CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

ORDER NO. 93-056

AMENDING ORDER NO. 90-134 WHICH AMENDED ORDER NO. 89-167, SITE CLEANUP REQUIREMENTS FOR:

APPLIED MATERIALS, INC.
3050 BOWERS AVENUE BUILDING 1 FACILITY
SANTA CLARA, SANTA CLARA COUNTY

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

1. Applied Materials, Inc. (hereinafter called the Discharger) has filed acceptable deed restrictions for the 3050 Bowers Avenue Building 1 facility as of June 10, 1992 with the Santa Clara County Recorder.

2. The Discharger submitted a January 28, 1991 "Annual Progress Report - Disposal of Extracted Ground Water, for Applied Materials Building 1, 3050 Bowers Avenue, Santa Clara, California", and a July 1, 1991 "Addendum-1991 Annual Progress Report - Disposal of Extracted Ground Water, for Applied Materials Building 1, 3050 Bowers Avenue, Santa Clara, California", concerning groundwater reuse/reclamation and concluded that extracted groundwater could potentially have some onsite industrial application, but costs of reuse would be prohibitively high and reuse is not economically feasible. The reports stated that treated groundwater would not be accepted by a publicly-owned treatment works and that reclamation by groundwater re-injection was costly and of small benefit.

3. The Discharger reports that some operations will be moved out of Building 1 but the equipment pad will remain in use and it will not be feasible to remediate soil beneath the pad or building.

4. The analyses of groundwater samples have verified an interval of volatile organic compound (VOC) pollution in groundwater below the A-aquifer sand near the source area. The VOCs were first detected in 1990. Historically the maximum reported concentrations in well AM1-10 (Figure 1) were 60 parts per million (ppm) 1,1,1-TCA on September 11, 1990, 4.8 ppm 1,1-DCA on January 3, 1991, and 2.7 ppm 1,1-DCE on September 11, 1990. This deeper interval is not controlled by groundwater extraction wells AM1-1 and AM1-5E.

The new extraction well AM1-10 is extracting less than 1 gpm polluted groundwater from this deeper interval, which has been named the A2 zone by the Discharger. In April 1993 the concentrations in groundwater from well AM1-10 were: 7.5 ppm 1,1,1-TCA, 1.0 ppm 1,1-DCA, and 0.27 ppm 1,1-DCE.

5. A site soil investigation described in the August 14, 1992 "A2-Zone Hydrogeology, VOC Mass and Distribution, and Feasibility Study Alternatives at Applied Materials Building 1, 3050 Bowers Avenue, Santa Clara, California" report, attempted to probe the A2 zone in the source area and provide information to be used in determining whether or not soil remediation was necessary. Based on the results of the investigation, the Discharger determined that:

   a. Deep borings into the A2 zone beneath the former tank area could not be completed.

   b. The investigation found total VOC concentrations generally less than 1 ppm, and total VOC concentrations of 4.97 ppm, 10.93 ppm and 20.47 ppm locally in three borings near the former source area, in fine-grained saturated soil in the A2 zone at a depth of about 26 to 29 feet, below the A-aquifer sand. This near-source area of soil pollution is under the concrete equipment pad adjacent to Building 1, and may extend beneath Building 1. This soil pollution at the A/A2 interface is estimated to contribute about 6% to the total site groundwater pollution by the slow process of desorption.

   c. An estimated 92% of the initial VOC pollution has already been removed, mostly by groundwater extraction. The estimated amount of VOCs removed by groundwater extraction is about 600 pounds.

   d. Estimated cleanup times are based on trends shown by 7 years of data at the site. It is believed that cleanup time estimates include any potential effects of DNAPLs and/or sorption at the site.

6. The Discharger has re-evaluated the remedial alternatives described in SCR Order No. 90-134, and now proposes to continue groundwater extraction and treatment until cleanup standards for VOCs are achieved in groundwater sitewide. The Discharger estimates this to take less than ten years, based on the declines in concentrations observed to-date in the historical extraction records of downgradient wells AM1-1 and AM1-5E. The Discharger proposes that no additional soil remediation be done.

7. The Board believes that the Discharger's estimated time required for the Discharger's proposed remediation to achieve cleanup standards is optimistic for the following reasons:

   a. The effect of on-going groundwater extraction on the source-area A sand cannot be directly verified because there is not a well into the A sand directly beneath the source area; and, the A sand in the source area may require a long time for remediation by groundwater extraction by a well outside the source area. Well AM1-EP which was constructed above the A sand has provided data on the effectiveness of groundwater extraction at the source area from 1985 through September 3rd, 1991. Although concentrations generally decreased during this period, showing declines from 370 to 0.180 ppm for 1,1,1-TCA, 13 to 0.043 ppm for 1,1-DCA, and 19 to 0.034 ppm for 1,1-DCE, concentrations of 1,1-DCA and 1,1-DCE were still above MCLs of 0.005 ppm and 0.006 ppm, respectively, when the period ended.

   b. As suggested by geohydrologic and chemical data from well AM1-10, a potential but yet-unidentified source of VOCs in the A zone may exist, and may be dense non-aqueous phase liquid (DNAPL) VOCs. If DNAPL VOCs are present they most likely will not be remediated by groundwater extraction but, depending on the quantity and concentration, could continue to release pollutants to the groundwater for many years, perhaps longer than the time estimated for remediation by the Discharger.

   c. The VOC pollution in the silty clay at the A/A2 interface may desorb slowly into groundwater and increase VOC concentrations and the time required for remediation.

   d. The "tailing effect" associated with groundwater extraction which has been found to extend the time to achieve groundwater cleanup.

8. The Board is willing to accept the Discharger's proposal for the following reasons:

   a. The equipment pad and Building 1 are expected to remain operational for an unspecified period; the remediation of saturated soil under the pad and building will be costly to Applied Materials and may have limited effect on site cleanup time. Consideration of any requirement for the direct remediation of this polluted soil will be deferred until the five-year status report is reviewed, and the efficiency of the extraction system is evaluated.

b. A deed restriction to restrict the installation of wells on the property and disturbance of the soil by excavation by any future owners is in place and will remain in place until cleanup is accomplished.

c. Groundwater monitoring and reporting requirements will continue.

d. The existing Order requires the Discharger to maintain physical control of the pollutant plume.

e. The Board will make a detailed review of site remediation at the end of five years, concurrently with the submittal of the Discharger's 5-year Status Report due October 1, 1994. The 5-year review will include a detailed evaluation of groundwater extraction and monitoring to show that cleanup standards are being achieved in a timely manner.

f. If extraction alone is not effective in remediating site pollution in a timely manner, the Board can modify requirements of this Order.

9. This action is an Order to enforce the laws and regulations administered by the Board. This action is categorically exempt from the provisions of the CEQA pursuant to Section 15321 of the Resources Agency Guidelines.

10. The Board has notified the Discharger and interested agencies and persons of its intent under the California Water Code to amend Site Cleanup Requirements and has provided them with the opportunity for a public hearing and an opportunity to submit their written views and recommendations.

11. The Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED, pursuant to provisions of the California Water Code and regulations adopted thereunder, that the Discharger shall comply with the following:

1. SPECIFICATION 3 in Order No. 90-134 is changed as follows: the final cleanup standard for 1,1,2-trichloroethane (1,1,2-TCA), based on the California Department of Health Services Maximum Contaminant Level (MCL), currently is 32 parts per billion (ppb), not 5 ppb as shown.

   The U.S. EPA has adopted a drinking water MCL of 5 ppb for this chemical, and a Maximum Contaminant Level Goal (MCLG) of 3 ppb, both of which will be enforced beginning January 1994. From Findings of the previous Order, the groundwater cleanup standard for 1,1,2-TCA at this site shall be 3 ppb in 1994.

2. PROVISION 6 is modified to include the following:

The annual report due March 15, 1994 shall be acceptable to the Executive Officer and shall include the results of an evaluation of groundwater extraction and monitoring to show that (1) extraction wells AM1-1 and AM1-10 can and do remediate the A-zone and A2-zone groundwater pollution in the source area, and (2) extraction well AM1-5E does hydraulically contain the pollutant plume onsite and prevents VOCs from migrating offsite.

This evaluation shall include but not be limited to:

a. Verification of the concentrations of VOCs in the A-zone aquifer;

b. Determination and documentation of the change of A2-zone groundwater pollution;

c. Discussion of the probability of the presence or absence of DNAPL in the A and A2 zones; and,

d. A review of the disparity in geological interpretations of the A zone between the Applied Materials Building 1 site on one side of Bowers Avenue and the Avantek site on the opposite side of Bowers Avenue, and correlation to show the relationship between the A zones of both sites; and a discussion of the potential influence of A2-zone groundwater on the VOC pollution detected in Avantek well AV-1B.

Following a review of the annual report and appropriate comments, the evaluation shall be utilized to prepare the 5-year status report to be submitted no later than October 1, 1994.

I, Steven R. Ritchie, 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 June 16, 1993.

Steven R. Ritchie
Executive Officer

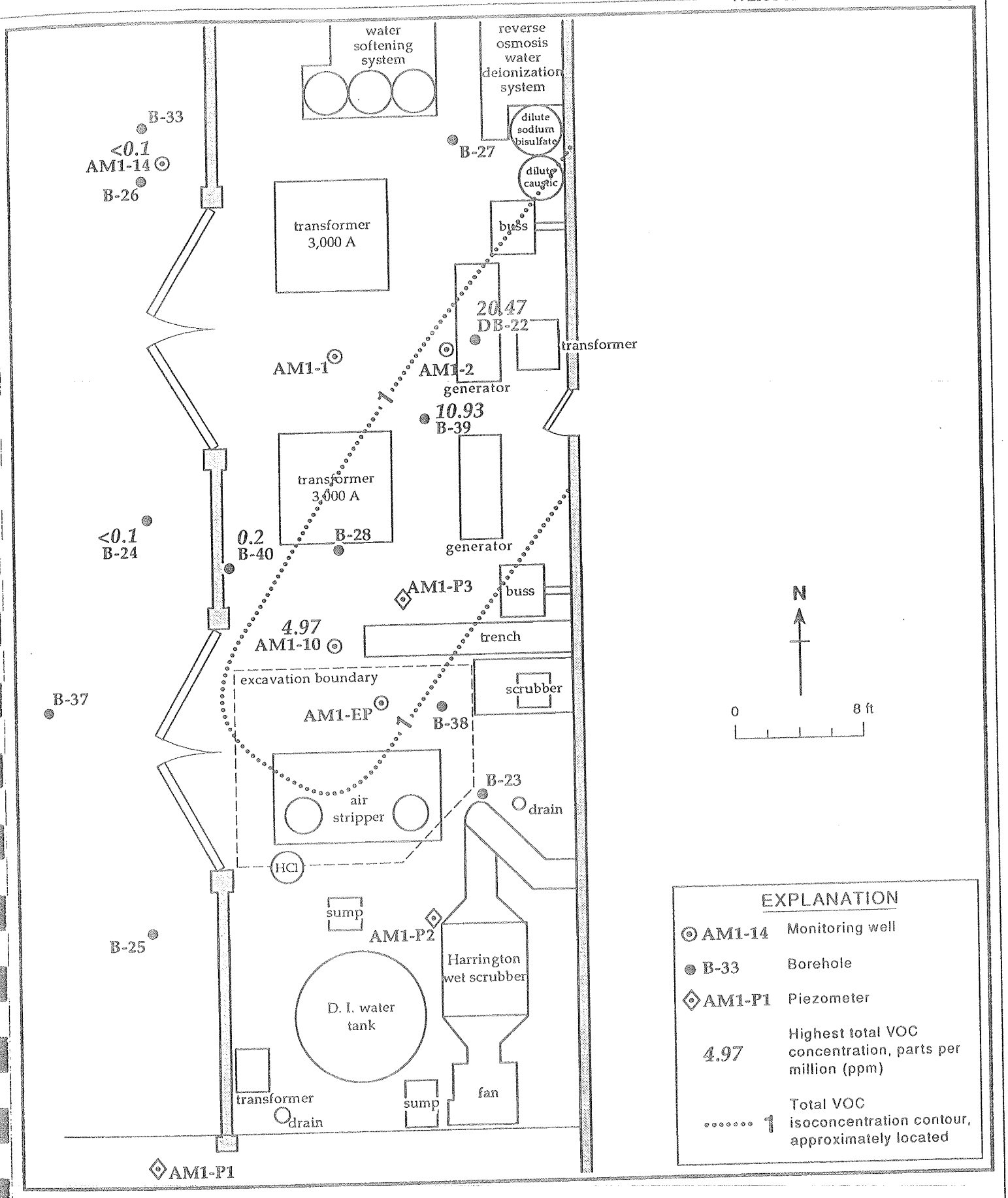

Figure 1 Total VOC Concentrations Greater Than 1ppm in the A/A2-Zone Confining Layer at Applied Materials Building 1 Equipment Pad