuisance as defined in California Water Code Section 13050(m).
2. **Good Operation and Maintenance (O&M):** The dischargers shall maintain in good working order and operate as efficiently as possible any facility or control system installed to achieve compliance with the requirements of this Order.
3. **Cost Recovery:** The dischargers shall be liable, pursuant to California Water Code Section 13304, to the Water Board for all reasonable costs actually incurred by the Water Board to investigate unauthorized discharges of waste and to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action, required by this Order. If the Site addressed by this Order is enrolled in a State Board-managed reimbursement program, reimbursement shall be made pursuant to this Order and according to the procedures established in that program. Any disputes raised by the dischargers over reimbursement amounts or methods used in that program shall be consistent with the dispute resolution procedures for that program.

4. **Access to Site and Records:** In accordance with California Water Code Section 13267(c), the dischargers shall permit the Water Board or its authorized representative:
  - a. Entry upon premises in which any pollution source exists, or may potentially exist, or in which any required records are kept, which are relevant to this Order.
  - b. Access to copy any records required to be kept under the requirements of this Order.
  - c. Inspection of any monitoring or remediation facilities installed in response to this Order.
  - d. Sampling of any groundwater or soil which is accessible, or may become accessible, as part of any investigation or remedial action program undertaken by the dischargers.
5. **Self-Monitoring Program:** The dischargers shall comply with the Self-Monitoring Program as attached to this Order and as may be amended by the Executive Officer.
6. **Contractor/Consultant Qualifications:** All technical documents shall be signed by and stamped with the seal of a California registered geologist, a California certified engineering geologist, or a California registered civil engineer.
7. **Lab Qualifications:** All samples shall be analyzed by State-certified laboratories or laboratories accepted by the Water Board using approved EPA methods for the type of analysis to be performed. All laboratories shall maintain quality assurance/quality control (QA/QC) records for Water Board review. This provision does not apply to analyses that can only reasonably be performed on-site (e.g., temperature).
8. **Document Distribution:** Electronic copies of all correspondence, technical reports, and other documents pertaining to compliance with this Order shall be provided within two weeks of the established task deadline to the following recipients:
  - a. City of Palo Alto, Fire Department
  - b. Santa Clara Valley Water District

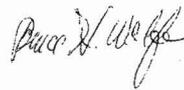
The Executive Officer may modify this distribution list as needed.

9. **Reporting of Changed Owner or Operator:** The dischargers shall file a written report on any changes in Site occupancy or ownership associated with the property described in this Order. This report shall be filed with the Water Board

within 30 days following a change in Site occupancy or ownership.

10. **Reporting of Hazardous Substance Release:** If any hazardous substance is discharged in or on any waters of the State, or discharged or deposited where it is, or probably will be, discharged in or on any waters of the State, the dischargers shall report such discharge to the Water Board by calling (510) 622-2300 during regular office hours (Monday through Friday, 8:00 to 5:00). A written report shall be filed with the Water Board within five working days. The report shall describe: the nature of the hazardous substance, estimated quantity involved, duration of incident, cause of release, estimated size of affected area, nature of effect, corrective actions taken or planned, schedule of corrective actions planned, and persons/agencies notified. This reporting is in addition to reporting to the Office of Emergency Services required pursuant to the Health and Safety Code.
11. **Rescission of Existing Order:** This Order supersedes and rescinds Water Board Order No. 95-222.
12. **Periodic SCR Review:** The Water Board will review this Order periodically and may revise it when necessary.

I, Bruce H. Wolfe, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on December 10, 2008.



Digitally signed  
by Bruce Wolfe  
Date:  
2008.12.12  
14:29:46 -08'00'

\_\_\_\_\_  
Bruce H. Wolfe  
Executive Officer

=====  
FAILURE TO COMPLY WITH THE REQUIREMENTS OF THIS ORDER MAY SUBJECT YOU TO ENFORCEMENT ACTION, INCLUDING BUT NOT LIMITED TO: IMPOSITION OF ADMINISTRATIVE CIVIL LIABILITY UNDER WATER CODE SECTIONS 13268 OR 13350, OR REFERRAL TO THE ATTORNEY GENERAL FOR INJUNCTIVE RELIEF OR CIVIL OR CRIMINAL LIABILITY  
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Attachments: Self-Monitoring Program  
Site Map

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
SAN FRANCISCO BAY REGION

SELF-MONITORING PROGRAM FOR:

ADVALLOY, INC.  
EAST CHARLESTON, INC., AND  
FAIRCHILD SEMICONDUCTOR CORPORATION

for the property located at

844 EAST CHARLESTON ROAD  
PALO ALTO  
SANTA CLARA COUNTY

1. **Authority and Purpose:** The Water Board requires the technical reports in this Self-Monitoring Program pursuant to Water Code Sections 13267 and 13304. This Self-Monitoring Program is intended to document compliance with Water Board Order No. R2-2008-0104 (Final Site Cleanup Requirements).
2. **Monitoring:** The dischargers shall measure groundwater elevations in all monitoring wells and shall collect and analyze representative samples of groundwater according to the following table:

Well #	Monitored Aquifer	Sampling Frequency	Analyses
MW1, MW-8, RW-1A, RW-2A	A	Q	8260, DO, pH, C, T, Tr, ORP, and biogeochem
MW-1B, MW-2B, MW-3B, RW-1B, RW-2B, IW-1B, IW-2B, IW-3B, IW-4B	B	Q	8260, DO, pH, C, T, Tr, ORP and biogeochem

MW-01A, MW-02A, MW-2, MW-3	A	SA	8260, DO, pH, C, T, Tr, ORP and biogeochem
<b>Well #</b>	<b>Monitored Aquifer</b>	<b>Sampling Frequency</b>	<b>Analyses</b>
MW-01B1, MW-01B3, MW-02B1, MW-02B2, Replacement to MW-07*	B	SA	8260, DO, pH, C, T, Tr, ORP and biogeochem
MW-4, MW-5	A	SA	8260, DO, pH, C, T, Tr, ORP and biogeochem

Key: Q= Quarterly; SA = Semi-Annually;  
8260 = EPA Method 8260 analysis with only the USEPA Method 8010 compounds reported  
DO = Dissolved oxygen  
C, T, Tr = Conductivity, temperature, and turbidity  
ORP = Oxidation reduction potential  
Biogeochem = ethene, ethane, methane, chloride and total organic carbon  
\* once online

The dischargers may propose changes in the above table; any proposed changes are subject to Executive Officer approval.

4. **Semi-Annual Monitoring Reports:** The dischargers shall submit semi-annual monitoring reports to the Water Board on January 31 and July 31 of each year. The first semi-annual report is due on January 31, 2009. The reports shall include:
  - a. **Transmittal Letter:** The transmittal letter shall discuss any violations during the reporting period and actions taken or planned to correct the problem. The letter shall be signed by the dischargers' principal executive officer or his/her duly authorized representative, and shall include a statement by the official, under penalty of perjury, that the report is true and correct to the best of the official's knowledge.
  - b. **Groundwater Elevations:** Groundwater elevation data shall be presented in tabular form, and a groundwater elevation map should be prepared for each monitored water-bearing zone. Historical groundwater elevations shall also be included.
  - c. **Groundwater Analyses:** Groundwater sampling data shall be presented in tabular

form. Timeseries of this data shall be included in a graphical format. An isoconcentration map should be prepared for one or more key contaminants for each monitored water-bearing zone, as appropriate. These isoconcentration maps shall delineate concentrations to their respective groundwater cleanup standard included in section B.2 of the accompanying Water Board Order No. R2-2008-0104. The report shall indicate the analytical method used, detection limits obtained for each reported constituent, and a summary of QA/QC (Quality Assurance/Quality Control) data. Historical groundwater sampling results shall also be included. Supporting data, such as lab data sheets, need not be included (however, see record keeping - below).

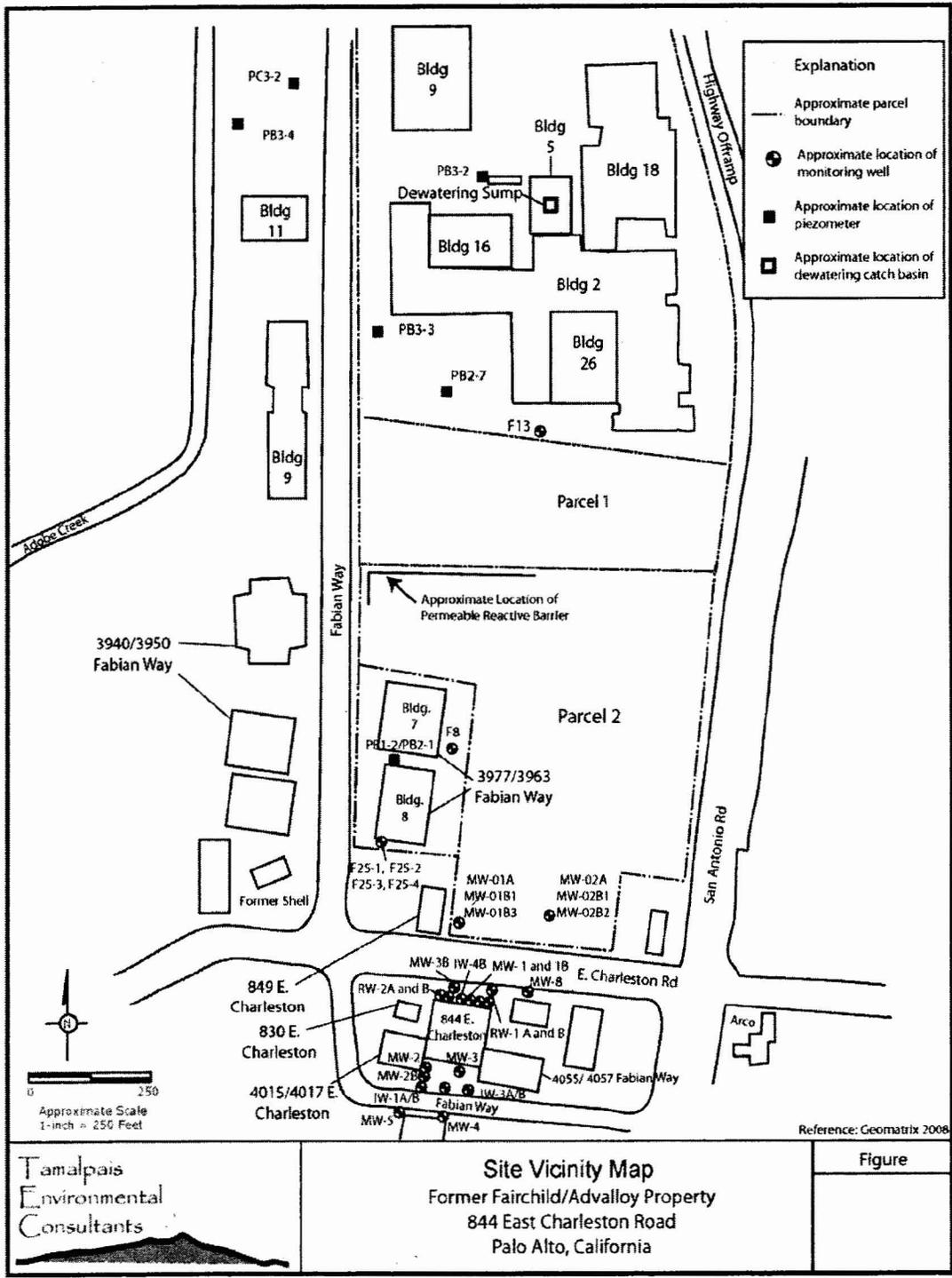
- d. Groundwater Remediation Evaluation: As applicable, the report should include the following for each aquifer of interest:
1. Evaluate the spatial stability of the groundwater plume leading edge using the isoconcentration maps included in the report. The report shall compare trichloroethylene (TCE) concentrations in the downgradient sentry wells (MW-01, MW-02 clusters and replacement MW-07) to the TCE groundwater cleanup standards concentrations listed in section B.2.
  2. Describe any significant increases in contaminant concentrations since the last report, and any measures proposed to address the increases. Quantify the degree of contaminant concentrations variability between sampling events. The degree of variability may be estimated using statistical tests (e.g., variance, standard deviation, coefficient of variation, and/or interquartile range).
  3. Compute the percentage reduction of the contaminants of concern since inception of the remediation action taken. The total percentage concentration reduction is:
 
$$100 \times \left[ 1 - \left( \frac{C_r}{C_0} \right) \right]$$
 where  $C_r$  is the contaminant concentration during the reported sampling period and  $C_0$  is the concentration at the start of the remediation action. Historical removal values shall be included in the semi-annual report.
  4. Estimate the time  $t$  at which the concentration of the contaminants of concern will reach their respective groundwater cleanup standards in the A- and B- aquifers. This value is estimated using the following equation for a first order rate:
 
$$t = \frac{-\ln \left[ \frac{C_{goal}}{C_0} \right]}{K_{point}}$$
 where  $C_{goal}$  is the groundwater cleanup standard (section B.2. of the accompanying Water Board Order No. R2-2008-X),  $C_0$  is the concentration at the start of the remediation action,  $K_{point}$  is the slope obtained from the best fitted curve of the natural log of the concentration vs. time graph. The monitoring well location where this value of  $t$  is computed should be the monitoring well with the highest concentration of the contaminant of concern within the A- and B- aquifers from the most recent sampling dataset.
  5. Compute the mass flux  $F$  of the contaminants of concern in the A- and B- aquifers along an east-west transect located downgradient of the actively remediated area.  $F$  is computed as:  $F = Q \times C$  where  $Q$  is the aquifer discharge (volume/time) and

$C$  is the concentration of the contaminant of concern along the two dimensional transect.

6. Determine the center of mass ( $R$ ) of the contaminants of concern in the A- and B-aquifers.  $R$  is derived from isoconcentration contours of the contaminant of concern using the sampling dataset. The mass of the dissolved contaminant of concern within each volumetric shell of groundwater saturated soil is calculated and the individual shell masses summed to yield a total dissolved contaminant of concern mass estimate. More specifically the mass of the contaminant of concern is calculated as the product of the mean concentration in the volumetric shell, the saturated soil volume, and a site-specific effective porosity value assumed to be representative of the Site.  $R$  is  $\frac{\sum m_i r_i}{\sum m_i}$  where  $r_i$  is the coordinate position within a volumetric shell of a mass  $m_i$ . Alternatively  $R$  may be determined graphically.
  7. Determine the centerline of the contaminants of concern in the A- and B-aquifers. The centerline of the contaminant of concern may be quantified using graphical or software based methods.
- e. **Mass Removal Results:** If applicable, the report shall include enhanced bioremediation results in tabular form, for each injection well and for the Site as a whole, expressed in mass of biostimulative whey mixtures injected and total groundwater volume remediated semi-annually for the A- and B- aquifers. The report shall also include contaminant removal results from other remediation systems (e.g., soil gas extraction, groundwater extraction), expressed in units of chemical mass removed semi-annually for the A- and B- aquifers. Historical mass removal results shall be included in the semi-annual report.
  - f. **Status Report:** The semi-annual report shall describe relevant work completed during the reporting period (e.g., site investigation, interim remedial measures) and work planned for the following semester.
5. **Violation Reports:** If the dischargers violate requirements in the Site Cleanup Requirements, then the dischargers shall notify the Water Board office by telephone as soon as practicable once the dischargers have knowledge of the violation. Water Board staff may, depending on violation severity, require the dischargers to submit a separate technical report on the violation within five working days of telephone notification.
  6. **Other Reports:** The dischargers shall notify the Water Board in writing prior to any Site activities, such as construction or underground tank removal, which have the potential to cause further migration of contaminants or which would provide new opportunities for Site investigation.
  7. **Record Keeping:** The dischargers or his/her agent shall retain data generated for the above reports, including lab results and QA/QC data, for a minimum of six years after origination and shall make them available to the Water Board upon request.

8. **SMP Revisions:** Revisions to the Self-Monitoring Program may be ordered by the Executive Officer, either on his/her own initiative or at the request of the dischargers. Prior to making SMP revisions, the Executive Officer will consider the burden, including costs, of associated self-monitoring reports relative to the benefits to be obtained from these reports.

**Figure 1: Site Vicinity Map**



Tamalpais  
Environmental  
Consultants

**Site Vicinity Map**  
Former Fairchild/Advalloy Property  
844 East Charleston Road  
Palo Alto, California

Figure