IT CORPORATION
A Member of The IT Group
4005 Port Chicago Highway
Concord, California 94520

JASCO Chemical Corporation
Mountain View, California
IT Project No. 907403 – December 2000

Revised PCE Investigation Report

Anthony B

REVISED PCE Investigation Report

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4005 Port Chicago Highway
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Prepared by:

Karel Detterman

Karel Detterman, RG
Senior Project Geologist

Approved by:

Karel Detterman for

Scott Rice, RG
Project Manager

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Acronyms and Abbreviations

µg/L	micrograms per Liter
bgs	below ground surface
CAP	Compliance Assistance Program
COC	chain of custody
DS-1	Drainage Swale Area 1
DS-2	Drainage Swale Area 2
DS-3	Drainage Swale Area 3
DVE	Dual Vacuum Extraction
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
FSP	Field Sampling Plan
HMMP	Hazardous Materials Management Plan
JASCO	JASCO Chemical Corporation
JPB	Joint Powers Board
mg/kg	milligrams per kilogram
NPL	National Priorities List
OHM	OHM Remediation Services Corp.
PCE	tetrachloroethene
PCP	pentachlorophenol
PID	photoionization detector
PRG	Preliminary Remediation Goal
QAPP	Quality Assurance Project Plan
RAP	Remedial Action Plan
RD	Remedial Design
RI	Remedial Investigation
RWQCB	Regional Water Quality Control Board
SVE	soil vapor extraction
SVOC	semivolatile organic compound
TPH	total petroleum hydrocarbons
UST	underground storage tank
VOC	volatile organic compound

Executive Summary

The PCE Investigation Report summarizes the investigation at the Jasco Chemical Corporation (JASCO) site in Mountain View, California, regarding the nature and extent of tetrachloroethene (PCE) in groundwater. The purpose of this report is to document JASCO's efforts to identify and address the PCE contamination identified at the eastern portion of the site and in upgradient areas and to support the conclusion that its presence is not associated with any past or present activities on the subject property. The site is located at 1710 Villa Street in Mountain View, California. JASCO took possession of the facility in 1976 and operated the facility as a chemical blending and repackaging plant until December 1995.

Several phases of soil sampling were conducted at potential source areas of the site before the site was placed on the National Priorities List and as components of the Remedial Investigation (RI) (OHM Remediation Services Corp. [OHM], 1991) and the Remedial Action Report for Soil (OHM, 1999). The drainage swale was the primary focus of these sampling events because it was the area at which contaminants were first detected in soil and groundwater. However, the investigations also evaluated the underground tank, drum storage, production, warehouse, and former diesel tank areas as potential source areas. PCE was detected in soil in only one area of the drainage swale area that received surface water runoff from adjacent properties. Because this area was subject to runoff from the railroad right-of-way and from properties to the east, JASCO installed a stormwater runoff system in 1988. In addition, JASCO conducted soil remediation by both excavation and dual vacuum extraction (DVE) between 1988 and 1996. PCE was not detected in soil samples collected during the installation of DVE wells; however, the DVE system was installed and operated for remediation of other volatile organic contamination remaining in this area. A comprehensive site sampling program was conducted in 1996 including grid sampling of the entire JASCO site. No PCE was detected in any of the nearly 200 soil samples from 96 sample locations.

Three water-bearing zones have been identified beneath the JASCO site during previous investigations, identified as the perched zone and the A- and B-aquifers. Between 1989 and July 1993, PCE was not detected in any of more than 20 groundwater monitoring events at 15 A- and B-aquifer wells. PCE was first detected in downgradient B-aquifer well I-2 in July 1993. PCE was first detected in the A-aquifer in April of 1995 at well V-10 near the eastern boundary of the JASCO site. Beginning in 1996, JASCO conducted a series of investigation phases and implemented a number of interim remedial actions to address the PCE presence. The investigation activities indicated an extensive plume of PCE in the B-aquifer extending both upgradient and downgradient of JASCO but with the primary plume body passing to the east of JASCO on off-site properties. The PCE plume in the perched and A-aquifers is smaller in area than the B-aquifer plume and centered in an area immediately east of well V-10 extending downgradient on areas immediately east of the JASCO site on off-site properties. Although the source of PCE was uncertain, JASCO implemented groundwater extraction at monitor well V-10 and installed additional extraction wells in the perched and B-aquifers as an interim measure to minimize further downgradient contaminant migration during the investigations.

The distribution of PCE in groundwater to the east of JASCO is inconsistent with that of other site contamination, which is focused on the western portion of the JASCO site within the drainage swale. The highest levels of PCE have been detected on property east of JASCO and elevated concentrations have been detected upgradient of all potential source areas. Low levels of PCE have been detected in groundwater within the drainage swale area. However, this contamination was detected only after groundwater extraction was initiated at well V-4, and its presence is attributed to the effects of pumping, drawing contaminants toward the pumping well. Concentrations of PCE at well V-10 decreased immediately after the DVE system was initiated in 1997 but continued a trend toward rising concentrations since 1998, suggesting that the source area is upgradient of the pumping well. Concentrations may also have been affected by variations in water table elevation. The region was subject to drought conditions in the late 1980s and early 1990s. The perched zone was unsaturated during investigation drilling until 1995 and water levels in the A- and B-aquifers have risen nearly 20 feet since 1992. The drought conditions and the discontinuous nature of the perched zone and A-aquifer may have impeded the movement of PCE from its source until the rising water table resulted in thicker and more continuous saturated zones. The B-aquifer is continuous and uniform, which could explain the more extensive plume and the earlier detection in downgradient wells. These data suggest that a source area may exist away from well V-10 and that extraction is resulting in downgradient and vertical movement of contaminant-laden groundwater from areas upgradient of JASCO.

JASCO operated from November 1976 to December 1995 as a chemical blending and repackaging plant. According to representatives of JASCO and as supported by chemical data that JASCO was required to supply to the City of Mountain View, PCE was never used, stored, or handled at the site during JASCO's 19 years of operation. Properties to the east of JASCO have historically been operated by industrial facilities that are likely to have used solvents. A JASCO representative identified the neighboring business to the southeast (upgradient) of the JASCO site as Peninsula Tube Bending, and structures associated with this site were noted in aerial photographs taken between 1964 and 1980. The West Coast Door Manufacturing Company originally occupied the 1710 Villa Street property before JASCO's operations as well as the property immediately east of JASCO and north of the Peninsula Tube Bending site. A warehouse building was constructed by West Coast Door Manufacturing immediately east of the JASCO warehouse in the early 1970s, which was later sold to the Pacific Press Publishing Association. The nature of activities conducted at this site are uncertain, although aerial photographs indicate storage areas on the property immediately east of well V-10. The Pacific Press Publishing Association owned property from immediately east of the JASCO site to Shoreline Avenue, where it operated a printing facility for 79 years, from 1904 to 1983.

In summary, the following conditions have been identified regarding the presence of PCE in soil and groundwater at the JASCO site:

1. PCE was not detected in soil samples collected during the RI except for several samples on railroad property in the drainage swale at the northwestern corner of the JASCO site. The sampling sites were located at an outlet for surface water drainage from areas to the east of the JASCO site.

2. Soil samples collected from the drainage swale area during installation of the DVE wells and after implementation of the stormwater runoff system did not contain PCE.
3. PCE was not detected in any soil samples conducted as part of a comprehensive confirmation soil sampling program of the entire JASCO facility under the Remedial Action for Soil in 1994 and 1995.
4. PCE was first detected in site groundwater in 1995 and its distribution at the site is inconsistent with historic contaminant presence and distribution at the site from known source areas.
5. The highest concentrations of PCE detected during the investigation were at locations on property to the east of the JASCO site and PCE has been detected at elevated levels at sample points upgradient of the JASCO site.
6. City of Mountain View Fire Department and JASCO records and correspondence indicate that PCE has not been stored, used, or distributed at the site.
7. The property immediately east of the JASCO facility had been previously occupied by companies whose industrial activities would typically have used solvents.

Based on the results from the PCE Hydropunch Investigation conducted between 1997 and 1999 and other technical and historical site data as summarized above, the PCE that is present in groundwater at the site does not appear to be associated with any of JASCO's industrial activities. In conclusion, the data suggest that the presence of PCE in groundwater represents movement from an off-site source to the east and upgradient of the JASCO facility.

Section 1
Introduction

The PCE Investigation Report, prepared by The IT Corporation (IT), summarizes the investigation at the Jasco Chemical Corporation (JASCO) site in Mountain View, California regarding the nature and extent of tetrachloroethene (PCE) in groundwater. This report represents data collected by JASCO between 1996 and 2000 to better define the nature, extent, and source of PCE in groundwater at the site and is supplemented with data collected during the other soil and groundwater sampling phases conducted since 1984. These sampling phases include the Preliminary Assessment, the Remedial Investigation (RI)/Feasibility Study (FS), the Remedial Action for soil, and the Quarterly Groundwater Monitoring Program. The purpose of this report is to document JASCO's efforts to identify and address the PCE contamination identified at the eastern portion of the site and in upgradient areas and to support the conclusion that its presence is not associated with any past or present activities on the subject property.

1.1 Site Location

The study area includes the real property located at 1710 Villa Street, Mountain View, California, (JASCO), and the property that lies west of JASCO at a distance of approximately 150 feet and north of JASCO at a distance of approximately 275 feet. Figure 1-1, "Site Location Map," shows the location of the study area relative to the City of Mountain View. Figure 1-2, "Site Plan," shows the study area relative to local roadways. The area to the north and west of JASCO includes a portion owned by the Peninsula Corridor Joint Powers Board (JPB) and a portion of the Central Expressway, an east/west transportation corridor through the City of Mountain View as shown in Figure 1-2. The JPB portion of the site consists of a 100-foot-wide swath wherein two sets of railroad tracks extend in a general northwest/southeast direction connecting San Francisco with San Jose and points south. The Central Expressway, separated from the JPB property by a 6-foot-high chain-link fence, is a four-lane expressway with a 20-foot-wide center median.

The study area relative to soil contamination encompasses the JASCO property and a portion of the property immediately north of the JASCO property boundary.

Figure 1-3, "Existing and Former Structures," depicts the layout of the site and some of the general structures that are or were present. Former structures included a chemical blending and packaging production area, a warehouse area for inventory, an office area, an underground storage tank (UST) area, and storage areas for new, empty containers and drums. Since December 1995, only the office area has remained in use.

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
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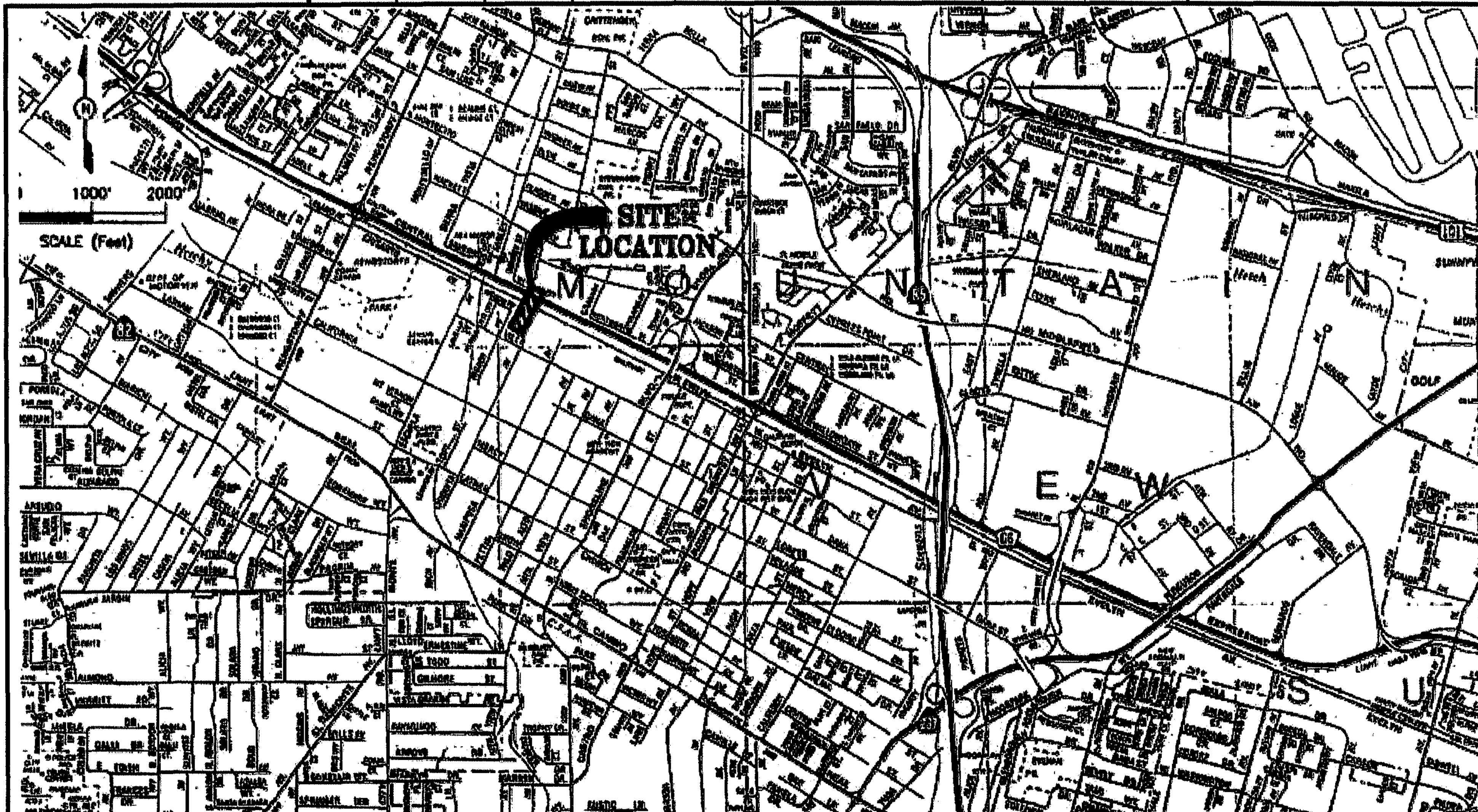

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MOUNTAIN VIEW, CA

FIGURE 1-1
SITE LOCATION MAP
JASCO CHEMICAL, CORP.

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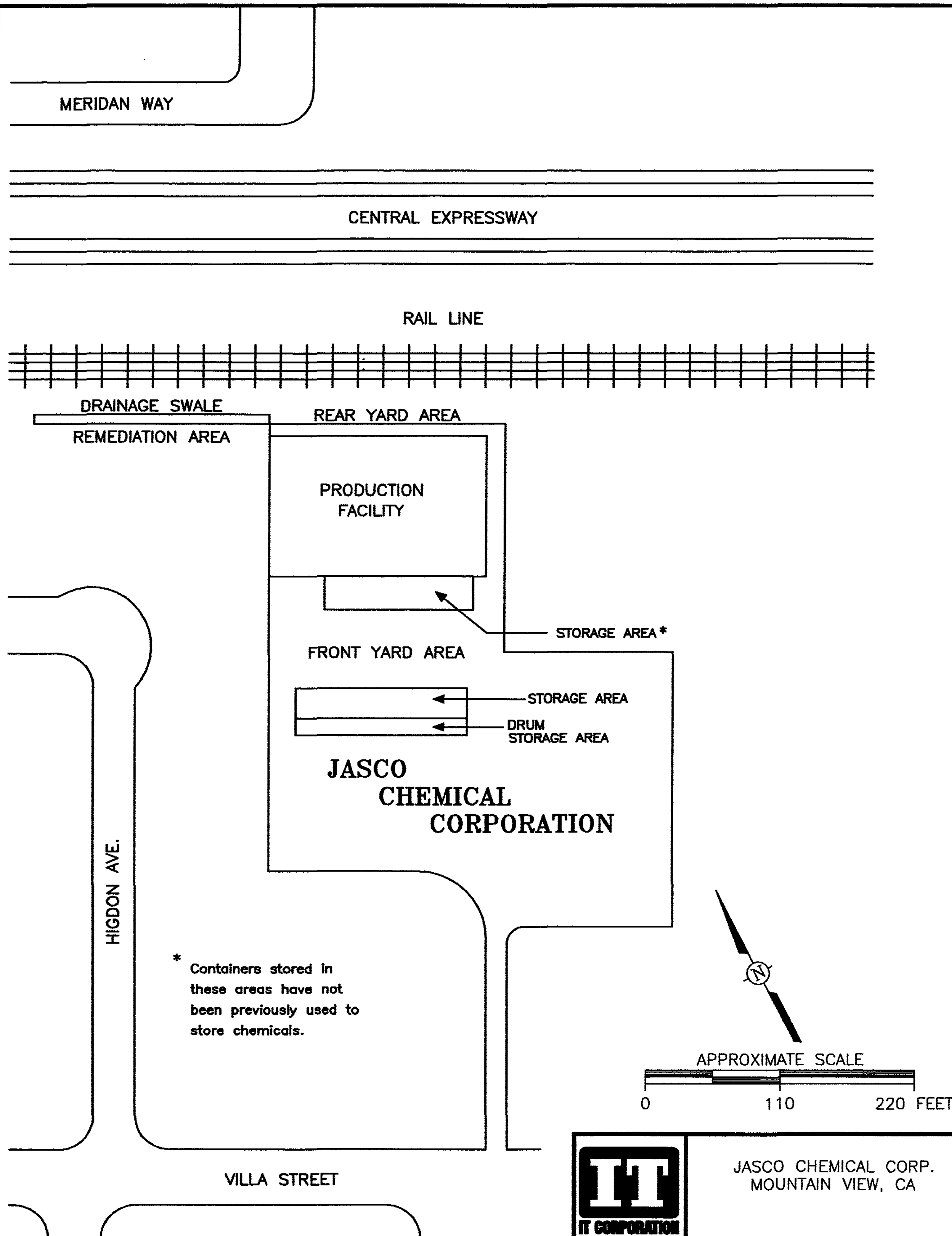

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FIGURE 1–2

SITE PLAN
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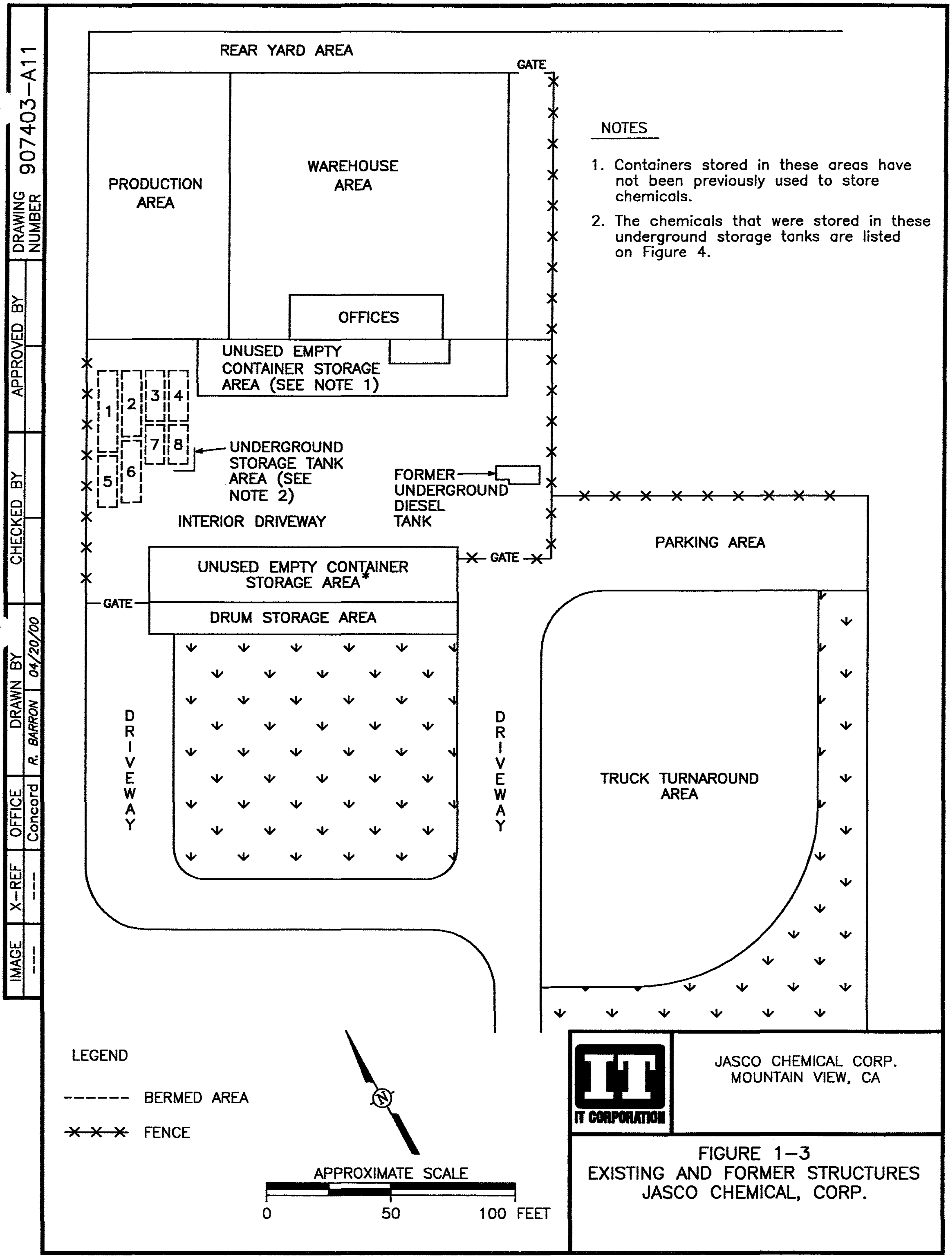


FIGURE 1-3
EXISTING AND FORMER STRUCTURES
JASCO CHEMICAL, CORP.

1.2 Site History

JASCO took possession of the facility in 1976 and operated the facility as a chemical blending and repackaging plant until December 1995. Before JASCO's operation, West Coast Doors, Inc., a manufacturer of residential and industrial doors, operated the facility.

The site was originally zoned for industrial use. In December 1985, the Mountain View City Council adopted the Villa-Mariposa Precise Plan. The Plan specified changes in land use within the area bounded by the JPB railroad tracks, Villa Street, Shoreline Boulevard, and the western boundary of the site; this area includes the JASCO site. The Plan dictated the transition of this area from industrial uses to primarily residential and research and development uses. Several industrial facilities that were in operation on property immediately east and southeast of the JASCO site vacated between 1986 and 1988. The JASCO facility terminated its operations in December of 1995.

Currently, the site is surrounded to the south, west, and east by multi-unit residential property and to the north by railroad tracks and property owned by the JPB.

Section 2
Previous Soil/Groundwater Investigations

2.1 Soil Sampling

The following section summarizes the soil data that was collected before PCE was identified in groundwater at the eastern portion of the site. This includes data collected during the PA/RI as well as during the Remedial Action for soil.

2.1.1 Preliminary Investigation/Remedial Investigation

Several phases of soil sampling were conducted at potential source areas of the site before the site was placed on the National Priorities List and again as a component of RI (OHM, 1991). The drainage swale was the focus of these primary sampling events because it was the area at which contaminants were first detected in soil and groundwater. However, the investigations also evaluated the underground tank storage area, drum storage area, and former diesel tank storage area as potential source areas. The following section describes the results of these earlier soil investigations relative to the presence of PCE in soil. Soil sampling beneath the production and warehouse areas, interior driveway, and truck turnaround areas was conducted as a component of the Remedial Action for soil and is described in Section 2.1.2.

Drainage Swale Area. Between 1984 and 1991, 24 boreholes were drilled within the drainage swale area in association with PAs and the RI. The total depths of the boreholes ranged from 3 feet (ft) below ground surface (bgs) to 30 ft bgs. More than 60 soil samples were collected and analyzed for volatile organic compounds (VOCs) and other target constituents. PCE was detected in eight of these samples at concentrations ranging from 0.21 to 16 milligrams per kilogram (mg/kg). The presence of PCE in soil was limited to the immediate vicinity of a surface depression in the swale near the northwestern corner of the JASCO property. This depression was an outlet for a subsurface drainage line from adjacent property to the east that began at the northeastern edge of the JASCO site and extended toward the west along the railroad right-of-way to the drainage swale area on the western side of the JASCO site. In addition, the natural drainage pattern within the swale is from the east to west, and runoff from areas east of the site collected in this depression until JASCO implemented a surface runoff management program in 1988. This program included installation of a liner to prevent percolation, regrading of the area to redirect runoff, and the installation of a sump to contain collected water.

UST Area. Five soil boreholes were drilled surrounding the UST farm between 1986 and 1991. The area contained eight USTs used to store a variety of chemicals used by JASCO; however, none of the USTs had been used to store PCE. The boreholes were drilled to total depths ranging from 20 to 36 ft bgs and a total of 25 soil samples were collected and analyzed for VOCs. No PCE was detected in any of the samples collected from this area. The USTs were removed in 1995 as a component of Remedial Action for soil activities. The results of subsequent confirmation soil sampling are summarized in Section 2.1.2.

Diesel Storage Tank Area. A diesel storage tank at the southeastern corner of the warehouse area was excavated and removed in 1987 (OHM, 1991). Two soil samples were collected from the excavation floor and wall immediately after removal and a borehole was drilled approximately 25 feet downgradient of the former tank area during a subsequent investigation phase. Six soil samples were collected from the borehole at depths ranging from 1 to 20 ft bgs. The excavation samples were analyzed for total petroleum hydrocarbons (TPH); and benzene, toluene, ethylbenzene, and total xylenes (BTEX); the borehole samples were analyzed for VOCs. PCE was not detected in any of the samples collected from the soil borehole. Additional soil sampling was conducted adjacent to this area as a component of the Remedial Action for soil and is described in Section 2.1.2.

Drum Storage Area. JASCO used a separate drum storage area to the south of the warehouse/production area for the temporary storage of empty containers. Between 1987 and 1990 four boreholes were drilled adjacent to this structure to depths ranging from 6 to 20 ft bgs, and 16 samples were analyzed for VOCs and other target constituents. PCE was not detected in any of the soil samples collected from this area.

2.1.2 Potential Source Area Sampling During Remedial Action

This section describes the soil sampling activities performed at various areas at the JASCO facility during Remedial Action for soil. The extent of this sampling is broader than the areas of remedial activity encompassing the entire JASCO property and portions of adjacent properties. The sampling program was conducted at the request and approval of the U.S. Environmental Protection Agency (EPA) to provide a method for determining whether contaminated soil was present anywhere at the site and not limited to potential source areas only. This section describes sampling events conducted in association with the Remedial Design/Remedial Action Plan (RD/RAP) (1996) as well as additional sampling requested by EPA during the course of the sampling activities. A detailed discussion of the results of this effort can be found in the Remedial Action Report for Soil (OHM, 1999).

The warehouse, production, drum storage, truck turnaround, and interior driveway areas were sampled to determine if soil was impacted by operations conducted in these areas. This sampling effort comprised nearly 200 soil samples from 96 individual boreholes in a grid pattern covering every portion of the JASCO site that was subject to chemical use, storage, or transport. Table 2-1, "Sampling Locations and Grid Dimensions," summarizes the number of boreholes and sample depths by area. All soil samples were collected by direct push drilling methods. Soil borehole locations and grid spacing are described in the Final Field Sampling Plan (FSP)/Quality Assurance Program Plan (QAPP) included in the RD/RAP (OHM, 1996). Soil sample locations were established based on the EPA guidance document, *Statistical Methods for Evaluating the Attainment of Cleanup Standards, Volume 3* (EPA, 1992), with modifications as specified by EPA. The sampling activities in each area were conducted under similar protocols and are described collectively. Figure 1-3 shows the locations of each area of concern. A brief description of each area with sampling results associated with PCE is provided below.

Table 2-1
Sampling Locations and Grid Dimensions

Area	Grid Spacing	Number of Soil Boreholes	Number of Samples per Borehole
Warehouse[1]	20-foot—equilateral triangle	26	Two—1 and 5 feet bgs
Production[1]	15-foot—square grid	17	Two—1 and 5 feet bgs
Drum Storage	19-foot—equilateral triangle	14[2]	Three—1, 5, and 10 feet bgs (10-foot samples were not analyzed unless contaminants of concern were detected at the 1- or 5-foot depths)
Truck Turnaround	35-foot—equilateral triangle	18	Two—1 and 5 feet bgs (Only 13 out of 18 of 5-foot samples were analyzed. The remaining 5 were not analyzed based on results from the 1-foot sample on agreement with EPA.)
Interior Driveway	15-foot-square grid (west and east ends of the area)	21	Three—1, 5, and 10 feet bgs (10-foot samples were not analyzed unless contaminants of concern were detected at the 1- or 5-foot depths)

[1] *The warehouse and production areas were sampled twice at selected boring locations to confirm the absence of methylene chloride.*

[2] *One soil boring location could not be completed due to the presence of a water pipeline.*

bgs denotes below ground surface.

2.1.2.1 *Warehouse Area*

The warehouse area encompasses the eastern three-fourths (12,000 square feet) of the office/warehouse/production structure. The warehouse was used to store packaged JASCO products being staged for shipping. The office area, which is within the warehouse, was not included in the sampling area. Soil borehole locations for the warehouse area are identified in Figure 2-1, "Soil Boring Locations, Warehouse and Production Areas."

Fifty-two samples were collected and analyzed from the 26 original soil boreholes completed in the warehouse area. No PCE was detected in any of the samples. The only VOC that was present was methylene chloride, which was detected in 17 out of 52 soil samples, at concentrations slightly above the cleanup standard of 0.2 mg/kg. The concentrations of methylene chloride detected in the 17 soil samples ranged from 0.21 mg/kg to 0.49 mg/kg. The primary analytical laboratory was only capable of analyzing VOCs in soil at medium-high detection range and did not have the instrumentation necessary to accurately analyze such low-level VOCs in soil. Due to this instrument limitation problem, the reporting limit for methylene chloride was at the cleanup standard of 0.2 mg/kg. Since methylene chloride is a common laboratory contaminant and the laboratory had suspected laboratory contamination, the methylene chloride results were deemed questionable. Twenty additional soil samples were collected from 15 new soil boreholes in the warehouse area and analyzed by a separate laboratory using more sensitive instrumentation. No VOCs were detected in any of the new soil samples. Specifically, methylene chloride was not detected above 0.013 mg/kg, which is significantly below the cleanup standard of 0.2 mg/kg. Analytical results for the original samples collected at the warehouse are presented in Appendix A, Table D-1. Analytical results for the resampling event in the warehouse are presented in Appendix A, Table D-2.

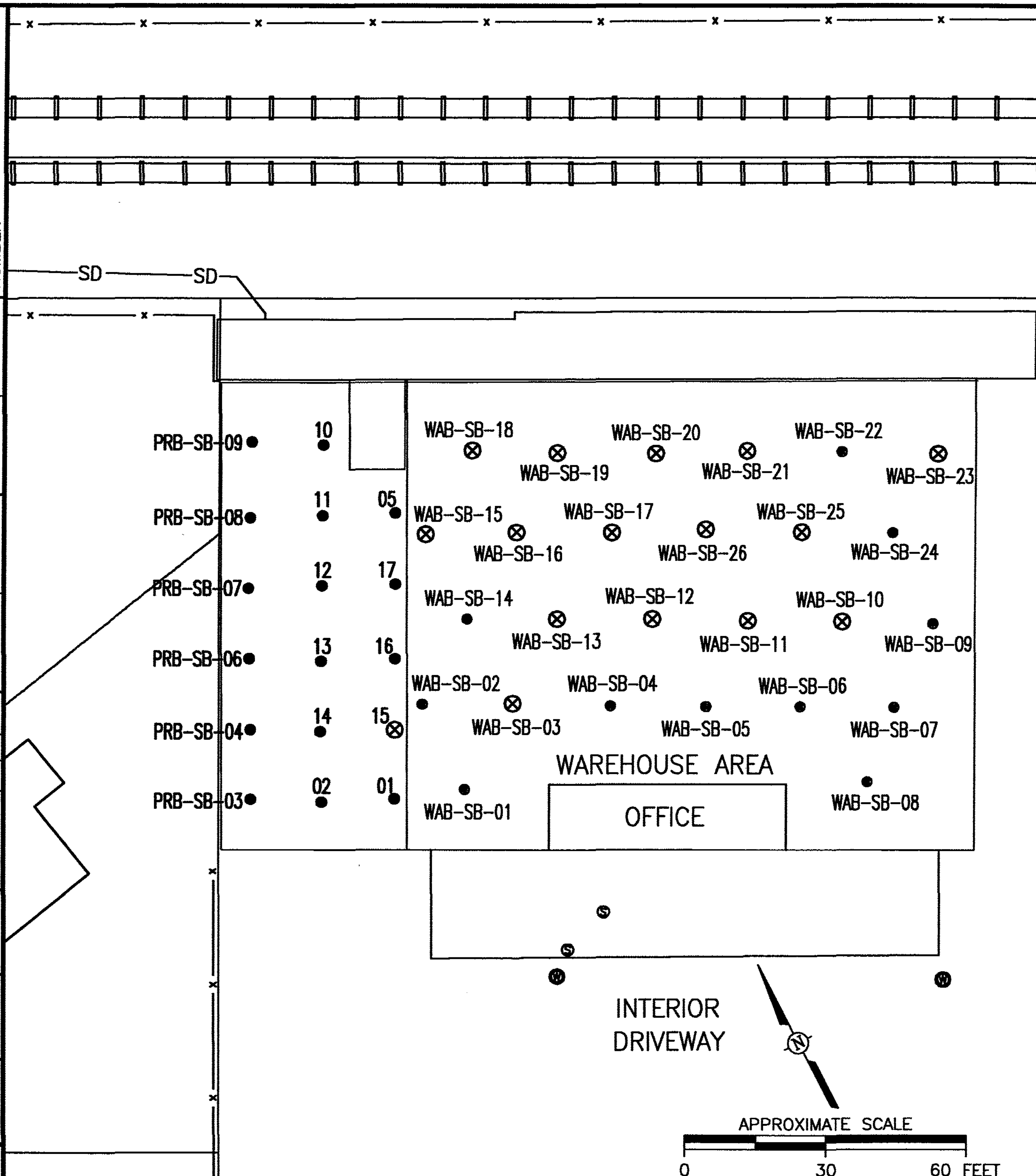
2.1.2.2 *Production Area*

The production area is a concrete bermed area encompassing the western third (4,000 square feet) of the enclosed office/warehouse/production structure. The production area was used primarily for blending and packaging chemicals. Sampling locations for the production area are identified in Figure 2-1.

Thirty-four soil samples were collected from the 17 original soil boreholes completed in the production area. Laboratory analysis did not detect PCE in any of these samples. Methylene chloride was detected in one sample at a concentration slightly above the detection limit and cleanup standard. However, a second sample from this location, analyzed by a more accurate method, did not contain methylene chloride above detection limits. Analytical results for the original samples collected from the production area are presented in Appendix A, Table D-3. Analytical results from the resampling event are presented in Appendix A, Table D-2.

2.1.2.3 *Drum Storage Area*

The drum storage area consists of an area approximately 20 feet by 120 feet abutting the covered parking structure south of the loading area. This area was used to store empty drums. Sampling locations for the drum storage area are identified in Figure 2-2, "Soil Boring Locations, Interior Driveway and Drum Storage Area."



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- SOIL BORING LOCATIONS

⊗ RESAMPLED SOIL BORING LOCATIONS

NOTE: SAMPLE NAMES FOR PRODUCTION AREA WERE ABBREVIATED FOR PRESENTATION PURPOSES

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FIGURE 2–1
SOIL BORING LOCATIONS, WAREHOUSE AND PRODUCTION AREAS

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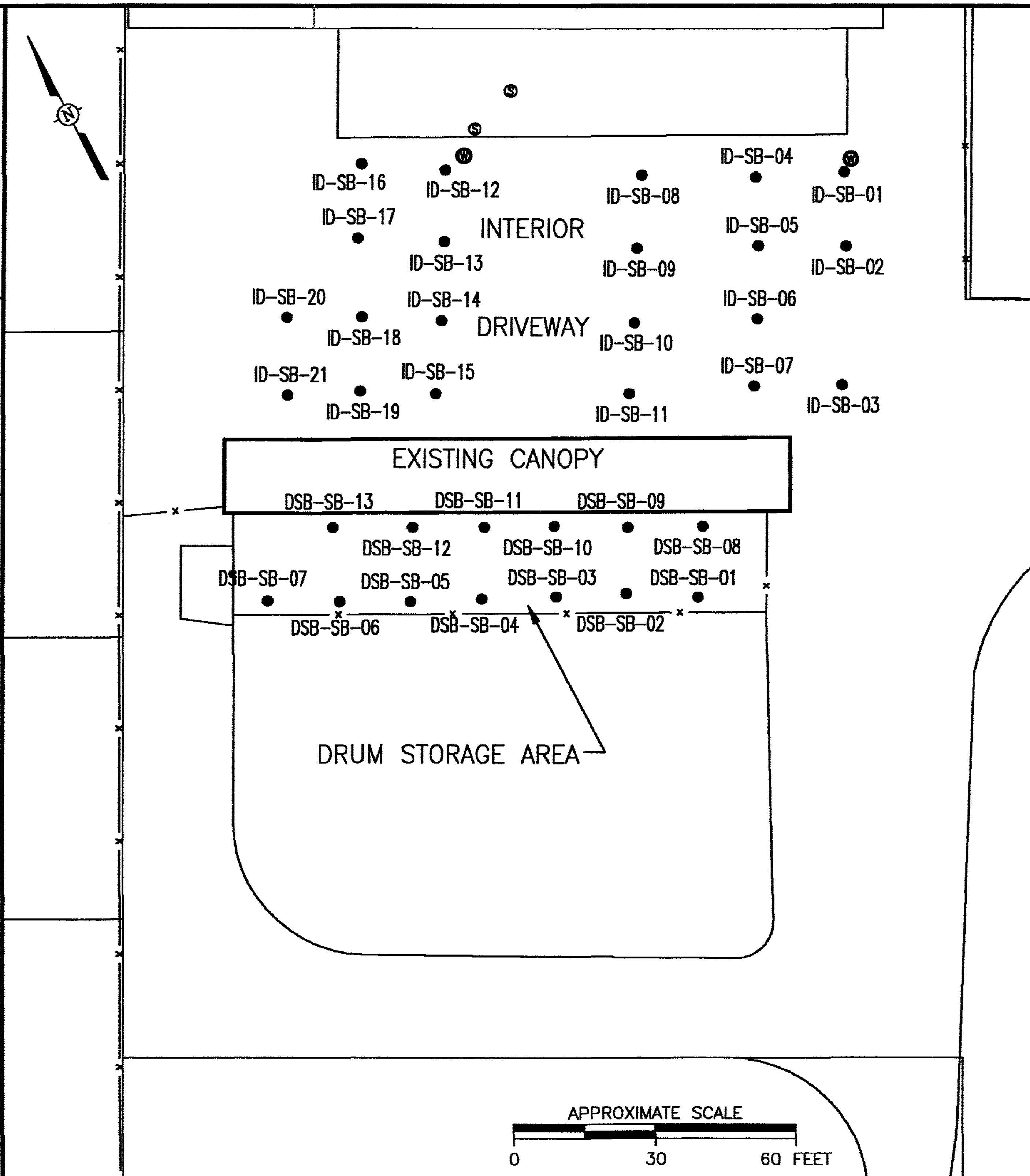

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- SOIL BORING LOCATIONS

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FIGURE 2-2
SOIL BORING LOCATIONS
INTERIOR DRIVEWAY AND DRUM
STORAGE AREA
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Twenty-eight soil samples were collected from 13 soil boreholes completed at the drum storage area. All samples collected at 1 and 5 ft bgs and two at 10 ft bgs were analyzed. PCE was not detected in any of the samples. Methylene chloride was detected in 26 samples, TPH in 7 samples, and acetone in one sample but at concentrations well below cleanup standards. The presence of methylene chloride and acetone is likely due to laboratory interference. Phenol, a non-target constituent, was detected in 23 samples at concentrations below EPA Region IX Preliminary Remediation Goals (PRGs) for residential soil. Analytical results for the drum storage area are presented in Appendix A, Table D-4.

2.1.2.4 Interior Driveway Area

The interior driveway area is located between the UST area and the former diesel tank area. This area was used to stage trucks during loading and unloading operations. Sampling locations for the interior driveway area are identified in Figure 2-2

Forty-six soil samples were collected from the 21 soil boreholes completed at the truck turnaround area. All samples collected from 1-foot and 5-foot depths were analyzed on a quick turnaround basis. Four soil samples at 10 ft bgs from soil boreholes ID-SB06, ID-SB07, ID-SB12, and ID-SB17 were analyzed for VOCs by EPA Method 8260 based on VOC results from the 1- and 5-foot depths. PCE was not detected in any of the samples. Methylene chloride was detected in 37 samples, TPH in 19 samples, and acetone in four samples but at concentrations well below cleanup standards. The presence of methylene chloride and acetone is likely due to laboratory interference. Phenol, a nontarget constituent, was detected in 26 samples at concentrations below EPA Region IX PRGs for residential soil. Analytical results for the interior driveway area are presented in Appendix A, Table D-6

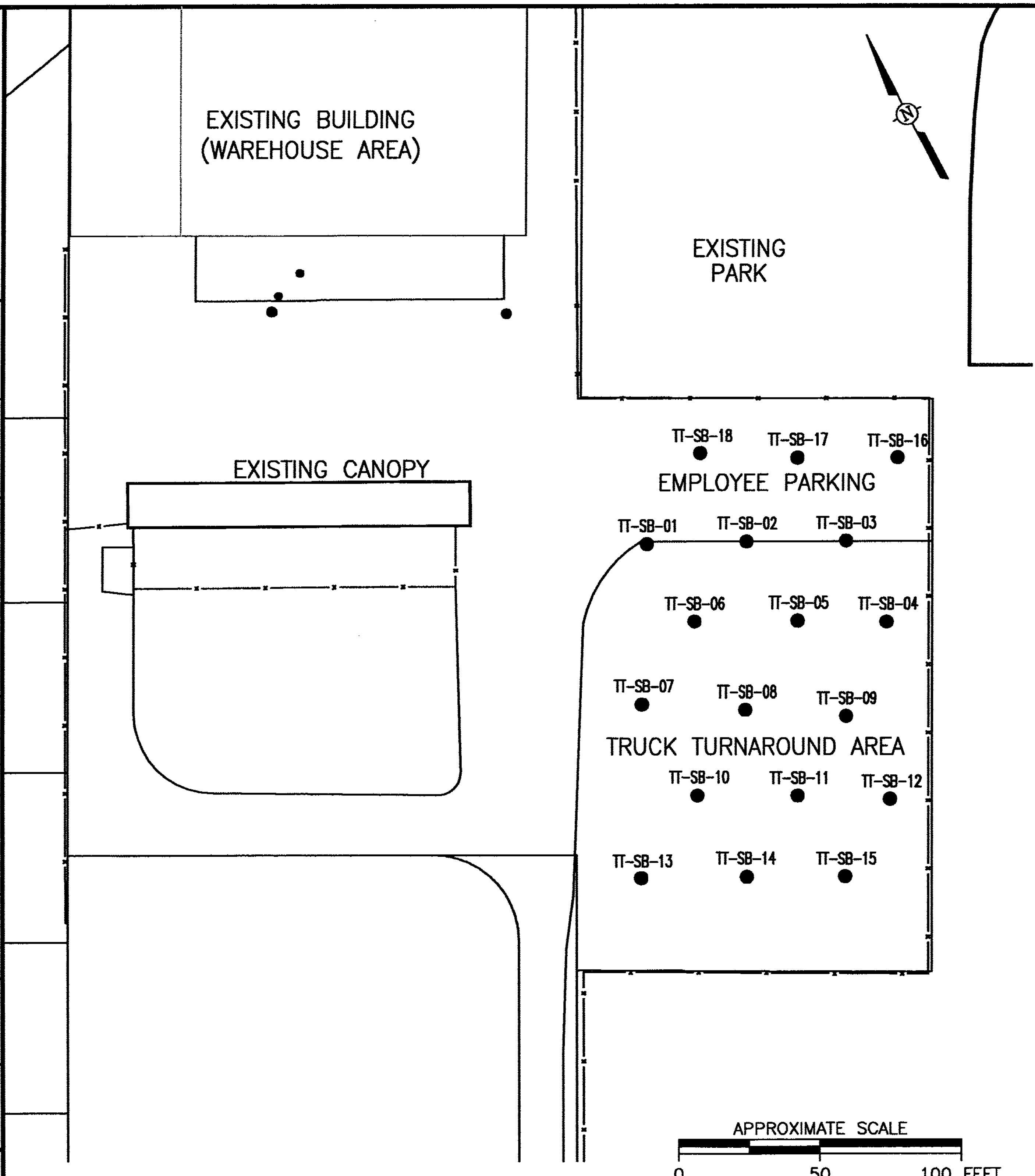
2.1.2.5 Truck Turnaround Area

The truck turnaround area encompasses approximately 19,000 square feet of partially paved area including the employee parking lot and the grass area directly south of the employee parking lot. Sampling locations for the truck turnaround area are identified in Figure 2-3, "Soil Boring Locations, Truck Turnaround Area."

Thirty-one soil samples were collected from the 18 soil boreholes completed at the truck turnaround area. All samples collected from 1 foot bgs and 13 samples collected from 5 ft bgs were analyzed. PCE was not detected in any of the samples. Methylene chloride was detected in 10 samples at concentrations below cleanup standards, but its presence is likely due to laboratory interference. TPH was detected in 20 samples and phenol in 14 samples at concentrations below cleanup standards or Region IX PRGs for residential soil. Analytical results for the truck turnaround area are presented in Appendix A, Table D-5.

2.1.3 Drainage Swale Area

The drainage swale is divided into three areas. Drainage Swale Area 1 (DS-1) encompasses the immediate vicinity of the former surface depression along the railroad right-of-way at the northwestern corner of the JASCO property. This is the area where the highest levels of contaminants were identified in subsurface soils at the site. A smaller subset of Area DS-1



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• SOIL BORING LOCATIONS

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FIGURE 2–3
SOIL BORING LOCATIONS
TRUCK TURNAROUND AREA
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was remediated in 1988 by excavation and off-site disposal. As the area was excavated to the depth of water and backfilled with cement, it was not a component of any subsequent sampling activities during Remedial Action for soil. Drainage Swale Area 2 (DS-2) is an elongated portion of the drainage swale extending approximately 160 feet to the west of Area DS-1. This area was subject to downgradient flow from Area DS-1 and was generally characterized by lower concentrations of target constituents during the RI.

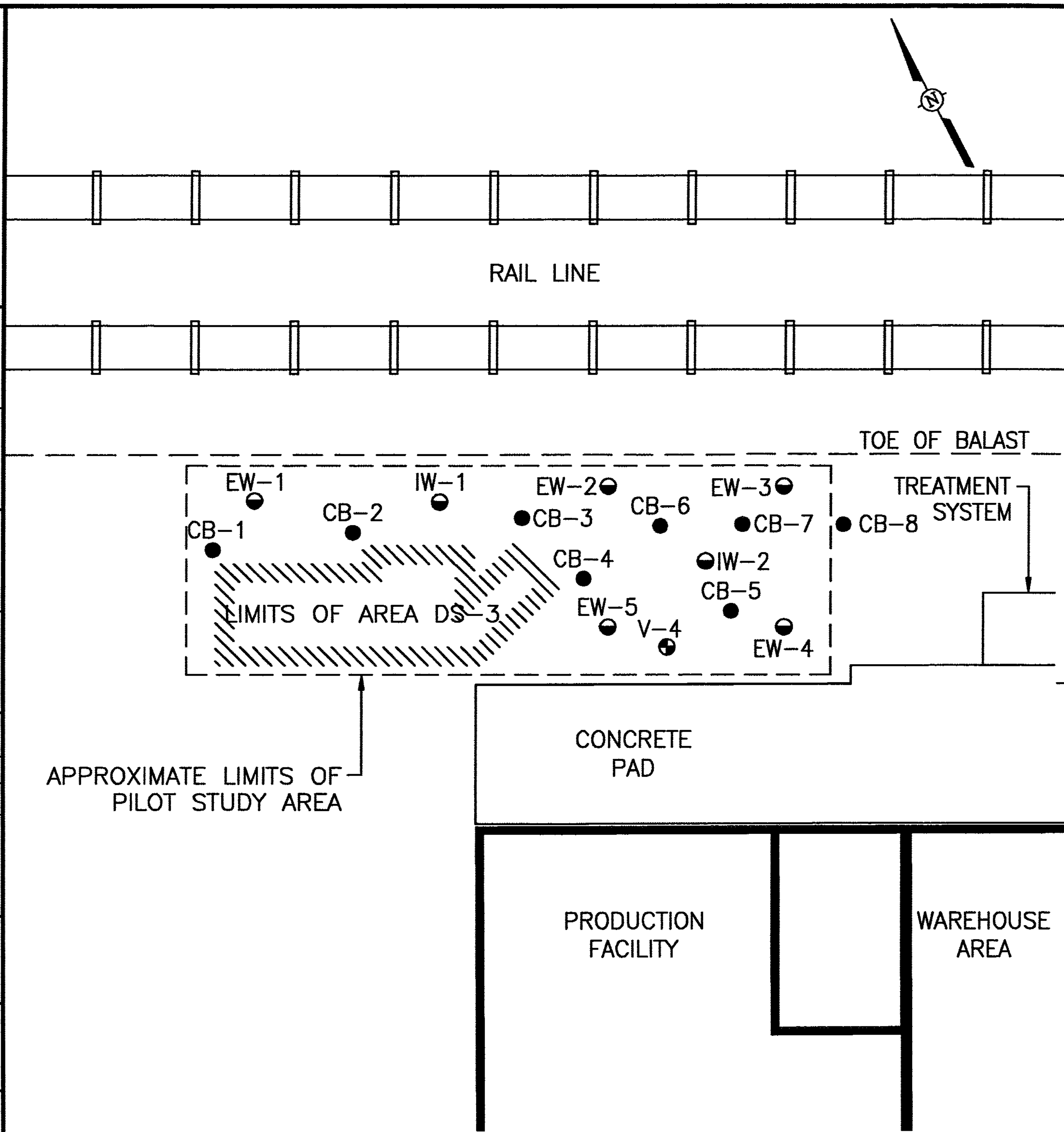
A dual vacuum extraction (DVE) system was operated at Area DS-1 and the adjacent portion of Drainage Swale Area 3 (DS-3) for 8 months under the pilot test program in 1995. This system provided soil remediation by soil vapor extraction (SVE) of vadose zone soils and groundwater extraction from the capillary fringe. Upon completion of the pilot test, eight confirmation soil boreholes were completed at Area DS-1. The soil boreholes were used to evaluate the effectiveness of the Fluid Injection with Vacuum Extraction system in reducing target constituent concentrations in the soil. Soil borehole locations are identified in Figure 2-4, "Locations of Confirmation Soil Borings at Area DS-1." The DVE system continued to operate for an additional two years and three months after this sampling event, removing contaminants from soil and groundwater.

Twenty-three soil samples were collected and analyzed from the eight confirmation soil boreholes completed in the DVE pilot study area (Area DS-1). Confirmation soil boreholes were completed using direct-push drilling methods. Soil samples were collected into clear acetate liners, were labeled and logged on the Chain-of-Custody Form (COC), and were stored in coolers containing ice before they were shipped to the laboratory. Three soil samples were collected from each borehole location: one within the upper screened zone at a depth of approximately 8 ft bgs and two within the middle screened zone at approximately 19 and 26 ft bgs. All soil samples were analyzed for semivolatile organic compounds (SVOCs) by EPA Method 8270, VOCs by EPA Method 8240, alcohols by EPA Method 8015m, and TPH by EPA Method 8015 modified.

PCE was not detected in any of the samples. Methylene chloride was detected in two samples at concentrations slightly above cleanup standards but its presence is likely due to laboratory interference. TPH was detected in each of the samples and phenol in eight samples at concentrations below cleanup standards or Region IX PRGs for residential soil. Pentachlorophenol was detected in four samples at concentrations well below the cleanup standard of 200 mg/kg. A table summarizing analytical results for these samples is presented in Appendix A, Table D-7, "Summary of Analytical Results for Drainage Swale Area 1 (DS-1)."

2.1.3.2 Drainage Swale Area 2 (DS-2)

Area DS-2 encompasses the remainder of the drainage swale area extending 160 feet to the west of Area DS-1 (see Figure 2-5, "Locations of Soil Borings Area DS-2"). The dimensions of this area are based on contaminant delineation from previous investigations, which are described in the RI (OHM, 1991). Based on previous investigations, the presence of target constituents in this area is limited to a few VOCs, acetone, methylene chloride, and 1,1-dichloroethane in a small area at a maximum depth of 3 ft bgs. Because of its proximity to the Pilot Study Area (Area DS-1), the soil in Area DS-2 may have been impacted by operation of the pilot study system.



NOT TO SCALE

LEGEND

- — — AREA OF PILOT STUDY
- ● CONFIRMATION BORING
- GROUNDWATER EXTRACTION WELL
- DVE EXTRACTION/INJECTION WELL
- AREA EXCAVATED DURING INTERIM REMEDIAL ACTION AND BACKFILLED WITH CONCRETE

IT CORPORATION

JASCO CHEMICAL CORP.
MOUNTAIN VIEW, CA

FIGURE 2-4
LOCATIONS OF CONFIRMATION SOIL BORINGS AT AREA DS-1
JASCO CHEMICAL, CORP.

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	Concord	R. BARRON 04/20/00			907403-A5

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY	APPROVED BY	DRAWING NUMBER
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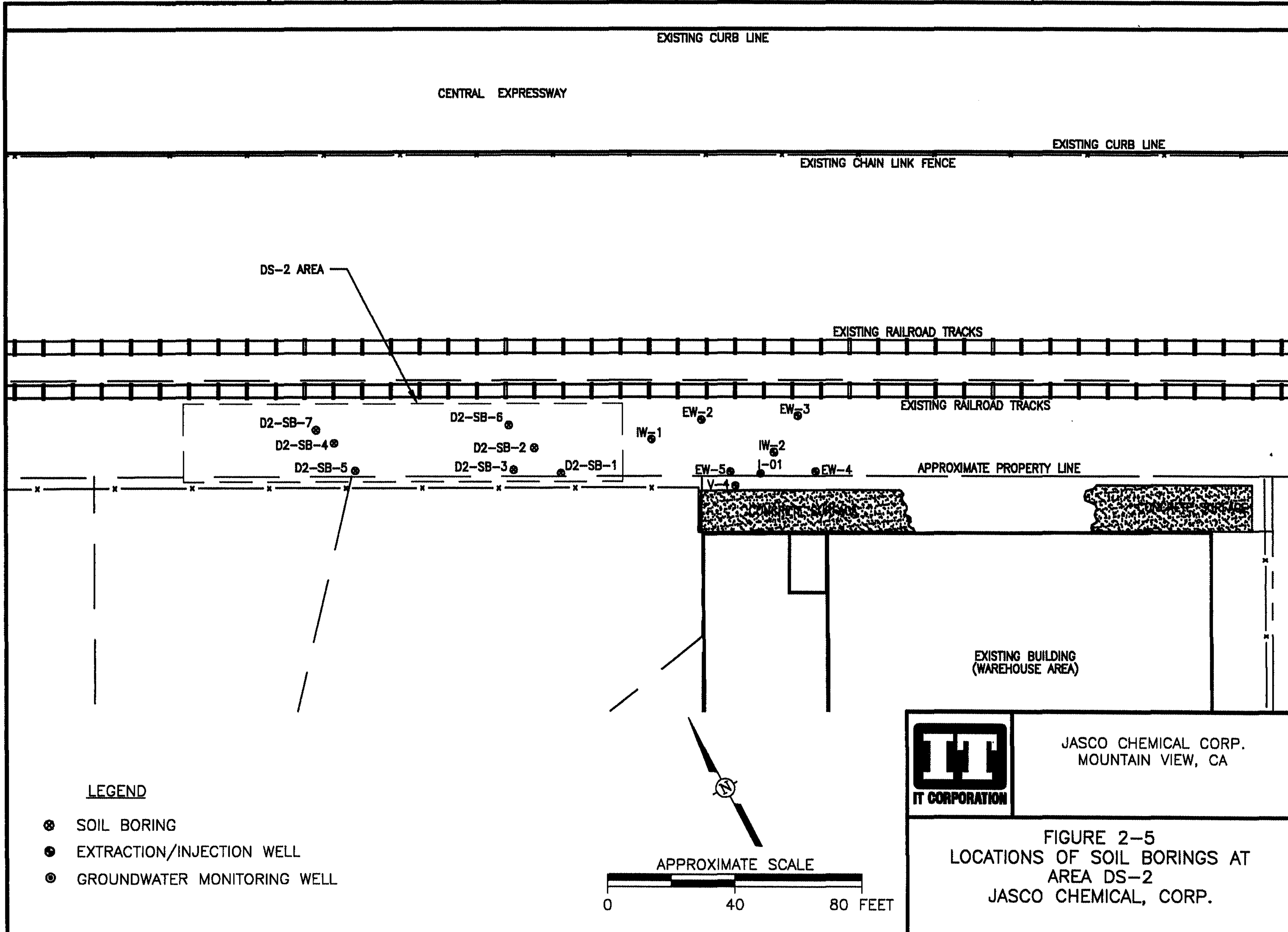


JASCO CHEMICAL CORP.
MOUNTAIN VIEW, CA

FIGURE 2-5
LOCATIONS OF SOIL BORINGS AT AREA DS-2
JASCO CHEMICAL, CORP.

Soil samples were collected from Area DS-2 to further evaluate the extent of target constituents in the immediate vicinity of previous boreholes SB-9, SB-10, and SB-12, which contained detectable concentrations of VOCs. Seven soil boreholes were completed in Area DS-2 using hand auguring equipment. Soil samples were collected into brass sleeves at 3 and 5 ft bgs. The samples were first screened using a portable photoionization detector (PID) to detect the presence of VOCs. The samples were labeled, logged on the COC, and stored in coolers containing ice before they were shipped to the laboratory.

PID readings indicated that VOCs were not present above background levels. In accordance with the FSP/QAPP (OHM, 1996), and based on these field screening results, the laboratory analyzed only the 3-foot interval soil sample from the three boreholes (SB-02, SB-03, and SB-04) that were located near former boreholes SB-9, SB-10, and SB-12. Soil samples from all other borehole locations were held at the laboratory pending laboratory results from boreholes SB-02, SB-03, and SB-04. Based on the previous analytical data from the area, the soil samples were analyzed for VOCs only, using EPA Method 8240.

Three soil samples from Area DS-2 were analyzed for VOCs by EPA 8260. PCE was not detected in any of these samples. Methylene chloride was detected at concentrations below the cleanup standard of 0.2 mg/kg. 1,1,1-trichloroethane was detected in one sample at a concentration well below the cleanup standard of 100 mg/kg. A table summarizing analytical results for the samples from Area DS-2 is presented in Appendix A, Table D-8, "Summary of Analytical Results for Drainage Swale Area 2 (DS-2)."

2.1.4 Underground Storage Tank Area

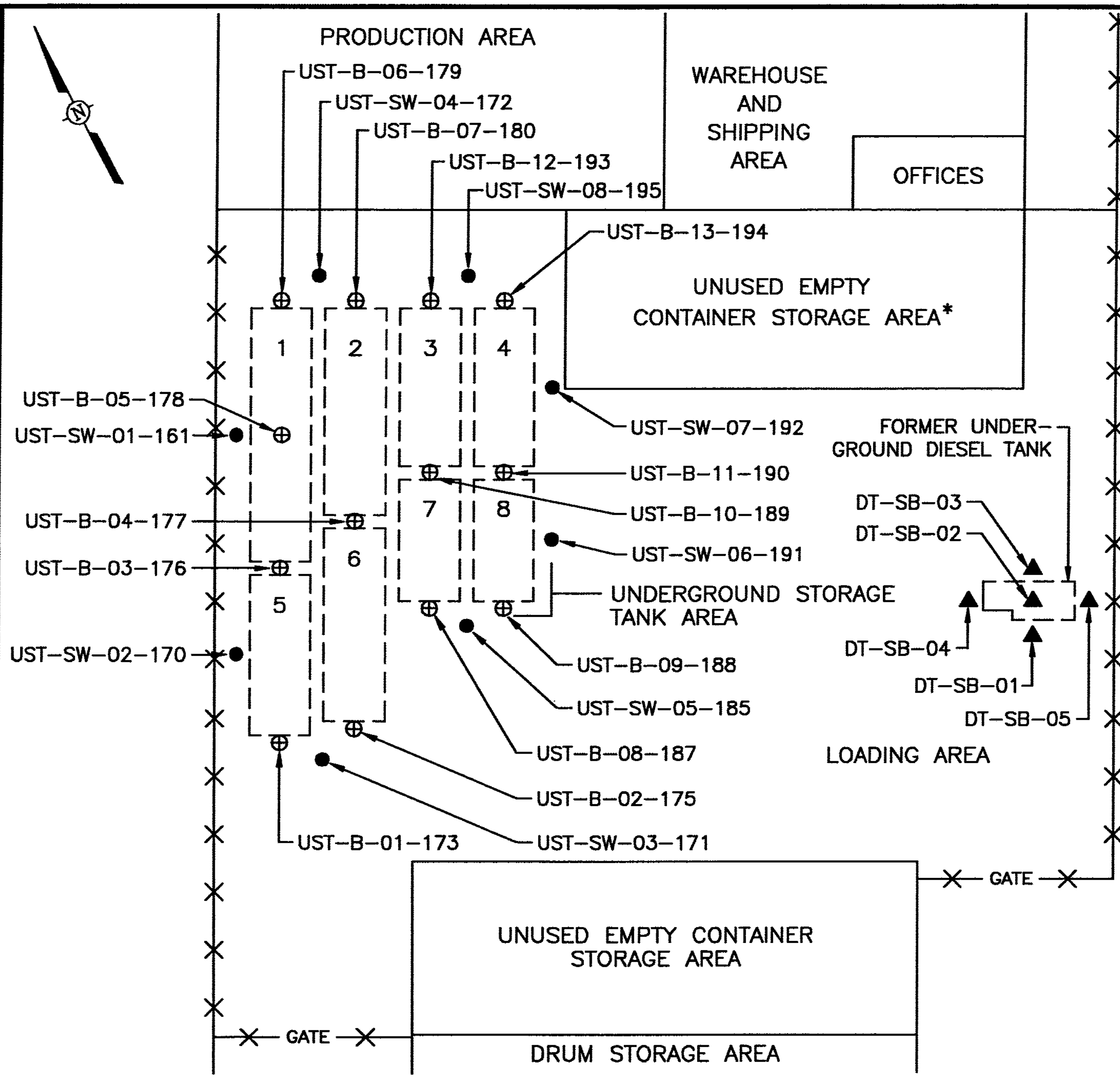
2.1.4.1 Excavation Sampling

The objective of sampling the UST excavation area was to confirm that contaminated soil was not present at the extent of the excavation after removal of the storage tanks. Soil sampling locations were determined based on the *Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites* (California Regional Water Quality Control Board [RWQCB], 1990) and are a function of the capacity of the tanks in gallons. Table 2-2, "JASCO UST Numbers, Capacity, and Soil Samples Required," shows the volumes of the eight USTs removed, the number of samples required, and the sample locations required.

The JASCO tanks were arranged in a pattern such that the tanks were situated end to end, in four rows of two tanks each (see Figure 2-6, "Soil Sample Locations, UST Farm and Former Diesel Tank Area"). Due to this orientation and the close proximity of the tank ends, only one soil sample was collected for verification for the ends of both tanks. Sidewall samples were systematically distributed along the walls of the excavation, at a frequency of one sample for every 20 linear feet. No sampling along distribution piping was necessary because the piping runs ended at the southern edge of the former production area less than 5 feet from the tank area.

Table 2-2
JASCO UST Numbers, Capacity, and Soil Samples Required

Tank Number	Capacity (gallons)	Number of Samples	Sample Location
1	12,000	3	One sample from each end of the tank and one in the middle
2	10,000	2	One sample from each end of the tank (tanks located end-to-end had one sample between the two ends)
3	6,000	2	
4	6,000	2	
5	5,000	2	
6	6,000	2	
7	5,000	2	
8	5,000	2	



Chemicals Stored

1. Methylene Chloride
2. Paint Thinner
3. Pentachlorophenol/Paint Thinner
4. Denatured Alcohol
5. Methanol
6. Deodorized Kerosene
7. Lacquer Thinner
8. Acetone

* Containers stored in these areas were not used to store chemicals.

LEGEND

- ⊕ BOTTOM SAMPLE
- ● SIDEWALL SAMPLE
- ▲ SOIL BORING LOCATION
- —x— FENCE LINE

APPROXIMATE SCALE
0 20 40 FEET

IT CORPORATION

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MOUNTAIN VIEW, CA

FIGURE 2-6
SOIL SAMPLE LOCATIONS UST FARM & FORMER DIESEL TANK AREA
JASCO CHEMICAL, CORP.

DRAWING NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	OFFICE	X-REF	IMAGE
907403-A6			R. BARRON 04/20/00	Concord	---	---

After the tanks were removed, the sidewalls and bottom of the excavation were first visually inspected for the presence of staining and then screened using a field flame ionization detector to detect the presence of VOCs. Thirteen verification soil samples were then collected from the bottom of the tank excavation at approximately 11 to 12 ft bgs, and eight sidewall samples were collected at approximately 6 to 7 ft bgs. All soil samples were analyzed for phenols by EPA Method 8270, VOCs by EPA Method 8240, alcohols by EPA Method 8015, and TPH by EPA Method 8015 modified

PCE was not detected in any of the samples. Methylene chloride and TPH was detected in a number of the samples but at concentrations at least an order of magnitude below cleanup standards. Tables summarizing analytical results for these samples are presented in Appendix A, Tables D-9 and D-10.

2.1.4.2 Stockpile Sampling

Soil that was excavated during the UST removal was staged in temporary stockpiles of approximately 40 cubic yards each. Eleven soil stockpiles were generated during the UST removal process. One discrete soil sample was collected from each stockpile to determine if target constituents were present above the soil cleanup standards listed in Table 2-3, "Cleanup Standards for Target Constituents in Soil." Stockpiles with constituent concentrations above the cleanup standard were remediated on site through an enhanced bioremediation system. Stockpiles with constituent concentrations below the cleanup standards were used as backfill material for the UST excavation.

One discrete soil sample was collected from each stockpile using hand auguring equipment. Soil samples were collected into brass sleeves at a depth of approximately 3 feet below the stockpile surface. The samples were labeled, logged on the COC, and stored in coolers containing ice before they were shipped to the laboratory. All of the soil stockpile samples were analyzed for phenols by EPA Method 8270, VOCs by EPA Method 8240, alcohols by EPA Method 8015, and TPH by EPA Method 8015 modified

Eleven soil samples were collected from the 11 soil stockpiles generated during the UST excavation. PCE was not detected in any of the samples. Pentachlorophenol was detected in sample number UST-SP-10 at a concentration of 260 mg/kg, which is above the cleanup standard of 200 mg/kg. This soil from this stockpile was subsequently remediated by enhanced bioremediation. The remaining ten stockpiles did not contain target constituents above the cleanup standards and were subsequently used as clean backfill material. Analytical results for the stockpile samples are presented in Appendix A, Table D-11.

2.1.5 Former Diesel Tank Area

A 600-gallon diesel UST, formerly located at the eastern edge of the loading area, was removed in 1987. The excavation encompassed an irregular area equivalent to approximately 100 square feet to a depth of approximately 10 feet. Analyses of soil samples collected from the excavation at the time of tank removal indicated the presence of TPH as

Table 2-3
Cleanup Standards for Target Constituents in Soil

Target Constituent	Soil Cleanup Standard, mg/kg
1,1-Dichloroethane (1,1-DCA)	0.6
1,1-Dichloroethene (1,1-DCE)	2
1,2-Dichloroethane (1,2-DCA)	0.03
1,2,-Dichloroethene (1,2-DCE)	1
1,1,1-Trichloroethane (1,1,1-TCA)	100
Acetone	30
Benzene	0.3
Chloroethane	4,000
Diesel or Kerosene Mixture	10,000
Ethylbenzene	3,000
Methanol	200
Methyl Ethyl Ketone	9
Methylene Chloride	0.2
Pentachlorophenol	200
Tetrachloroethene (PCE)	7
Toluene	3
Trichloroethene (TCE)	3
Vinyl Chloride	0.02
Xylene	2,000

mg/kg denotes milligrams per kilogram

diesel fuel at concentrations between 59 and 360 mg/kg. BTEX concentrations ranged from 0.39 to 9.6 mg/kg. Soil samples collected between the surface and the depth of groundwater at downgradient borehole B-7 did not contain detectable concentrations of TPH as diesel, indicating a lack of downgradient migration of these constituents.

OHM presented a modification to the Work Plan (included in the RD/RAP [OHM, 1996]) regarding excavation at the former diesel UST area in a letter to EPA, Region IX on August 20, 1996. The change in plan was necessary due to the presence of a telephone pole in close proximity to the former tank location, which prevented the use of an excavator. Soil sampling using direct-push drilling techniques was used in lieu of excavation to determine if target constituents were present above the soil cleanup standards. Five soil boreholes were completed in the former diesel UST area on August 26, 1996. Four boreholes were located at the approximate center point of each sidewall and one at the center bottom of the former excavation, as illustrated in Figure 2-6.

Soil samples were collected into clear acetate liners, labeled, and logged on the COC. The samples were stored in ice-filled coolers before they were shipped to the laboratory. One soil sample was collected from each sidewall borehole location at approximately 4 ft bgs. Two soil samples were collected from the center borehole location at 4 and 9 ft bgs. All soil samples were analyzed for VOCs by EPA Method 8240, alcohols by EPA Method 8015, and TPH by EPA Method 8015 modified

Six soil samples were collected from the five soil boreholes completed at the former diesel UST area. PCE was not detected in any of the six samples. One sample contained TPH at a concentrations several orders of magnitude below the cleanup standard. A table summarizing analytical results for this area is presented in Appendix A, Table D-13.

2.2 Quarterly Groundwater Sampling

Installation and sampling of groundwater monitoring wells at the JASCO site was initiated in 1984. JASCO has conducted monitoring of groundwater quality at the site since 1989. The following sections describe the construction of the existing monitoring well program and summarize the historic groundwater quality.

2.2.1 Monitoring Well Network

The existing monitoring well network, which consists of 13 groundwater monitoring wells and 9 piezometers, was installed between 1987 and 1999. Two piezometers are completed in the perched zone, ten wells and five piezometers are completed in the A-aquifer, and three wells and two piezometers are completed in the B-aquifer. The distribution of perched, A-aquifer, and B-aquifer monitoring wells is identified in Figure 2-7, "Piezometer and Groundwater Monitoring Well Network."

DRAWING NUMBER 907403–A10

APPROVED BY

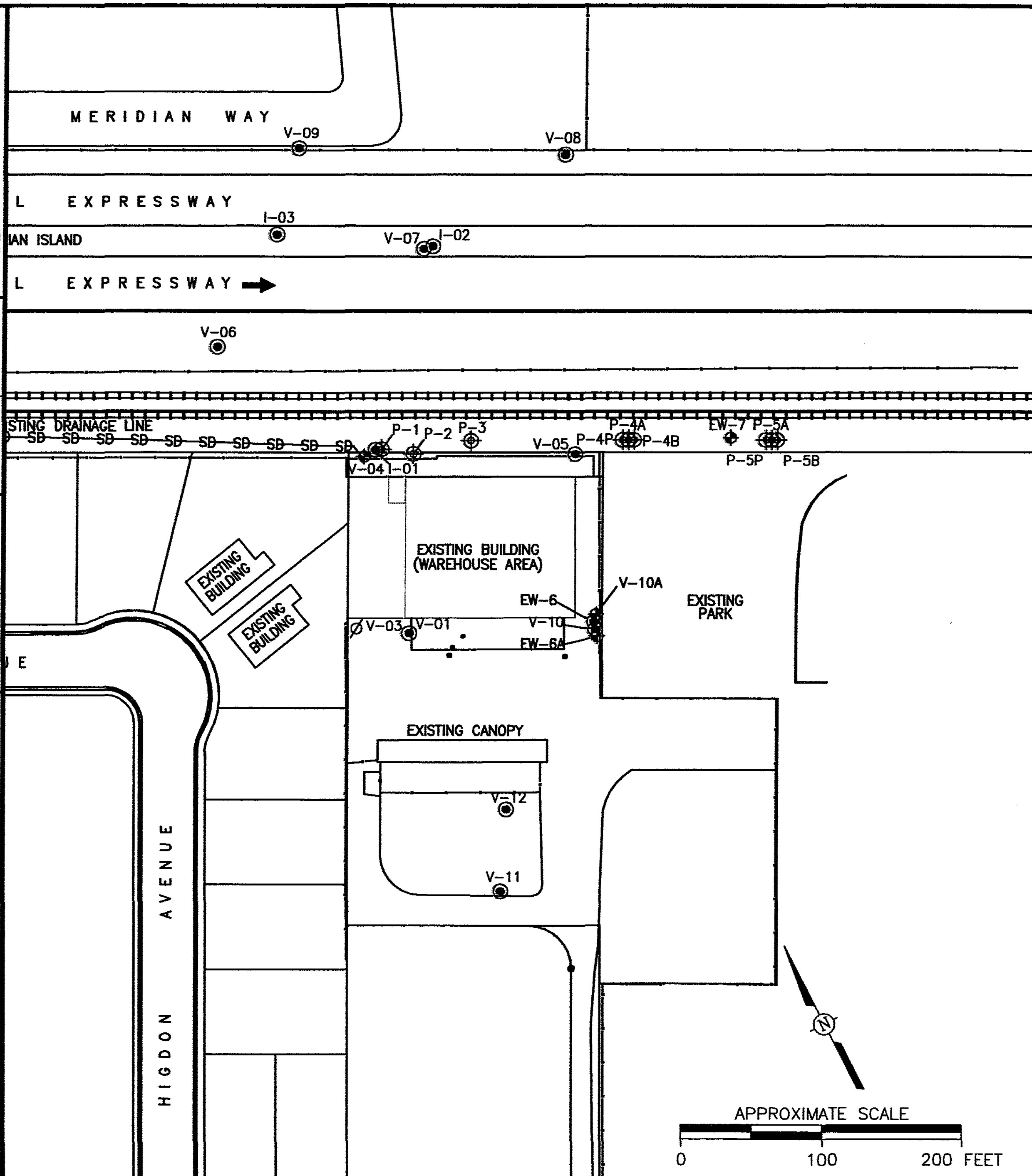
CHECKED BY

DRAWN BY R. BARRON 04/25/00

OFFICE Concord

X-REF ---

IMAGE ---



LEGEND

V–05 ◉ GROUNDWATER MONITORING WELLS

EW–6 GROUNDWATER EXTRACTION WELLS

P–4A PIEZOMETER

V–03 Ø DESTROYED WELL

IT CORPORATION

JASCO CHEMICAL CORP.
MOUNTAIN VIEW, CA

FIGURE 2–7
PIEZOMETER AND GROUNDWATER MONITORING WELL NETWORK
JASCO CHEMICAL, CORP.

The distribution of the A-aquifer wells provides groundwater quality and potentiometric surface data from both upgradient and downgradient locations as well as from potential source areas. Well V-1 is located on site just north of the former underground storage tank farm. Monitoring wells V-4 and V-5 and piezometers P-1, P-2, and P-3 are located, respectively, within and to the east of the former drainage swale area. Piezometer clusters P-4 and P-5 are located east of and cross gradient of the former drainage swale area.

Monitoring wells V-6, V-7, V-8, and V-9 are located off-site and downgradient of the site. Monitoring well V-10 is located on site just downgradient of the former diesel fuel storage tank. Monitoring well V-11 is located on site and upgradient of the potential source areas and monitoring well V-12 is located adjacent to the former drum storage area.

The three B-aquifer monitoring wells are located within and downgradient of the former drainage swale area (Figure 2-7). Monitoring well I-1 is located just north of the production area within the former drainage swale area. Monitoring wells I-2 and I-3 are located within the median of the Central Expressway to the north and northeast, respectively, of monitoring well I-1.

2.2.2 Well Construction

Each of the 14 groundwater monitoring wells associated with the site are constructed of Schedule 40 polyvinyl chloride (PVC) with casing diameters, screened intervals and slot thickness of varying dimensions. Table 2-4, "Summary of Construction Details of Monitoring Wells and Piezometers," provides a summary of construction details of the monitoring wells and piezometers and the aquifer in which they are screened. Monitoring wells V-1 to V-12 were completed by the hollow stem auger method. Monitoring wells I-1 to I-3 were constructed using both the hollow-stem auger and mud-rotary methods. The mud-rotary method was used at these locations to allow drilling of a larger diameter borehole and installation of conductor casing from the surface to the A-B-aquitard. The conductor casing was used to seal the A-aquifer before drilling deeper and installing a B-aquifer monitoring well. Piezometers P-1 through P-5 were drilled using a hollow stem auger drill rig. Appendix B-1 includes well completion diagrams for each of the piezometers and monitoring wells.

2.2.3 Sampling Methodology

Groundwater samples are collected by purging a minimum of three casing volumes from each well before sampling. Filed parameters of pH, electrical conductivity, temperature, and turbidity are monitored after each casing volume in removed. After the parameters stabilize, (less than a 10 percent change between successive readings), a groundwater sample is collected with a Teflon™ bailer and transferred to the appropriate containers. Depending upon the laboratory analysis, samples are collected in 40-milliliter (ml) vials with Teflon™ septum or in 1-liter glass bottles with Teflon™-lined caps. The samples are logged, labeled, and stored in an ice chest for delivery to the certified laboratory.

Table 2-4
Summary of Construction Details of Monitoring Wells and Piezometers

Well #	Installation Date	Aquifer	Bore Diameter inches	Boring Depth feet	Well Depth feet	Bottom Seal Materials	Formation at Total Depth	Top of Casing Elevation feet	Casing Type	Casing Diameter inches
V-1	5/24/84	A	8"	50	48	bent./cement	alluvium	57.95	Schedule 40 PVC	2
V-2	8/22/86	A	8"	35	35	—	alluvium	—	Schedule 40 PVC	2
V-3	11/3/86	A	10"	35	35.5	—	alluvium	57.96	Schedule 40 PVC	5
V-4	4/2/87	A	10"	40	35	bentonite	alluvium	58.31	Schedule 40 PVC	4
V-5	4/27/87	A	8"	40.5	36.5	bentonite	alluvium	60.55	Schedule 40 PVC	2
V-6	4/28/87	A	8"	47.5	42.7	bentonite	alluvium	58.47	Schedule 40 PVC	2
V-7	4/29/87	A	8"	42.5	35.5	bentonite	alluvium	56.36	Schedule 40 PVC	2
V-8	2/24/88	A	8"	49.2	37	bentonite	alluvium	57.19	Schedule 40 PVC	2
V-9	2/29/88	A	8"	33	28	bentonite	alluvium	56.34	Schedule 40 PVC	2
V-10	3/5/88	A	8"	38	32	bentonite	alluvium	58.86	Schedule 40 PVC	2
V-11	6/20/90	A	10"	41.5	41.5	—	alluvium	59.24	Schedule 40 PVC	4
V-12	6/21/90	A	10"	42	41.5	—	alluvium	58.89	Schedule 40 PVC	4
I-1	5/11/87	B	7"/13.5"	62.5	57.5	bentonite	alluvium	59.00	Schedule 40 PVC	2
I-2	8/14/87	B	7"/13.5"	59.5	54.5	bentonite	alluvium	57.30	Schedule 40 PVC	2
I-3	8/21/87	B	7"/13.5"	71	56	bentonite	alluvium	57.05	Schedule 40 PVC	2
EW-6A	3/17/98	Perched	12"	20	20	—	alluvium	58.72	Schedule 40 PVC	6
V-10A	3/16/98	A	12"	36	35	—	alluvium	58.99	Schedule 40 PVC	6
EW-7	3/29/99	B	12"	64	64	—	alluvium	59.64	Schedule 40 PVC	6
P-1	8/5/97	A	8"	43	41.5	—	alluvium	58.89	Schedule 40 PVC	2
P-2	9/2/97	A	8"	43	41	—	alluvium	59.73	Schedule 40 PVC	2
P-3	9/3/97	A	8"	41	40	—	alluvium	57.63	Schedule 40 PVC	2
P-4P	3/25/99	Perched	8"	21	21	—	alluvium	60.01	Schedule 40 PVC	2
P-4A	3/25/99	A	8"	36	36	—	alluvium	60.05	Schedule 40 PVC	2
P-4B	3/26/99	B	8"	59	56	bentonite	alluvium	59.94	Schedule 40 PVC	2
P-5P	3/25/99	Perched	8"	21	21	—	alluvium	59.38	Schedule 40 PVC	2
P-5A	3/25/99	A	8"	36	36	—	alluvium	58.78	Schedule 40 PVC	2
P-5B	3/26/99	B	8"	70	65	bentonite	alluvium	59.45	Schedule 40 PVC	2

Table 2-4 (continued)
Summary of Construction Details of Monitoring Wells and Piezometers

Well #	Slot Thickness inches	Screened Interval feet	Filter Pack Material	Filter Pack Interval feet	Impermeable Seal Material	Impermeable Seal Interval feet	Sanitary Seal Material	Sanitary Seal Interval feet	Conductor Casing Diameter inches	Conductor Casing Interval feet
V-1	0.010	28-47	Aquarium #4	26-48	None	—	bent./cement	0-26	—	—
V-2	Na	10-35	Lonestar #3	8-35	bentonite	7-8	bent./cement	0-7	—	—
V-3	0.020	20-35	Lonestar #3	17-35	bentonite	16-17	bent./cement	0-16	—	—
V-4	0.010	28-35	Lonestar #3	27-35	bentonite	25-27	bent./cement	0-25	—	—
V-5	0.010	33.5-36.5	Lonestar #3	32-36.5	bentonite	31-32	bent./cement	0-31	—	—
V-6	0.010	37.5-42.7	Lonestar #3	35.5-42.7	bentonite	34.5-35.5	bent./cement	0-34.5	—	—
V-7	0.010	24-35.5	Lonestar #3	22-35.5	bentonite	21-22	bent./cement	0-21	—	—
V-8	0.020	32-37	Lonestar #3	31-37	bentonite	28.5-31	bent./cement	0-28.5	—	—
V-9	0.020	23-28	Lonestar #3	22-28	bentonite	20-22	bent./cement	0-20	—	—
V-10	0.020	25-32	Lonestar #3	24-32	bentonite	22-24	bent./cement	0-22	—	—
V-11	0.010	31.5-41.5	#2-16	30-41.5	bentonite	29-30	bent./cement	0-29	—	—
V-12	0.010	31.5-41.5	#2-16	29-41.5	bentonite	28-29	bent./cement	0-28	—	—
I-1	0.010	48.3-57.5	Lonestar #3	46.3-57.5	bentonite	40-46.3	bent./cement	0-40	—	—
I-2	0.020	49-54.5	Lonestar #3	47-54.5	bentonite	45-47	bent./cement	0-45	—	—
I-3	0.020	49-56	Lonestar #3	46.5-56	bentonite	43.5-46.5	bent./cement	0-43.5	—	—
EW-6A	0.010	9'9"-9'8"	#2-12	8'9"-20	bentonite	6'9"-8'9"	bent./cement	0-6'9"	—	—
V-10A	0.010	24.5-34.5	#2-12	23.5-36	bentonite	21.5-23.5	bent./cement	0-21.5	—	—
EW-7	0.020	44-59	Lonestar #3	42-64	bentonite	40.5-42	bent./cement	0-40	14	0-40.5
P-1	0.020	31-41	#2-12	28-41.5	bentonite	26-28	bent./cement	0-26	—	—
P-2	0.020	30.5-41	#2-12	28.5-41	bentonite	26.5-28.5	bent./cement	0-26.5	—	—
P-3	0.020	32-40	#2-12	30-40	bentonite	28-30	bent./cement	0-28	—	—
P-4P	0.020	13-21	Lonestar #3	12-21	bentonite	10-12	bent./cement	0-905	—	—
P-4A	0.020	26-36	Lonestar #3	25-36	bentonite	23-25	bent./cement	0-22.5	—	—
P-4B	0.020	44-56	Monterey #3	42-56.5	bentonite	40-42	bent./cement	0-39.5	8	0-40
P-5P	0.020	13-21	Lonestar #3	12-21	bentonite	10-12	bent./cement	0-9.5	—	—
P-5A	0.020	26-36	Lonestar #3	25-36	bentonite	23-25	bent./cement	0-22.5	—	—
P-5B	0.020	45-65	Monterey #3	43-65.5	bentonite	39-43	bent./cement	0-38.5	8	0-39

2.2.4 *Summary of Historic Groundwater Quality*

The JASCO site has been monitored and sampled on a quarterly basis for 53 quarters, or 13 years and 1 quarter (first quarter 1987 through first quarter 2000). JASCO began quarterly monitoring and sampling in 1988. The groundwater data discussed in this section draws upon all historical data but is focused primarily on the results of the last four quarters of groundwater monitoring, from January 1999 through December 1999. Historical analytical results for each well are provided in the analytical summary tables found in Appendix C, "Historical Groundwater Analytical Results."

Historically, groundwater containing target constituents exceeding the cleanup levels has been generally limited to portions of the shallow A-aquifer within the drainage swale area near monitoring well V-4 and directly upgradient at the southern edge of the production area (monitoring wells V-1 and V-3). The interim groundwater extraction system that JASCO has operated at monitoring well V-4 contained contaminants from the drainage swale and areas immediately upgradient since 1987.

Target constituents detected in groundwater of the A-aquifer have been limited to TPH as diesel, TPH as JASCO paint thinner, and nine volatile organic compounds: acetone, chloroethane, 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), methylene chloride, pentachlorophenol (PCP), PCE, 1,1,1-trichloroethane (1,1,1-TCA), and vinyl chloride. At monitoring well V-4, the concentrations of 1,1-DCA, 1,1-DCE, and vinyl chloride are consistently greater than their respective cleanup standards. The detection of PCP is infrequent. PCE is present at monitoring well V-4; however, the concentrations are more variable than with the other constituents, suggesting that the PCE is being drawn from an upgradient source to the east as a result of groundwater pumping. The identification of PCE in groundwater during quarterly groundwater analyses is discussed in greater detail in Section 3.0. The maximum concentrations of the detected compounds at monitoring well V-4 over the previous four quarterly sampling events were 41 micrograms per liter (μg/L) for 1,1-DCA; 16 μg/L for 1,1-DCE; less than10 μg/L for PCP; 31 μg/L for PCE; and 2.9 μg/L for vinyl chloride. Excluding PCE, constituents detected at other well locations at concentrations less than cleanup standards were 1,1-DCA and 1,1-DCE (wells V-1 and V-7); 1,1,1-TCA (monitoring well V-7); TPH (monitoring wells V-1 and V-11); and PCP (monitoring wells V-7 and V-9). Of these wells, only V-1 and V-7 have historically contained target constituents exceeding cleanup standards, most recently in April 1995, which is before the Remedial Action for soil was implemented.

Analytical results from the past eight quarters of groundwater monitoring (January 1998 to October 1999) indicate that PCE was the only target compound detected in the B aquifer at levels exceeding cleanup standards. 1,1-DCA, 1,1-DCE, and toluene have been detected at low concentrations at both monitoring wells I-1 and I-2. Appendix C shows the historic concentrations of target constituents in B-aquifer groundwater since the initiation of groundwater monitoring.

Section 3
Identification of PCE in Groundwater

Before July 1993, PCE had not been detected in any of the groundwater monitoring wells since the initiation of groundwater sampling activities in 1984. This period encompassed more than 20 quarterly groundwater monitoring events. The historic distribution of target constituents in groundwater at each of the groundwater monitoring wells is provided in Appendix C. The first detection of PCE in site groundwater was in July 1993 when it was detected in B-aquifer monitoring well I-2 at 2.4 µg/L, but was not detected in any of the other A- or B-aquifer wells at the site. Monitoring well I-2 is located downgradient of the site, within the median of the Central Expressway. Between July 1993 and April 1995, this pattern was consistent, with PCE detected only at monitoring well I-2. The concentration of PCE at this well varied from below detection limits to 25 µg/L but showed an increasing trend. Since that time, the concentration of PCE at monitoring well I-2 has fluctuated from 7 µg/L to 41 µg/L. Figure 3-1, "PCE Concentration at Well I-2 *vs.* Groundwater Elevation, 1992 through 1999," graphically presents the distribution of PCE at monitoring well I-2 since 1992 with a comparison to groundwater elevations.

In April 1995, PCE was first detected at A-aquifer monitoring well V-10 near the western property boundary of the JASCO site. Beginning in January 1996, PCE has also been detected in A-aquifer monitoring well V-8, downgradient of well V-10. Figure 3-2, "PCE Concentration at Well V-10 *vs.* Groundwater Elevation, 1994 through 1999," graphically present the distribution of PCE at monitoring well V-10 since 1993. Since January 1996, PCE has been consistently present in A-aquifer monitoring wells V-4, V-8, V-10, and B-aquifer monitoring wells I-2 and I-3. The highest concentrations detected during quarterly monitoring were at well V-10, although additional site assessments have indicated higher levels of PCE contamination to the east of well V-10 on adjacent property. These additional assessments are discussed in Section 6.0.

Between April 1997 and April 1998, JASCO performed groundwater remediation at monitoring well V-10 and at an adjacent well installed in the perched zone above the A-aquifer using a DVE system that was in operation to remediate soil within the drainage swale area. In April 1998, these two wells were converted for groundwater extraction and treatment using an air stripper/carbon adsorption treatment system installed for remediation of drainage swale groundwater. These activities are discussed in greater detail in Section 4.0.

The quarterly groundwater monitoring data do not suggest a strong correlation between concentrations of PCE and operation of the treatment systems. Concentrations of PCE at monitoring well V-10 decreased immediately after initiation of the DVE system in 1997 but continued a trend toward rising concentrations in 1998. Concentrations may also have been affected by variations in water table elevation. The data suggest that a source area may exist away from well V-10 and that extraction is resulting in movement of contaminant-laden groundwater to the extraction well. This situation appears to exist at monitoring well V-4 in

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
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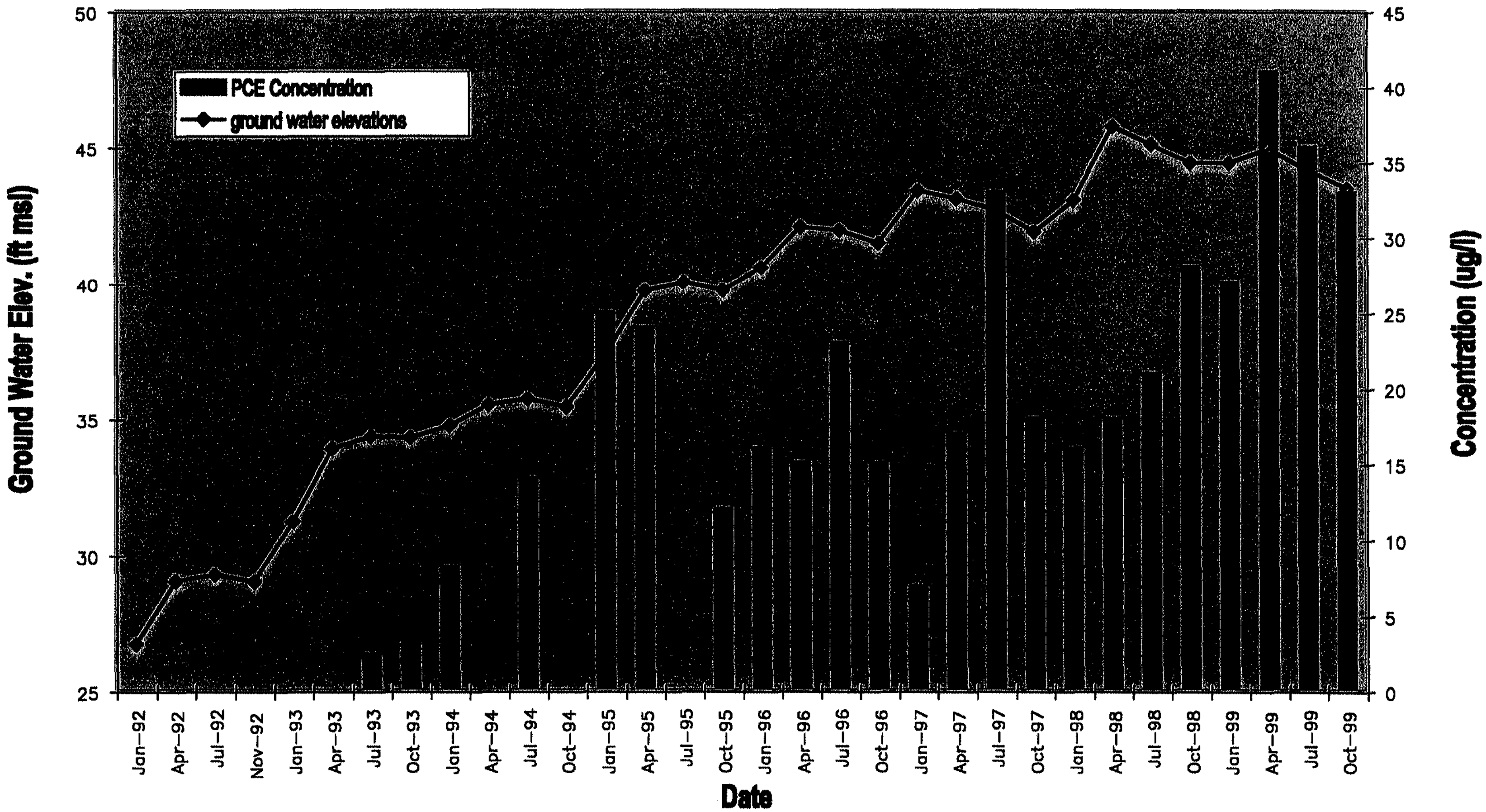

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FIGURE 3-1
PCE CONCENTRATION AT WELL I-2 vs GROUNDWATER ELEVATION, 1992 TO 1999
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IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
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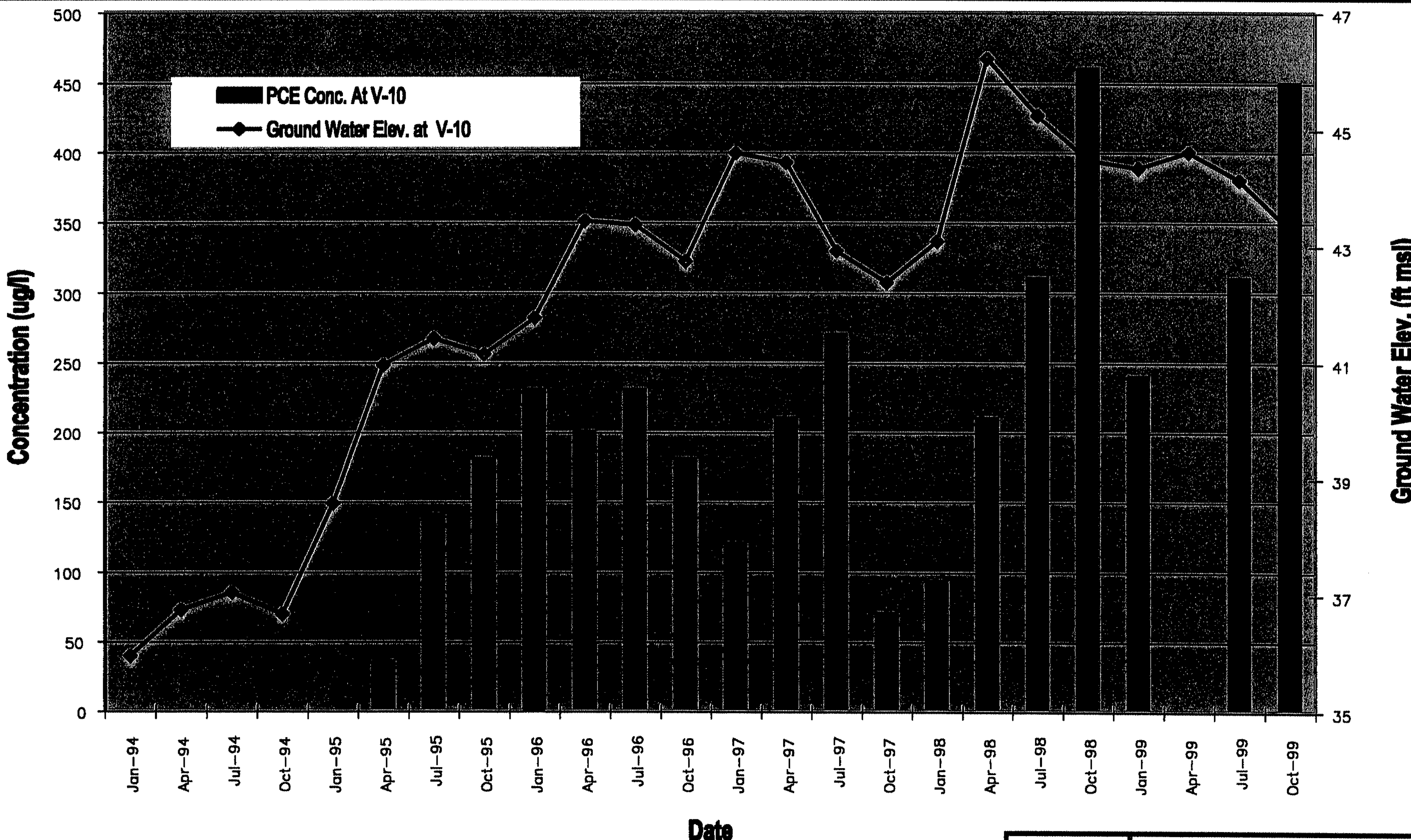

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FIGURE 3-2
PCE CONCENTRATION AT WELL V-10 vs
GROUNDWATER ELEVATION,
1994 TO 1999
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the drainage swale where extraction is drawing contaminants from the eastern side of the site as is suggested from the maps of the piezometric water surface during pumping (see Section 5.0). The following sections, which describe the results of additional investigations, provide more detailed information regarding the conditions that suggest a source other than the JASCO site.

Section 4
Summary of Additional Investigation and Remedial Activities

Since the initial identification of PCE at A-aquifer monitoring well V-10, JASCO has conducted a series of investigation phases and implemented a number of interim remedial actions. The investigation activities were conducted to delineate the extent of PCE in groundwater at the site and to better evaluate potential sources and contaminant pathways. Although the source of PCE was uncertain, JASCO implemented groundwater extraction at monitoring well V-10 and installed additional extraction wells as an interim measure to minimize further downgradient contaminant migration during the investigations.

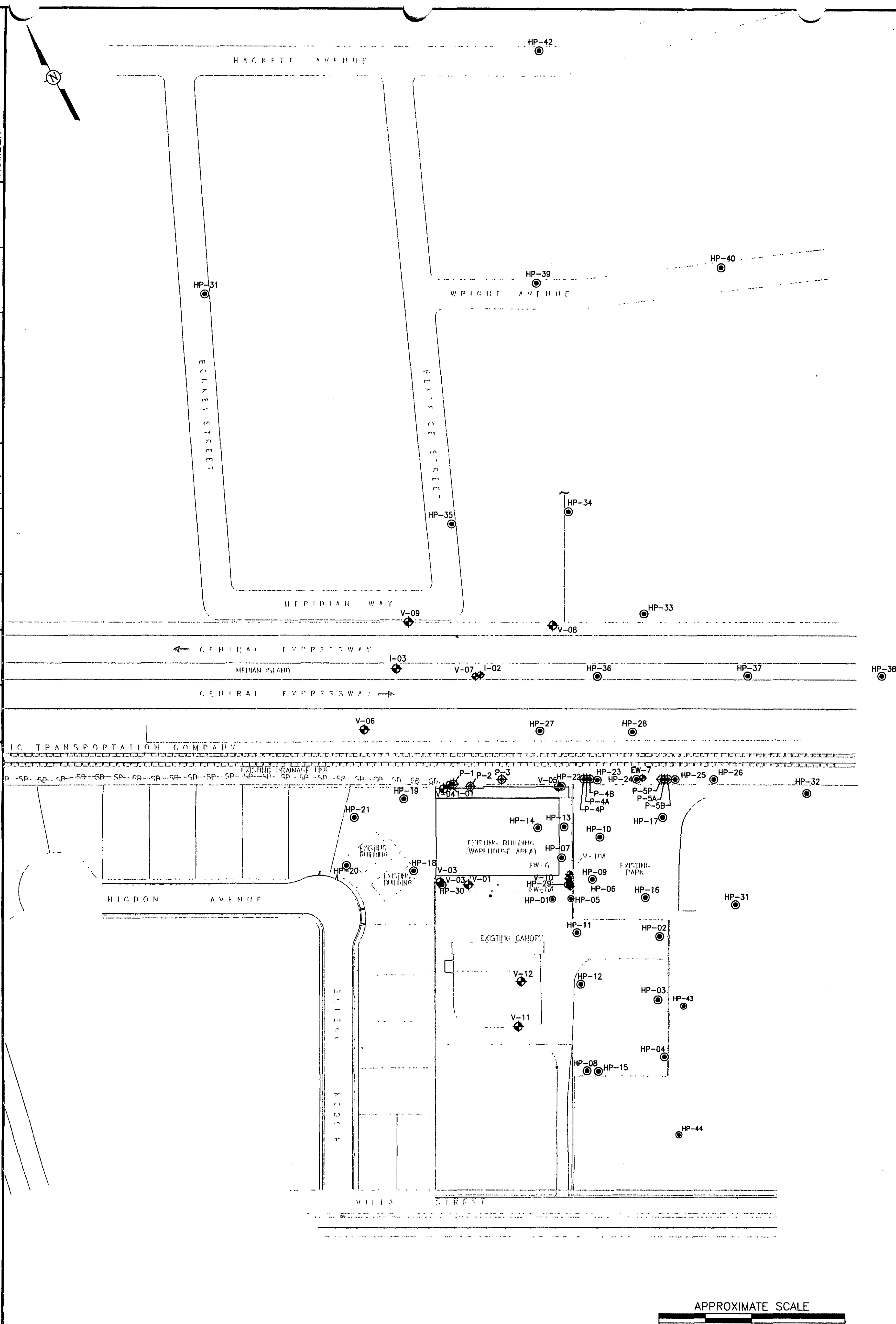
4.1 Additional Plume Delineation through Hydropunch Sampling

Between February 1997 and August 1999, JASCO completed 44 hydropunch (HP) soil boreholes, located both on and off the JASCO property during eight phases of work, to further characterize the site hydrogeology and PCE contamination in groundwater. The locations of all 44 hydropunch boreholes are identified in Figure 4-1, "Hydropunch Locations during Groundwater Delineation." The rationales for each Hydropunch phase of work is summarized in Table 4-1, "Summary of Hydropunch Boring Phases," and the Hydropunch boring logs are presented in Appendix E.

All Hydropunch boreholes were completed using direct-push drilling techniques. Soil samples were collected at various depths at the discretion of the Field Geologist. Soil samples were collected into clear acetate liners, labeled, logged on the COC, and then stored in ice-filled coolers before they were shipped to the laboratory. The samples were analyzed for VOCs by EPA Method 8260. Tables summarizing the analytical results for both soil and groundwater samples are presented in Appendix D. The Hydropunch analytical results are presented in Appendix F.

4.2 Dual Vacuum Extraction Well at Well V-10

A combined SVE and DVE system was placed in operation in the drainage swale area as part of a pilot test program in April 1995. Details concerning the construction of the system can be found in the Pilot Test Work Plan (OHM, 1994). The primary objective of the system was to evaluate the technology as a method for remediating contaminated soil above the water table. However, the DVE system also provided groundwater remediation by (1) removing vadose zone contaminants that may have otherwise migrated to the groundwater and (2) extracting contaminants directly from the capillary fringe and the top of the water table.



LEGEND

- HP-41 DIRECT PUSH BORING LOCATIONS
- V-11 GROUNDWATER MONITORING WELLS AND EXTRACTION WELLS
- P-3 PIEZOMETER

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FIGURE 4-1
HYDROPUNCH BORING LOCATIONS
DURING GROUNDWATER DELINEATION
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IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
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Table 4-1
Summary of Hydropunch Boring Phases

Phase Number	HP Numbers	Dates Drilled	Location and Rationale
Phase 1	HP 1-7	2/10-2/12/97	The seven hydropunch boreholes were drilled in the immediate vicinity and upgradient of well V-10.
Phase 2	HP 8-17	7/31-8/6/97	The ten hydropunch boreholes were drilled at locations adjacent to, downgradient, and upgradient of well V-10 and east of V-10 and the neighboring property.
Phase 3	HP 18-24	2/23-2/27/98	HP-18 through HP-21 were drilled on the property west of the Jasco site, to establish the western extent of groundwater contamination exceeding established cleanup standards. HP 22 through HP 24 were drilled east of the Jasco property, in the drainage swale east of well V-5.
Phase 4	HP 25-28	5/4-5/7/98	HP 25 and HP 26 were drilled east of HP 24 along the railroad tracks, and HP 27 and HP 28 were drilled to the north and across the railroad tracks, from locations of HP 22 through HP 24 to further investigate cross-gradient, down gradient and vertical migration of PCE along the railroad tracks.
Phase 5	HP 29-35	6/24-7/1/97	HP 29 was drilled in the vicinity of V-10 to evaluate if PCE had migrated vertically in the B-aquifer in this area. HP 30 was drilled immediately downgradient of the former UST pit and the former monitoring well V-3 to assess the current water quality in the A-aquifer. HP 31 and HP 32 were drilled in the Villa-Mariposa Apartment complex adjacent and immediately east of Jasco to delineate the eastern edge of the PCE plume. HP 33 through HP 35 were drilled downgradient and across Central Expressway to delineate the downgradient edge of the PCE plume.
Phase 6	HP 36-39	9/21-9/24/98	HP 36 through HP 38 were drilled in the median of the Central Expressway to assess contaminant flow pathways between the northern property line of Jasco and monitoring well V-8 and to delineate the eastern edge of the PCE plume. HP 39 was completed along Wright Avenue to delineate the downgradient boundary of the PCE plume.
Phase 7	HP 40-42	3/10-3/12/99	HP 40 drilled 250 east of HP 39 to define eastern extent of the plume in the perched, -A, and B-aquifers. HP 41 drilled 400 feet east of HP 39 on Bonney Street to define western extent of PCE plume in B-aquifer. HP 42 drilled 300 feet downgradient of HP 39 to define downgradient extent of PCE plume in B-aquifer.
Phase 8	HP 43-44	8/11-8/12/99	HP 43 and HP 44 were drilled east of eastern property line of Jasco, on the Villa Mariposa Apartment complex to establish the upgradient extent of the PCE plume.

HP denotes Hydropunch.

In response to the appearance of PCE in monitoring well V-10 (see Section 2.0), well V-10 was converted for DVE in April 1997 and connected to the DVE system by aboveground piping. Groundwater extraction at well V-10 was accomplished by installing an inner pipe within the well casing and applying a vacuum on the pipe. A blower system installed at the drainage swale area provided the vacuum. Vapors and entrained groundwater were extracted from the well and directed to the treatment system via aboveground piping. The treatment system consisted of a blower, primary and secondary liquid vapor separators, heat exchanger, and liquid- and vapor-phase carbon canisters.

Operation of the DVE system was suspended in April 1998 when groundwater extraction was converted to a traditional pump and treat system using air stripping treatment technology. This conversion was necessary to address a change in discharge permitting authority.

4.3 Installation of Perched Zone Extraction Well EW-6A and A-Aquifer Extraction Well V-10A

On March 17 to 19, 1998, extraction wells EW-6 and V-10 were replaced by larger-diameter wells EW-6A and V-10A, to accommodate installation of larger electric-submersible pump for higher flow rates. The new wells were installed immediately adjacent to the existing wells EW-6 and V-10.

West Hazmat Drilling Corporation drilled the boreholes for well V-10A on March 16, 1998, and for well EW-6A on March 17, 1998. Groundwater was not encountered during the drilling of the borehole for well EW-6A. Soil samples were not collected during drilling due to the close proximity, approximately 6 feet, of adjacent boreholes that have been logged previously. The well was completed above grade and was plumbed to the groundwater extraction system. Well construction details are summarized in Table 2-4. The boring logs and well completion diagrams are included in Appendix B-2.

Well development was performed on March 19, 1998, during a step drawdown test. The well was first surged and bailed with a surge block. Approximately 440 gallons of water and sediment were pumped from the well using a development rig. The well development logs are presented in Appendix B-2.

Upon completion, submersible electrical pumps were installed and plumbed to the groundwater treatment system adjacent to well V-4. These two wells have been in continuous operation since April 1998, providing extraction and treatment of contaminated groundwater from the perched zone and A-aquifer.

4.4 *Installation of B-Aquifer Extraction Well EW-7 and Piezometers P-4 and P-5*

The B-aquifer extraction well EW-7 and piezometers P-4 and P-5 were installed between March 22, 1999 and April 1, 1999, on a narrow dirt road on the south side of the railroad tracks along the railroad right-of-way to the north and east of the JASCO property. The location of the well was selected based on the results of Hydropunch sampling (see Section 6.0) that indicated that the highest PCE concentrations in B-aquifer groundwater were along the railroad right-of-way approximately 100 feet to the east of the JASCO site. Although this area of B-aquifer contamination is not directly downgradient of source areas on site and investigation activities had not been completed, JASCO implemented this interim remedial measure to limit further contamination migration. This well has been in continuous operation since April 1999.

4.4.1 Extraction Well

A mud-rotary drill rig from Exploration Drilling was used to drill a 19-inch-diameter borehole to a depth of 39 feet. A 14-inch-diameter steel conductor casing was placed in the borehole and pushed from a depth of 39 feet to 40½ feet and was grouted into the clay aquitard between the A- and B-aquifers. The grout was allowed to set up for 24 hours. A hollow-stem auger rig from West Hazmat then drilled a 12-inch borehole through the conductor casing, from a depth of 39 feet to 64 feet below grade. The borehole was continuously logged and sampled. The well was completed above grade and was plumbed to the groundwater extraction system. Well construction details are summarized in Table 2-4. The boring logs and well completion diagrams are included in Appendix B-2.

Well development was performed on April 15 and 16, 1999. Approximately 425 gallons of water and sediment were pumped from the well using a development rig. The well development logs are presented in Appendix B-2.

4.4.2 Piezometers

West Hazmat Drilling Corporation drilled the boreholes for B-zone piezometers, P4-B and P5-B, on March 22, 23, and 26, 1999. Each borehole was continuously logged and sampled to identify the perched, A- and B-aquifers. Eight-inch-diameter steel conductor casing was grouted into the clay aquitard between the A- and B(10)- aquifers in both of the B-zone wells. A hollow-stem auger drill rig installed the perched and A-zone piezometers. The subcontractor installed flush-mount, 12-inch-diameter piezometer well vaults. Well construction details are summarized in Table 2-4. The boring logs and well completion diagrams are included in Appendix B-2.

Well development was performed on April 5 and 16, 1999. The well development logs are presented in Appendix B-2.

Section 5
Site Geology and Hydrogeology

Data collected during installation of 14 monitoring wells, nine piezometers, seven DVE wells, three extraction wells, and 44 direct-push boreholes, and more than 90 shallow soil boreholes has been used to characterize the subsurface lithology, stratigraphic relationships, and hydrogeology at the site. Figure 4-1 identifies the locations of the wells and Hydropunch boreholes. The site is underlain by unconsolidated Holocene alluvium consisting of interbedded clays, silts, sands, and gravels that exhibit a high degree of lateral and vertical heterogeneity. Figure 5-1, "Locations of Geologic Cross-Sections A-A', B-B', and C-C'," provides the locations of cross-sections A-A', B-B', and C-C'. Cross-sections A-A', B-B', and C-C' are identified in Figure 5-2, "Geologic Cross-Section A-A'," Figure 5-3, "Geologic Cross-Section B-B'," and Figure 5-4, "Geologic Cross-Section C-C'," respectively.

Three water-bearing zones have been identified beneath the JASCO site during previous investigations and have been identified as the perched zone and the A-, and B-aquifers. The perched, A, and B aquifers have been explored during the Hydropunch boring program and their geology and hydrogeology are discussed below.

5.1 Perched Zone

The perched zone consists of interbedded sand, silty sand, and silty sand with gravel encountered between 9 ft and 18 ft bgs. The perched zone is typically overlain by a clay unit that extends from the ground surface to the varying depths of the top of the perched zone. Based on continuous core samples collected from 44 direct-push boreholes both on and off site, the perched zone appears relatively continuous across the site. The data collected to date show that this unit varies in thickness from 17 feet at HP-9 to nonexistent at HP-2, where it appears to pinch out. The lithology of the perched zone suggests that it represents a former stream channel that meandered across the eastern portion of JASCO and adjacent properties to the east. The bottom of the perched zone, illustrated in Figure 5-5, "Structural Contours for the Bottom of the Perched Groundwater Zone," appears to be bowl-shaped and is the deepest near HP-10, located east and off site from JASCO.

The perched zone has only recently been identified as a water bearing zone. During the installation of the existing groundwater monitoring well network in the late 1980s, this zone was not identified as a water bearing zone by previous consultants. Likewise, during drilling associated with the RI as well as the installation of the DVE wells in the drainage swale, this zone was not saturated. The absence of water in this zone before activities is most likely attributed to drought conditions that existed in the area from the late 1980s until 1993. Groundwater elevations found in monitoring wells V-1 and V-10 from March 1991 to March 1998 were plotted on Figures 5-2 and 5-3, respectively. During the early 1990s,

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
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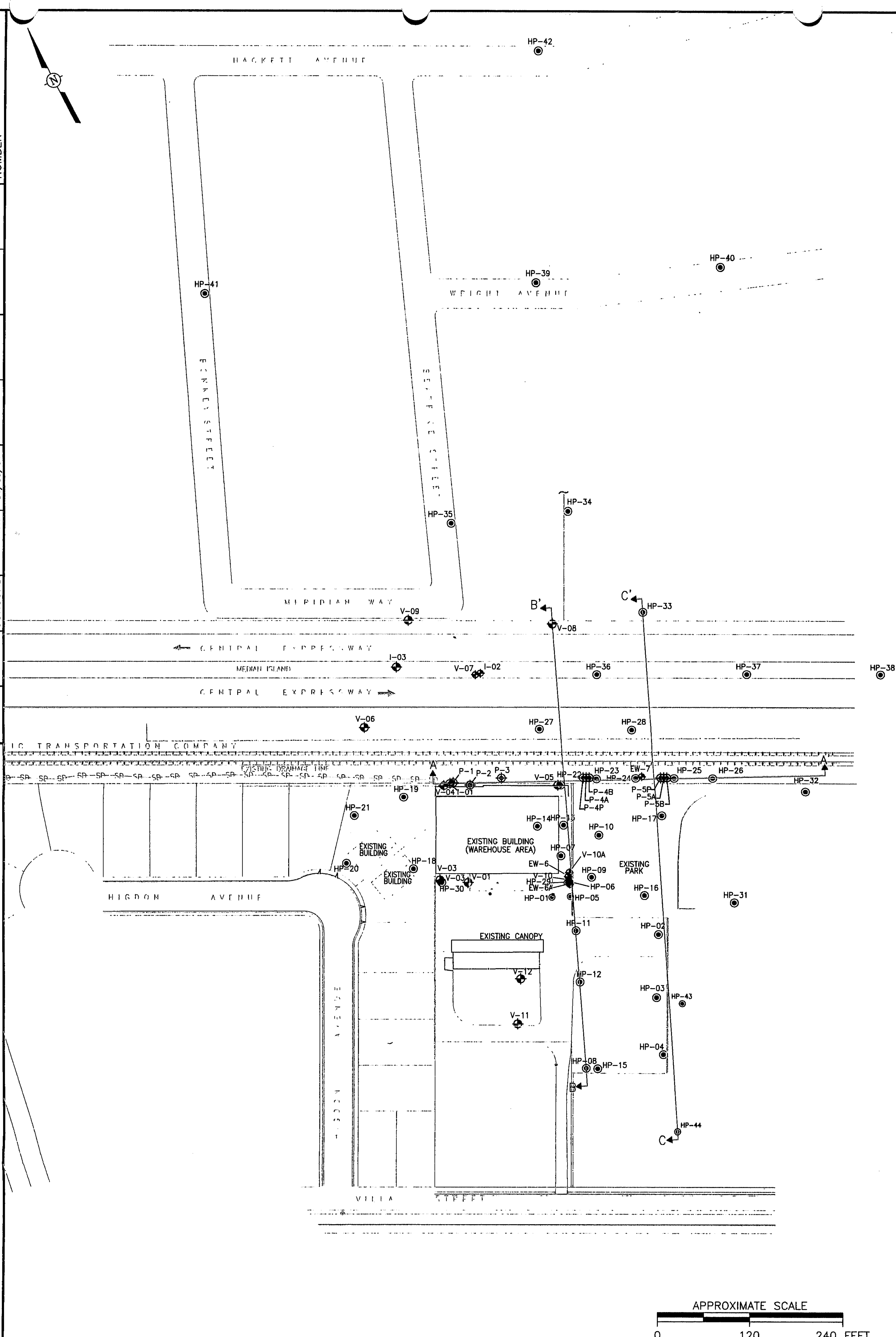

LEGEND

- HP-41 DIRECT PUSH BORING LOCATIONS
- V-11 GROUNDWATER MONITORING WELLS AND EXTRACTION WELLS
- P-4B PIEZOMETER
- A A' GEOLOGIC CROSS-SECTION LINE

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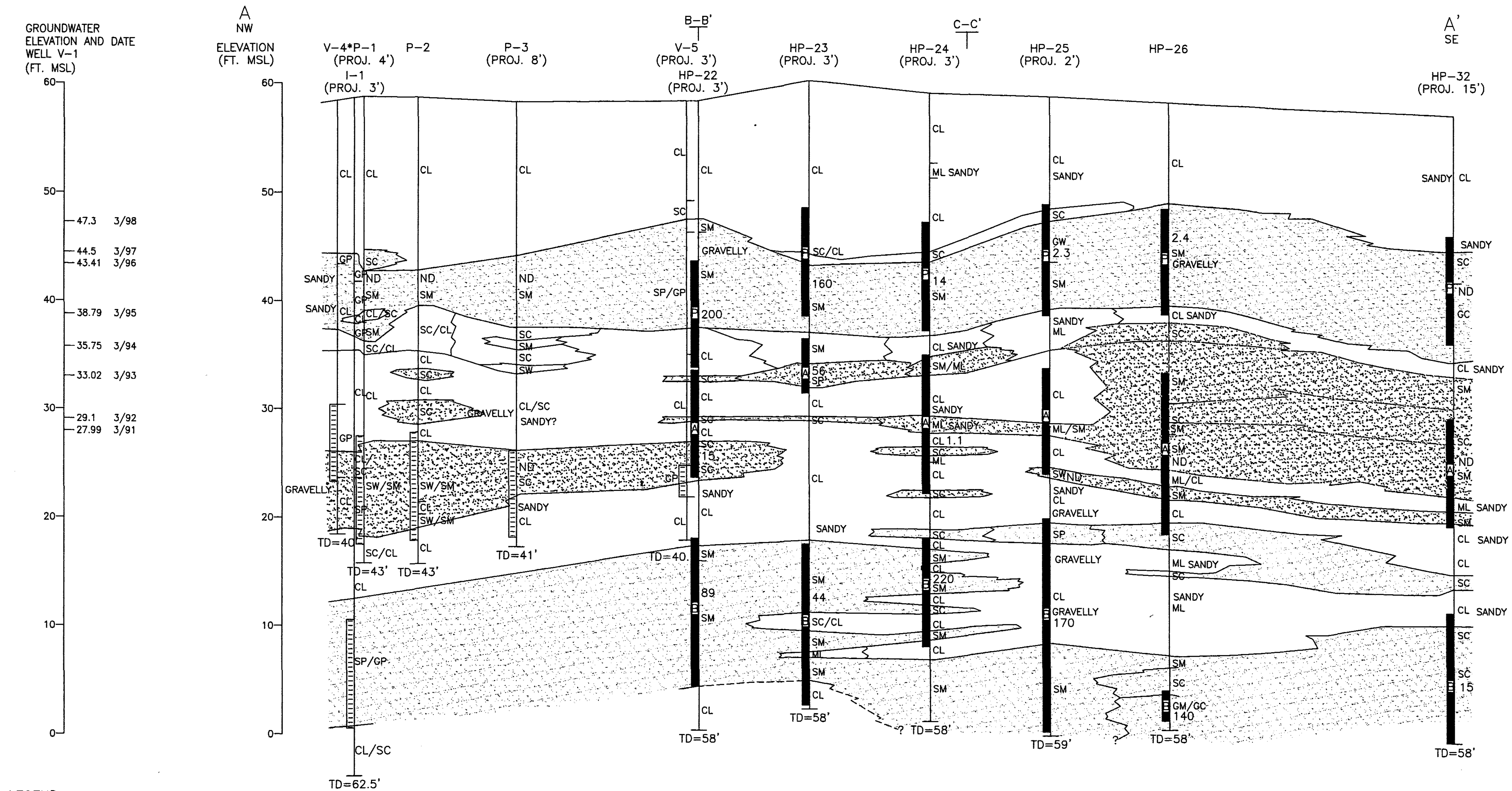
REVISED FIGURE 5-1

LOCATIONS OF GEOLOGIC CROSS SECTIONS A-A', B-B', AND C-C'



A CROSS-SECTION 5-1

LEGEND

PERCHED ZONE PERMEABLE UNITS: SW, SC, SP, SM, GP, GM, GW

A AQUIFER PERMEABLE UNITS: SW, SC, SP, SM, GP, GM, GW

B AQUIFER PERMEABLE UNITS: SW, SC, SP, SM, GP, GM, GW

LOW PERMEABILITY UNITS: CL, ML, SC/CL

GEOLOGIC CONTACT

15 CONCENTRATION OF PCE IN WATER (ug/L)

ND NOT DETECTED ABOVE METHOD DETECTION LIMIT (ug/L)

P PERCHED ZONE GROUNDWATER SAMPLE INTERVAL

A A-AQUIFER GROUNDWATER SAMPLE INTERVAL

B B-AQUIFER GROUNDWATER SAMPLE INTERVAL

NOTE

1. SEE FIGURE 5-1 FOR LOCATION OF CROSS-SECTION.
2. "*" DENOTES WELL/BORING FOR WHICH GEOLOGIC DESCRIPTION WAS DEEMED UNUSABLE.

VERTICAL SCALE (FEET) 0 10

HORIZONTAL SCALE (FEET) 0 50

VERTICAL EXAGGERATION: 5x

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REVISED FIGURE 5-2

GEOLOGIC CROSS-SECTION A-A'
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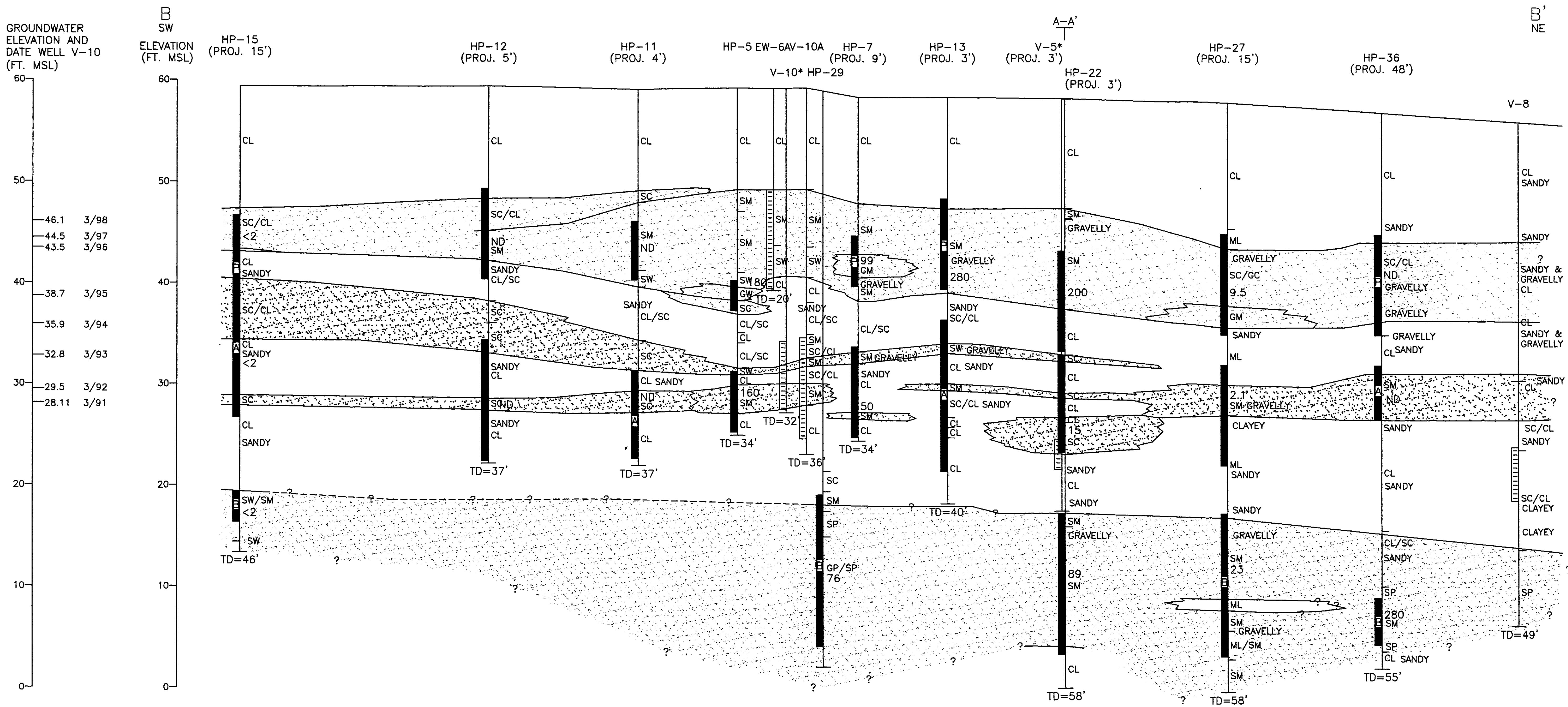
IMAGE ---



LEGEND

PERCHED ZONE PERMEABLE UNITS: SW, SC, SP, SM, GP, GM, GW

A AQUIFER PERMEABLE UNITS: SW, SC, SP, SM, GP, GM, GW

B AQUIFER PERMEABLE UNITS: SW, SC, SP, SM, GP, GM, GW

LOW PERMEABILITY UNITS: CL, ML, SC/CL

GEOLOGIC CONTACT

15 CONCENTRATION OF PCE IN WATER (ug/L)

ND NOT DETECTED ABOVE METHOD DETECTION LIMIT (ug/L)

P PERCHED ZONE GROUNDWATER SAMPLE INTERVAL

A A-AQUIFER GROUNDWATER SAMPLE INTERVAL

B B-AQUIFER GROUNDWATER SAMPLE INTERVAL

B CROSS-SECTION 5-1

NOTE

1. SEE FIGURE 5-1 FOR LOCATION OF CROSS-SECTION.
2. "*" DENOTES WELL/BORING FOR WHICH GEOLOGIC DESCRIPTION WAS DEEMED UNUSABLE.

VERTICAL SCALE (FEET) 0 10

HORIZONTAL SCALE (FEET) 0 50

VERTICAL EXAGGERATION: 5x

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REVISED FIGURE 5-3

GEOLOGIC CROSS-SECTION B-B'
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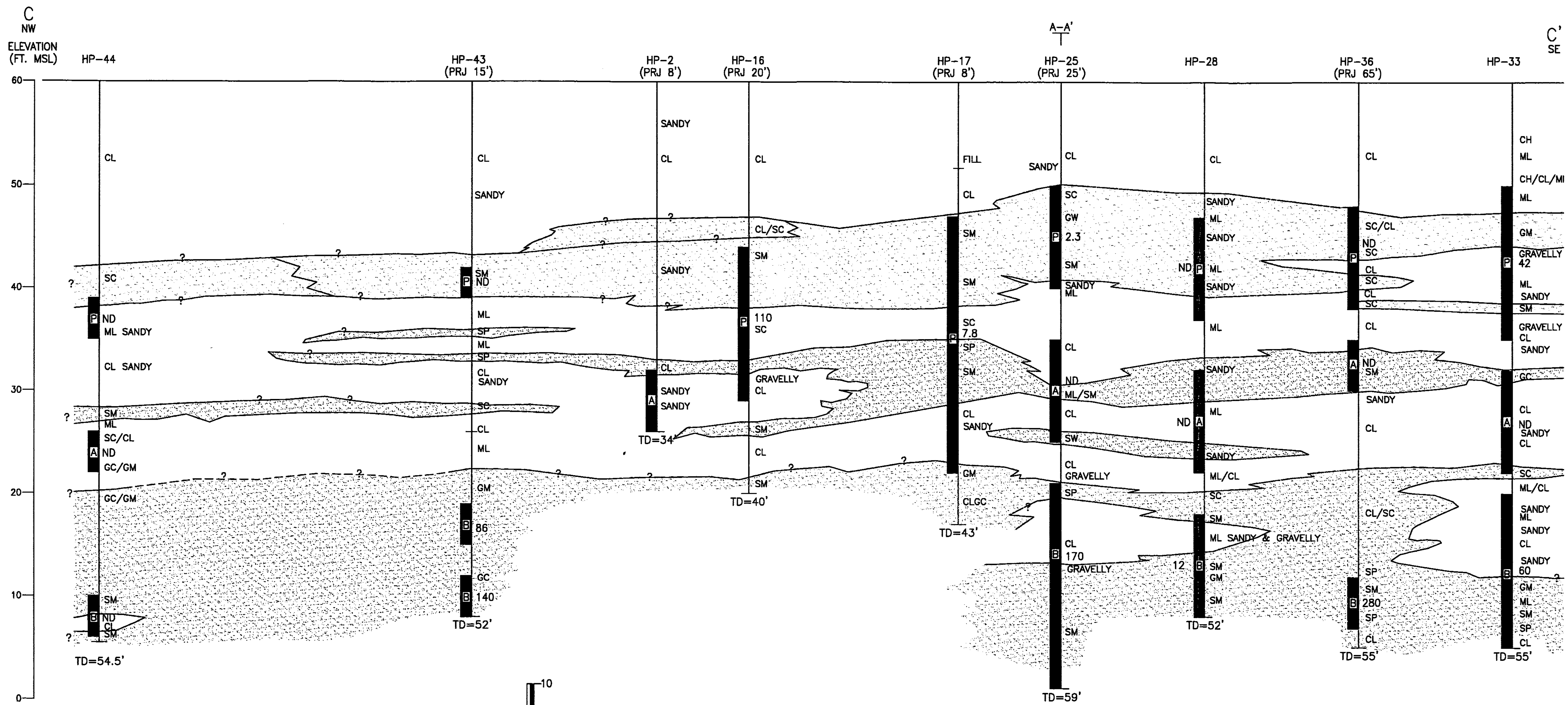

VERTICAL SCALE (FEET)

10

0

50

HORIZONTAL SCALE (FEET)

VERTICAL EXAGGERATION: 5x

C / 5-1 CROSS-SECTION

LEGEND

PERCHED ZONE PERMEABLE UNITS: SW, SC, SP, SM, GP, GM, GW

A AQUIFER PERMEABLE UNITS: SW, SC, SP, SM, GP, GM, GW

B AQUIFER PERMEABLE UNITS: SW, SC, SP, SM, GP, GM, GW

LOW PERMEABILITY UNITS: CL, ML, SC/CL

GEOLOGIC CONTACT

15 CONCENTRATION OF PCE IN WATER (ug/L)

ND NOT DETECTED ABOVE METHOD DETECTION LIMIT (ug/L)

P PERCHED ZONE GROUNDWATER SAMPLE INTERVAL

A A-AQUIFER GROUNDWATER SAMPLE INTERVAL

B B-AQUIFER GROUNDWATER SAMPLE INTERVAL

NOTE

1. SEE FIGURE 5-1 FOR LOCATION OF CROSS-SECTION.
2. "*" DENOTES WELL/BORING FOR WHICH GEOLOGIC DESCRIPTION WAS DEEMED UNUSABLE.

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FIGURE 5-4
GEOLOGIC CROSS-SECTION C-C'
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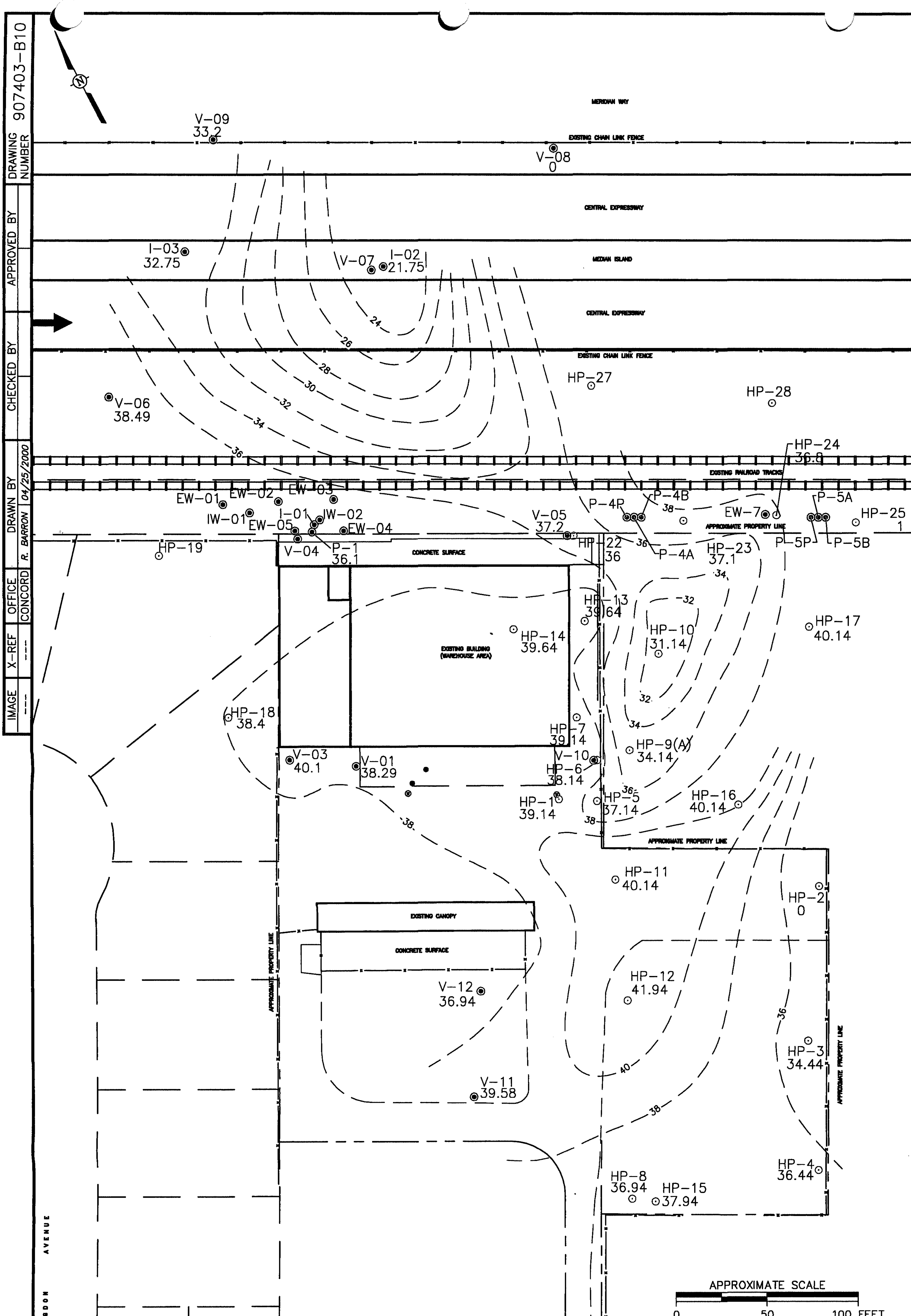

LEGEND

V-12 36.94 — MONITORING WELL, EXTRACTION WELL, OR PIEZOMETER LOCATION AND ELEVATION OF BOTTOM OF PERCHED ZONE ABOVE MEAN SEA LEVEL.

HP-18 — DIRECT PUSH BORING

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FIGURE 5-5
STRUCTURAL CONTOURS
FOR BOTTOM OF PERCHED
GROUNDWATER ZONE
(FEET MEAN SEA LEVEL)
JASCO CHEMICAL, CORP.

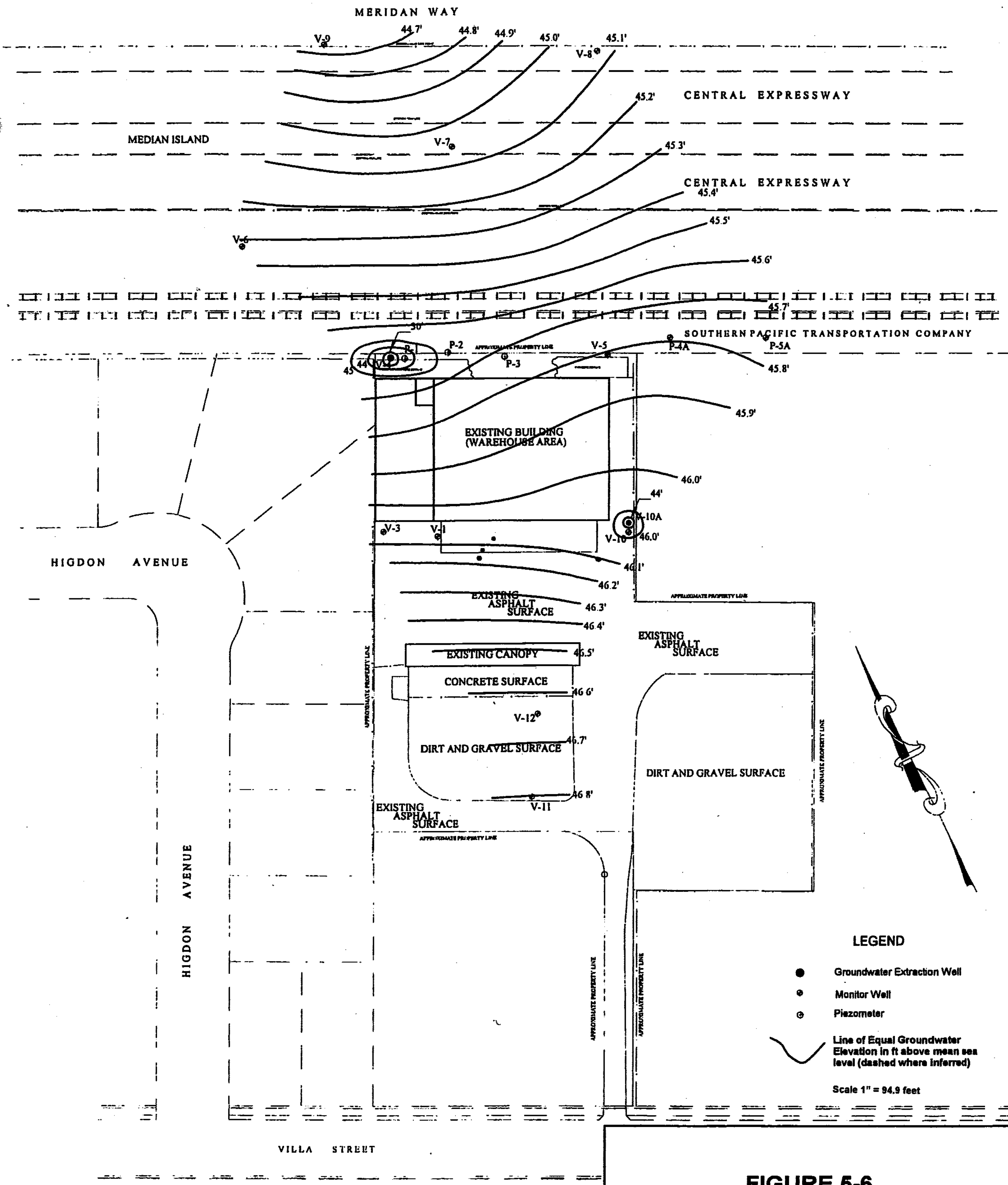
as shown on Figures 5-2 and 5-3, the groundwater surface was coincident with the mid- to lower A-aquifer, but as the groundwater elevation rose approximately 19 feet in the two wells between 1991 and 1998, the perched zone became saturated as a result of a return to normal precipitation patterns in the region. It is most likely that a low-yielding perched zone with limited lateral extent exists outside of the project area, with significant lateral variations in permeability. Groundwater flow direction and gradient cannot be determined at this time because only two piezometers, P-4P and P-5P, have been completed in the perched zone.

5.2 A-Aquifer

The A-aquifer consists of a number of water bearing units composed of sands, silty sands, and silty/clayey sands with gravel interbedded with silt and clay units. These water bearing units are encountered at depths ranging from 30 to 32 ft bgs and vary greatly in thickness from less than 1 foot to 16 feet. The A-aquifer also varies from place to place with its number of layers, from four thin layers at HP-24 to one thick and one thin layer at HP-26. The A-aquifer was found to be 14.7 feet thick near monitoring well I-2 and 16 feet thick near HP-26. It was found to be 1 foot thick in HP-44, and thinnest near monitoring well I-3, where it is identified only by a soil color change and an increase in sand content. In general, the A-aquifer appears to be thickest at the western portion of the JASCO site and thinnest to the east where it is absent in portions of the adjacent property to the east of JASCO (see Figure 5-6, "Potentiometric Surface, A-Aquifer, February 2000"). The direction of groundwater flow in the A-aquifer is generally to the north/northeast (see Figure 5-6) with a gradient ranging from 0.004 to 0.007 vertical feet per each linear foot in the direction of groundwater flow. The extraction of groundwater from monitoring well V-4 has caused a depression in the water table in the immediate vicinity of the well. Downgradient of monitoring well V-4, A-aquifer groundwater flow appears to be directed along a northeast trending line centered near monitoring well V-7. The aquitard separating the A-aquifer and the B-aquifer ranges in thickness from 6 feet at well I-1 to 17 feet at well I-2.

5.3 B-Aquifer

The B-aquifer consists predominantly of silty and gravelly sand. The thickness of the B-aquifer ranges from 6 feet in two layers at HP-33 to at least 15 feet at HP-44, and is generally present from 40 to 60 ft bgs. The B-aquifer mostly appears in a thick layer, but can appear in thinner layers, as found at HP-24, illustrated in Figure 5-2. The direction of groundwater flow within the aquifer is generally to the north/northeast with a gradient ranging from 0.004 to 0.007 vertical feet per each linear foot in the direction of groundwater flow (see Figure 5-7, "Potentiometric Surface, B-Aquifer, February 2000"). Earlier reports suggested that the B-aquifer could be further divided into a B and B(2) aquifer. Although some separation of layers within the B-aquifer can be found, the more recent data suggest that any separation is localized and probably does not represent a regional feature.



LEGEND

- Groundwater Extraction Well
- Monitor Well
- Piezometer
- Line of Equal Groundwater Elevation in ft above mean sea level (dashed where inferred)

Scale 1" = 94.9 feet

FIGURE 5-6
POTENTIOMETRIC SURFACE
A-AQUIFER
FEBRUARY 2000

Jasco Chemical Corporation
Mountain View, California

IT Corporation

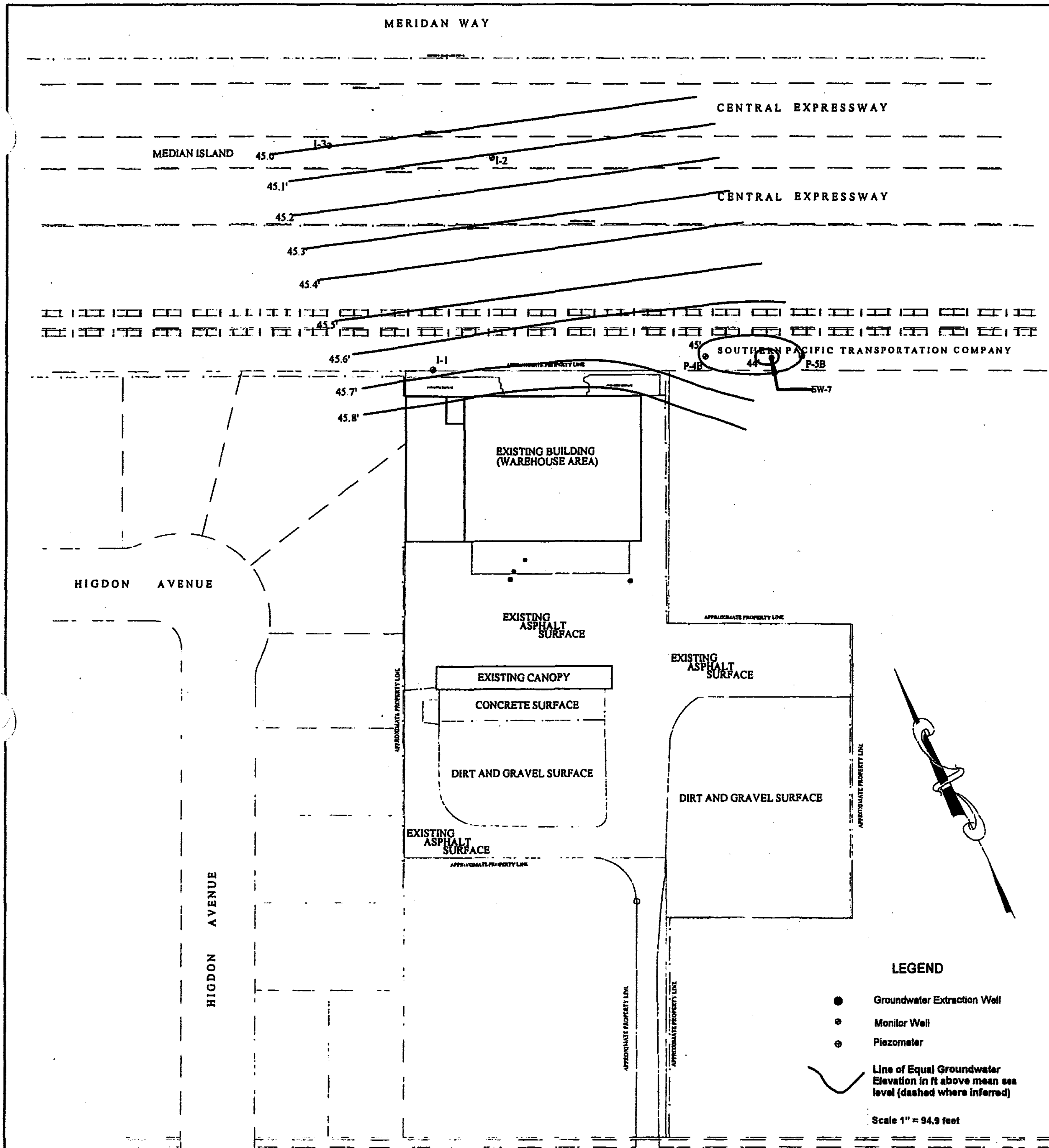


FIGURE 5-7
POTENTIOMETRIC SURFACE
B(1)-AQUIFER
FEBRUARY 2000

Jasco Chemical Corporation
Mountain View, California

IT Corporation

5.4 Underlying Aquifers

Limited information exists about the lithology of the soil beneath the B-aquifer. According to a study performed by Harding Lawson and Associates at a group of sites located approximately 1½ miles east of JASCO, the C-aquifer is generally separated from the overlying B-aquifer by a 20- to 40-foot-thick clay layer or by a series of thinner clay layers (HLA, 1987). The aquitard is laterally continuous and consists of stiff silty clay with lenses of sand. The top of the C-aquifer is located at a depth of 150 ft bgs (94 feet below mean sea level).

No potential conduits have been identified at the site that penetrate the aquitards beneath the B-aquifer. For site conditions to affect the quality of groundwater in the C-aquifer, target constituents would have to migrate vertically from the A-aquifer through two B-level aquifers and through three aquitards separating the various A-, B-, and C-level aquifers.

5.5 Aquitards between the Perched, A-, and B- Aquifers

The lithology of the aquitards between perched, A-, and B-aquifers consists predominantly of silty, sandy, and/or slightly gravelly clays or silts. The aquitard materials are highly variable and range from tight and impermeable to loose and slightly permeable. The more permeable areas between the three aquitards may provide the paths for vertical migration between the aquifers.

Section 6
Analytical Data from Hydropunch Sampling Activities (1997 to 1999)

6.1 Summary of Soil Sampling Analytical Results

Twenty-five soil samples were collected from 13 direct-push borehole locations (HP-1 through HP-7, HP-9, HP-10, HP-16, HP-17, HP-43, and HP-44). PCE was detected in five of the samples (HP-2, HP-5, HP-6, HP-7, and HP-9 at concentrations ranging from 0.0095 mg/kg to 0.1 mg/kg, which are all below the soil cleanup standard of 7 mg/kg. None of the shallow soil samples collected from soils above the perched zone, at depths of 15-feet-or-less bgs, contained detectable concentrations of PCE. All of the samples containing PCE were from depths of 20 to 35 feet and were from Hydropunch boreholes located next to JASCO's eastern property boundary or on the property to the east of JASCO. The highest PCE concentration was detected at HP-5 within 5 feet of JASCO's eastern property boundary and approximately 30 feet upgradient from well V-10 where PCE was first detected in A-aquifer groundwater. PCE was also detected at HP-9 on adjacent property approximately 30 feet east of JASCO's eastern boundary. In addition, PCE was detected at HP-2 which is located approximately 125 feet upgradient of well V-10 and upgradient of all potential source areas identified on the JASCO property. The only other VOC detected in the soil was toluene, which was detected in the two Hydropunch boreholes HP-43 and HP-44, located on the property east of JASCO, at concentrations of 0.066 and 0.047 mg/kg from depths of 13 feet and 8 feet, respectively. These two boreholes were located 200 to 300 feet upgradient of well V-10 and upgradient of the JASCO site itself. Tables of the results of analyses of soil samples during the additional PCE investigation are provided in Appendix D.

The presence of PCE and other contaminants in upgradient locations and the absence of PCE in shallow soil suggest that a shallow soil source does not exist on the JASCO property near well V-10. The distribution of PCE at these locations does not correspond to any potential source area investigated on site. Furthermore, the presence of PCE in soil samples only from depths at or below the perched zone suggests that the presence may be the result of downgradient migration from another source area.

6.2 Summary of Groundwater Sampling Analytical

Forty-four hydropunch boreholes have been completed using direct-push technology from February 1997 through August 1999. The results from these monitoring points have been combined with the results from the Fourth Quarter 1999 groundwater sampling event to produce isopleth maps of PCE concentrations in each of the three water bearing zones. The extent of PCE in each water bearing zone is discussed below.

6.2.1 *Perched Zone*

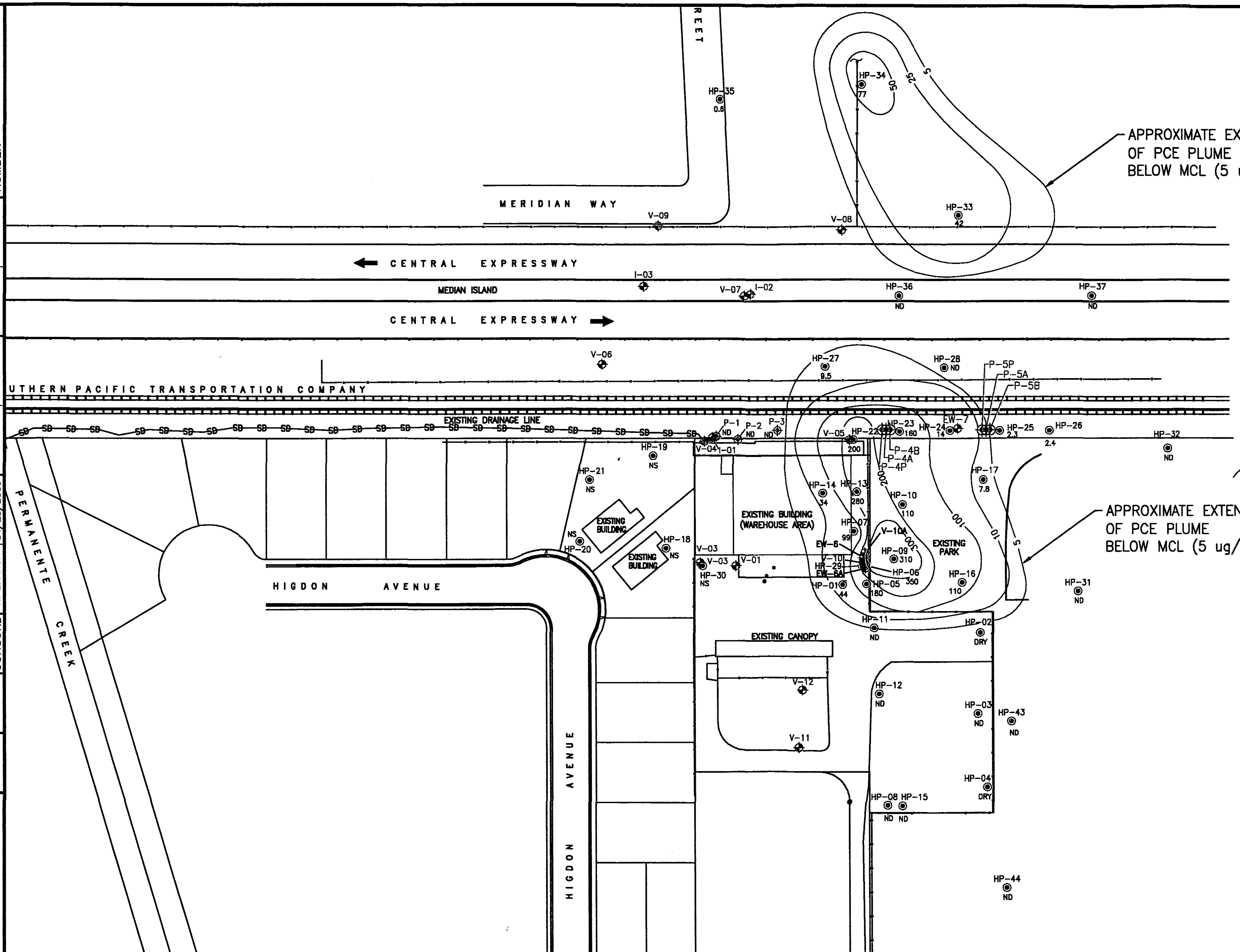
The highest concentration of PCE in the perched zone has been detected on adjacent property to the east of monitoring well V-10. Monitoring points HP-6 and HP-9, located near monitoring well V-10, contained PCE concentrations of 350 and 310 µg/L, respectively. Subsequent monitoring points show that the PCE plume attenuates relatively quickly in the upgradient direction to the south and cross-gradient to the east and west of the V-10 area. As shown in Figure 6-1, "Isopleth of PCE Concentrations Perched Zone," the plume has migrated approximately 500 feet downgradient to the north. The downgradient limit of the plume is defined by HP-39, which did not contain detectable concentrations of PCE.

Figure 6-1 identifies two plumes that are separated along the Central Expressway. Based on the available data, it appears that the plume may have separated as a result of pumping from perched-zone extraction well EW-6A, which has been operating since May 1998. These data suggest that pumping at extraction well EW-6A is controlling downgradient migration of the plume at the "hot spot" area near well V-10. Lithologic data also suggests that the perched zone and A-aquifer may be hydraulically connected; therefore, pumping from A-aquifer extraction well V-10(A) may also contribute to maintaining hydraulic control of the plume.

6.2.2 *A-Aquifer*

The highest concentrations of PCE in the A-aquifer have been detected on the eastern side of the property at monitoring well V-10(A) (450 µg/L, October 1999). The highest PCE concentration in a Hydropunch borehole was detected at HP-6 (210 µg/L), located within 10 feet of well V-10. However, at HP-9, where the highest PCE concentration was detected in the perched zone, and at other Hydropunch boreholes on adjacent property to the east of JASCO, the A-aquifer zone was not present and samples could not be collected. The data show that the PCE plume attenuates rapidly upgradient to the south and cross-gradient to the east and west of the "hot spot" near well V-10. As illustrated in Figure 6-2 "Isopleth of PCE Concentrations A-Aquifer," the plume extends approximately 400 feet to the north of V-10 where the downgradient limit of the plume is defined by borehole HP-34.

During the drilling of Hydropunch Borehole HP-43, a perched-zone water sample (HP43-04) was obtained at depths between 17 ft and 21 ft bgs. An A-zone sample was attempted in a poorly-sorted sand (SP) at depths between 24 ft and 28 ft bgs, but no groundwater recovery occurred. The next promising water bearing zone was sampled (HP43-05) in a silty gravel (GM) at depths between 40 ft and 46 ft bgs and was initially thought to belong to the A-aquifer. A third sample (HP43-06) was obtained from depths of 48 ft to 52 ft bgs; however, when the boring log for HP-43 was plotted on cross section C-C', it became obvious that the groundwater sample HP43-05 obtained from depths between 40 ft and 46 ft bgs belonged to the B1 aquifer, and near HP-43, the A-aquifer consisted of approximately three thin layers of clayey sand and sand. The PCE concentrations in HP43-05 and HP43-06 were found to be 86 µg/L and 140 µg/L, respectively. As a result, the HP-43 PCE concentrations were both included in Figure 6-3, "Isopleth of PCE Concentrations in the B-Aquifer."



LEGEND

P-1	PIEZOMETER
I-01	MONITORING WELLS AND EXTRACTION WELLS
HP-14	DIRECT PUSH BORING
10	ISOCONCENTRATION LINE (ug/L); DASHED WHERE INFERRED
160	PCE CONCENTRATION (ug/L)
ND	NOT DETECTED ABOVE THE METHOD DETECTION LIMIT

NOTES:

1. MONITORING WELL CONCENTRATION DATA FROM AUGUST 1998.
2. HYDROPUNCH DATA FROM FEBRUARY 1997 THROUGH SEPTEMBER 1998.

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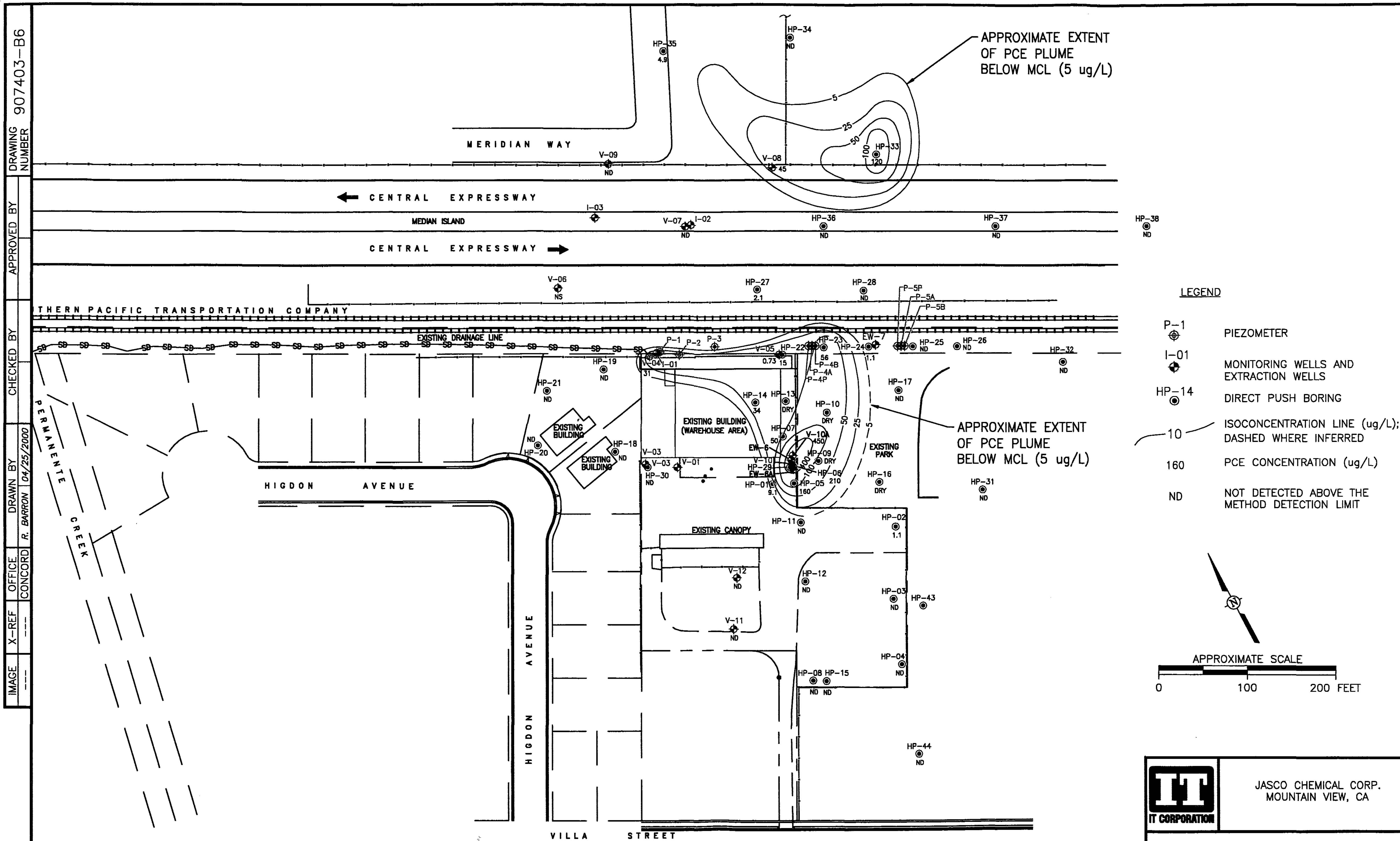
FIGURE 6-1
ISOPLETH OF PCE CONCENTRATIONS (ug/L) PERCHED ZONE
JASCO CHEMICAL, CORP.

DRAWING NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	OFFICE	X-REF	IMAGE
907403-B7			R. BARRON 04/25/2000	CONCORD	---	---



NOTES:

1. MONITORING WELL CONCENTRATION DATA FROM AUGUST 1998.
2. HYDROPUNCH DATA FROM FEBRUARY 1997 THROUGH SEPTEMBER 1998.

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JASCO CHEMICAL CORP.
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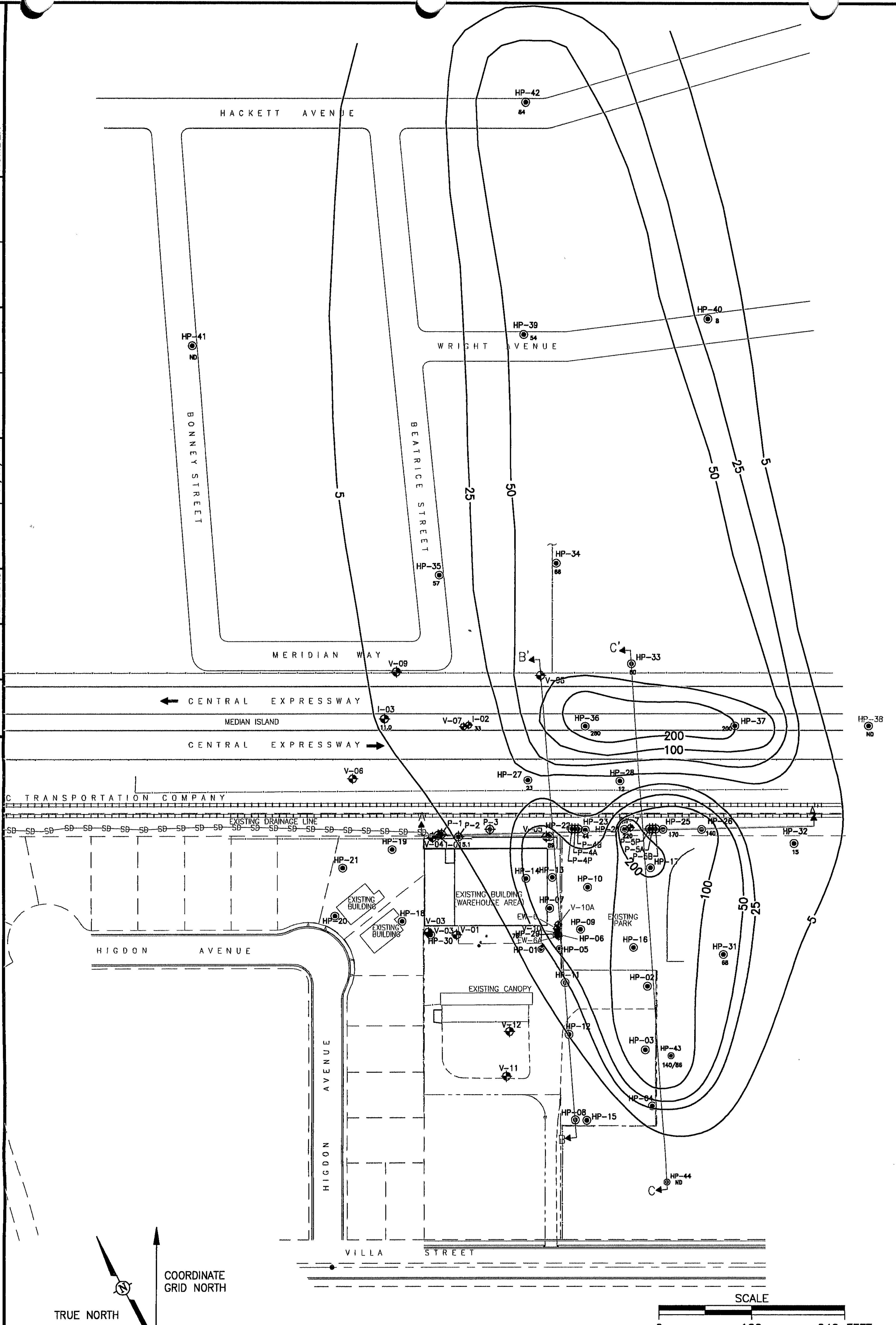
FIGURE 6–2
ISOPLETH OF PCE CONCENTRATIONS (ug/L) A – AQUIFER
JASCO CHEMICAL, CORP.



LEGEND

HP-41 DIRECT PUSH BORING LOCATIONS

V-11 GROUNDWATER MONITORING WELLS AND EXTRACTION WELLS

P-4B PIEZOMETER

10 ISOCONCENTRATION LINE (ug/L); DASHED WHERE INFERRED

IT CORPORATION

JASCO CHEMICAL CORP.
MOUNTAIN VIEW, CA

REVISED FIGURE 6-3

ISOPLETH OF PCE CONCENTRATIONS (ug/L) B – AQUIFER

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	CONCORD	SJZ	01/09/01			907403-B11

The plume in the A-aquifer exhibits similar characteristics as the perched-zone plume in that it is present as two plumes that appear to be separated along the Central Expressway. As previously mentioned, the current plume configuration may be attributed to pumping from extraction well V-10(A), which has been operating since May 1998. Figure 6-4, "PCE Concentration at Well V-8 *vs.* Volume Extracted at V-10/EW-6, 1995 to 1999" shows the inverse relationship of the line representing PCE concentration in V-8 and the line representing the volume of groundwater extracted from wells V-10(A) and EW-6A. This inverse relationship suggests that pumping at extraction wells EW-6A and V-10(A) is controlling downgradient migration of the plume at the "hot spot" area near well V-10. Figure 6-5, "PCE Concentration at Well V-10 *vs.* Volume Extracted at V-10/EW-6, 1994 to 1999" indicates the same effect is occurring in downgradient well V-10. The effect of groundwater extraction on PCE distribution can also be seen at well V-4 where groundwater extracting appears to be drawing PCE from the vicinity of well V-10 toward the pumping well, as can be seen in Figure 6-5.

6.2.3 B-Aquifer

The highest concentration of PCE in the B-aquifer has been detected at monitoring point HP-24 which is located along the railroad tracks approximately 100 feet east of JASCO's eastern property boundary. However, elevated concentration of PCE were detected as far upgradient of the site as HP-43, which is located on adjacent property approximately 200 feet upgradient of the JASCO facility and all identified potential source areas associated with JASCO. The distribution of PCE in the B-aquifer is illustrated in Figure 6-3. The western edge of the plume is defined by monitoring wells I-1 and I-3, where PCE concentrations were measured during the Fourth Quarter 1999 sampling event at 5.1 and 11 μg/L, respectively. The eastern edge of the plume is defined by monitoring point HP-38 in which PCE was not detected. The upgradient extent of the plume is defined by HP-44 in which PCE was not detected. As illustrated in Figure 6-5, PCE was detected in hydropunch sampling point HP-42 located approximately 900 feet downgradient of the JASCO property; however, the downgradient extent of the plume is not yet defined. The presence of PCE in cross-gradient monitoring point HP-31 at 68 μg/L and in upgradient point HP 43 at 140 μg/L results in a primary contaminant plume that begins upgradient of the potential source areas on the JASCO property and passes largely to the east of the JASCO site. Only a portion of the western edge of the plume passes beneath the JASCO site. These data suggest that there may be an upgradient and off-site source for PCE detected in the B-aquifer.

As a secondary test of this data, JASCO performed a simple particle tracking exercise using the PATH3D program augmented by the MODFLOW and Groundwater Vista programs for establishing groundwater flow fields. This modeling was performed using available site data from previous reports or groundwater models, supplemented with well documented generic data when site-specific data was not available. Although JASCO recognizes the limitations of such modeling exercises, the results are consistent with the known extent of the contaminant plume. Model input and output are provided in Appendix J. The model indicates that it would take approximately 20 years for a contaminant entering the B-aquifer upgradient and to the east of JASCO to migrate along the direction of groundwater flow as far as Hackett Avenue. This distance is consistent with the maximum downgradient extent

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY	APPROVED BY	DRAWING NUMBER 907403-A14
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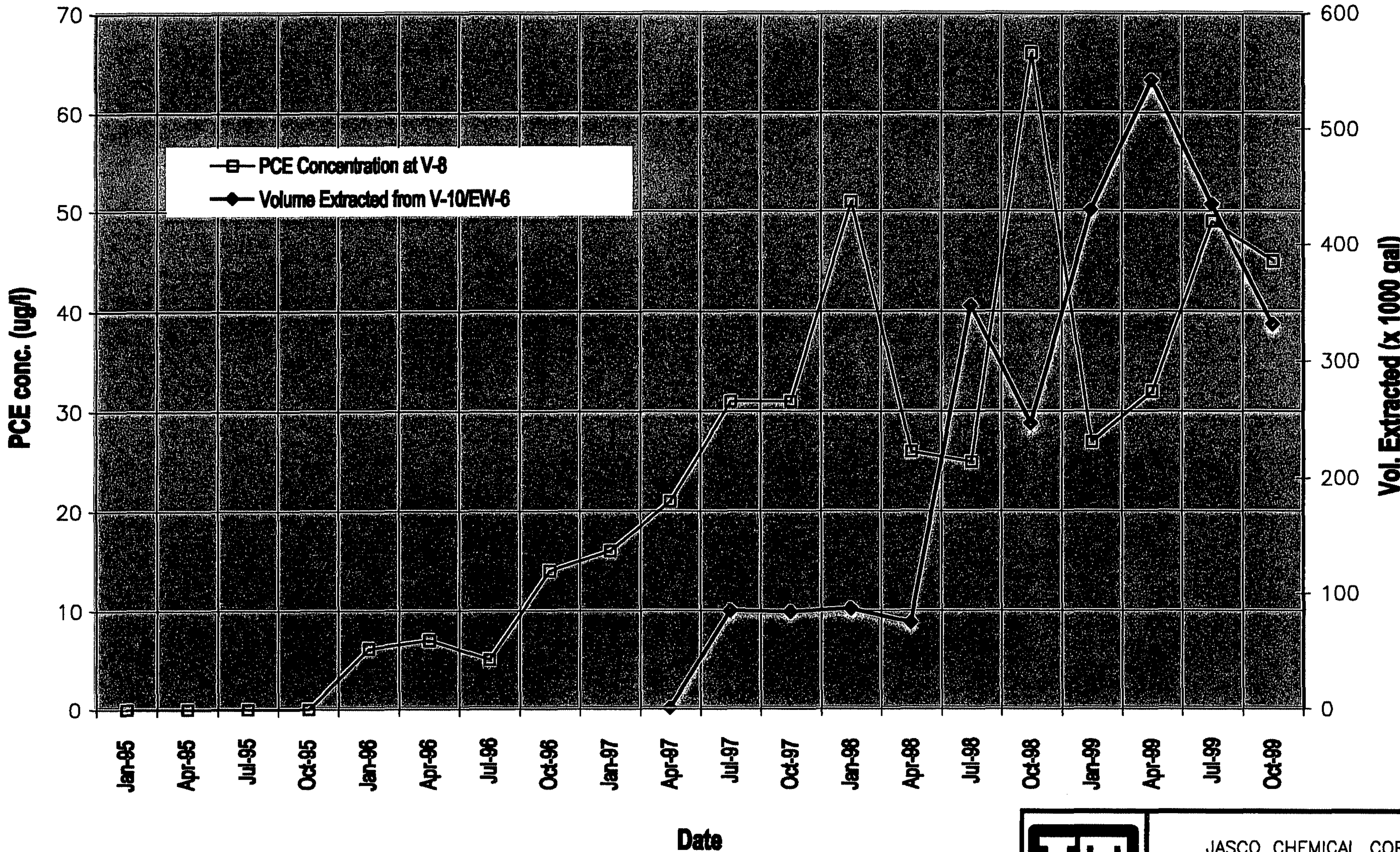

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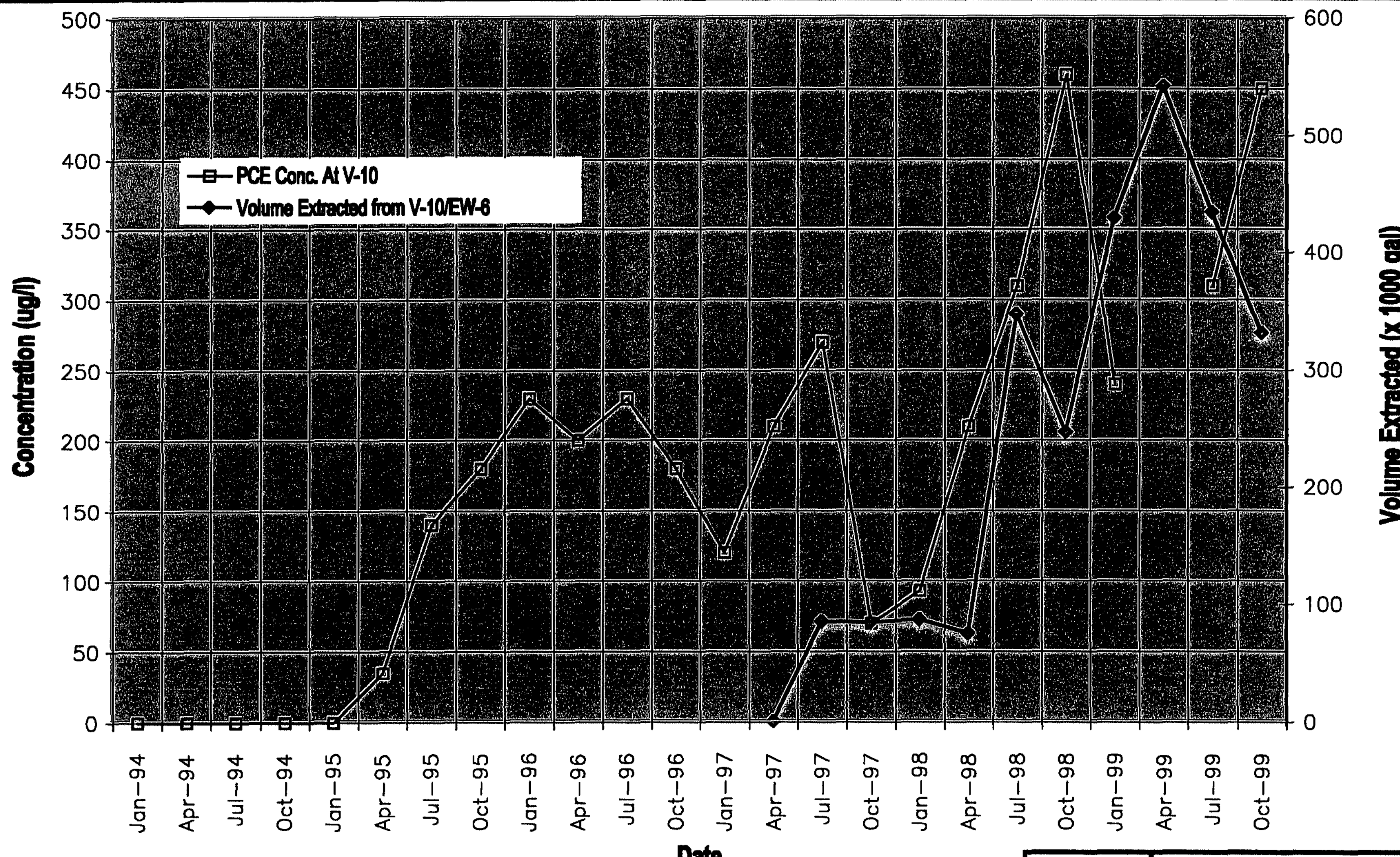
FIGURE 6-4
PCE CONCENTRATION AT WELL V-8 vs
VOLUME EXTRACTED AT V-10/EW-6

JASCO CHEMICAL, CORP.

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	---	Concord	R. BARRON	04/21/2000					907403-A13



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MOUNTAIN VIEW, CA

FIGURE 6-5
PCE CONCENTRATION AT WELL V-10 vs VOLUME EXTRACTED FROM V-10/EW-6

JASCO CHEMICAL, CORP.

identified during the Hydropunch sampling activities. As the downgradient edge of the plume was not delineated by these sampling events, it is likely that the plume extends farther downgradient than currently indicated, suggesting that the contaminants had been present in upgradient areas longer than 20 years. Thus, in addition to the presence of PCE upgradient of all potential source areas at JASCO, the contaminants are likely to have been present in these upgradient areas at a time that predates JASCO's ownership and operation of the 1710 Villa Street facility.

Section 7
PCE Usage at Jasco Chemical Corporation

JASCO operated from November 1976 to December 1995 as a chemical blending and repackaging plant. According to representatives of JASCO and as supported by chemical data that JASCO was required to supply to the City of Mountain View, PCE was never used, stored, or handled at the site during JASCO's 19 years of operation.

A copy of JASCO's Hazardous Materials Management Plan (HMMP) dated October 21, 1991, as prepared by and on file at the City of Mountain View Hazardous Materials Division, is included in Appendix G. PCE or any of its common trade names is not listed in any of the HMMPs filed with the City during JASCO's operation of the Mountain View facility.

Section 8
Summary of Surrounding Property Usage

As the presence of PCE could not be attributed to any potential source area on site and because data indicated contamination existed on adjacent properties upgradient and cross-gradient of the site, JASCO collected additional data regarding historic property usage near the site. The scope of work included a review of historical aerial photographs from 1939 to 1994, a records and agency review of federal, state, and county lists of possible hazardous waste site, and the City of Mountain View library, Community Development Department, and Fire Department research.

8.1 Summary of Historical Research and Aerial Photograph Review

Photographs from 1939 through 1950 show that the JASCO site and adjacent land use was agricultural. The adjacent area west of the JASCO facility has been dominated by residential use since at least 1964. The only industrial activity visible on adjacent properties was located immediately east of JASCO. The neighboring business was identified as Peninsula Tube Bending by a JASCO representative. The 1994 photograph of the site showed that the JASCO buildings had not changed significantly since the 1959 photograph, although within that time interval, buildings located immediately to the east were built and removed. An aerial photograph dated April 25, 1966 showed the future JASCO warehouse and the "L" shaped Peninsula Tube Bending Building. The property immediately east of the future JASCO warehouse was undeveloped. Acknowledging the vertical exaggeration inherent in viewing aerial photographs stereo pairs, the parking lot area of Peninsula Tube Bending appeared to have the highest elevation followed by the future JASCO truck turnaround area. The lowest elevation area appeared to lie immediately east of the future JASCO warehouse, resulting in an apparent surface drainage trending from Peninsula Tube Bending northward toward the railroad tracks.

The Tube Bending Shop buildings were noted in photographs between 1964 and 1980. A City of Mountain View Planning Department memo dated December 26, 1962 indicated that Mr. Lewis L. Hepfler requested architectural approval for a building located at 1678 Villa Street to be used as a warehouse. Business meeting minutes from a February 27, 1963 Mountain View Planning Commission meeting regarding Conditional Use Permit and Site Plan-Architectural Approval, 1678 Villa Street stated "...The Public Works Department stated the developer should be alerted that the area where the warehouse is proposed cannot be drained and cannot by sewered by gravity into existing City system." Business meeting minutes from May 22, 1963 regarding 1678 Villa Street stated "...for the record, the storm drainage into the property probably cannot be accomplished by gravity, but would possibly have to be pumped." According to a City of Mountain View Building Inspection Permit dated August 13, 1965, interior improvements were made to existing buildings located at 1678-1682 Villa Street. The owner at that time was the D.S. Hamway Company and the use of the structure is described as a "Tube Bending Shop."

A second Building Inspection Permit dated May 10, 1966 lists the owner as Henry Spates and indicates repair work was conducted at 1678 Villa Street. Vehicle and/or material storage was noted at the western edge of this facility in several photographs, especially in the 1978 photograph. A record review of microfiche documents at the City of Mountain View Community Development Department, Building Inspection Division indicated that in December 1971, the Mountain View Building Inspector sent the Hamway Company a "Notice of Violation" for unauthorized land use as "maintaining an auto junk yard" on property zoned R-3 (residential).

A business known as West Coast Door Manufacturing Company originally occupied the 1710 Villa Street property before the JASCO facility, as indicated by City of Mountain View Fire Department records dating back to 1955. A warehouse building was constructed by West Coast Door Manufacturing immediately east of the JASCO warehouse between August 1971 and April 1974 (evidenced by aerial photographs). As discussed in more detail later, West Coast Door Manufacturing apparently sold the property immediately east and adjacent to the future JASCO warehouse to the Pacific Press Publishing Association.

According to copies of newspaper articles found in the History Room at the City of Mountain View Library and included in Appendix H, Pacific Press Publishing Association, owned by the Seventh-Day Adventist Church, was located at 1350 Villa Street since 1904. It was the oldest business in Mountain View and was "the most complete publishing house west of Chicago," according to a 1975 newspaper article. For 79 years, from 1904 to 1983, the company operated and slowly expanded its printing and binding plant from the original 15 acres westward, toward JASCO. Rolls of paper and other printing supplies were shipped to Pacific Press Publishing by rail. At the end of World War II, a pressroom, photography studio, an addition to the engraving facilities, and a book department were added to the facilities. A June 1975 newspaper article described a three-stage expansion plan that included acquiring the title to the 2.25 acres located immediately to the east of the existing JASCO warehouse, then owned by West Coast Doors. Two 36,000-square-foot warehouses were located on the acquired property. The use of the warehouses by Pacific Press Publishing is unknown. In 1983, Pacific Press Publishing sold its property, then comprised of 20 acres—to South Bay Development and Construction Company and relocated to Boise, Idaho.

A record review of microfiche documents at the City of Mountain View Community Development Department, Building Inspection Division indicated that in 1963, Pacific Press Publishing requested architectural approval for a flammable storage and paint shop in an M-2 district. In 1974 Pacific Press Publishing requested site plan and architectural approval to permit proposed use of an existing gasoline storage tank for alcohol, a new canopy, and a 9-foot-by-23-foot addition for an existing flammable storage area. Examination of microfiche blueprints dated September 1963 and November 1973 showed the location of the flammable storage building and paint shop was along the railroad tracks and on the west side of Pacific Avenue. Pacific Avenue no longer exists but was the extension of Mountain View Avenue on the north side of Villa Street. The California Air Resources Board (1989) provides "Compliance Assistant Program" (CAP) publications for industries that use air-polluting chemicals. Solvents containing PCE can be used in conjunction with inks and the drying of printed ink. The CAP publication for "Solvent Cleaners" states that "...solvent cleaning is also used in non-metal working industries such as printing, chemicals, plastics, rubber, textiles, glass, paper and electric power. Often, the function of the organic solvents in these industries is to provide maintenance cleaning of electric motors, fork lifts, printing presses, *etc.*"

8.2 Record and Agency Review

The record and agency review (Appendix I) identified 18 sites of potential contamination within a one-mile radius of JASCO. Four of the sites, other than JASCO, reported releases of VOCs. PCE has been identified in soil and groundwater from the Plessy Micro Sciences site located approximately 0.75 mile cross-gradient from JASCO and at the Teledyne and SpectraPhysics sites located approximately 1 mile downgradient of JASCO. None of the sites where VOCs were identified were located upgradient or within 0.5 mile of JASCO. Only one site was located upgradient and within 0.25 mile of JASCO. This site was noted as a facility where hazardous materials may be handled but no releases have been reported.

Based on the agency records reviewed, IT did not identify any evidence of known chemical releases that may have potentially contributed to the presence of PCE in the groundwater at the JASCO site. However, environmental/hazardous materials records were not found relating to the two industrial properties that were operating immediately east of the JASCO site between 1964 and 1980. The operation of these facilities predates the environmental documentation available in the requested database. Based on the aerial photograph review, potential material storage was noted near the area where the highest levels of PCE in groundwater have been identified.

Section 9
Summary and Conclusions

In summary, the following conditions have been identified regarding the presence of PCE in soil and groundwater at the JASCO site:

1. PCE was not detected in soil samples collected during the RI except for several samples on railroad property in the drainage swale at the northwestern corner of the JASCO site; the sampling sites were located at an outlet for surface water drainage from areas to the east of the JASCO site.

2. Soil samples collected from the drainage swale area during installation of the DVE wells and after implementation of the stormwater runoff system did not contain PCE.

3. PCE was not detected in any soil samples conducted as part of a comprehensive confirmation soil sampling program of the entire JASCO facility under the Remedial Action for soil in 1994 and 1995.

4. PCE was first detected in site groundwater in 1995. Its distribution at the site is inconsistent with historic contaminant presence and distribution at the site from known source areas. Particle tracking modeling suggests that the contaminants were present in upgradient groundwater before JASCO's ownership and operation of the property.

5. The highest concentrations of PCE detected during the investigation were at locations on property to the east of the JASCO site, and PCE has been detected at elevated levels at sample points upgradient of the JASCO site.

6. City of Mountain View Fire Department and JASCO records and correspondence indicate the PCE has not been stored, used, or distributed at the site.

7. The property immediately east of the JASCO facility had been previously occupied by companies whose industrial activities would typically have used solvents.

Based on the results of the PCE Hydropunch investigation conducted between 1997 and 1999 and other historical site data as summarized above, the PCE that is present in groundwater at the site does not appear to be associated with any of JASCO's industrial activities. Its detection in soil samples within the drainage swale area during the RI can be attributed to surface water runoff and not a release from the site. Before JASCO's implementation of the surface water runoff system in the drainage swale, this area collected runoff from areas east of the site along the railroad right-of-way. Soil samples collected during installation of the DVE pilot study and after the installation of the runoff collection system did not contain PCE, suggesting that the source of runoff had been eliminated.

A comprehensive, sitewide sampling program was conducted as part of the Remedial Action for soil during which PCE was not detected in any of nearly 200 samples collected from 96 sampling locations covering the entire site. PCE was not detected in any of these samples indicating that a surface source does not exist on the JASCO site. This is further supported by the results of soil sampling during the PCE excavation described in this report. PCE was detected at low concentrations at depths below 20 feet at several locations at JASCO's eastern boundary and on adjacent property but not in shallower samples collected from the same boreholes. That the minor soil contamination is present only at depths within the saturated zones and not at shallower depths suggests that a soil source does not exist in this area and that the contaminants probably represent movement of off-site sources through groundwater.

PCE has been detected in groundwater primarily at the eastern portion of the site and follows a dissimilar pattern to the groundwater contamination at the western portion of the site that has been associated with JASCO's activities. Although the initial detection of PCE was at well V-10, which is on JASCO property, subsequent groundwater sampling from temporary boreholes as described in this document indicate that higher levels of PCE exist on off-site property to the east of JASCO. This sampling activity has also identified elevated PCE concentrations in B-aquifer groundwater on off-site property upgradient of the JASCO site and all identified potential source areas. The plume of PCE contamination in the B-aquifer extends from this upgradient area downgradient on property east of the JASCO site. The contamination identified in JASCO's on-site groundwater monitoring wells appears to represent the western edge of the plume or, in the case of well V-4, migration of PCE from this eastern area on onto JASCO property as a result of groundwater extraction.

The distribution of PCE in the perched and A-aquifers are less extensive than in the B-aquifer which, can be attributed to the nature of the aquifer materials. Lithology beneath and near JASCO suggests the existence of meandering buried stream channels of varying lateral continuity. The perched zone was also found to completely dry up under drought conditions, as last experienced between the late 1980s to the early 1990s. Both the perched and A-aquifers exhibit stream channel characteristics, while the B1-aquifer appears to be more continuous and uniform beneath the area. It is feasible that a combination of drought conditions and the discontinuous nature of the perched- and A-aquifers impeded the movement of PCE from its source. However, since the B-aquifer is continuous and uniform, once PCE reached it, the PCE would be able to move throughout the B-aquifer more easily.

City of Mountain View Fire Department and JASCO records indicate that PCE was not stored, used, or distributed at this or any of its other facilities. The absence of PCE in site soils on the property itself also suggests that it was not in use on the site before JASCO began its site operations. Public records obtained from the City of Mountain View Library and the Building Inspection Department indicate that property immediately east of the JASCO facility was occupied by a number of businesses that are likely to have used solvents (Peninsula Tube Bending and Pacific Press Publishing). These businesses ceased operation in the early to mid-1980s. Because this predates many of the local, state, and federal environmental regulations, minimal data exists regarding chemical usage, spills, or other adverse conditions during their occupation of the site.

Although JASCO recognized the likelihood that the PCE contamination was not associated with its activities and does not accept responsibility for its presence of PCE, it has modified its existing remedial action program to provide remediation of the PCE as it continued its investigation of potential source areas. This work has included the installation and operation of DVE and groundwater extraction wells in all three aquifers to minimize further migration of PCE in groundwater. At present, JASCO is operating three groundwater extractions wells for the control of PCE in the perched zone, A- and B-aquifers at the eastern portion of the site, and along the railroad right-of-way further east of the site.

In conclusion, the data collected as part of this PCE investigation, combined with historical site data suggest that the presence of PCE in groundwater represents movement from an off-site source to the east and upgradient of the JASCO facility and is unrelated to any past or present activity conducted by JASCO.

Section 10
References

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Appendix J

Appendix J
Groundwater Modeling

DISCUSSION OF GROUNDWATER MODELING AND PARTICLE TRACKING OF PCE AT JASCO CHEMICAL CORPORATION NATIONAL PRIORITY LIST (NPL) SITE

This brief report presents IT Corporations's (IT) model design and preliminary results for the application of MODFLOW and PATH3D groundwater models to evaluate particle transport at the JASCO site at 1710 Villa Street in Mountain View, California. A two-layer model was designed. Layer 1 in the model corresponds to the unconfined A-aquifer and Layer 2 corresponds to the confined B-aquifer. Flow and particle tracking work concentrated on Layer 2 because the contaminant plume is most extensive in the B-aquifer. The model was designed as a steady-state model.

1. Modeling Area and Grids

The modeling area was selected based on the size of the plumes; the orientations of the model boundaries were chosen based on the groundwater contour maps. The X- and Y-axes were selected generally east–west and north–south with the Y-axis 27 degrees east of north. For simplicity, the text will refer to the X-axis as east–west and the Y-axis as north–south. The modeling area is 1,800 feet (east–west) by 1,750 feet (north–south). IT used uniform grids with grid spacing of 25 feet in both orientations. The model area consists of 70 rows and 72 columns.

The top and bottom elevations of the B-aquifer were identified from 27 available soil boreholes drilled during previous sampling events. These data were then imported to Surfer to make contour maps for the top and bottom surfaces of the B-aquifer. These contour maps were later imported to Groundwater Vista and used to set the top and bottom elevations in the Model Layer 2. The top of Model Layer 1 was set at 50 feet, which is about 5 feet higher than the mean groundwater level in A-aquifer. (Note: To get accurate results with PATH3D, the top of Unconfined Layer 1 should be close to the groundwater level, not to the ground surface.)

2. Boundary Conditions

When the Y-axis was chosen along east 27 degrees of the north, the groundwater flow direction was approximately along the Y-axis. Therefore, the model is assumed to have constant heads on the north and south boundaries with no-flow conditions on the east and west boundaries.

Because the modeling area is larger than that of the previous groundwater contour maps, extrapolation was used to include groundwater levels on the north and south boundaries. On the February 2000 water level map, the contour line passing well HP-01 was about 46.1 feet, and that passing the midpoint of wells V-8 and V-9 was 44.8 feet. The distance between the two contour lines was 365 feet. These data yielded a hydraulic gradient of 0.0036 feet per foot. Based on the gradient, IT calculated the water levels at the north and south boundaries to be 41.1 feet and 47.7 feet, respectively. These values were then used to set the boundary conditions in the model. Because the observed water levels in the A- and B-aquifers were very similar on the February maps, the same boundary values were used in Model Layers 1 and 2.

3. Conductivity (K), Specific Yield (Sy), and Storativity (S)

All three parameters can be obtained from the pumping test. Because IT did not have site-specific data for the B-aquifer, well-documented generic data was used in some cases. A conductivity of 10 feet per day was used for the A-aquifer, which is consistent with previous aquifer testing results. A conductivity of 20 feet per day was initially applied to the B-aquifer, which is characterized by more a more permeable and laterally continuous lithology. A specific yield of 0.15 and storativity of 0.002 was chosen. Note: specific yield and storativity are not needed for steady-state flow modeling, but they are needed for transient flow modeling, and they are always required for transport modeling. These values are typical values in the Central Valley and in many other places in California. These initial values were later calibrated against the drawdown result from extraction well EW-7, as discussed below.

4. Recharge Rate

The annual precipitation at the site is approximately 20 inches. Assuming 95 percent is runoff, IT used 5 percent of the precipitation as the recharge rate in the model (2.3E-4 feet per day).

5. Extraction Wells

At present, there are three extraction wells: V-4 (4 gallons per minute [gpm]) and V-10 (2 gpm) in the A-aquifer and EW-7 (15 gpm) in the B-aquifer.

6. Tetrachloroethene (PCE) Plumes

The scenario for this study is as follows: If PCE were released on off-site property upgradient and to the southeast of the JASCO site, how far would it have traveled in 20 years? Twenty years represents the approximate length of time between JASCO's initiation of operation at the site and the maximum downgradient identification of PCE in the B-aquifer.

Assuming the groundwater seepage velocity is v, the PCE transport velocity is v/R, where R is called the retardation factor. We calculated R at the site as follows.

$$R = 1 + K_{oc} \times F_{oc} \times (rho / n_e) = 9.83$$

Where:
K_{oc} = 661 ml/g (organic carbon distribution coefficient)
F_{oc} = 0.2% (organic carbon fraction)
rho = 1.67 g/ml (soil density)
and n_e = 0.25 (effective soil porosity)

7. Preliminary Calibration

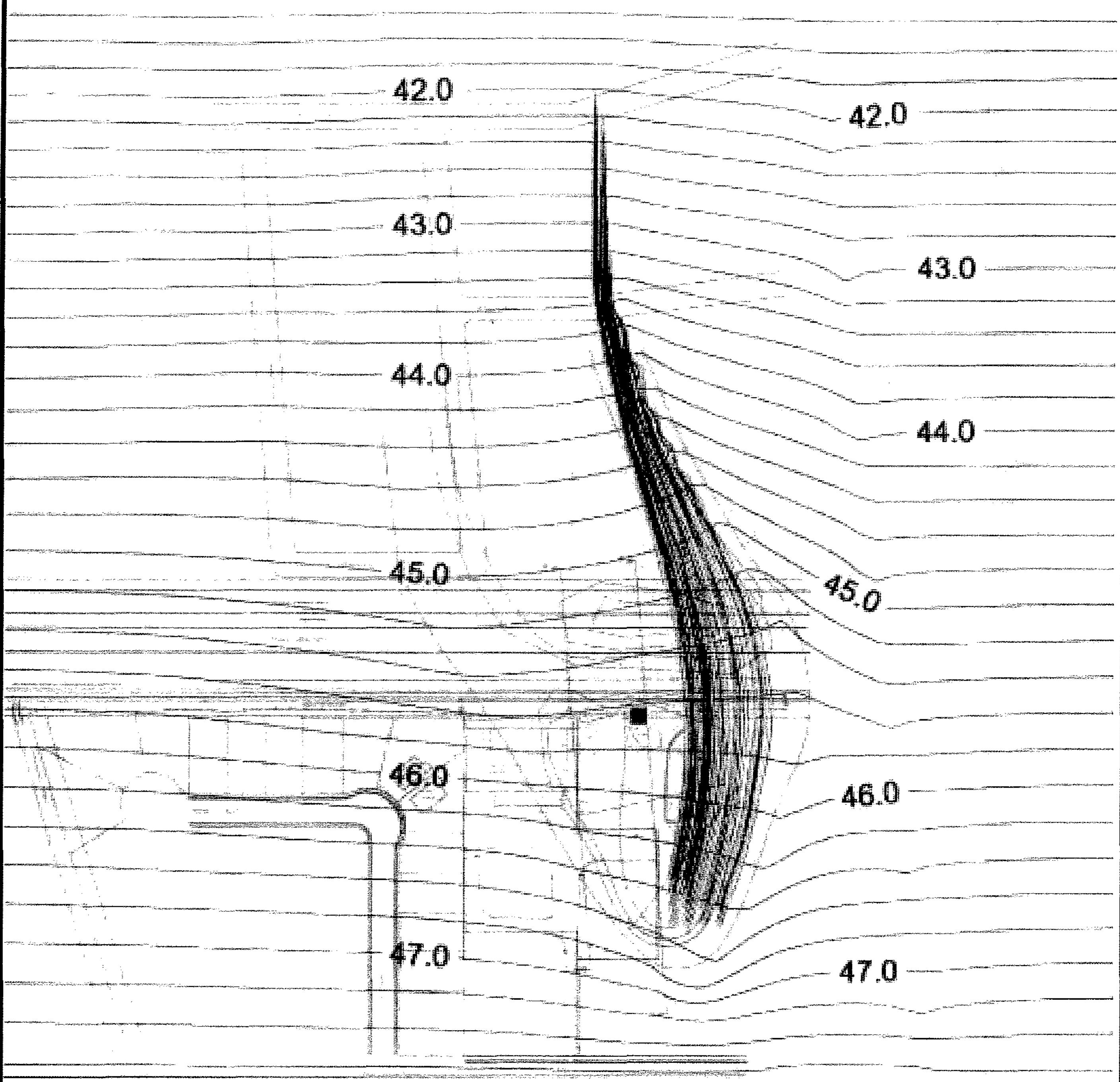
The model was preliminarily calibrated as follows: After the model was set, it was run with all three pumping wells operating. The conductivity was adjusted in Layer 2 to achieve a drawdown of 3 feet at well EW-7, which was the observed drawdown from the field. If the K value was increased to 33 feet per day, the drawdown became 3 feet. The K value in Layer 2 was therefore updated as 33 feet per day.

Based on the current shape of the plume, a minor adjustment of the K values in the B-aquifer was made. Groundwater flow has the tendency to take paths in comparably higher conductivity zones and bends away from lower conductivity zones. The K value in the area corresponding to the plume was increased, and the K value on the east side of the plume was decreased. The model was rerun with all three pumping wells operating, and the drawdowns were examined. When the higher K value was 50 feet per day and the lower K value was 0.5 feet per day, the drawdown at well EW-7 reached 2.8 feet. This was comparable with the observed drawdown at well EW-7 (about 3 feet). IT concluded that the model was calibrated with the drawdown data. The model could be further refined and calibrated in greater detail if more site-specific data was collected, especially data from pumping tests.

8. Particle Tracking

PATH3D was used for particle tracking. The flow field needed for particle tracking was generated with MODFLOW. To examine how far the plume would have moved in a 20-year period, IT forward tracked for 20 years, considering the PCE retardation factor. Particles were released from the area upgradient and southeast of the JASCO site, which corresponds to the upgradient edge of the B-aquifer contaminant plume. Influence from the three extraction wells were omitted in the model because these wells were installed after 1985. The model results suggested that after 20 years the PCE plume could reach as far as Hackett Avenue, the most downgradient extent of the known contaminant plume. The attached figure shows shows the maximum downgradient extent of the particle tracking model after 20 years. It would take approximately seven years for the PCE plume to reach the Central Expressway.

It should be noted that the particle tracking method only considers the advection component for plume migration; it does not account for the effect of dispersion; that is, particle tracking only shows the longitudinal advance of a plume, not the transverse expansion of a plume. The plot indicates that the particle paths are limited in a narrow band, but in reality the plume must have expanded laterally in a wider area due to dispersion. Because of the effect of dispersion, when the plume front reached the Central Expressway, the plume would have also expanded laterally to the locations of wells V-8 and V-9. This can be shown with other transport programs such as MT3DMS.



DRAWING NUMBER 907403-A16

APPROVED BY

CHECKED BY

DRAWN BY R. BARRON 01/22/01

OFFICE Concord

X-REF --

IMAGE modflow

IT CORPORATION

JASCO CHEMICAL CORP.
MOUNTAIN VIEW, CA

FIGURE J-1

PATH3D GENERATED WITH MODFLOW DEPICTING FORWARD TRACKING OF PARTICLES FOR 20 YEARS

McClellan Air Force Base Project
Bldg. 740
McClellan AFB, CA 95652

PO Box 2226
North Highlands, CA 95660

Phone: (916) 923-2181
Fax: (916) 923-0114

1-800-433-6012
#415

the IT group

Fax

To: Max/Carol
From: Scott
Fax: 650 968 6640
Pages: 7
Phone: 650 968 6005
Date:
Re: DCE
CC:

Comments:

Max/Carol,
Here is the draft of the interim report to Ellen per our discussion. I wanted to lay the foundation of our case in the report even though we will prepare a formal report because I suspect Ellen will forward this to her technical staff. I have faxed this to Don also and will incorporate my changes prior to submitting to Ellen. I have omitted most of the tables for convenience but the final memo will be about 25 pages.

Scott

Soil samples were collected from borings located near well V-10 in February of 1997 and in July-August of 1997. No contaminants were detected in soil samples collected from a depth of 10 to 15 feet. Between a depth of 20 and 35 feet, consistent with the A-aquifer, PCE was detected along the eastern property boundary near well V-10 and on adjacent property immediately to the east at concentrations ranging from 0.035 to 0.1 mg/kg. Contaminants were not detected in soil samples collected from other areas on the site or on adjacent properties during the sampling activities conducted between 1997 and 1999. Table 1 summarizes the results of soil sampling conducted during these drilling activities. Soil samples were not collected from all temporary borings due to the limited presence and concentration in samples collected during the initial sampling phases in 1997.

Jasco has compiled the results of groundwater sampling from temporary borings drilled between 1997 and 1999. The samples were collected over a two and a half year period, therefore the data does not represent a "snapshot" in time. However, the data does exhibit consistent trends that are apparent from the attached figures. Table 2 provides a summary of all groundwater analyses conducted from temporary borings since 1997. The perched and A-zones exhibit similar trends with the highest PCE concentrations on adjacent property to the east of well V-10 and a second pocket of contamination to the east and downgradient of the Jasco site. Contamination was also identified at HP-43 and HP-44 approximately 200-300 feet upgradient of the Jasco facility and on adjacent property to the east. PCE contamination in the B-aquifer is more extensive than in the shallower zones, probably because this zone is thicker and more uniform than the perched zone and A-aquifer. In the deeper B-aquifer, the plume of PCE contamination exceeding 100 ug/l extends from HP-43 approximately 200 feet upgradient of the Jasco facility along a roughly north-south trending line centered approximately 150 feet east of the Jasco facility boundary on adjacent property.

Jasco is currently performing additional data interpretation including lithologic cross-sections and evaluation of potential contaminant pathways. Copies of previous lithologic cross sections not including data collected in the past six months are attached. The results of the interprepation will be provided in a formal report presenting all data collected to date. An outline of this report is attached. Preliminary data suggest that the source of the PCE may have been on adjacent property to the east and mobilized by the rising water table following the drought period of 1986 to 1991. PCE was not detected in groundwater samples from on-site monitor wells located near potential source areas and was not detected at well V-7 until 1996. It is possible that multiple source areas may have existed to the east of Jasco as this property was under several industrial uses until the mid 1980s. Alternatively, the contamination may represent a single source which was mobilized by the rising water table and has been migrating downgradient as a slug. Jasco is currently conducting extraction and treatment of perched zone and A-aquifer groundwater near well V-7 and B-aquifer groundwater near HP-25 to the east of the Jasco facility along the railroad right-of-way. Jasco installed this interim system to best contain the current plume during potential source investigation.

OUTLINE OF REPORT OF PCE INVESTIGATION

1.0 INTRODUCTION
- 1.1 Site Location
- 1.2 Site History

2.0 PREVIOUS SOIL/GROUNDWATER INVESTIGATIONS
- 2.1 Soil Sampling
  - 2.1.1 Preliminary Investigations
  - 2.1.2 Potential Source Area Soil Sampling During Remedial Action
- 2.2 Quarterly Groundwater Sampling
- 2.3 Summary of Remedial/Removal Actions

3.0 SUMMARY OF ADDITIONAL INVESTIGATION/REMEDIAL ACTIVITIES
- 3.1 Additional Plume Delineation
- 3.2 Dual Vacuum Extraction at Well V-10
- 3.3 Installation of Perched Zone Extraction Well Near V-10
- 3.4 Installation of B-Aquifer Extraction Well at Railroad Right-of-Way

4.0 SITE GEOLOGY/HYDROGEOLOGY
- 4.1 Vadose Zone/Perched Groundwater
- 4.2 A-aquifer
- 4.3 B-aquifer

5.0 ANALYTICAL DATA FOR ADDITIONAL SAMPLING ACTIVITIES
- 5.1 Soil
- 5.2 Groundwater

6.0 EVALUATION OF POTENTIAL CONTAMINANT MIGRATION

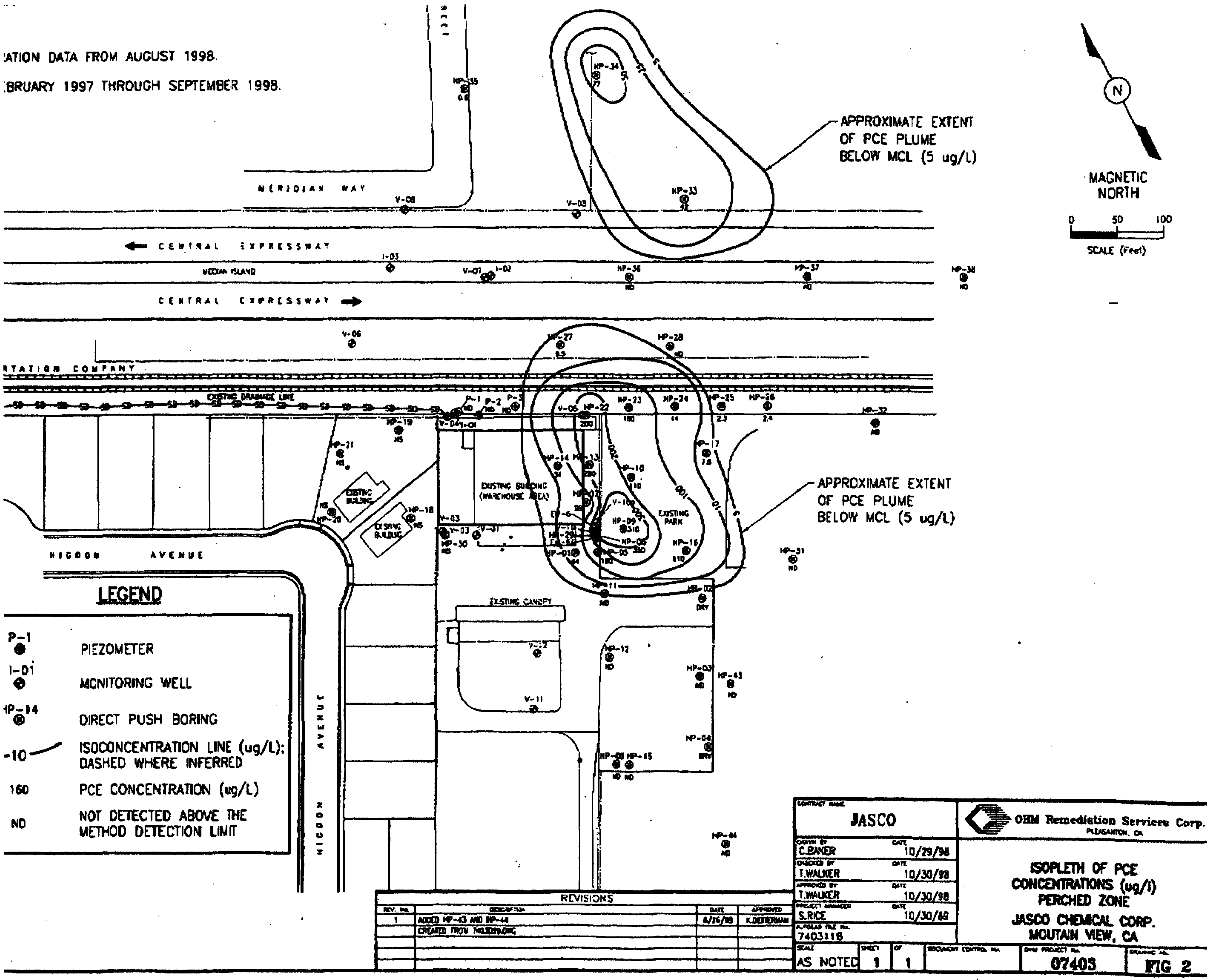
7.0 CHEMICAL USAGE AT JASCO CHEMICAL CORP

8.0 HISTORY OF SURROUNDING PROPERTY USES

9.0 CONCLUSION

Figures and Tables to include:
- Site Map
- Groundwater Flow Direction Maps
- Contaminant Plume Maps for Each Water-Bearing Unit
- Lithologic Cross Sections
- Summary Tables of Hydropunch Soil and Groundwater Analytical

Appendices to include:
- Historic Groundwater Elevation Data
- Laboratory Reports of Hydropunch Soil and Groundwater Data
- Lithologic Logs for Hydropunch Data
- Summary Tables of Quarterly Groundwater Monitoring Data (1989 to date)
- Summary Tables of Groundwater Elevation Data
- Documentation of Chemical Usage On-Site
- Documentation of Previous Uses of Adjacent Properties



ATION DATA FROM AUGUST 1998.
BRUARY 1997 THROUGH SEPTEMBER 1998.
APPROXIMATE EXTENT OF PCE PLUME BELOW MCL (5 ug/L)
MAGNETIC NORTH
SCALE (Feet)
0 50 100
MERIDIAN WAY
CENTRAL EXPRESSWAY
MEDIAN ISLAND
CENTRAL EXPRESSWAY
EXISTING DRAINAGE LINE
EXISTING BUILDING (WAREHOUSE AREA)
EXISTING PARK
EXISTING CANOPY
HIGDON AVENUE
APPROXIMATE EXTENT OF PCE PLUME BELOW MCL (5 ug/L)
LEGEND
P-1 PIEZOMETER
I-01 MONITORING WELL
HP-14 DIRECT PUSH BORING
-10 ISOCONCENTRATION LINE (ug/L); DASHED WHERE INFERRED
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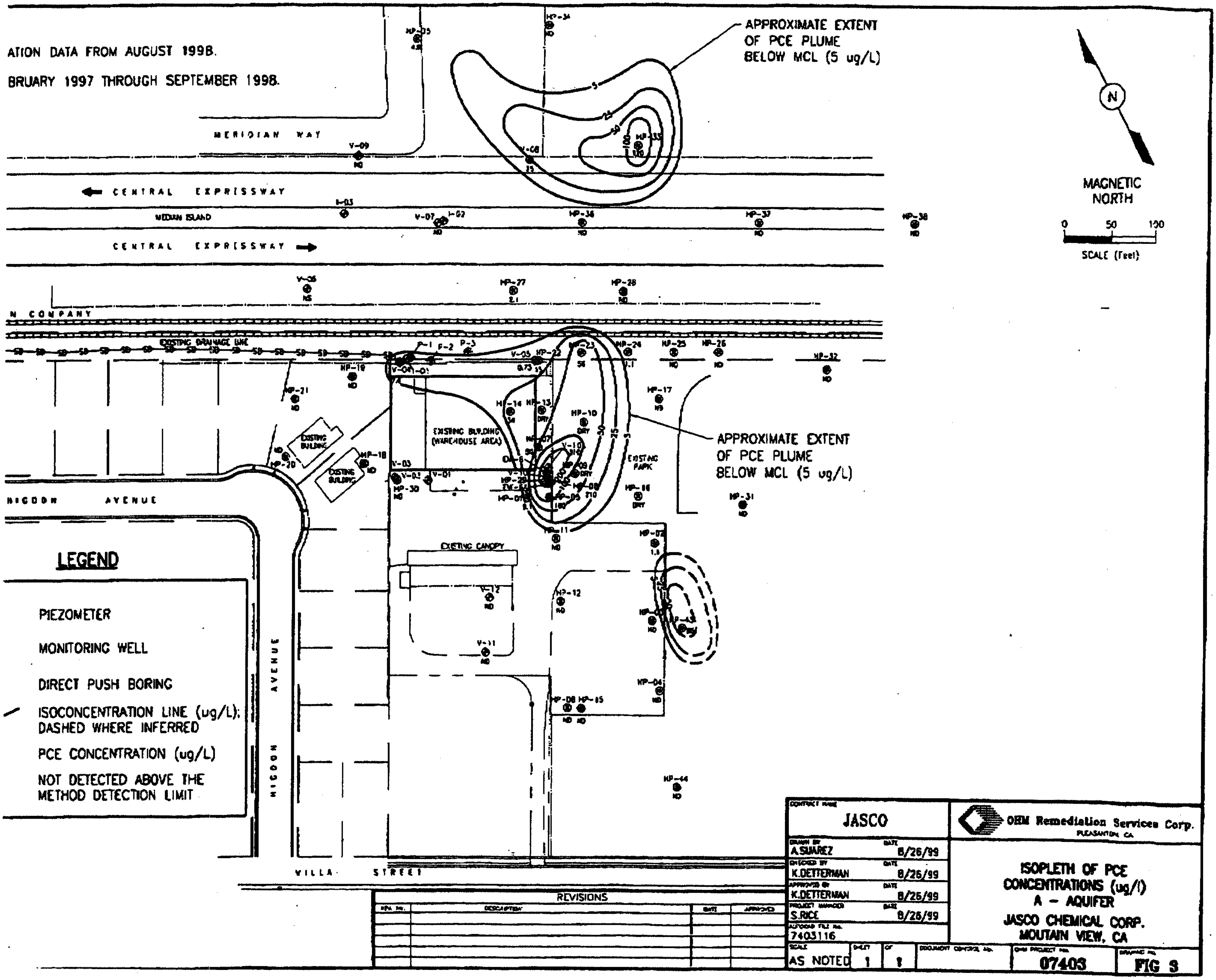
JASCO
DRAWN BY C.BAKER DATE 10/29/98
CHECKED BY T.WALKER DATE 10/30/98
APPROVED BY T.WALKER DATE 10/30/98
PROJECT MANAGER S.RICE DATE 10/30/69
7403118
SCALE AS NOTED SHEET 1 OF 1
OHM Remediation Services Corp. PLEASANTON, CA
ISOPLETH OF PCE CONCENTRATIONS (ug/l) PERCHED ZONE
JASCO CHEMICAL CORP. MOUTAIN VIEW, CA
07403
FIG 2



ATION DATA FROM AUGUST 1998.
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0 50 100
SCALE (Feet)
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CENTRAL EXPRESSWAY
MEDIAN ISLAND
CENTRAL EXPRESSWAY
N COMPANY
EXISTING DRAINAGE LINE
EXISTING BUILDING (WAREHOUSE AREA)
EXISTING BUILDING
EXISTING PARK
EXISTING CANOPY
APPROXIMATE EXTENT OF PCE PLUME BELOW MCL (5 ug/L)
HIGDON AVENUE
VILLA STREET
LEGEND
PIEZOMETER
MONITORING WELL
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ISOCONCENTRATION LINE (ug/L); DASHED WHERE INFERRED
PCE CONCENTRATION (ug/L)
NOT DETECTED ABOVE THE METHOD DETECTION LIMIT
REVISIONS
DESCRIPTION
DATE
APPROVED
CONTRACT NAME
JASCO
OHM Remediation Services Corp.
PLEASANTON, CA
DRAWN BY A.SUAREZ DATE 8/26/99
CHECKED BY K.DETTERMAN DATE 8/26/99
APPROVED BY K.DETTERMAN DATE 8/26/99
PROJECT MANAGER S.RICE DATE 8/26/99
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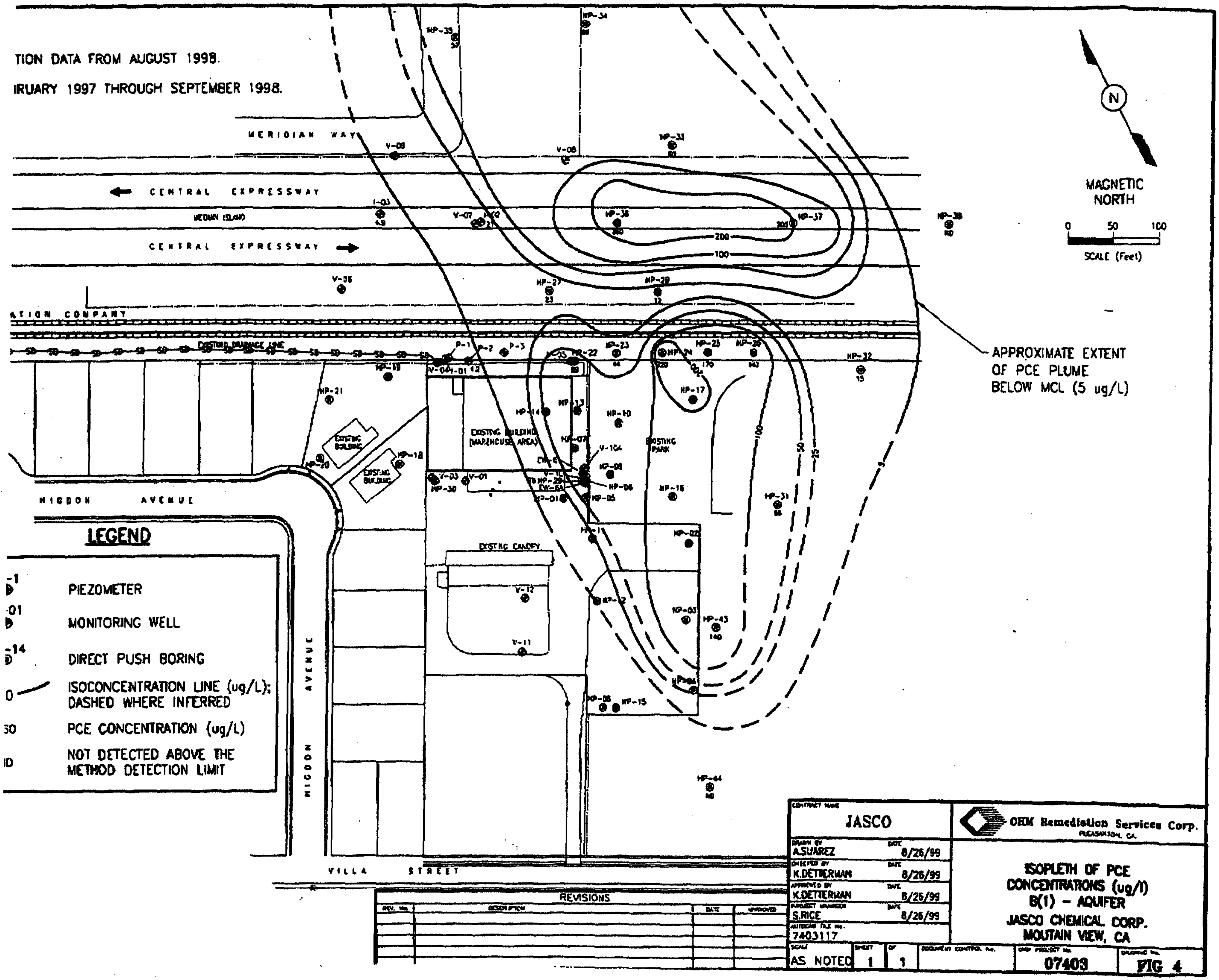
SCALE AS NOTED
SHEET 1 OF 1
OHM PROJECT No. 07403
DRAWING No. FIG 3
ISOPLETH OF PCE CONCENTRATIONS (ug/l) A – AQUIFER
JASCO CHEMICAL CORP. MOUTAIN VIEW, CA



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HIGDON AVENUE
HIGDON AVENUE
VILLA STREET
EXISTING BUILDING (WAREHOUSE AREA)
EXISTING BUILDING
EXISTING CANOPY
EXISTING PARK
MAGNETIC NORTH
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SCALE (Feet)
APPROXIMATE EXTENT OF PCE PLUME BELOW MCL (5 ug/L)
LEGEND
PIEZOMETER
MONITORING WELL
DIRECT PUSH BORING
ISOCONCENTRATION LINE (ug/L); DASHED WHERE INFERRED
PCE CONCENTRATION (ug/L)
NOT DETECTED ABOVE THE METHOD DETECTION LIMIT
REVISIONS
JASCO
OHM Remediation Services Corp.
DRAWN BY A.SUAREZ 8/26/99
CHECKED BY K.DETTERMAN 8/26/99
APPROVED BY K.DETTERMAN 8/26/99
PROJECT MANAGER S.RICE 8/26/99
AUTOCAD FILE No. 7403117
ISOPLETH OF PCE CONCENTRATIONS (ug/l) B(1) - AQUIFER
JASCO CHEMICAL CORP. MOUTAIN VIEW, CA
SCALE AS NOTED
SHEET 1 OF 1
07403
FIG 4