URS

September 18, 2007

Mr. Eric Yunker
Superfund Project Manager
U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street (SFD-7-3)
San Francisco, CA 94105

Subject: **RAC IX Contract No. W-98-225**
Cooper Drum Company WA No. 247-RDRD-091N
Transmittal of Final OU2 Soil Remedial Design Report

Dear Mr. Yunker:

This letter transmits two copies of the OU2 Soil Remedial Design Report for the Cooper Drum Company Superfund Site in South Gate, California. DTSC and EPA Region 9 comments have been incorporated into the final document.

If you have any questions or require further information, please contact me at (916) 679-2049.

Sincerely,

URS Group, Inc.

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Task Manager

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Project Engineer

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Attachment

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SOIL REMEDIAL DESIGN REPORT

OPERABLE UNIT 2

COOPER DRUM COMPANY SUPERFUND SITE

Prepared for:

Contract No. 68-W-98-225/WA No. 047-RDRD-091N
U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street
San Francisco, California 94105

Prepared by:

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September 18, 2007

DISCLAIMER

This design report has been prepared for the United States Environmental Protection Agency by URS Group, Inc. (URS). This document is intended to transmit the design requirements from information collected by URS during the remedial design field sampling efforts initiated in May 2003 at the Cooper Drum Company Superfund Site.

The limited objective of this design report, the ongoing nature of the project, along with the evolving knowledge of site conditions and chemical effects on the environment and human health, must all be considered when evaluating the design because subsequent facts may become known that may make this document premature or inaccurate.

This design report has been prepared by URS under the review of registered professionals. The conclusions and recommendations in this design are based on URS' data evaluation. The interpretation of the data and the conclusions drawn were governed by URS experience and professional judgment.

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ACRONYMS AND ABBREVIATIONS

AOC	Administrative Order of Consent
ARAR	applicable or relevant and appropriate requirements
ASTM	American Society for Testing and Materials
BDR	basis of design
bgs	below ground surface
CatOx	catalytic oxidation
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
COC	contaminant of concern
CQCP	Construction Quality Control Plan
cy	cubic yard
DCA	dichloroethane
DCE	dichloroethene
DCP	dichloropropane
DL	detection limit
DPA	drum processing area
DPE	dual-phase extraction
DTSC	California Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
FSP	field sampling plan
GAC	granular activated carbon
gpm	gallons per minute
HASP	Health and Safety Plan
hp	horsepower
HRA	health risk assessment
HRC	hydrogen release compound
HWA	hard-wash area
I&C	instrumentation and control
in. H_2O	inches of water
in. Hg	inches of mercury
ISCO	in situ chemical oxidation
LADHS	Los Angeles County Department of Health Services
LACSD	Los Angeles County Sanitation District

ACRONYMS AND ABBREVIATIONS (Continued)

lb/day	pounds per day
LEL	lower explosive limit
LGAC	liquid-phase granular activated carbon
MCL	California maximum contaminant level
mg/kg	milligrams per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEC	National Electrical Code
NFPA	National Fire Protection Association
NPL	National Priorities List
O&M	operation and maintenance
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCE	tetrachloroethene
PCB	polychlorinated biphenyl
PFD	process flow diagram
PLC	programmable logic controller
POC	point of contact
ppb	parts per billion
ppbv	parts per billion by volume
ppmv	parts per million by volume
PRP	potentially responsible party
PVC	polyvinyl chloride
QA	quality assurance
RA	remedial action
RAO	remedial action objective
RAWP	Remedial Action Work Plan
RD	remedial design
RDR	remedial design report
RI/FS	remedial investigation/feasibility study
ROD	record of decision
ROI	radius of influence
RPO	remedial process optimization
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act of 1986
SCAQMD	Southern California Air Quality Management District
scfm	standard cubic feet per minute
SVE	soil vapor extraction

ACRONYMS AND ABBREVIATIONS (Continued)

SVOC	semivolatile organic compound
TBC	to be considered
TBD	to be determined
TCE	trichloroethene
TCP	trichloropropane
TDS	total dissolved solids
TEFC	totally enclosed, fan-cooled
URS	URS Group, Inc.
VC	vinyl chloride
VGAC	vapor granular activated carbon
VOC	volatile organic compound
VP	vapor monitor points
WDR	Waste Discharge Requirement
XRF	X-ray fluorescence
°C	degrees Celsius
µg/L	micrograms per liter

ES.0 EXECUTIVE SUMMARY

In June 2001, the United States Environmental Protection Agency (EPA) added the Cooper Drum Company Site (Site) to the National Priorities List (NPL) of hazardous waste sites requiring remedial action (RA). This Remedial Design Report (RDR) presents the remedial design for the selected RA for the soil Operable Unit 2 (OU 2) at the Site, located in South Gate, Los Angeles County, California. The remedial design (RD) for Operable Unit 1 (OU 1), or the contaminated site groundwater, is presented in a separate RDR.

The OU 2 (alternatively referred to as "impacted soil" or simply "soil" throughout this report) RA includes dual-phase extraction (DPE) for subsurface soils down to the water table, excavation of near surface soils, and institutional controls where excavation is not feasible.

This RDR provides the design criteria, including the assumptions and parameters used in developing the RD for OU 2 soil, and the estimated costs and schedule for implementation of the RA. The soil RD closely follows the selected remedy for soil, as delineated in the Site Record of Decision (ROD) (EPA, 2002).

ES.1 CONTAMINANTS OF CONCERN AND CLEANUP GOALS

The ROD identifies the contaminants of concern (COCs) as volatile organic compounds (VOCs) in soil gas and non-VOCs, including lead, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs), in soil.

The ROD specifies the cleanup goals for VOCs as "to be determined (TBD)," pending collection of soil gas samples after implementation of the RA. The soil gas concentrations are to be used in the VLEACH (or comparable) model to predict impact to groundwater, and in the Johnson and Ettinger model to estimate indoor air concentrations. Remediation of soil gas is to continue until predicted impacts to groundwater are at levels less than drinking water standards, and predicted indoor air concentrations are less than levels that would pose a human health risk.

The ROD specifies the cleanup goal for PCBs in soil as 870 parts per billion (ppb). This level was back-calculated by applying residential exposure parameters used in the Site human health risk assessment and a target health risk level of 1 in 100,000. The ROD also describes the cleanup level for PAHs in soil as being based on the upper tolerance limit background benzo(a)pyrene-toxicity equivalent (B(a)P-TE) concentration for the southern California PAH data set, which is 900 ppb B(a)P-TE. Finally, the ROD specifies a cleanup goal for lead of 400 parts per million (ppm). This level was established based on an evaluation of lead uptake of children's blood.

Post-ROD supplemental investigations of the Site indicated the presence of elevated levels of 1,4-dioxane (a semivolatile organic compound [SVOC]) in the perched aquifer and shallow groundwater. A cleanup goal for 1,4-dioxane was not specified in the ROD. However, other regulatory criteria can be used as a basis for cleanup. The drinking water preliminary remediation goal (PRG) for 1,4-dioxane is 6.1 micrograms per liter (µg/L), and the Department of Health Services (DHS) action level for this compound is 3 µg/L. The cleanup goal for 1,4-dioxane will be assessed during implementation of the RA.

ES.2 ROD SELECTED REMEDY FOR OU 2 SOIL

The remedial action objectives (RAOs) for Cooper Drum, as stated in the ROD, are to protect human health and the environment from exposure to contaminated soil, groundwater, and indoor air, and to restore the groundwater to a potential beneficial use as a drinking water source. The ROD-selected remedy meets these RAOs through treatment of soil and groundwater contaminated with COCs.

The ROD specifies the following remedial design strategy for remediation of contaminated soil at the Site:

- To remove the potential threat to human health, the selected remedy for soil will use DPE for treatment of VOCs in soil.
- Other non-VOC soil contaminants, including PAHs, PCBs, and lead, will be excavated for disposal.
- Institutional controls will be implemented to prevent exposure to soil contaminants where excavation is not feasible.

ES.3 DESIGN STRATEGY FOR IMPACTED SOIL

Two depth intervals will require remedial action: surface to near-surface soils impacted with non-VOCs, and a deeper vadose zone impacted with VOCs and 1,4-dioxane (perched aquifer only).

The soil RD is divided by affected media: soil vapor (gas) and perched groundwater and soil. The vadose zone and the perched aquifer are impacted in two areas of the Site: the former hard wash area (HWA) and the drum processing area (DPA).

ES.3.1 Soil Vapor and Perched Aquifer

The RD uses DPE to simultaneously extract soil vapors and dewater the perched aquifer, which in turn expands the effect of soil vapor extraction in the dewatered zone. Extracted soil vapor will be treated at an on-site treatment system, using catalytic oxidation, followed by acid scrubbing. When influent vapor concentrations decrease to below approximately 150 parts per million by volume (ppmv) the emission controls system will be switched to granular activated carbon (GAC)

DPE will be performed prior to excavation of the shallow soils.

The DPE design also includes dewatering of the perched aquifer, which is continuous in the HWA and DPA, and occurs from approximately 35 to 40 feet below ground surface (bgs). The perched aquifer is a stratified layer within the Bellflower Aquiclude, which also includes the deeper Gaspur and Exposition aquifers. The extracted water, at an estimated design rate of 5 gallons per minute (gpm), from the perched aquifer will be conveyed to the treatment compound where it will be treated in an advanced oxidation process unit (mainly to treat 1,4-dioxane), followed by a liquid-phase granular activated carbon (LGAC) polishing unit. The treated groundwater will then be discharged via two mechanisms: injection (using two injection wells located in the vicinity of the HWA) into the impacted Gaspur aquifer, and discharge to the sanitary sewer. (The same treatment and discharge sequence will be used to treat extracted water from the impacted Gaspur aquifer as part of the groundwater RA; therefore, the water from the two aquifers will be indistinguishable during treatment and discharge processes.)

Removal of VOCs from soil will prevent the downward migration of these compounds at concentrations that would impact groundwater at levels greater than drinking water standards, or their upward migration at concentrations that would cause indoor health risks. Dewatering and treatment of the impacted water from the perched aquifer will expose more of the vadose zone for vapor extraction.

Two existing soil vapor extraction (SVE) wells and four existing vapor monitor points are incorporated in the RD. However, each existing SVE well is to be converted to a DPE well by installing a well with a submersible pump (lowered to the perched aquifer) within approximately 5 feet of the SVE well. Inside each DPE well, extracted water will be conveyed via a water outlet and extracted vapor will be transferred via a vapor outlet to the treatment compound. This same design is used in all (new) DPE wells. (See Drawing P-1, which shows the process flow for the soil remediation system.)

SVE tests at the Site indicate the SVE radius of influence (ROI) is approximately 55 feet. Based on this ROI estimate, and using the 1,000 parts per billion by volume (ppbv) composite soil gas VOC plume as a conservative boundary for the area requiring RA, seven new DPE wells (five new wells in the HWA and two new wells in the DPA) also are included in the RD. The SVE depth interval is from approximately 10 to 30 feet bgs. Correspondingly, the RD includes installation of 13 new vapor monitor wells (nine in the HWA and four in the DPA), mostly within 25 to 50 feet from the SVE wells, with monitoring depths at 10, 20, and 30 feet bgs.

ES.3.2 Soil

The RD includes the removal of Site surface and near surface soil that is impacted with non-VOCs at levels exceeding the cleanup goals, as described in Section ES.1.

Initial soil removal activities will consist of four excavation areas (two areas each in the HWA and DPA) to maximum depths ranging from 2 feet bgs to 5 feet bgs. Excavation will be conducted to 5 feet bgs because the main concern is to prevent direct exposure to near surface contaminated soil. For soils deeper than 5 feet, the ROD allows, "implementation of institutional controls for soil contaminated with non-VOCs in areas where excavation is not feasible, such as under existing structures."

Confirmation soil samples will be collected at the excavation areas (the excavation walls and floor) to ensure that all impacted soils are removed from the Site. Pending the confirmation sampling analytical results, additional excavation of Site soils may be necessary. All excavated soils will be transported and disposed of at an approved off-site facility. All excavated areas will be backfilled with clean soil material.

Removal of non-VOCs to the health-based cleanup levels will protect receptors at or near the site during ongoing and future activities. However, institutional controls will be implemented for soil contaminated with non-VOCs in areas where excavation is not feasible, such as under existing structures. Therefore, hazardous waste will remain at the property at levels not suitable for unrestricted use of the land. In this case, institutional controls will be implemented in the form of a State Land Use Covenant with the property owner. The Covenant shall conform with the requirements of pursuant to Civil Code section 1471, Health and Safety Code section 25355.5 and the California Code of Regulations, title 22, section 67391.1.

1.0 INTRODUCTION

In June 2001, the United States Environmental Protection Agency (EPA) added the Cooper Drum Company Site (Site) to the National Priorities List (NPL) of hazardous wastes sites requiring remedial action. URS Group, Inc. (URS) completed a remedial investigation/feasibility study (RI/FS) report for the Site in May 2002. The RI/FS summarized previous investigations; the nature and extent of contamination; a human health risk assessment (HRA); contaminants of concern (COCs); RI activities, conclusions, and recommendations; remedial action (RA) objectives; and an evaluation of RA alternatives. The selected RAs for soil and groundwater were documented in the Record of Decision (ROD). The site has been categorized into two operable units (OUs) for the remedial phase: OU 1 consists of the impacted groundwater and OU 2 consists of the impacted soil (and a perched aquifer) in the source area. This Remedial Design Report (RDR) describes the initial phase of remedial activity for the Site and presents the design for the soil (OU 2) RA.

1.1 PURPOSE AND OBJECTIVES

This RDR presents the design for two selected soil RAs at the Cooper Drum Company Site in South Gate, Los Angeles County, California. The two soil RAs include a limited surface to near-surface soil removal for soils impacted with heavy metals, polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) and a deeper vadose zone RA for volatile organic compound (VOC)-impacted soil. This RDR provides the design criteria, including the design, assumptions, and parameters used in developing the remedial design (RD) for OU 2. The RAs were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent possible, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The decision was based on the Administrative Record file for the Cooper Drum Company Site and is detailed in the *Record of Decision, Cooper Drum Company, City of Southgate, California Record of Decision* (EPA, 2002). The implementation of the two soil RAs will be as follows: the deeper vadose zone RA will be completed prior to the shallow vadose zone RA. The work will be performed in this sequence to minimize worker exposure to site contamination during the shallow vadose zone RA.

1.2 SITE DESCRIPTION AND HISTORY

1.2.1 Site Description

The Site is located at 9316 South Atlantic Avenue in South Gate, Los Angeles County, California. It is identified as EPA ID CAD055753370 (Latitude 33 56' 49" N, Longitude 118 11'42" W). The Site, which consists of 3.8 acres of mixed residential, commercial, and industrial land use, is 10 miles south of Los Angeles and approximately 1,600 feet west of the Los Angeles River (Figure 1-1). Site facilities include drum processing and storage areas, an office, a warehouse, and maintenance buildings. The former hard-wash area (HWA) is in the northeastern area of the Site, which includes a covered shed area. The drum processing building, which is referred to as the Drum Processing Area (DPA) in this report, is located along the southern property boundary. The Site layout, including the HWA and DPA, is shown on Figure 1-2. All Site buildings have concrete floors, and the entire facility has been asphalt-paved since

1986. The Tweedy School on the adjacent property has been closed since 1988 because of a concern that children attending the school could be exposed to contamination migrating off site.

1.2.2 Site History

Since 1941, the Site has been used by several companies to recondition and recycle used steel drums that once contained various industrial chemicals. The Cooper Drum Company operated from 1972 to 1992, reconditioning drums using a process that consisted of flushing and stripping the drums for painting and resale. Drum process waste was collected in open concrete sumps and trenches, resulting in releases to soil and groundwater beneath the site.

Following is a history of the Site use for the reconditioning and recycling of steel drums containing residual chemicals.

- Since 1941, the northern portion of the Site has been owned and operated by drum recycling companies. The use and ownership of the southern portion of the site prior to 1971 is unclear. The Cooper Drum Company purchased both parcels and operated the facility from 1972 until 1992.
- Reconditioning activities took place within the present-day DPA (Figure 1-2), in the central portion of the Site. When necessary, heavy duty cleaning, called "hard washing," was performed in the northeastern portion of the site (the former HWA shown on Figure 1-2). Caustic fluids, generated by reconditioning and hard washing activities, and waste materials removed from inside the drums were collected in open concrete sumps and trenches. This led to the contamination of the soil and groundwater beneath the Site. Recent investigations have shown that most Site contamination can be traced to the HWA and the DPA.
- Beginning in 1987, the Cooper Drum Company facilities were retrofitted to provide better environmental protection. Closed-top steel tanks were installed over the sumps, and the trenches were replaced with hard piping. The former HWA was closed and replaced with a new hard-wash area in the DPA, which also provided hard piping and secondary containment.

The Cooper Drum Company continued to operate the facility until 1992. In 1992, the drum reconditioning business was sold to Waymire Drum Company, which operated the facility until 1996. Since 1996, Consolidated Drum Company has been the drum-reconditioning operator at the site. The facility was refitted to process plastic totes (large square containers). Consolidated Drum used an aboveground, enclosed system for containing liquids and wastes until their departure in 2003.

1.2.3 Current Site Operations

Consolidated Drum Company terminated its lease with the Cooper Trust in October 2003 and moved its operations to off-site facilities. All drum-recycling equipment and associated containment piping and tanks were removed from the site. Currently, the site is fully operational; however there are no longer any drum operations. As of April 2004, there were three new tenants on site, including a pallet storage company, a towing company, and an automotive repair and salvage company. This last company moved out as of May 26, 2006, and the pallet company expanded into the available space.

1.3 REMEDIAL DESIGN REPORT ORGANIZATION

This RDR includes the following:

- Section 1.0 A brief introduction of the site and the purpose of the RD
- Section 2.0 A summary of the remedial investigations performed at the site
- Section 3.0 The general project approach and design objective
- Section 4.0 The design for the non-VOC soil removal action
- Section 5.0 The design for the VOC-impacted vadose zone remediation
- Section 6.0 Construction and Implementation of the Remedial Design
- Section 7.0 The environmental and public impact reduction plan

2.0 REMEDIAL INVESTIGATION SUMMARY

2.1 PREVIOUS INVESTIGATIONS

From 1984 through 1989, the Los Angeles County Department of Health Services (LADHS) issued several Notices of Violation to the Cooper Drum Company as a result of incidents involving the release of hazardous substances at the Site. The LADHS required the Cooper Drum Company to conduct investigations of soil and groundwater. In 1989, the California Department of Health Services, now known as the Department of Toxic Substances Control (DTSC), also collected soil samples from under the DPA. The studies identified the following hazardous substances in soils at or near the Site:

- Tetrachloroethene (PCE) (a cleaning solvent)
- Trichloroethene (TCE) (a cleaning solvent)
- Dichloroethene (DCE) (a byproduct of TCE)
- Petroleum hydrocarbons
- PCBs
- PAHs
- Metals

Under direction of LADHS, consultants for the Cooper Drum Company excavated and removed contaminated soil from the property and from the adjacent Tweedy Elementary School, after caustic fluids leaked from trenches under the DPA building onto school property. To assess impacts to groundwater in the uppermost aquifer beneath the Site (approximately 40 to 80 feet below ground surface [bgs]), four monitoring wells were installed on site and one upgradient well was installed off site.

Groundwater beneath the Site was identified as contaminated with VOCs. In 1987, the City of South Gate closed four municipal water supply wells found to contain PCE. These wells are in South Gate Park, within 1,500 feet southwest of the site. At that time, the City listed the Cooper Drum Company as a possible source of the PCE contamination; however, recent investigations indicate that groundwater contamination found beneath the site did not contribute to the deeper groundwater contamination affecting those municipal wells. The groundwater contamination originating from the Site is moving to the south, not toward the municipal wells. It is confined to the upper aquifer and is not currently affecting any drinking water supplies in the City of South Gate because the municipal wells are completed in deeper aquifers.

The Tweedy School, on the adjacent property, was closed in 1988 because of the concern that children attending the school could be exposed to contamination migrating from the Site and from other industrial operations in the area.

Based on the discovery of the soil and groundwater contamination, EPA first proposed the Cooper Drum Company Site for inclusion on the NPL in 1992. EPA issued the General Notice and 104(e) letters to the Cooper Drum Company owners and operators at that time. During 1993, EPA met with Arthur Cooper, the site owner and previous operator (before Waymire Drum Company took over operations in 1992), who was considered a potentially responsible party (PRP). The purpose of the meeting was to discuss the special notice letter EPA was planning to send to him and to begin negotiations for an Administrative Order of Consent (AOC) to conduct the RI. Later that same year, the Cooper estate declared bankruptcy upon the death of Mr. Cooper. Given its lack of assets, the Cooper estate was no longer considered a viable PRP to help pay for the Cooper Drum Company investigation and remediation. Consequently, the Site became a fund-lead site, where Superfund trust fund money is used for site activities. Based on additional site investigation data collected by EPA, the Site was proposed for the NPL in January 2001. In June 2001, the EPA added the Site to the NPL of hazardous waste sites requiring remedial action.

EPA conducted the RI activities for Cooper Drum from 1996 to 2001. EPA initiated a soil gas survey in 1996 to identify potential hot spots (areas where contaminant concentrations of VOCs are the highest) for a Phase 1 RI. This investigation identified hot spots in the vicinity of the former HWA, in the north-eastern portion of the property, and in the DPA, in the central portion of the property. The Phase 1 RI was designed to further investigate the potential presence of VOCs, semivolatile organic compounds (SVOCs), and metals in soil and groundwater beneath the Site and the adjacent Tweedy School property. Based on the results of the Phase 1 RI, EPA expanded its investigation of soil and groundwater to delineate the extent of contamination as part of a Phase 2 RI conducted between September 1998 and March 2001. The complete RI report, *Cooper Drum Remedial Investigation Feasibility Study Report* (the Site RI/FS) (URS*,* 2002) was released in May 2002.

The main hydrogeologic features penetrated by borings and wells completed during the RI field investigation include the Bellflower Aquiclude, the perched aquifer, the Gaspur Aquifer, and the Exposition Aquifer. These units constitute a shallow aquifer and a deeper aquifer. The shallow aquifer consists of the saturated portion of the Bellflower Aquiclude, which incorporates the perched aquifer (approximately 35 to 40 feet bgs), and the Gaspur Aquifer. The Bellflower Aquiclude extends to approximately 70 feet bgs, where it is underlain by the Gaspur Aquifer, which extends to approximately 110 to 120 feet bgs. The upper portion of the deeper aquifer system is represented by the Exposition Aquifer, which underlies the shallow aquifer. These hydrogeologic units are presented on generalized geologic cross-section B-B′ shown on Figure 2-1.

Nearby properties that also have undergone investigation as sources of groundwater contamination under the direction of the Los Angeles Regional Water Quality Control Board (RWQCB) include the Jervis Webb site (north of the Site) and two former Dial Corporation sites (northeast and east of the Site). Data from investigations at these three sites indicate that groundwater flows in a southerly direction. High concentrations of TCE in the shallow aquifer have been detected under the Jervis Webb site (33,000 parts per billion [ppb]) and in a downgradient monitoring well (6,700 ppb) 200 feet upgradient from and northeast of the Site. Given its proximity, the groundwater contamination from Jervis Webb may have commingled with and impacted the Cooper Site plume. To the southeast and further down gradient of the Cooper Drum plum is a fourth site (Seam Masters Site) that has shown high levels of TCE (up to 16,000 micrograms per liter [µg/L]). Based on investigation activities performed during the RD, groundwater contamination from the Seam Masters site has commingled with the downgradient (outside the property boundary) portion of the Cooper Drum Plume. The need to reduce commingling of these two plumes was an important consideration during the groundwater remedy selection.

The RI confirmed that waste collected in open concrete sumps and trenches resulted in releases to soil, and that migration of some of these contaminants impacted the shallow aquifer beneath the Site. The primary source of contamination was the HWA, where drum-processing operations took place until 1976, when they were moved to the DPA on the southern side of the property. The DPA also became a source of contamination as a result of chemical spills documented during the 1980s. Beginning in 1987, the Cooper Drum Company facilities were upgraded to prevent any further release of chemical wastes and to meet environmental regulations. The former HWA was closed and replaced with a new HWA in the DPA.

Site operations have resulted in the discharge of contaminants to the surface soil, vadose zone (i.e., unsaturated zone), and underlying groundwater. Although various chemicals have been released to the Site, VOCs are found in both the vadose zone and groundwater. VOCs and non-VOCs have been found in the vadose zone and surface soils.

The principal COCs identified in Site groundwater are 1,2,3-trichloropropane (TCP); TCE; and 1,2-dichloroethane (DCA) and a semivolatile compound, 1,4-dioxane. This compound was recently detected at the site (April 2004) after completion of the ROD in September 2002, and has consequently been incorporated into the RD. Eight other COCs identified in the RI/FS are vinyl chloride (VC); 1,2-dichloropropane (DCP); 1,1-DCA; cis-1,2-DCE; PCE; trans-1,2-DCE; 1,1-DCE; and benzene. The groundwater plume is characterized by high levels of cis-1,2-DCE and TCE. Arsenic and metals found in groundwater at concentrations exceeding drinking water standards are considered to be naturally occurring. Chemical property summaries for the key COCs are provided in Appendix A.

The principal VOC contaminants in the Site soil are the same 11 VOCs listed for groundwater. The non-VOCs in the soil are benzo(a)pyrene; PCBs (Aroclor-1260 and Aroclor-1254); lead; benzo(b)fluoranthene; dibenz(a,h)anthracene; benzo(a)anthracene; benzo(k)fluoranthene; chrysene; and indeno(1,2,3-cd) pyrene. Soil lead concentrations of 1,920 to 3,240 milligrams per kilogram (mg/kg) were detected in subsurface and surface soils. The soil COCs and their cleanup levels are listed in Table 2-1.

2.2 SUPPLEMENTAL RI DATA

The California DTSC agreed to the selected soil and groundwater remedies stated in the ROD, provided additional data were collected to address data gaps prior to implementation of the selected remedies. The EPA included the following components in the selected soil and groundwater remedies to address these concerns.

- Conduct additional soil gas sampling in the DPA and former HWA to further define the extent of non-VOC contamination and the need to excavate beyond the estimated 1,650 tons of soil. (The initial soil volume estimate was approximately 2,700 tons of soil. This number has been revised due to the limitation on the excavation depth, which will be required to be no greater than 5 feet bgs.)
- Conduct additional soil gas sampling in the DPA to further identify the extent of VOC contamination and the need for remediation using dual-phase extraction (DPE) in this area.

The RD supplemental sampling effort was completed between May 2003 and March 2006 and the results were presented in a technical memorandum (URS, 2006). A summary of the field sampling results, including conclusions and recommendations from the Technical Memorandum follows.

- The extent of non-VOC soil contamination is well defined in the former HWA. Based on perimeter sampling on the north side of the DPA building, PAH soil contamination is likely to be present beneath the drum processing building. Since it is not considered feasible to excavate beneath the building, institutional controls will be needed for this area. The volume of non-VOC-contaminated soil originally estimated in the ROD has changed from 2,700 tons, originally estimated, to approximately 1,650 tons presented in this RDR.

- The extent of VOC soil contamination is well defined in both the former HWA and DPA. Based on the RD soil gas sampling results for VOC contamination, in addition to the HWA, the DPA will also require remediation.
- The most significant discovery during the sampling effort was the presence of 1,4-dioxane in the site groundwater. It has been added to the Site COCs and will require the use of chemical oxidation as part of the groundwater remedy. 1,4-Dioxane was also detected in the perched aquifer beneath the HWA (up to 320 µg/L) and the DPA (up to 35 µg/L). This COC will be treated by an ex situ treatment system described in this RDR.

The chemical properties of 1,4-dioxane are provided in Appendix A.

The RD sampling effort sufficiently addressed the soil data gaps. The extent of non-VOC soil contamination was defined, and it was determined that the VOC soil contamination in the DPA would require remediation. Additionally soil sample results for 1,4-dioxane were well below the residential PRG of 44 mg/kg, such that this compound was not considered to be a COC for soil remediation. Data from the supplemental sampling effort, along with the RI data, have been incorporated into this RDR, as necessary. The data from the RD supplemental sampling efforts represent the most current data for the site, including soil, soil gas, and groundwater. For convenience, a complete set of the data tables, figures, and pertinent boring logs is included in Appendix B. Of particular interest are the non-VOC soil data, the soil gas data (including soil gas isoconcentration maps), and boring logs in the HWA and DPA. The figures showing the extent of non-VOC soil contamination and iso-concentration maps of soil gas contamination have been incorporated into Section 3.0 as a basis for the RD.

2.3 SUMMARY OF RECORD OF DECISION

The ROD for the Cooper Drum Site was signed on September 28, 2002. At the time, the known contaminants in groundwater consisted of VOCs only; therefore, the ROD did not make specific mention of 1,4-dioxane. However, by maintaining a comprehensive approach to cleanup, which employed the use of both in situ and ex situ technologies for cleanup and containment, the ROD-selected remedy for soil and groundwater remains viable for all Site COCs. The remedial action objectives (RAOs) for Cooper Drum, as stated in the ROD, are to protect human health and the environment from exposure to contaminated soil, groundwater, and indoor air, and to restore the groundwater to a potential beneficial use as a drinking water source. The ROD-selected remedy meets these RAOs through treatment of soil and groundwater contaminated with COCs.

2.3.1 Selected Action for Soil

The following paragraphs are excerpts from the Cooper Drum ROD:

- To remove the potential threat to human health, the selected remedy for soil will use DPE for treatment of VOCs in soil.
- Other non-VOC soil contaminants, including SVOCs, PCBs, and lead, will be excavated for disposal.

- Institutional controls will be implemented to prevent exposure to soil contaminants where excavation is not feasible.

EPA believes the selected remedy for Cooper Drum meets the threshold criteria and provides the best balance of tradeoffs among the alternatives considered. The EPA expects the selected remedy to satisfy the statutory requirements of CERCLA Section 121(b): (1) protection of human health and the environment; (2) compliance with applicable or relevant and appropriate requirements (ARARs); (3) cost effectiveness; (4) use of permanent solutions and alternative treatment technologies to the maximum extent practicable; and (5) use of treatment as a principal component.

2.3.2 Detailed Description of the ROD-Selected Remedy

The selected soil remedy components are as follows:

- In the former HWA, extract VOC-contaminated soil vapor and groundwater simultaneously using DPE technology. Treat the extracted soil vapor and groundwater using vapor and liquid phase carbon in vessels at an on-site treatment plant.
- After removal of VOCs, discharge the treated soil vapor into the air. The treated water will be re-injected into the aquifer or discharged to the public sewer system operated by the Los Angeles County Sanitation District.

The ROD indicated the total DPE remedial action duration is projected to be five years. Actual operation of the DPE system is estimated to be two years. It is assumed that vapor monitor wells and groundwater extraction well could continue to be sampled for at least three more years to ensure the remedial actions goals have been met.

Additional components of the soil remedy with respect to additional sampling to evaluate the need for use of DPE in the DPA and determine the extent of non-VOC contaminated soil for excavation are discussed in Section 2.2.

A final soil remedy component was as follows:

- Implement institutional controls for soil contaminated with non-VOCs in areas where excavation is not feasible, such as under existing structures, by requiring the execution and recording of a restrictive covenant which will limit activities that might expose the subsurface and would prevent future use, including residential, hospital, day care center and school uses, as long as contaminated soil remains on site.

Further detail on the objectives of the institutional controls and specific provisions the property owner must comply with are described in the ROD.

2.3.3 Rationale for the Selected Remedy

Five principal factors were considered in choosing the selected remedy for soil:

1. VOCs in soil are mobile but are low level threats to human health, since they exist at relatively low concentrations and can be contained.

2. DPE, an enhancement of the presumptive remedy of soil vapor extraction (SVE), can be used to simultaneously treat VOCs in soil and in the perched aquifer, which starts at about 35 feet bgs.
3. Excavation and disposal of shallow soil will be effective, because non-VOCs in shallow soil are not mobile and are localized in a confined area.
4. Use of institutional controls will eliminate/minimize the potential for exposure to any residual subsurface contamination.
5. The selected remedy is protective of human health and environment and complies with ARARs for VOCs and non-VOCs.

2.4 SUMMARY OF OU 1 GROUNDWATER REMEDY

The cleanup strategy for the groundwater (or shallow aquifer) contaminated with VOCs will use a combination of methods to achieve remedial goals and restore the potential beneficial use of the aquifer as a drinking water source. However, this RDR addresses only the dewatering of the perched groundwater in the area of the soil gas contamination to maximize soil cleanup of the COCs in the vadose zone. Selected remedies for the groundwater have been finalized and will be presented in the OU 1 (Groundwater) Remedial Design Report.

An enhanced reductive dechlorination (HRC) pilot-scale field treatability study was conducted in the main source area (HWA) from December 2003 through April 2005. The use of HRC led to the biodegradation of chlorinated ethenes; however, it was not successful in degrading 1,4-dioxane. EPA decided to evaluate in situ chemical oxidation (ISCO) technologies for the purpose of advanced treatment of all contaminants in the site groundwater. Based on the pilot test results, conducted from July 2005 through June 2006, the selected ISCO technology—ozone combined with hydrogen peroxide injection—will be selected as a source area in situ groundwater remedy, along with downgradient groundwater extraction for hydraulic containment of the plume's leading edge. An in situ permeable bioremediation barrier will also be used to expedite remediation of the portion of the plume (where 1,4-dioxane concentrations are lower) between the source area and downgradient containment extraction wells

2.5 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Remedial actions selected under CERCLA must comply with ARARs under federal environmental laws or under state environmental or facility siting laws, when those are more stringent than the federal requirements. The ARARs and to-be-considered (TBC) criteria identified in the ROD for the two soil remedies (excavation and DPE) are included in Appendix C.

If, after implementation of the remedy, hazardous waste still remains at the property at levels that are not suitable for unrestricted use of the land, additional institutional controls may be required in the form of a State Land Use Covenant with the property owner. The Covenant shall conform with the requirements of pursuant to Civil Code section 1471, Health and Safety Code section 25355.5 and the California Code of Regulations, title 22, section 67391.1.

A copy of the text for these regulations and a fact sheet for recorded land use covenants is also provided in Appendix C.

3.0 PROJECT APPROACH AND DESIGN OBJECTIVES

3.1 PROJECT APPROACH AND DESIGN OBJECTIVES

Based on previous site investigations, as summarized in Section 2.0, two zones will require soil remedial actions, including limited surface to near-surface soil removal for soils impacted with lead, PCBs, and PAHs and a deeper vadose zone RA for soils impacted with VOCs. The impacted areas for the HWA are shown on Figures 3-1 through 3-3 for PAHs, PCBs and lead, respectively. The impacted areas for the DPA are shown on Figures 3-4 and 3-5 for lead and PAHs, respectively. There are no PCB-impacted areas in the DPA. The cleanup levels for non-VOCs in the soil were presented in Table 2-1.

The vadose zone and underlying shallow aquifer is impacted in the HWA and DPA. The VOC impacts to the vadose zone in the HWA and DPA are depicted on Figures 3-6 through 3-20. These figures present isoconcentration maps for selected VOCs at depth intervals of approximately 10, 20, and 30 feet bgs. In regard to the impacted shallow groundwater at the Site, this document addresses treatment for the perched aquifer only. Groundwater treatment for the shallow aquifer is currently being finalized and will be discussed in greater detail in its own RDR.

RAOs for the Cooper Drum Site were established in the Site RI/FS and published in the Site ROD (EPA, 2002).

- Restore the groundwater to drinking water standards (maximum contaminant levels [MCLs]) for beneficial use.
- Remediate soil COCs (VOCs) to prevent contaminants from migrating into groundwater at levels that would exceed drinking water standards.
- Where feasible, remediate non-VOC-contaminated soil above health-based action levels that are protective of ongoing and potential future site uses.
- Remediate COCs (VOCs) in soil and groundwater to health-based action levels to eliminate potential exposures to indoor air contaminants created by Site contamination.

The remedial actions selected address impacted soil and groundwater and will meet these objectives.

3.2 DESIGN STRATEGY

This section details the design strategy and design for the three soil remedial actions to be implemented at the Site:

- SVE/DPE for subsurface contamination between the ground surface and approximately 50 feet bgs;
- Removal of the near-surface soils up to 5 feet bgs; and
- Institutional controls for impacted soils under existing buildings and greater than 5 feet bgs.

For simplicity purposes, these descriptions are divided by affected media: soil, soil vapor (gas), and perched groundwater. Institutional controls are used in areas of the Site for impacted media where buildings or areas are not easily accessible. As previously discussed, DPE will be performed prior to excavation of the shallow soils. The institutional controls will be implemented in conjunction with the DPE to prevent any exposure prior to the excavation of soils and continued after the excavation, as needed.

3.2.1 Soil Vapor

The chosen remedial alternative will be designed to efficiently promote the removal of volatile compounds from the soil particles and water film covering the unsaturated soil so that they can be carried advectively, under the influence of an applied vacuum, to the surface for collection and treatment. Extracted soil vapor will be treated at an on-site treatment system. The removal of VOC-impacts to soil from the Site will prevent its vertical migration at concentrations that would exceed drinking water standards. The task flow diagram for the SVE and DPE system design is shown on Figure 3-21. The design details for the deeper vadose zone soils and the perched aquifer remediation are provided in Section 5.0.

3.2.2 Soil

The chosen remedial alternative will be designed to remove Site subsurface soil that is impacted with Site COCs above cleanup levels, as detailed in Table 2-1. Removal of non-VOC COCs (e.g., lead) to the health-based cleanup levels will protect receptors at or near the site during ongoing and future activities. Institutional controls will be implemented for soil contaminated with non-VOCs in areas where excavation is infeasible, such as under existing structures or greater than 5 feet bgs. Design details for the near-surface soil remediation are provided in Section 4.0.

3.2.3 Perched Groundwater

The chosen remedial alternative will be designed to remove the affected perched groundwater to further reduce the migration of contaminants to the shallow aquifer in the future. Groundwater treatment for the shallow aquifer is not addressed in this report. A perched aquifer has been identified at the site beginning at approximately 35 feet bgs. The perched aquifer has been shown to contain high COC concentrations. Therefore, DPE will be used to dewater the perched aquifer to further expose the vadose zone and subsequently remove the COCs. It is possible, due to seasonal infiltration or other means, that once this perched zone has been dewatered and remediation has ceased, the perched zone may return to saturated conditions. It is anticipated the overall VOC mass will be reduced by DPE such that rebound concentrations in the perched aquifer are expected to be below action levels. Following are factors considered for employing DPE:

- The generally shallower occurrence (approximately 35 feet bgs) of the water table in the perched zone and the high concentrations of VOC contaminants present in this zone;
- The limited hydraulic connection between the perched aquifer and shallow aquifer (as indicated by the hydraulic head difference between the wells completed in the perched and shallow aquifers); and
- The possibility that the perched zone could be dewatered at generally low flow rates (less than 10 gallons per minute [gpm]) and treated.

In addition, as an incidental consequence of applying a vacuum as required with DPE or SVE, the water table rises under and around the DPE wells, a phenomenon called upwelling. Typically, upwelling occurs only as the SVE system is turned on or active. By sucking the DPE well dry, the ability of the system to extract contaminated soil gas increases in the deeper unsaturated zone because of drier conditions and the larger exposure of the screen area in the vadose zone.

Another option would be to remediate the perched aquifer at the same time the shallow aquifer is remediated. However, an in situ method, such as ISCO, may not be equally effective in both water-bearing zones given the localized and possibly seasonal nature of perched water and its low transmissivity. Pump and treat also may be less effective based on the limited hydraulic connection between the two zones. Therefore, the RD has included DPE in the HWA as the remedy, since there is a significant COC mass in the perched zone. Groundwater sample results in December 2003 from DPE-1 (in the HWA) showed the highest VOC concentrations (total VOCs greater than 2,200 µg/L) as compared to any monitor well completed in the shallow aquifer.

DPE will also be applied to the DPA. VOC concentrations in groundwater are much lower in this area of the site. Groundwater sample results from DPE-2 (in the DPA) show approximately 250 µg/L of total VOCs. This is consistent with monitor wells MW-1 (not detected), MW-4 (<50 µg/L total VOCs), and MW-22 (approximately 12 µg/L total VOCs) that are completed in the shallow aquifer around the DPA. However, soil gas concentrations remain high in the DPA, and SVE should be implemented there. By using SVE/DPE, extracting soil gas and any contaminated groundwater available in the perched aquifer, the overall site cleanup time can be shortened by not allowing VOCs in the vadose zone and perched aquifer to further impact the groundwater beneath the DPA. Groundwater analytical results from DPE-1 and DPE-2 are included in Appendix B.

4.0 DESIGN FOR SOIL REMOVAL ACTION

4.1 SITE SOIL DESIGN

Impacted soils will be excavated to remediate lead, PCB, and PAH contamination present in HWA and DPA subsurface soils at levels exceeding cleanup goals. This work will not be performed until after DPE remediation of the vadose zone and perched aquifer has been completed. In the meantime, institutional controls will prevent exposure to the contamination. The Site is currently covered with asphalt, preventing any direct worker exposure. Initial soil removal activities will consist of four excavation areas (two areas each in the HWA and DPA) to maximum depths ranging from 2 feet bgs to 5 feet bgs. It is not necessary to excavate beyond 5 feet, since the main concern for the near surface non-VOC contamination is direct exposure. For soils deeper than 5 feet, the ROD allows, "implementation of institutional controls for soil contaminated with non-VOCs in areas where excavation is not feasible, such as under existing structures." The following assumptions limit the excavation depth to 5 feet bgs:

- Any future construction trenching or foundation installation is not expected to exceed 5 feet.
- The vertical extent of PAHs and lead have been defined and it is unlikely that these contaminants will impact groundwater, provided an asphalt cap is in place and infiltration is negligible.
- Assuming excavation will remove contamination to 5 feet, there will be no direct exposure pathways after backfilling the excavation.
- Excavation below 5 feet is not cost-effective.
- Institutional controls (i.e., land use restrictions; see ROD page 55) would be put in place to alert any future construction events that may occur below 5 feet.

Confirmation soil samples will be collected at the excavation perimeter (the excavation walls and floor) to ensure that all impacted soils are removed from the Site. Confirmation sampling will follow the procedures prescribed in the Excavation Confirmation Sampling Plan (Section 4.3). The sampling plan will use the *Guidance on Surface Soil Cleanup at Hazardous Waste Sites: Implementing Cleanup Levels* (EPA, 2004). Pending the confirmation sampling analytical results, additional excavation of Site soils may be necessary. All excavated soils will be transported and disposed of at an approved off-site facility as detailed in the Transportation Plan (Section 4.5). All excavated areas shall be backfilled as detailed in the Excavation Work Plan, Appendix D. Institutional controls will be employed for soil contaminated with non-VOCs in areas where soil excavation is infeasible, as described above. Requirements for use of institutional controls in the form of land use covenants were referenced in Section 2.5. Detailed descriptions of the design assumptions, including excavation limits, for the design are provided in the following subsections.

4.2 PRIMARY EXCAVATION AREA AND VOLUME

Cleanup levels and the COCs that exceeded these levels at the Site are listed in Table 2-1. The initial excavation areas at the Site were delineated by comparing the concentrations of contaminants in soil samples collected during the previous site characterization activities to the cleanup levels. The Site cleanup levels will be further evaluated using recent EPA Guidance 9355.0-91 (EPA, 2004). Therefore, the cleanup levels listed in Table 2-1 may be redefined using an “area average.” Results of this approach will be presented to all related parties for approval in the final confirmation soil sampling plan. The proposed initial excavation will be performed based on the hot spots identified by the cleanup levels in Table 2-1. The soils will be excavated in 1- to 2-foot intervals to the maximum depth of 5 feet. Areas outside of the initially identified hot spots will be excavated where confirmation sample results exceed the cleanup levels shown in Table 2-1 (or the re-evaluated cleanup levels), provided these areas are less than 5 feet deep and are outside Site structure boundaries. Sheet piling or other means of shoring may be used near Site structures or as needed. Shoring will be based on visual observations and geotechnical evaluations made during excavation. Areas with soil sample results that are less than cleanup levels, under Site structures, or in excess of 5 feet bgs will not be excavated.

Determination of the excavation area will include consideration of existing Site structures. Excavations will not require the demolition of existing structures; any subsurface soil contamination exceeding cleanup levels and underlying Site structures will not be excavated. Institutional controls will be enacted at the Site to limit exposure in these areas.

Based on previous site characterization activities, four areas (two each in the HWA and the DPA) have been delineated for primary excavation at depths ranging from 2 to 5 feet bgs. Areas delineated for excavation range from 1,200 to 5,100 square feet. Excavation limits are shown on Figures 4-1, 4-2, and Drawing C-2. These limits bound the soils that exceed soil cleanup levels. The initial excavation areas, depths, and volumes are summarized in Table 4-1. These two areas were determined using the criteria listed in Table 4-2. The excavation volume calculations are presented in Appendix E.

4.3 EXCAVATION CONFIRMATION FIELD SAMPLING PLAN

This field sampling plan (FSP) is presented as part of the Sample Analysis Plan (Appendix F). Confirmation sampling will be performed during primary excavation activities to ensure that soils with contamination levels exceeding the soil cleanup levels listed in Table 2-1 have been excavated. Confirmation samples will be collected from the excavation floors and walls. Along the excavation floor, soil samples will be collected on 20-foot centers, and sidewall samples will be collected at 40-foot intervals. Soil samples should also be collected on excavation perimeters to confirm that the surface contamination surrounding the excavation is below established cleanup levels (Table 2-1).

Sample Collection

Soil samples may be collected by one of the following methods:

- A spade-and-scoop method or, when the excavation does not allow for safe sampling by this method.
- Driving a stainless steel liner into soil contained in a backhoe bucket.

If the spade-and-scoop method is used, samples will be collected with a pre-cleaned or decontaminated stainless steel spade. The soil will be transferred into the appropriate sample container, secured, and properly labeled. If a stainless steel liner is used, the liner will be prepared for chemical analysis by covering the ends of the tube with Teflon sheeting and plastic end caps, and sealed with tape. The liner will be properly labeled and placed in a new resealable plastic bag. Samples collected by either method designated for laboratory analysis will be placed in an ice chest and kept cool (approximately 4 degrees Celsius [°C]) until they can be transported under chain-of-custody procedures to an analytical laboratory.

Sample Analysis

All confirmation soil samples collected during the removal action will be screened using field-screening methods for the COCs: lead, PAHs, and PCBs. Field-screening methods include a field-portable X-ray fluorescence (XRF) for lead and immunoassay test kits for PAHs and PCBs. The field immunoassay kits manufactured by SDI have the following minimum detection limits (DLs): 0.5 ppm for total PCBs and 0.2 ppm for PAHs as phenanthrene. Therefore, the minimum DL for total PCBs is less than the cleanup goal of 0.870 ppm which, per the Cooper Drum ROD, was back-calculated by applying residential exposure parameters used in the Site HHRA and a target health risk level of 1 in 100,000. The ROD also describes the cleanup level for PAHs in soil as being based on the upper tolerance limit background benzo(a)pyrene-toxicity equivalent (B(a)P-TE) concentration for the southern California PAH data set, which is 0.9 ppm B(a)P-TE. The immunoassay kit with the minimum DL of 0.2 ppm does not differentiate between phenanthrene and other PAHs. However, a table is provided that allows cross-referencing of the sample results with concentration equivalents for other PAHs. Additionally, the immunoassay kits are to be used as field screening tools, with 20% of the samples to be split and sent off for laboratory analysis.

4.4 STORAGE OF EXCAVATED MATERIAL AND SOIL PROFILE SAMPLING

All excavated material will be stockpiled on site in the areas designated in the Excavation Work Plan, presented in Appendix D. Under the State Water Resources Control Board General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit, 99-08-DWQ), a Storm Water Pollution Prevention Plan is required for projects involving 1 or more disturbed acres. However, the area being excavated at the site is less than 1 acre (0.22 acre or 9,575 square feet) and does not fall under these regulations. Precautions will be taken to prevent the migration of excavated material off Site. These will include placing stockpiles of excavated material onto one layer of polyethylene plastic sheeting and covering the stockpiles with polyethylene plastic sheeting. Berms will be constructed as necessary to divert runoff away from the stockpiles and to prevent the runoff from leaving the site or going to the Site drains.

Material from the four excavated areas may be kept separated for purposes of soil profiling. Soil profiling samples will be collected at an approximate interval of one sample per 150 cubic yards (cy) or as requested by the disposal facility.

4.5 TRANSPORTATION AND DISPOSAL OF EXCAVATED MATERIAL

This section was developed to provide details on the safety precautions taken to identify applicable permits, transportation routes, and transportation mechanisms from Cooper Drum to the appropriate off-site (Class I, Class II, or Class III) disposal facilities.

4.5.1 Soil and Concrete/Debris Transportation

After the soils have been characterized, the excavation subcontractor will load nonhazardous (e.g., Class II) contaminated soil and concrete/debris into end-dump trucks for transportation to the designated

Class II disposal facility (Appendix D). Any hazardous or Class I soil will be loaded into roll-off bins or trucks, manifested, and transported to the designated Class I disposal facility. Each truck will be decontaminated, and its load will be covered with plastic sheeting or tarpaulins and secured. Other measures that may be taken to prevent contaminated material from spreading off site during the loading process are: using water for dust suppression during loading activities, knocking off loose soil from trucks before leaving the Site, and washing down trucks and equipment before leaving the Site. Each load will then be inspected before leaving the decontamination area. Trucks will leave the Site by following the haul route presented in the following section. The truck will follow a route proceeding from the Site North on Rayo Ave, then East on Firestone Boulevard. This will take the trucks to Interstate 710.

4.5.2 Directions to Designated Disposal Facility

Prior to starting the excavation work, a disposal facility will need to be determined. At that time, detailed directions with a map will be provided to the hauling subcontractor.

4.6 SPILL RESPONSE

This section provides contingency measures to be employed in the event of spills and discharges that may occur during the handling and movement of potentially contaminated material (e.g., soil) and water. All trucking company employees have been trained to use the following procedures in responding to an accident or spill involving hazardous material.

- Approach the situation with extreme caution.
- Identify the hazards involved relative to:
  - Physical harm to people;
  - Assessing the physical damage;
  - Assessing the possibility of a release of hazardous waste; and
  - Identifying the hazardous waste involved by using information on the manifest.
- Contain the spill to prevent further spreading of the hazardous waste.
- Completely isolate the hazardous area.
- Evacuate all personnel from the hazardous area.
- Deny entry to anyone except emergency/rescue/response personnel (only after making all emergency response personnel fully aware of the hazard).
- Notify the proper emergency agencies (including Fire and Safety, Police, California Highway Patrol, and any other emergency agencies as appropriate).
- Contact the emergency phone number on the manifest to convey full details of the incident to the shipper.
- Contact the trucking company dispatcher and give full details of the incident.
  - The dispatcher will notify all government agencies involved in the transportation of the hazardous waste of the release or potential release of a hazardous substance.

- The trucking company will arrange for equipment to be mobilized to the site, and personnel will be dispatched or the driver on the scene will begin cleanup efforts.
- The trucking company safety coordinator will respond to the scene or will send a representative as soon as possible to direct the cleanup and will be the point of contact (POC) with all government agencies involved in the incident.
- The trucking company safety coordinator will file all appropriate information with all regulatory agencies involved.
- Drivers are instructed to give information only to emergency response personnel and not to any news media.

4.7 SITE RESTORATION

Clean backfill material will be obtained from an offsite source and will be sampled and analyzed to ensure compliance with the project specifications. Backfilling and grading will be accomplished to restore pre-excavation drainage characteristics at the Site. The soil will be compacted in a maximum of 6-inch lifts to 90% of the maximum dry density for cohesionless soils and to 85% of the maximum dry density for cohesive soils, based on the Modified Proctor Test (American Society for Testing and Materials [ASTM] D1557). A minimum of one density test will be performed per 6-inch compacted lift at each excavated area.

After the excavation is backfilled, the ground surface will be restored to its original condition, including asphalt patching of excavated areas. Pre-excavation grades will be maintained. Backfilling details and asphalt restoration details will be included on the project engineering drawings and the project specifications.

5.0 DESIGN FOR DPE REMEDIAL ACTION

5.1 DESIGN STRATEGY

One of the most effective soil treatment systems, which is in most cases, both technically and economically feasible for sites contaminated with VOCs, is vapor extraction using DPE and/or SVE. DPE is a system that extracts soil gas and groundwater simultaneously. The extracted soil gas and groundwater are passed through a treatment unit to remove the VOCs before they are released as exhaust to either the atmosphere (vapors) or re-injected into the shallow aquifer/discharged to sanitary sewer (water). This system is a proven technology and has historically shown very promising results in reducing soil and groundwater contamination to a point where environmental impact is no longer significant. The perched groundwater and condensate from the SVE will be treated along with influent from groundwater extraction wells for the OU 1 (groundwater) RA at an onsite treatment system. The effluent from this treatment system will be proportionally discharged to the Los Angeles County Sanitary District (LACSD) sanitary sewer and re-injected into the shallow aquifer.

5.1.1 Pilot Test Summary

The design for VOC removal in the vadose zone, using DPE in the former HWA and DPA, was based on pilot tests performed in the field at the Site. The testing objective was to evaluate the potential application of DPE/SVE technology to remediate contaminated soils beneath the Site. This test was conducted to determine soil air permeability and to estimate the radius of influence (ROI) of an SVE well. This information was needed to design an effective DPE/SVE system (e.g., to determine blower size, number of wells, and flow rates). Effective ROI depends on the rate of gas flow being extracted; the diameter of the well; subsurface material permeability; well screen thickness; and the soil type, moisture, and clay fraction.

SVE pilot tests were conducted in SVE-1 on January 3, 2001, and in SVE-2 on March 3, 2004. These well names have since been changed to DPE-1 and DPE-7, respectively, to reflect the dual-phase removal action. The SVE tests were performed using a trailer-mounted SVE system provided by Environmental Supply and permitted under the Southern California Air Quality Management District (SCAQMD). Vapor probes VP-1 and VP-2 were monitored during the SVE-1 test. Vapor probes VP-3 and VP-4 were monitored during the DPE-7 test. Vacuum response was measured using a Magnehelic pressure gauge connected to each vapor probe. A range of gauges was used to obtain more sensitive measurements. DPE-1 and DPE-7 wells were operated for three and four hours, respectively. Three and four influent air samples were obtained from DPE-1 and DPE-7 wells, respectively, for VOC analysis; the results are provided in Appendix G. Figure 5-1 shows the location of the wells used and cross-sections in the HWA and DPA. Figures 5-2 through 5-4 are lithologic cross-sections A-A′ through C-C′, which present the generalized geologic conditions in the areas of the two tests.

5.1.2 SVE Test Results

During the test, influent air samples were collected in Summa canisters for VOC analysis as the air stream entered the air emissions control system from the extraction well. Also during the test, vacuum readings at the extraction well and at nearby observation probes were recorded at three depths. Figures 5-5 and 5-6 illustrate and summarize observed vacuum responses, soil lithology, and relative distance from the SVE pilot test extraction well. Tables 5-1 and 5-2 summarize the air flow rates and vacuum measurement at the end of each test. Vacuum measurements collected during the tests are included on the field data sheets in Appendix G.

Estimates of soil permeability (k) and the ROI of vapor extraction wells are each fundamental to the design of a vapor well field for a vapor extraction system. On-site testing provides the most accurate estimate of k. Both k and ROI are used to space extraction wells and size the SVE system. Soil gas permeability, or intrinsic permeability, varies according to grain size, soil uniformity, porosity, and moisture content. The value of k is a physical soil property and is independent of extraction and injection rates. The DPE and SVE design methodology used two techniques to calculate and cross-check the DPE ROI in each area. These two methods included an empirical calculation method and a graphical method.

5.1.3 Methodology and Calculation of SVE ROI and Flow Rate

The ROI was calculated by two methods, graphically and empirically, to cross-check the results. The graphical method of calculating the ROI was determined using data from two SVE tests conducted at the Site on January 3, 2001, at well DPE-1 and on March 3, 2004, at well DPE-7. DPE-1 is in the HWA, and DPE-7 is in the DPA. The SVE wells and vapor probes or vapor monitoring wells were used to determine SVE well ROIs. Vacuum responses at three depths (10, 20, and 30 feet bgs) were recorded from four vapor monitoring wells (VP-1 through VP-4) located various distances from DPE-1 and DPE-7 (Figures 5-5 and 5-6). The ROI was determined by plotting vacuum response versus distance using the 10-foot and 30-foot depths from the two vapor monitoring wells located 25 feet and 45 feet from DPE-1. The high vacuum reading (at the 20-foot reading) at VP-2 was observed and not used; it may indicate a preferential flow pattern in this zone. The vacuum readings recorded from VP-3 and VP-4 could not be used to determine the ROI graphically because the two vapor monitoring wells were set at equal distances from DPE-7; this was a result of constraint caused by the location of SVE-2 within the DPA building. In determining the ROI, vacuum readings at each depth (i.e., 10 and 30 feet bgs) were plotted (Figures 5-7 and 5-8). These figures show that the best-fit line intersects the x-axis at about 52 to 60 feet for the 10-foot bgs and 30-foot bgs zones, respectively. It should be noted that a 0.1-inch of water (in. H_2O) line was used, which is the assumed minimum vacuum at which an acceptable level of influence for SVE will be effective. By averaging the ROIs (i.e., where the best-fit line intersects the x-axis), we estimated the overall ROI to be 55 feet. However, as the soils dry up, as a result of longer term DPE action, the ROI should improve.

The empirical method for calculating the ROI is presented here. Vacuum was applied to the DPE wells during the test until steady state conditions were observed. The criteria for “field steady-state conditions” were defined as stable vacuum readings on observation wells (until the vacuum response does not change by more than 10% over a 15-minute interval) and field-monitored vapor concentrations leveling off in value. Then vacuum readings at near steady-state condition were used to calculate the air permeability of the soils, using the following equation by Johnson et al. (1990):

$$\frac{Q}{H} = \pi \frac{k}{\mu} p_w \frac{\left[1 - \left(P_{ATM} / P_w\right)^2\right]}{\ln\left(R_w / Ri\right)}$$

Where:

k = permeability, Darcy

Q = air flow rate, cm^3/sec
μ = viscosity of air, centipoises
H = height of extraction well screen, feet
R_w = radius of vapor extraction well, cm
R_i = distance to monitoring well, cm
P_w = absolute pressure at vapor extraction well, atm
P_i = pressure at distance R_i

By using the following conversion factors:

472 cm^3/sec/cfm

30.48 cm/foot

406.8 in. H_2O/atmosphere

And rearranging the equation becomes:

$$kH \frac{\mu(406.8)\left(Q\, {cm3}/{sec}\right)\left(472 \frac{cfm}{{cm3}/{sec}}\right)(406.8 - P_w)\, 1n\left(\frac{R_w}{R_i}\right)}{\Pi(30.48)\left[(406.8 - P_w)^2 - (406.8 - P_i)^2\right]}$$

This equation was used to estimate the air permeability of the soils beneath the site. As shown in Tables 5-3 and 5-4, the air permeability of the soils is approximately 0.7 to 0.8 Darcy. The ROIs were calculated to range from approximately 31 feet (in one area) to 65 feet. This range agrees well with the ROI that was estimated graphically. Therefore, the design ROI chosen for these HWA and DPA sites is 55 feet.

5.1.4 Design Strategy

Results of the pilot test and calculations indicate that SVE is an appropriate choice for remediating the vadose zone soils in the HWA and DPA. The Site also exhibits a shallow perched aquifer, with high concentrations of COCs (see Section 3.2.3). Although partial cleanup of VOCs in the perched aquifer groundwater will be accomplished by operation of the SVE system for soil vapor remediation, we propose to use a groundwater recovery system to enhance the degraded water in the perched aquifer. A simple modification to the SVE wells and treatment system will be employed to remediate the shallow perched aquifer and speed up the removal of COCs from this area. This modification to these SVE wells will include using groundwater extraction pumps in the same extraction well for dual phase extraction of soil vapor and groundwater (DPE wells). The DPE will serve to lower the perched aquifer and expose more vadose zone soils impacted with COCs for extraction as soil vapor. Extracted groundwater will be conveyed to an on-site treatment system. The design for the DPE wells and treatment system follows.

5.2 VADOSE ZONE DESIGN

The vadose zone design evolved from the pilot test results and calculations summarized in Section 5.1. This design demonstrates a practical application of DPE technology to the HWA and DPA. System design calculations are included as Appendix H. These calculations determine the friction losses through the system in order to determine the SVE blower and individual submersible groundwater pumps.

DPE will be used to remediate VOC-impacted soil present in the vadose zone that is beyond the excavation limits, including under existing structures. The DPE system will require the installation of several DPE wells in the HWA and DPA areas of the Site. Extracted soil vapor will be treated using an on-site treatment system and discharged to the atmosphere. A detailed description of the design assumptions and the design for the SVE system is provided hereafter. Data obtained from SVE pilot tests were used to determine the well ROI and flow rates.

5.2.1 DPE Well Placement

Per the Cooper Drum ROD (EPA, 2002), the cleanup levels for VOCs in soil are to be determined (TBD) based on the remedial goals, which are:

- To prevent the vertical migration of leachate at concentrations that would impact the shallow aquifer at levels exceeding MCLs; and
- To ensure that residual VOC concentrations remaining in soil (after soil vapor extraction) are protective of potential indoor air receptors.

To evaluate attainment of these goals, performance evaluation soil gas samples will be collected during soil vapor extraction. The sampling results will then be used in the VLEACH model to evaluate impact to groundwater, and in the Johnson & Ettinger Model to estimate indoor air concentrations.

Although soil VOC cleanup levels are TBD, it was important to delineate an approximate area where soil vapor extraction would occur. Therefore, the cumulative 1,000 parts per billion by volume (ppbv) VOC isoconcentration contour, drawn based on soil gas samples from all depths, was used as a reasonable estimate for the horizontal and vertical extent of remedial action. The 1,000 ppbv contour is expected to be a conservative estimate of the extent of contamination that requires cleanup, because unless the contamination is right at the capillary fringe or just under the soil surface, soil gas concentrations less than this level are not likely to trigger model-predicted impacts greater than MCLs in groundwater, or greater than health risk levels in indoor air.

DPE well locations and ROIs (using the 55-foot ROI) were plotted on a site map showing the extent of soil vapor contamination exceeding 1,000 ppbv at 10, 20, and 30 feet bgs. Wells were placed to have overlapping ROIs and to encompass the 1,000 ppbv isoconcentration contour. This method confirmed that six wells would be required in the HWA and three wells, two of which are new, would be required in the DPA. The plots are shown as Figures 5-9 through 5-11 (HWA) and Figures 5-12 through 5-14 (DPA). The proposed well layouts were determined giving consideration to the use of existing SVE wells (used in the SVE test [SVE/DPE-1 and SVE-2/DPE-7]).

5.2.2 Design Flow Rates

Flow rates were recorded from the DPE wells (DPE-1 and DPE-7) during the SVE field test and these rates were used to determine a practical flow rate from each vapor extraction well. Field data collected during the SVE test are provided on Tables 5-1 and 5-2. Flow rates were plotted versus vacuum for the extraction well (Figure 5-15). It is assumed that a vacuum of 6 inches of mercury (in. Hg) or 82 in. H_2O is an acceptable wellhead vacuum for a typical SVE system. At this vacuum, the wells produced 47 cubic feet per minute (cfm). The total theoretical flow rate, if all wells are open, is estimated to be approximately 450 cfm. However, from a long-term operations and maintenance (O&M) perspective and based on site characteristics a more realistic design flow for the Site is 250 cfm. It has been shown to be more cost-effective to operate SVE and DPE systems at slightly lower flow rates at sites that contain finer grain soils, such as those found at this Site. In addition, at each boring location a well will be installed with two discrete screened intervals. This will allow control of the vadose zone removal action by extracting from a select interval to maximize mass removal based on soil characteristics and contamination concentrations. The deeper screened well will also be screened into the saturated zone of the perched aquifer. A submersible pump will be installed in the deeper well to extract groundwater as required.

The HWA airflow strategy is to use the original main extraction well, DPE-1. The airflow strategy in the DPA is to use the original main extraction well, DPE-7, with the other surrounding extraction wells operating in a phased approach. The DPE wells located in the most contaminated areas will be brought online to the treatment system first, and as system capacity allows, bring more wells online based on contaminant concentrations and mass removal rates.

As described above, Both the HWA and DPA extraction wells will operate in phases, with various combinations of extraction wells operating in each area. The target extraction rate per well is 50 standard cubic feet per minute (scfm). Each well will also be designed to operate as an extraction or air inlet well. The remediation system will include an air inlet valve for air dilution. Thus, the plant operators can control the extraction (ventilation) at the treatment compound to generate a ventilation rate of 50 cfm per well. The ventilation rate control features include a valve at the wellhead valve box to convert each well from an extraction well to an air inlet well, valves at the main pipe rack to the control panel to control the number of wells operating at any given time interval, and the automatic and manual air dilution valves for the system.

5.2.3 Basis of Design for DPE Wells and Treatment Compound

Following is a summary of the design inputs for the DPE wells.

- Ten-inch borehole/6-inch Schedule 40 polyvinyl chloride (PVC) well casings for the deep wells, depth-discriminate soil sampling and continuous well logging.
- Eight-inch borehole/4-inch Schedule 40 PVC well casings for the shallow wells, depth-discriminate soil sampling and continuous well logging.
- In the HWA, existing DPE-1 well will be used, screened between 8 and 43 feet bgs. Five additional double nested wells will be installed in HWA. In the DPA, DPE-7 will be used, screened between 8 and 48 feet bgs. Install two new double nested DPE wells. Wells will be referred to as DPE-3S through DPE-8S and DPE-3D through DPE-8D, where the “S” refers to shallow and the “D” refers to deep.
- The new DPE wells’ shallow well will be installed to 32 feet bgs total depth and screened between 10 and 30 feet bgs. The deep nested well will be screened from 30 to 48 feet bgs, and have a total depth of 50 feet bgs.
- Vapor extraction rate of 50 scfm from each well (determined empirically from SVE test).
- Extraction well ROI of 55 feet as determined from SVE tests.
- In the deeper screened wells, a 0.5 horsepower (hp) submersible pump will be used in each new well yielding a 0.5 to 1.0 gpm water extraction rate per well.

- Soil gas concentrations detected during the SVE test:
  - Total VOCs, the sum of each speciated compound reported on the Method TO-14 analyses, range from approximately 440 parts per million by volume (ppmv) to 1,160 ppmv at SVE-1 and SVE-2, respectively, at the end of the pilot test. The samples contained PCE, TCE, fuel constituents and several breakdown products of chlorinated solvents. Analytical reports are presented in Appendix G as part of the Pilot Test Data.

Summary of DPE Treatment Compound (SVE and Groundwater Systems):

- For the SVE and ex situ groundwater treatment systems, a 25-foot by 30-foot concrete pad (6-inch slab with edge footing) with secondary containment will be constructed. It will be designed for Seismic Zone 4 and require approximately 120 feet exterior 8-foot chain-link fencing with vinyl security slats, one standard 12-foot gate, and one man gate.
- Electrical service and remote monitoring communication tied to existing local services. Existing power is approximately 600 A, 480 V. SVE requires approximately 100 to 200 A, 230V, depending on specific equipment. The groundwater equipment, discussed in greater detail in the groundwater basis of design (BDR), will require approximately 230A, 208V. A total of 330 to 430 A will be required for the complete remediation system, which includes the OU 2 treatment system discussed in the OU 2 BDR.
- Capacity of 250 cfm at 10 in. Hg, SVE blower with a knockout pot and catalytic oxidizer (CatOx), with a quench and acid gas scrubber air emission control (condensate to be sent to treatment system).
- Groundwater extracted as part of dual-phase operations will be sent to an equalization tank, then pumped into an ex situ ozone and hydrogen peroxide treatment system. Prior to discharge/re-injection, groundwater will be sent through two liquid-phase granular activated carbon (LGAC) vessels to remove any remaining contaminants to levels below discharge limits.

5.2.4 Basis of Design for Vapor Monitor Well Installation

This section identifies the locations for new vapor monitor well installations (referred to as vapor monitor points [VPs]) to evaluate the performance of the DPE wells. The design includes nine operating DPE wells. There are currently four VPs at the site: two are in the DPA and two are in the HWA. Extraction wells DPE-1 through DPE-6 together with the associated VP-1 and VP-2 are located within the HWA as shown in Drawing C-1. Extraction wells DPE-7, DPE-8, DPE-9 as well as the VP-3 and VP-4 are located in the DPA, also shown in Drawing C-1.

Thirteen VPs will be installed to monitor remediation activities and measure the clean-up progress at the site. VP-5 through VP-8 will be added to the DPA, and VP-9 through VP-17 will be added to the HWA.

The new VPs will provide access to more specific locations and depths and will allow measurement of the induced vacuum and collection of soil gas samples for analysis. The locations of the additional nine VPs in the HWA and four VPs in the DPA were chosen to characterize the two target zones.

A general design of a VP is shown on Drawing C-5. The VPs are placed downgradient and within the plumes to ensure full coverage. Table 5-5 provides a matrix showing the DPE wells and the relative distances to the VPs. Each DPE well will be monitored by at least two VPs within its ROI to monitor induced vacuum and trends in the plume.

In the HWA, one VP will be located within a distance of approximately 25 feet and the second VP will be located at a distance of approximately 50 feet relative to the DPE.

Since a concrete foundation, approximately 4 feet high and 35 feet wide, crosses the DPA, no VPs could be placed within this area. However, the locations of the new VPs are within the design limits and are not expected to compromise the new monitoring system.

5.3 PERCHED GROUNDWATER DESIGN

Groundwater extraction will be employed to dewater the perched aquifer (located at approximately 35 to 40 feet bgs), which over time will more fully expose the vadose zone and promote further removal volatilization of contaminants. Extracted groundwater will be pumped to the surface to the on-site treatment system and discharged, as discussed previously in Section 5.1. A detailed description of the design assumptions and the design for the groundwater extraction system is located in the OU 1 Groundwater RDR. Appendix I of this RDR presents a technical memorandum detailing results from a pump test performed on the perched aquifer. Section 5.5 presents some general concepts of the DPE well and treatment of the extracted groundwater

5.4 DETAILED DESIGN OF DUAL-PHASE EXTRACTION COMPONENTS

This section summarizes the DPE design details. Additional detail is provided in the O&M Guidelines provided in Appendix L of this RDR. Design highlights follow.

5.4.1 DPE Well Details

DPE well design features include the ability of these wells to extract vapor and liquid (groundwater) from the subsurface zone. The wells will include an electric submersible pump to remove groundwater and depress the perched zone, in an effort to continuously lower the perched water table in this area. This feature will allow more of the vadose zone to be exposed, thereby promoting more rapid removal of source area contamination and COCs dissolved in the soil pore water, and restoring the site effectively. The electrical supply line and the water discharge line will be contained within the well casing. At the surface, the wellhead in the vault box will be designed to allow the electrical line and the water line to penetrate the pipe wall without affecting the vacuum within the well.

In addition, the DPE wells will include a vertical “T” connection with a valve, so that these wells also can be modified at the vault box for conversion to an air inlet well. Ultimately, the operator will have a great deal of flexibility in the field to make modifications at the wellheads or at the vault box to control the ventilation rate and each well’s function as a DPE well, an air inlet well, or an isolated well, shut off from the remediation system.

5.4.2 Blower Design and Selection

Blower design is based on the pilot test data and results as summarized in Section 5.1. The blower will be a positive displacement specified to produce approximately 10 inches vacuum of mercury. It will include a particulate filter, inlet and outlet silencers, and an acoustical sound enclosure to reduce the noise impacts to the surrounding neighbors. The blower design also will be specified to meet an explosion-proof classification (i.e., NEMA Class 1, Division 1). This will provide an extra level of safety for the operators and the public from the potential explosive mix of COCs at this site. Since the system is integrated, the CatOx manufacturer will specify the actual system blower. Sample blower curves and other treatment equipment are included as Appendix J.

The blower to be specified to the vendor will operate at 250 scfm and produce 10 inch Hg of vacuum.

5.4.3 Groundwater Extraction Pump Design

The deeper extraction well at each location will include groundwater extraction pumps. These pumps will continually depress the perched aquifer to further expose the vadose zone, promoting more rapid COC removal by vapor extraction. The pilot testing performed at the Site included groundwater extraction and subsequent measurements on the aquifer to properly size the groundwater extraction pumps.

Groundwater extraction pump design details are based on two short-term pumping tests (3 to 4 hours) performed on wells SVE/DPE-1 and SVE-2. Based on the two pumping tests, a design flow rate from each well is 0.5 to 1.0 gpm per well, for a total system flow rate of 4.0 to 8.0 gpm. The total depth of each well will be 50 feet bgs. A 2-foot sump will be included in each well design for placement of the extraction pump. The design screen interval is 30 to 45 feet bgs. A submersible pump controlled with a variable frequency drive will be used to achieve the low flows and prevent the well from running dry. Test results are summarized in the URS Technical Memorandum dated July 13, 2004 (URS, 2004; Appendix I)

5.4.4 Air Emission Controls

Based on the Site COCs, the contaminants being removed from the vadose zone will include chlorinated compounds. A CatOx vapor emission control unit has been selected for this application. In addition, a quench followed by an acid gas scrubber will be required to remove acid gases and prevent the production of dioxins and furans created by the oxidization of chlorinated compounds. An integrated system supplied by one vendor will be used.

CatOx was chosen as the emissions control system, based on soil gas and SVE test contaminant concentrations measured during the RI and related pilot testing. VOC concentrations (see Appendix G) are too high for vapor-phase carbon and too low for a thermal oxidizer to be efficient.

5.4.5 Extracted Groundwater Treatment

Based on the Site COCs, the contaminants being removed from the perched aquifer will include chlorinated compounds and 1,4-dioxane. The treatment technology selected for this application will be an advanced oxidation system combing in ozone and hydrogen peroxide to destroy the contaminants. LGAC vessels will follow the oxidation system to act as a polishing step prior to discharging treated groundwater.

5.4.6 Manifold and Piping Design

All extraction wells will have flow control valves at the wellhead and a “T” connection that will allow each well to also act as an air inlet well within the underground vault box. The DPE wells will be piped individually to the treatment system that conveys airflow to the treatment compound. The conveyance line will be sloped back to the extraction wells to prevent liquid blockage, in the event the vapor stream condenses in the lines. This design provides operational flexibility by allowing the operators to control flow and take measurements from each DPE well at the compound.

5.4.7 Treatment System Controls and Monitoring Points

The DPE monitoring systems will include the following components to promote safe and efficient remediation operations.

- *Vacuum Gauges* on each vapor inflow line and on the manifold headers.
- *Lower Explosive Limit (LEL) meter at the catalytic oxidizer*. If this LEL is exceeded, it usually indicates that the vapor mix is potentially too rich. When this condition occurs, the system will automatically add dilution air to lower the inlet concentration. If the dilution air valve is open 100% and inlet concentrations still exceed the LEL, the LEL meter will trigger a system shutdown.
- *Flow Rates* monitored via *pitot tubes, static pressure gauges, and temperature gauges* on each line. If the flow rates fall outside of the operating limits, headers may be blocked or plugged.
- *Temperature Switches* on the blower exhaust to monitor for safe operation. If this temperature is too high, it usually indicates motor problems or other upstream issue causing back-pressure on the blower. When temperatures exceed the high temperature set point, it will trigger a system shutdown. Temperature gauges will be included on the CatOx to monitor for safe operation. If the temperature is too high, it usually indicates CatOx problems, such as high inlet concentrations, and will trigger a system shutdown.
- *Pressure Switches* on the inlet and outlet side of the blower. If the pressures fall outside of the operating limits, the structural integrity of the pipe/equipment may be exceeded, which will trigger system shutdown.
- *An Hour Meter* to document system performance. It also will communicate to the controller so that the system can be monitored remotely to verify operation.
- *Tank Float Switches* at several locations to monitor key liquid levels in several tanks. The tanks include the “knock-out” pots for vapor condensate, the equalization tank for the extracted groundwater, the acid gas scrubber tank, the process tank, and the sump on the process pad. These switches monitor the low level, high level, and high/high level in the tanks. These level controls are used with the controller to call for more caustic or process water or to stop the flow into a tank. The high/high level float switch is used to shutdown the remediation system as a safeguard.
- *Flow Meters/Totalizers* at the discharge location to the sewer/injection well to monitor the total volume of groundwater discharged to each location.

Controls associated with the treatment systems are typically installed on the system by the manufacturer as part of a typical controls package. A review of the manufacturer's controls will be conducted prior to ordering to ensure all parameters are met to operate safely and continuously.

5.4.8 Instrumentation

The remediation system instrumentation and control (I&C) system assures that the system components operate correctly and efficiently. This coordination and control also provides for safety and security. The instrumentation designed for the Site remediation system will allow the system to operate with a high degree of automation and remote monitoring. The system employs three types of control: local control, centralized control, and remote control.

- Local control refers to the control of the valves at the wellheads for the DPE wells. These valves will not be automated at the field location.
- The centralized control refers to the control elements that will be located in the system compound. This control methodology allows the operator to control mechanical components (e.g., valves) and electrical components (e.g., switches) by hand in the compound. The centralized control methodology will have the greatest degree of control and override power of the three control methods.
- The remote control methodology will allow the operator (or others with the proper codes) to monitor the remediation and "stop" the system using the programmable logic controller (PLC).

Modems and telemetry will be employed to monitor and control the system. There also will be an auto-dialer to alert operating personnel of any malfunctions. These components, along with the PLC, will allow operators to monitor the system remotely.

The following instrumentation and process components are typical of what will be available on the remediation system:

- Pressure/vacuum gauges for each SVE well on the pipe rack in the compound
- Blower motor thermal overload switch
- Vacuum relief valve to secure blower shutdown
- Pressure and temperature monitors on the SVE lines
- High and low temperature shutoff at the air pollution control device
- Pressure relief valves at the blower inlet and outlet
- High liquid and high/high liquid shutdown in the groundwater surge tank
- High liquid and high/high liquid shutdown in the vapor knock-out drum
- Water flow totalizer and system run clocks
- Localized control panels and central control panel for the submersible groundwater pumps

The remediation system operators also will have other portable monitoring equipment and tools for proper system adjustment and operation.

5.4.9 Electrical Controls

The electrical equipment will be designed and selected in accordance with the classification of the various areas of the remediation system. In accordance with the National Electrical Code (NEC), and considering the mixture of vapors the system will handle at the Site, the system is assumed to require Class 1, Division 1, electrical components, especially given that the system will be remotely monitored and managed by operating personnel only 1 to 3 times per month. Class 1, Division 1-specified components are designed to operate in atmospheres with potentially explosive or flammable vapors.

The motors for the system will be specified to be totally enclosed, fan-cooled (TEFC) as well as explosion-proof. The motors also will be rated "T," as defined by the NEC, and comply with the National Fire Protection Association (NFPA) 497M (or latest equivalent) to produce lower temperatures on the external housing, to comply with the Class 1, Division 1, criteria.

Other electrical components will be specified to operate under outdoor weather conditions for this area in California. The electrical panel will include safety components, such as breakers and electrical grounding. There will be an emergency shut-off switch inside the compound. The remediation system will be lighted at night for security and safety.

5.4.10 Process Safety Checklist

In addition to the mechanical controls, which provide safe operation, mentioned above, the system design will specify that the remediation system include the following key process safety features.

- An O&M manual for pertinent equipment;
- A clearly marked emergency shut-off switch in the treatment compound area;
- NFPA warning signs and placards on the security fence;
- Emergency contact names and phone numbers on the security fence;
- Security fencing and lighting;
- Spill prevention and containment cabinet;
- First aid kit;
- Clearly marked directional flow arrows on the process piping;
- Fire extinguisher; and
- Other safety components, as required.

A process safety review will be accomplished as an expanded component of the quality assurance (QA) review that is standard procedure for URS design projects.

The deliverable product resulting from this effort will be a checklist that demonstrates compliance with ARARs and pertinent codes and standards for the project remediation system. This checklist will be a living document that follows the development of the design to the "final" stage and into system installation. It is currently anticipated that approximately one page of text may be incorporated into the process flow diagram (PFD) to record the revision number, date, and initials of the reviewing engineer.

5.5 DESIGN ASSUMPTIONS FOR DPE SYSTEM OPERATION

The overall treatment process is DPE. The single treatment compound will be centrally located to minimize trenching and materials. The compound will be capable of treating up to 250 scfm of COC-laden vapor streams and up to 10 gpm of perched groundwater and condensate from the vapor streams.

5.5.1 VOC Mass Estimates to Cleanup

From previous VLEACH model runs, mass estimates of the contamination were calculated for both the HWA and DPA. At the HWA, approximately 2,900 pounds is estimated to be in the vadose zone. In the DPA, roughly 1,100 pounds of VOCs is estimated. Many of the parameters in the mass calculation are estimates or have a range of possible values, adding additional uncertainty to the estimate. However, this mass calculation should not be construed as the exact amount of contamination to be removed from the site.

During the SVE test, DPE-1 (located in the HWA) and DPE-7 (located in the DPA) were able to produce 9.5 pounds per day (lb/day) and 4.7 lb/day, respectively. These removal rates are likely the maximum extraction rates to be expected. As the DPE system extracts mass from the vadose zone, the mass removal rate will decrease. The rate at which the removal rate declines depends on a variety of subsurface variables, such as the relationship between soil air permeabilities, the location of contamination in the vadose zone, and the location of the extraction well to the contamination in the specific geologic formation and its ability to effectively volatilize the contaminants. As the DPE RA progresses, the monitoring and performance data collected will be used to optimize the treatment system and expedite Site cleanup. An estimate for this site, based on other Superfund sites across the country, the expected time to reach cleanup goals would be approximately three years, but depending on subsurface conditions could take as long as 10 years.

5.5.2 System Performance Sampling

System samples will be required during system startup and operations to ensure proper operation of the proposed remediation equipment. A detailed summary of the proposed sample schedule is presented in Table 5-6. The sampling frequency and parameters are typical for DPE systems. The system inlet and outlet will need to be monitored for VOCs, as well as for other emissions criteria, such as acid gas emissions produced during the oxidation of chlorinated compounds, to ensure proper operation. The Permit to Operate issued by the South Coast Air Quality Management District, Los Angeles County Sanitation District permit and/or Los Angeles RWQCB Waste Discharge Requirement (WDR) permits may require additional parameters and monitoring frequency. The permits will determine the actual sampling frequencies, parameters, and analytical methods. The two later permits will be obtained under the OU 1 (groundwater) RA.

The system operators, with the help of the design engineers, will monitor long-term system performance. Key parameters, such as mass removals, discharge limitations, and run time efficiency, will be tracked and monitored. This data will allow for a complete review, and remedial process optimization (RPO) reviews will be implemented when necessary. As part of the RPO evaluation a recommendation for switching off the emission controls system from CatOx to vapor granular activated carbon (VGAC) should be made as influent concentrations fall below approximately 150 ppmv.

5.5.3 Post-Remediation Confirmation Compliance Monitoring

Once contaminant concentrations have reached target cleanup levels or concentrations shown not to further impact groundwater above cleanup goals, the system will be turned off. This shutdown will allow for any potential rebound in the perched aquifer and vadose zone to occur. During this time, quarterly well sampling events will be conducted for six months to 1 year, to confirm the site is clean or if concentrations have rebounded to levels above the cleanup goals. The confirmation sampling will include at least one sample from each extraction and monitoring well. If results show evidence of rebound the system will be restarted. If concentrations remain below target cleanup levels, the Site will be recommended for closure sampling. Closure sampling will include the collection of soil gas samples at areas that were previously impacted and should have been remediated by the Removal Action. Step-out sample locations from these initial closure sample locations may be required by the Regulatory Agencies to demonstrate complete remediation of the site for closure.

5.6 TREATMENT PROCESS OPERATION DETAILS

The performance standards focus on these objectives:

1. Operator and personnel safety
2. Process efficiency with zero incidents
3. Cost effectiveness

The remediation system design will incorporate mechanical and electrical safeguards. Operator training, safety consciousness, and experience will be required for safe operation. The remediation system will include design flexibility to maximize process efficiency. Operator training, along with engineering technical services, will be required to meet the second objective of process efficiency with zero incidents. Accomplishing the first two objectives listed above, along with maximizing run time, will help achieve the third objective, cost effectiveness.

5.6.1 Media, Byproducts, and Process Rates

The media extracted from the HWA and DPA (soil vapor and perched groundwater) contain COCs. One recent addition to the COCs for the groundwater is 1,4-dioxane, which has been found in the last two groundwater monitoring rounds at concentrations ranging from 69 μg/L to 700 μg/L.

The anticipated flow rates from the DPE system will be approximately 5 to 10 gpm. This flow will be combined with the liquid generated from the caustic gas scrubber, for a maximum design rate of 12 gpm. The byproducts from the liquid treatment system will be treated water that meets the discharge requirements and spent LGAC.

The anticipated airflow from the DPE blower will be approximately 250 scfm. The byproducts from the catalytic oxidizer with the acid scrubbing process will be carbon dioxide discharged to the atmosphere and spent scrubber slurry (slightly basic) discharged to the sewer.

5.6.2 Waste Streams

Local Sanitary Sewer District

The discharge to the LACSD sanitary sewer has a maximum design rate of approximately 40 gpm. The quality discharge limitations for flow rates, temperature, pH, total dissolved solids (TDS), select metals, and volatile organics will be monitored and controlled carefully.

South Coast Air Quality Management District

The discharge to the atmosphere has a maximum design rate of approximately 300 scfm. The quality discharge limitations for flow rates, particulates, and volatile organics will be monitored and controlled carefully, and will meet South Coast Air Quality Management District requirements.

Granular-Activated Carbon

The granular activated carbon (GAC) will be selected, handled, and disposed of with the assistance of a pre-qualified carbon vendor. The plant operators will supervise the carbon changeouts. After changeout, the carbon vendor will perform the actual carbon removal and regeneration for future use or disposal to a licensed landfill.

5.6.3 Project Quality Checklist, Pertinent Codes, and Standards

The Project Quality Checklist includes a section on Process Safety, ARARs, Pertinent Codes, and Standards. This checklist is a living document that will follow the development of the design to the “final” stage and into installation. The checklist is currently anticipated to consist of approximately one page of text that may be incorporated into the PFD engineering drawing. It will also record the revision number, date, and initials of the reviewing engineer.

5.6.4 Other Technical Factors

As other technical factors that become apparent regarding the remediation system design or O&M, this RDR will be revised and recorded, as appropriate. All revisions to this RDR and/or engineering drawings must be approved in advance by EPA Region IX.

6.0 CONSTRUCTION AND IMPLEMENTATION

6.1 PLANS

The following plans must be provided before implementation of the RA

The Remedial Action Work Plan (RAWP) identifies construction and implementation issues to be carried out by the remedial action contractor. The RAWP will include a Site Health and Safety Plan (HASP), Sampling and Analysis Plan (SAP), and the Construction Quality Control Plan (CQCP).

A generalized CQCP has been included as Appendix K of this RDR. The RAWP, HASP, and SAP will be prepared by the remedial action contractor. The CQCP is intended to establish project organization and includes requirements for independent evaluation of the construction conformance to the design specifications. A draft SAP has also been prepared for the soil excavation and is provided in Appendix F.

A Construction Completion Report will be prepared by the construction contractor that includes discussion of field design changes, as-builts, quality control results, and health and safety documentation.

A generalized O&M manual for the DPE system has been included as Appendix L of this RDR; however, a more specific O&M manual, which includes system and vendor specific guidelines must be provided by the construction contractor. The O&M manual will be provided in conjunction with the RAWP. The O&M manual will include: (1) a description of the treatment system operation, (2) a description of potential operating problems and solutions, (3) specifications and maintenance schedules for all equipment.

6.2 DESIGN DRAWINGS

A full set of design drawings are attached in this volume of the RDR (Volume I). These design drawings for the RA have been previously referenced in prior sections of this report

6.3 SPECIFICATIONS

Complete specifications for the remedial action are provided in Volume III of this RDR and are intended to accompany the Drawings package for use in the field during construction.

6.4 SCHEDULE

A remedial action schedule is also included in this volume of the RDR (Volume I). The schedule includes both the OU 1 groundwater and OU 2 soil RA. Because a start date for the RA has not been determined, the schedule is based on days to complete each task following start of construction activities.

6.5 COST ESTIMATE

A remedial action cost estimate has been prepared based on the design presented herein and is provided in this volume of the RDR (Volume I). The cost estimate was prepared using prior experience and actual subcontractor bids. The cost estimate is expected to be within plus 15% and minus 5 percent.

The total estimated capital cost for the soil RA is approximately $2,201,000. This estimate assumes that construction of the RA occurs in the first year (i.e., capital costs are not inflated or discounted). This cost estimate includes the installation cost for the groundwater remediation equipment because extracted water from the perched aquifer will be treated as part of the soil RA.

The total present worth O&M cost is estimated at $836,000. This estimate accounts for inflation, as well as a discount rate of 7%, over the 3-year duration of the project. The cost associated with O&M of the groundwater treatment equipment is included in this estimate.

Based on these estimates of the capital and the present worth O&M costs, the total cost for implementation of the soil RA is approximately $3,037,000 in 2007 dollars.

6.6 CONTRACTOR QUALIFICATIONS

The contractor shall have three to five years experience with soil and groundwater remediation systems, piping systems, and excavation of remedial sites. The contractor will be responsible for the quality performance of work specified and preparation of products and reports required for completion of installation of systems. The contractor will also manage all solid wastes generated during construction and excavation of the site, including sampling and disposal of wastes. The contractor will provide technical and administrative services, monitor, supervise, review work performed, coordinate budgeting and scheduling to assure that the project is completed within budget, on schedule, and in accordance with approved procedures and applicable laws and regulations. All employees or subcontractors performing work on this site will be 40-hour trained under Code of Federal Regulations (CFR) 1910.120 and California Code of Regulations (CCR) Title 8-5192. The contractor shall be bonded and licensed in the state of California, providing references and descriptions of previous related work. The contractor will identify the potential physical and chemical hazards that may be encountered, and will specify health and safety control measures to be implemented throughout the course of the project.

6.7 COOPER DRUM PROPERTY SITE ACCESS

The area of the Cooper Drum property where remediation equipment will be installed must be vacated and secured during the RA. This will enable safety and prevent exposure to hazardous substances during installation and operation of the remedial systems.

6.8 OFF-SITE EASEMENT AND ACCESS

Since the Cooper Drum Site is bordered between Coryal Street and Rayo Avenue, with downgradiant extraction wells located on McCallum Avenue and additional monitoring wells to be located between Southern Avenue and McCallum Avenue, it is expected that the contractor will gain required permits, easements, and rights of way to access properties and/or public areas. The contractor will need to prepare traffic plans, and schedule traffic controls prior to the start of work, taking into consideration delays and restrictions in the work schedule to accommodate possible delays due to weather, traffic, and easement and access restrictions.

7.0 ENVIRONMENTAL AND PUBLIC IMPACT REDUCTION PLAN

The overall remediation system will be designed and constructed with the objective of reducing environmental and public impacts. As stated in Section 5.0, the system operation objectives will be to achieve:

- Operator and personnel safety
- Process efficiency with zero incidents
- Cost-effectiveness

These objectives will contribute to promoting little or no impact on the environment and the public. In addition, the remediation system will include security, electrical grounding, visual impact reduction, security fencing, and spill containment. This section details these additional environmental and public impact reduction plans.

7.1 SECURITY AND FENCING

System security features include automatic alarm settings on the process equipment and corresponding automatic notification to the responsible system operators. In addition, the system will include dusk-to-dawn lighting and automatic electrical shut-offs, in the event vandals tamper with the equipment and cause an auto-trip alarm. The system will include 8-foot chain-link fencing with lockable gates for entry and exit, and security slats that will block the view of the process equipment to reduce public curiosity.

7.2 ELECTRICAL GROUNDING

The remediation system will be designed and installed with electrical grounding to reduce the potential for operator electrocution. Electrical grounding is also required because this system will process impacted groundwater. Noise abatement features will be included on the key pieces of process equipment.

7.3 VISUAL SCREENING

The security fencing will be installed with colored slats in the chain link for visual screening. This type of fencing is very durable, secure, and suitable for this type of application. The screening should reduce complaints approximately visual concerns from local residents.

7.4 SPILL CONTAINMENT

The remediation system will be constructed on a concrete pad with spill containment features. The containment sump will include an alarm feature that will be tied into an automatic interlock for system shutdown.

8.0 REFERENCES

Johnson, P., C. Stanley, M. Kemblowski, D. Byers, J. Colhart, 1990. A Practical Approach to the Design, Operation, and Monitoring of In Situ Soil Venting Systems. *Ground Water Monitoring Review*, p. 163, Eq. 5. Spring.

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EPA, 2004. *Guidance on Surface Soil Cleanup at Hazardous Waste Sites: Implementing Cleanup Levels*. May.

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URS, 2004. *Cooper Drum Superfund Site Remedial Design Supplemental Field Sampling Results Technical Memorandum*. April.

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TABLES

TABLE 2-1

Cleanup Levels for Contaminants of Concern

Medium	Contaminant of Concern	Cleanup Level	Basis for Cleanup Level	Risk at Cleanup Level
Soil (VOCs)	1,1-Dichloroethane (1,1-DCA)	Leachate <MCL[a]	VLEACH modeling	TBD
	1,1-Dichloroethene (1,1-DCE)	Leachate <MCL	VLEACH modeling	TBD
	1,2-Dichloroethane (1,2-DCA)	Leachate <MCL	VLEACH modeling	TBD
	1,2-Dichloropropane (1,2-DCP)	Leachate <MCL	VLEACH modeling	TBD
	1,2,3-Trichloropropane (1,2,3-TCP)	Leachate <PQL	VLEACH modeling	TBD
	Benzene	Leachate <MCL	VLEACH modeling	TBD
	cis-1,2-Dichloroethene (cis-1,2-DCE)	Leachate <MCL	VLEACH modeling	TBD
	trans-1,2-Dichloroethene (trans-1,2-DCE)	Leachate <MCL	VLEACH modeling	TBD
	Tetrachloroethene (PCE)	Leachate <MCL	VLEACH modeling	TBD
	Trichloroethene (TCE)	Leachate <MCL	VLEACH modeling	TBD
	Vinyl chloride	Leachate <MCL	VLEACH modeling	TBD
Soil (nonVOCs)	Aroclor-1254	870 µg/kg	Human health hazard	1 e-05
	Aroclor-1260	870 µg/kg	Human health hazard	1 e-05
	B (a)P-TE [b] – Benzo(a)anthracene – Benzo(a)pyrene – Benzo(b)fluoranthene – Benzo(k)fluoranthene – Chrysene – Dibenz(a,h)anthracene – Indeno(1,2,3-cd)pyrene	900 µg/kg	Background	Background
	Lead	400 mg/kg	Human health hazard	IEUBK Model
Groundwater (VOCs)	1,1-Dichloroethane (1,1-DCA)	5 µg/L	MCL	Cancer risk at 2.6e-06
	1,1-Dichloroethene (1,1-DCE)	6 µg/L	MCL	HI = 0.04
	1,2-Dichloroethane (1,2-DCA)	0.5 µg/L	MCL	Cancer risk at 4.0e-06
	1,2-Dichloropropane (1,2-DCP)	5 µg/L	MCL	Cancer risk at 3.1e-05
	1,2,3-Trichloropropane (1,2,3-TCP)	1 µg/L	PQL [c]	Cancer risk at 6.2e-04
	Benzene	1 µg/L	MCL	Cancer risk at 9.0e-06
	cis-1,2-Dichloroethene (cis-1,2-DCE)	6 µg/L	MCL	HI = 0.23
	trans-1,2-Dichloroethene (trans-1,2-DCE)	10 µg/L	MCL	HI = 0.19
	Tetrachloroethene (PCE)	5 µg/L	MCL	Cancer risk at 1.2e-05
	Trichloroethene (TCE)	5 µg/L	MCL	Cancer risk at 4.9e-06
	Vinyl chloride	0.5 µg/L	MCL	Cancer risk at 2.2e-05
Groundwater (SVOCs)	1,4-Dioxane	6.1 µg/L	PRG[d]	TBD

TABLE 2-1

(Continued)

[a] MCLs from Title 22 California Code of Regulation Section 64431 and 64444 unless otherwise specified.
[b] Based on upper tolerance limit (UTL) background benzo(a)pyrene-toxicity equivalent (B(a)P-TE) concentration for southern California PAH data set.
[c] No MCL established for 1,2,3-trichloropropane. The PQL was identified as a remedial goal for 1,2,3-trichloropropane.
[d] Cleanup action level will be reassessed and any revisions will be incorporated into the remedial action.

HI	=	hazard index
IEUBK Model	=	Integrated Exposure Uptake Model for Lead in Children
MCL	=	California primary maximum contaminant level
PRG	=	preliminary remediation goal
PQL	=	Practical quantification limit
SVOC	=	semivolatile organic compound
TBD	=	to be determined
VOC	=	volatile organic compound
µg/L	=	micrograms per liter
µg/kg	=	micrograms per kilogram

TABLE 4-1

Summary of Excavation Areas

Site Area	Excavation Area	COCs Exceeding Cleanup Levels	Area (sq ft)	Depth (ft)	Volume (cu yd)
Drum Processing Area	West (#1)	PAHs	2,475	2.5	229.2
Drum Processing Area	West (#2)	PAHs	900	5.0	166.7
Drum Processing Area	East (#1)	PAHs	300	5.0	55.5
Drum Processing Area	East (#2)	Lead, PAHs	1,700	5.0	314.8
Former Hard-Wash Area	West	Lead	1,200	2.5	111.1
Former Hard-Wash Area	East	Lead, PCBs	3,000	2.5	277.8
Total Volume of Excavated Soil					1,155
Soil Expansion (fluff) 10%					116
Total					1,271

COC = contaminant of concern
cu yd = cubic yard
ft = feet
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
sq ft = square feet

TABLE 4-2

Design Assumptions for Soil Removal Action

Non-VOC COCs: PCBs, PAHs, and lead.
Initial excavation limits determined from previous site investigations including May 2003.
Site consists of sandy silts interspersed with layers of clay.
Two excavation areas and depths each in the former HWA and DPA.
HWA west excavation summary:
– Surface area: 30 feet by 40 feet
– Excavation depth: 2.5 feet bgs
– Excavation area is covered with asphalt
– Estimated volume: 111 cubic yards
HWA east excavation summary:
– Surface area: 60 feet by 50 feet
– Excavation depth: 2.5 feet bgs
– Excavation area is covered with asphalt
– Estimated volume: 279 cubic yards
DPA west excavation summary:
– Surface area: 65 feet by 60 feet
– Excavation depth: 2.5 feet and 5.0 feet bgs
– Excavation requires shoring for depths greater than 4 feet bgs, or as identified by Competent Person
– Excavation area is covered with asphalt
– Estimated volume: 395 cubic yards
DPA east excavation summary:
– Surface area: 80 feet by 25 feet
– Excavation depth: 5 feet bgs
– Excavation requires shoring for depths greater than 4 feet bgs, or as identified by Competent Person
– Excavation area is covered with asphalt
– Estimated volume: 370 cubic yards
Total volume of soil (approximate): 1,271 cubic yards
Soil mass 1,653 tons (assuming 1.3 tons/cubic yard)
Confirmation samples to be collected as per the Confirmation Sampling Plan; along the excavation floor on 20-foot centers and on sidewalls every 40 feet below the zone of contamination.
Excavated material to be stockpiled on site. Profile sampling for off-site landfill disposal to be taken at approximate frequency of one sample for 150 cubic yards, or as required by the landfill.
Transport excavated material off site to appropriate landfill.

bgs = below ground surface
COC = contaminant of concern
DPA = Drum Processing Area
HWA = Hard-Wash Area
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
VOC = volatile organic compound

TABLE 5-1

DPE-1 Test Data

Well Name	DPE-1	VP-1 10 feet	VP-1 20 feet	VP-1 30 feet	VP-2 10 feet	VP-2 20 feet	VP-2 30 feet	
Distance from SVE (feet)	–	20	20	20	45	45	45	
Screen Interval (feet bgs)	8–43	9.5–10	19.5–20	29.5–30	9.5–10	19.5–20	29.5–30	
Flow rate (cfm)	Vacuum (in. H_2O)	Vacuum (in. H_2O)	Vacuum (in. H_2O)	Vacuum (in. H_2O)	Vacuum (in. H_2O)	Vacuum (in. H_2O)	Vacuum (in. H_2O)	Elapsed Time
22	30	0	0.3–0.7	0.6–1.1	0.2	0.8–1.5	0	30 min.
53	65	0.1	0.7–0.9	1.5–3.3	0.3–0.5	1.6–3.2	0.4–0.9[a]	65 min.
88–98	130	3.5[a]	2.3–5.0	4.5	0.9	5–10	2.0–3.2	180 min.

[a] Changed gauge.

bgs = below ground surface
cfm = cubic feet per minute
DPE = dual-phase extraction
in. H_2O = inches of water
SVE = soil vapor extraction
VP = vapor point

Note: Vapor samples collected from DPE-1 at 10, 90, and 180 minutes (shutdown).

TABLE 5-2

DPE-7 Test Data

Well Name	DPE-7	VP-3 10 ft bgs	VP-3 20 ft bgs	VP-3 30 ft bgs	VP-4 10 ft bgs	VP-4 20 ft bgs	VP-4 30 ft bgs	
Distance from SVE (feet)	–	50	50	50	50	50	50	
Screen Interval (feet bgs)	8–48	9.5–10	19.5–20	29.5–30	9.5–10	19.5–20	29.5–30	
Flow rate (cfm)	Vacuum (in H_2O)	Vacuum (in H_2O)	Vacuum (in H_2O)	Vacuum (in H_2O)	Vacuum (in H_2O)	Vacuum (in H_2O)	Vacuum (in H_2O)	Elapsed Time
24.5	40	0.3–0.6	0.65–0.7	0.7–1.15	0.17–0.2	0.45–0.85	0.67–1.1	40 min.
45.8	80	0.6–1.3	0.7–1.5	1.15–2.9	0.2–0.5	0.85–1.62	1.1–2.7	105 min.
72.5	132	1.3–2.2	1.5–4.1	2.9–4.9	0.5–0.63[a]	1.62–4.13[a]	2.7–4.79	235 min.

[a] Changed gauge.

bgs = below ground surface
cfm = cubic feet per minute
DPE = dual-phase extraction
ft = feet
in. H_2O = inches of water
SVE = soil vapor extraction
VP = vapor point

Notes: Vacuums at all vapor probes gradually increased through the test, with the exception of the VP-4-10 feet, which stabilized after 120 minutes.

Vapor samples collected from DPE-1 at 10, 30, 100, and 235 minutes (shutdown).

TABLE 5-3

Soil Permeability Test Results, DPE-1[a]

Monitoring Well		Flowrate (ft^3/min)	Distance to Extraction Well (ft)	Absolute Pressure Extraction Well (in. H_2O)[b]	Absolute Pressure Monitoring Well (in. H_2O)	Air Permeability (Darcy)	Calculated Radius of Influence (ft)
Well No.	Screen Interval (ft)						
VP-1, 10	9–10	98	25	276.8	403.3	0.70	30.8
VP-1, 20	19–20	98	25	276.8	401.8	0.70	31.6
VP-1, 30	29–30	98	25	276.8	402.3	0.70	30.8
VP-2, 10	9–10	98	50	276.8	405.90	0.77	52.1
VP-2, 20	19–20	98	50	276.8	[c]	[c]	[c]
VP-2, 30	29–30	98	50	276.8	403.60	0.79	59.0

[a] Well casing radius 0.167 feet and well screen in the vadose zone 8 to 43 feet bgs.
[b] Absolute pressure is the difference between vacuum-influenced data and atmospheric pressure (406.8 in. H_2O).
[c] Field data appear high; not used in calculation.

bgs = below ground surface
DPE = dual-phase extraction
ft = feet
ft^3/min = cubic feet per minute
in. H_2O = inches of water
VP = vapor point

TABLE 5-4

Soil Permeability Test Results, DPE-7[a]

Monitoring Well		Flowrate (ft^3/min)	Distance to Extraction Well (ft)	Absolute Pressure Extraction Well (in. H_2O)[b]	Absolute Pressure Monitoring Well (in. H_2O)	Air Permeability (Darcy)	Calculated Radius of Influence (ft)
Well No.	Screen Interval (ft)						
VP-3, 10	9–10	98	50	276.8	404.6	0.80	64.9
VP-3, 20	19–20	98	50	276.8	402.7	0.79	62.0
VP-3, 30	29–30	98	50	276.8	401.9	0.80	64.9
VP-4, 10	9–10	98	50	276.8	406.2	0.77	51.3
VP-4, 20	19–20	98	50	276.8	402.7	0.79	62.0
VP-4, 30	29–30	98	50	276.8	402.0	0.80	64.5

[a] Well casing radius 0.167 feet and well screen in the vadose zone 8 to 43 feet bgs.
[b] Absolute pressure is the difference between vacuum-influenced data and atmospheric pressure (406.8 in. H_2O).

bgs = below ground surface
DPE = dual-phase extraction
ft = feet
ft^3/min = cubic feet per minute
in. H_2O = inches of water
VP = vapor point

TABLE 5-5

Distance and Direction of Vapor Monitor Points Relative to Dual-Phase Extraction Wells

HWA								DPA			
	DPE-1	**DPE-2**	**DPE-3**	**DPE-4**	**DPE-5**	**DPE-6**			**DPE-7**	**DPE-8**	**DPE-9**
VP-1[a]	**25 SE**	**73 S**	**108 W**	**41 NW**	**89 NE**	**108 E**		VP-3[a]	**48 NW**	**85 N**	**45 NE**
VP-2[a]	**50 W**	**83 SW**	**126 W**	**111 N**	**59.5 N**	**38 SE**		VP-4[a]	**52 SW**	**3.5 S**	**85 SE**
VP-9	**44 S**				**51 NE**			VP-5	**31 SE**	**49 NE**	
VP-10	**72 SE**			**25 S**				VP-6	**38 NE**		
VP-11			**52 S**	**63 NE**				VP-7		**52 NW**	**48 S**
VP-12			**28 E**	**92 NE**				VP-8			**40 NW**
VP-13		**53 SE**	**59 W**								
VP-14		**25 NE**	**75 E**								
VP-15		**52 W**			**50 NW**						
VP-16						**26 W**					
VP-17					**25 NW**	**55 S**					

[a] Existing vapor monitoring points.

DPE = dual-phase extraction
E = east
N = north
NE = northeast
NW = northwest
S = south
SE = southeast
VP = vapor (monitor) point
W = west

Notes: 1. Distance (in feet) and direction are from DPE to VP (i.e., VP-1 is located 25 feet southeast of DPE-1).
2. N, S, E, W, NE, SE, NW, and SW are general compass direction.

TABLE 5-6

Summary of Monitoring Schedule for DPE with Catalytic Oxidation/Caustic Scrubber Emission Control System and Residual Sampling Frequency

Parameter	Sample Location	Sample Frequency	
		Initial Operations[a]	Long-Term Operations
VOCs (EPA Modified Method TO-15 or approved equivalent)	System Inlet & Outlet	Weekly	Monthly
	Operating DPE Wells	Weekly	Quarterly
	Soil Vapor Monitor Points[b]	Weekly	Quarterly/ SemiAnnually/Annual
	AWS liquids	Once	Annually
	Scrubber Blowdown	Once	Annually
Acid Gas (HCl) (CARB Method 421 or approved equivalent)	System Outlet	Once	Annually
Dioxins/Furans (EPA Method 23 or approved equivalent)	System Outlet	Once	Annually
	AWS liquids	Once	Annually
	Scrubber Blowdown	Once	Annually
$CO/SO_2/NO_x/PM$ (CARB Methods 5 and 10)	System Outlet	Once	Annually

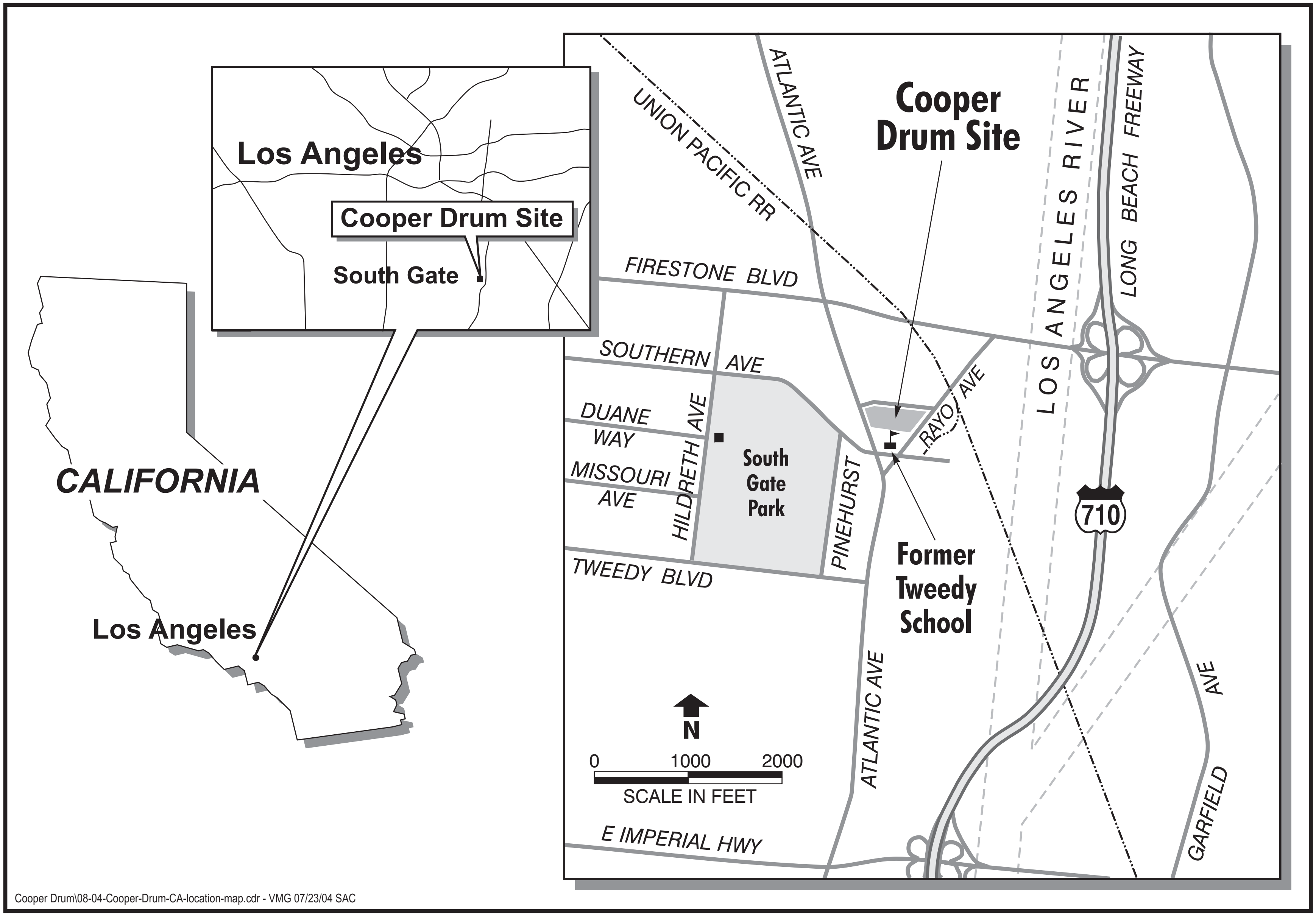
[a] Initial operations typically last one to four weeks. During this time, the remediation equipment is being fine tuned to operate at maximum efficiency given the Site conditions.

[b] Initially all soil vapor monitor points will be sampled quarterly. As concentrations decline, the sampling frequency shall decline as follows:

- Quarterly – soil vapor concentration greater than cleanup goals;
- Semiannual – soil vapor concentrations less than cleanup goals during the previous sample event;
- Annual – soil vapor concentrations less than cleanup goal for two consecutive sample events;
- Stop sampling a well, until confirmation sampling, if soil vapor concentrations less than cleanup goal for three consecutive sample events.
- If concentrations increase above cleanup goals at any time, the well shall resume the quarterly sampling frequency and follow the process listed above.

AWS = air/water separator
CARB = California Air Resources Board
CO = carbon monoxide
DPE = dual-phase extraction
EPA = United States Environmental Protection Agency
HCl = hydrochloric acid
NO_x = nitrogen oxides
PM = particulate matter
SO_2 = sulfur dioxide
VOC = volatile organic compound

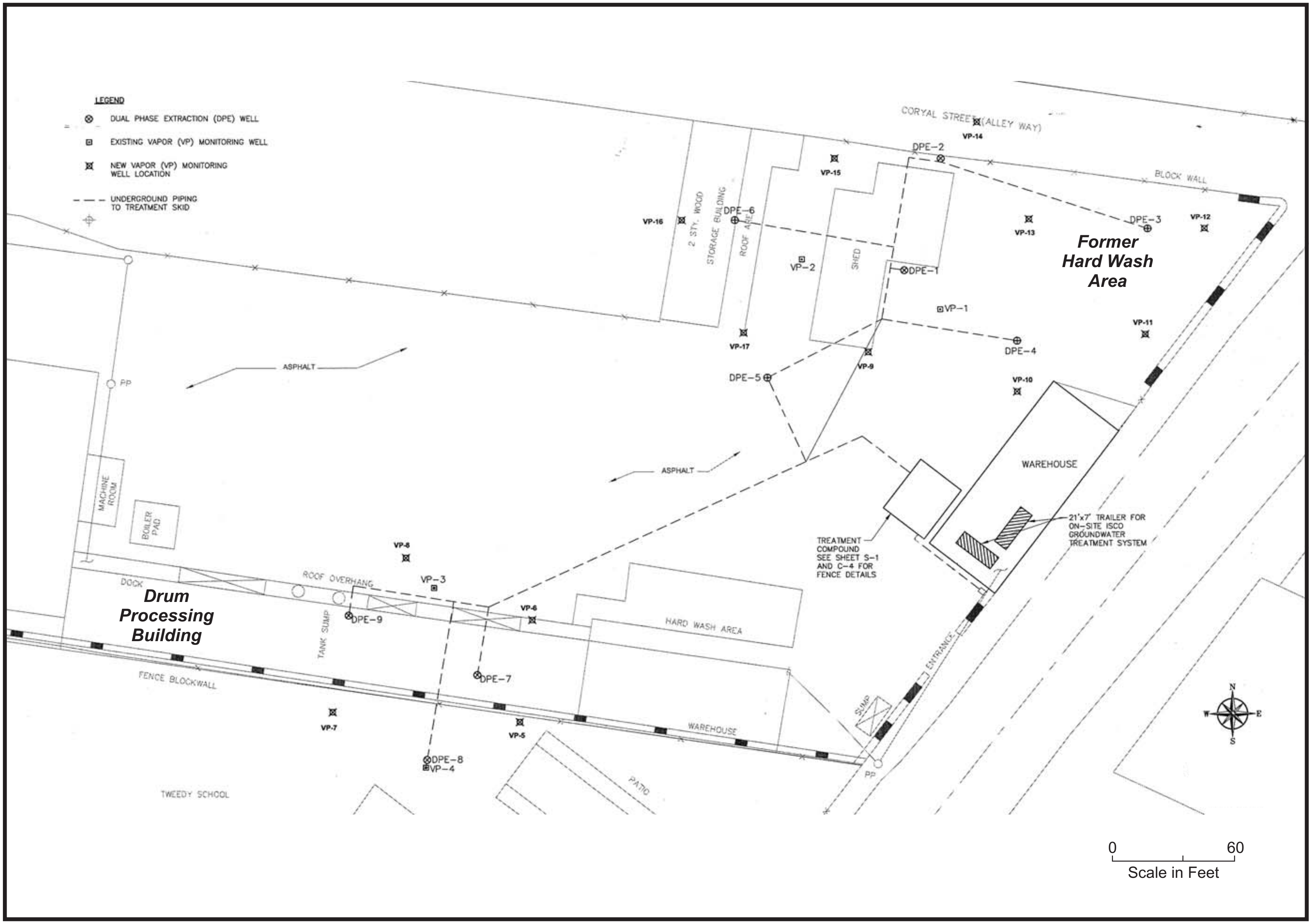
FIGURES



Cooper Drum\08-04-Cooper-Drum-CA-location-map.cdr - VMG 07/23/04 SAC

Figure 1-1. Site Location Map

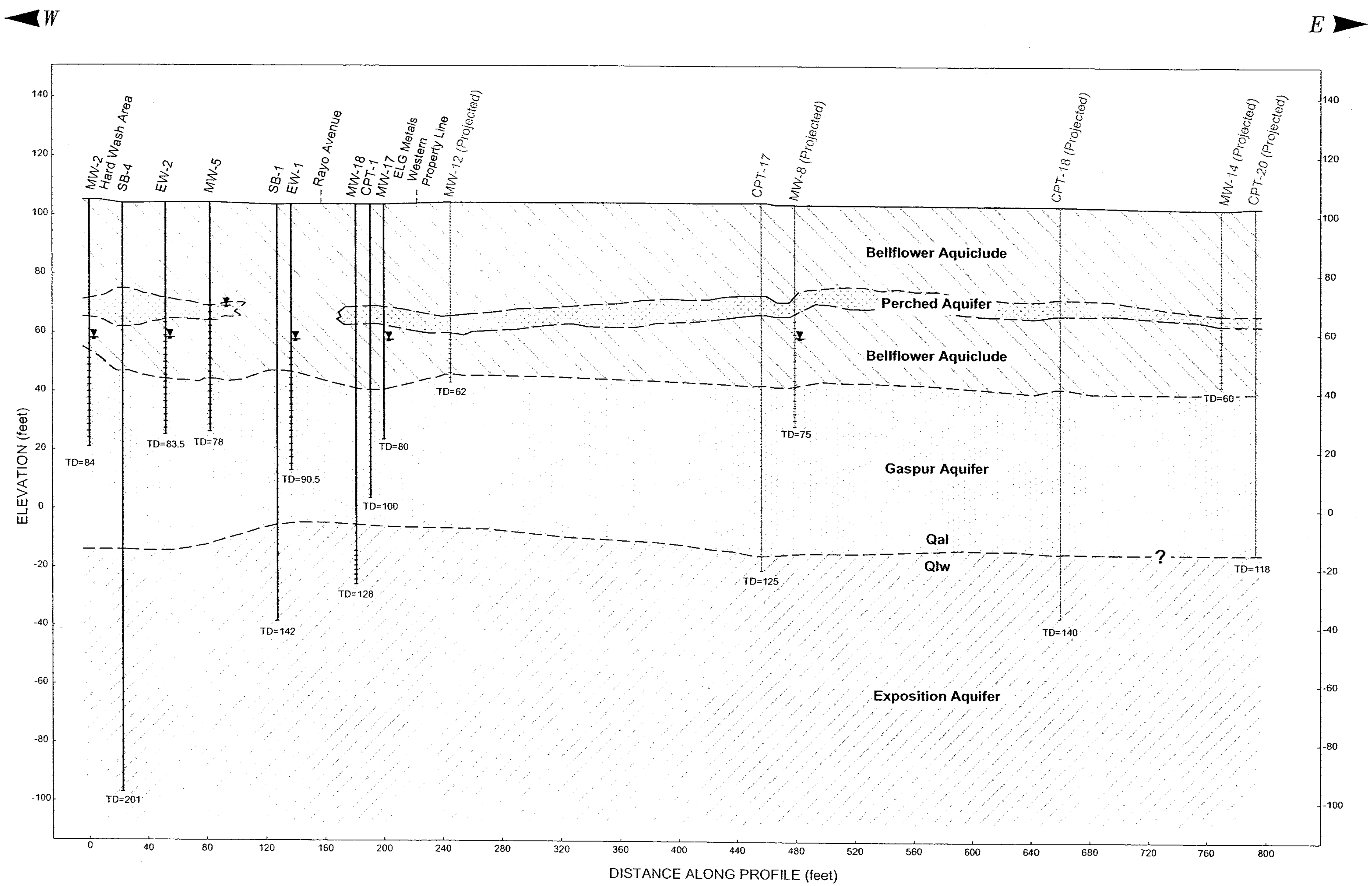
URS



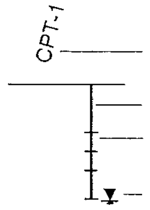
Site Map and Piping Layout

Figure 1-2

Cooper Drum\09-07-site-map-piping-scan.cdr - LCT 09.06.07 SAC



EXPLANATION:



Qal = Quaternary Alluvium
Qlw = Upper Pleistocare lakewood formation

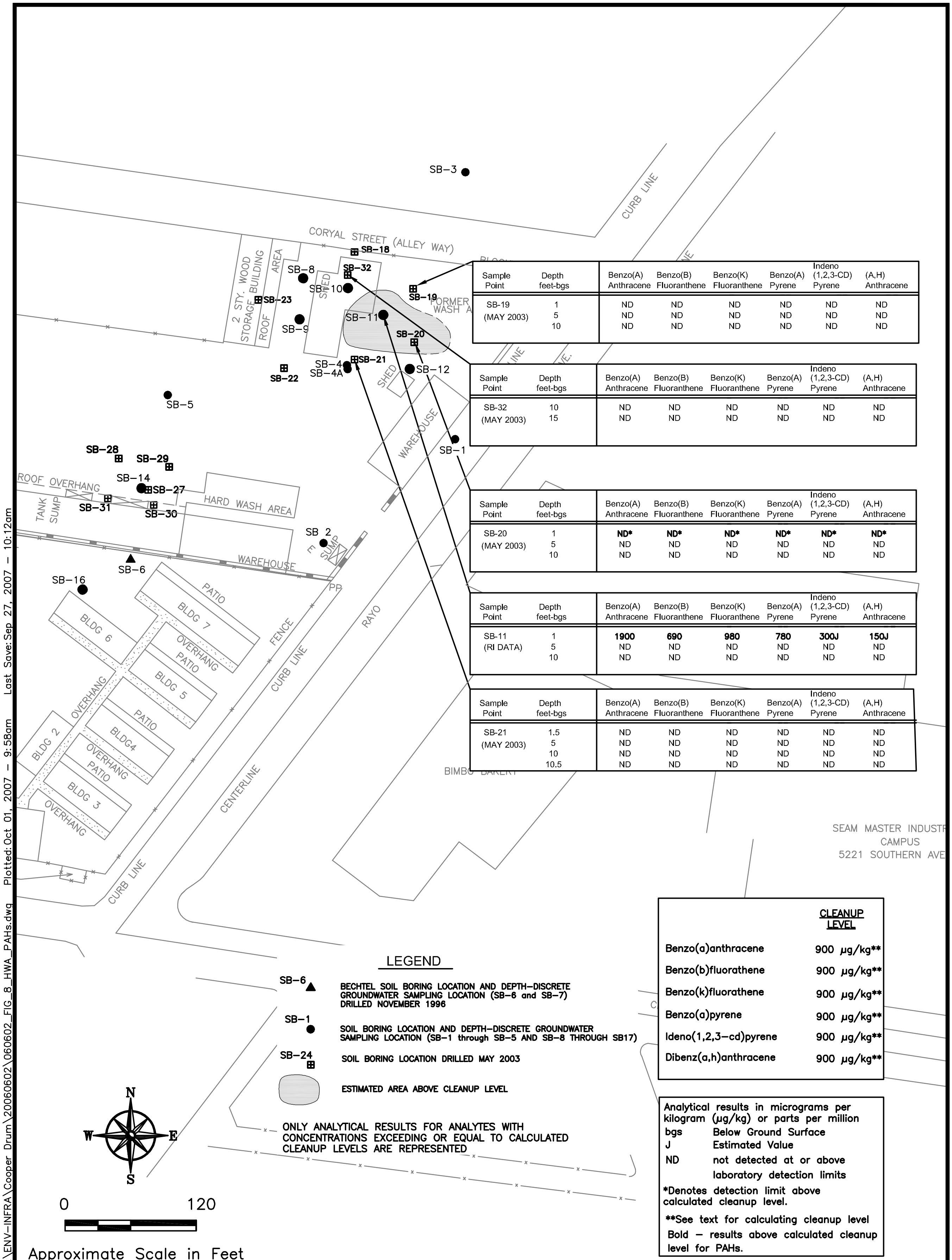
Horizontal Scale (feet)
Scale: 1" = 80'
Vertical Exaggeration: 4x
Scale: 1" = 40'

PLOT BY: RTAYLOR - Dec 19, 2006 - 7:32:04am
DRAWING: T:\current-work files\COOPER-DRUM\Ed-Cooper-drum-12-19-06\04006052-1_XSAAC.DWG
XREFS:

URS

Generalized Geologic Cross Section B-B'

Figure 2-1



Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	(A,H) Anthracene
SB-19 (MAY 2003)	1	ND	ND	ND	ND	ND	ND
	5	ND	ND	ND	ND	ND	ND
	10	ND	ND	ND	ND	ND	ND

Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	(A,H) Anthracene
SB-32 (MAY 2003)	10	ND	ND	ND	ND	ND	ND
	15	ND	ND	ND	ND	ND	ND

Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	(A,H) Anthracene
SB-20 (MAY 2003)	1	**ND***	**ND***	**ND***	**ND***	**ND***	**ND***
	5	ND	ND	ND	ND	ND	ND
	10	ND	ND	ND	ND	ND	ND

Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	(A,H) Anthracene
SB-11 (RI DATA)	1	**1900**	**690**	**980**	**780**	**300J**	**150J**
	5	ND	ND	ND	ND	ND	ND
	10	ND	ND	ND	ND	ND	ND

Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	(A,H) Anthracene
SB-21 (MAY 2003)	1.5	ND	ND	ND	ND	ND	ND
	5	ND	ND	ND	ND	ND	ND
	10	ND	ND	ND	ND	ND	ND
	10.5	ND	ND	ND	ND	ND	ND

LEGEND

- SB-6 ▲ BECHTEL SOIL BORING LOCATION AND DEPTH-DISCRETE GROUNDWATER SAMPLING LOCATION (SB-6 and SB-7) DRILLED NOVEMBER 1996
- SB-1 ● SOIL BORING LOCATION AND DEPTH-DISCRETE GROUNDWATER SAMPLING LOCATION (SB-1 through SB-5 AND SB-8 THROUGH SB17)
- SB-24 ⊞ SOIL BORING LOCATION DRILLED MAY 2003
- ESTIMATED AREA ABOVE CLEANUP LEVEL

ONLY ANALYTICAL RESULTS FOR ANALYTES WITH CONCENTRATIONS EXCEEDING OR EQUAL TO THE CALCULATED CLEANUP LEVELS ARE REPRESENTED

	CLEANUP LEVEL
Benzo(a)anthracene	900 µg/kg**
Benzo(b)fluorathene	900 µg/kg**
Benzo(k)fluorathene	900 µg/kg**
Benzo(a)pyrene	900 µg/kg**
Ideno(1,2,3-cd)pyrene	900 µg/kg**
Dibenz(a,h)anthracene	900 µg/kg**

Analytical results in micrograms per kilogram (µg/kg) or parts per million

bgs	Below Ground Surface
J	Estimated Value
ND	not detected at or above laboratory detection limits

*Denotes detection limit above calculated cleanup level.

**See text for calculating cleanup level

Bold – results above calculated cleanup level for PAHs.

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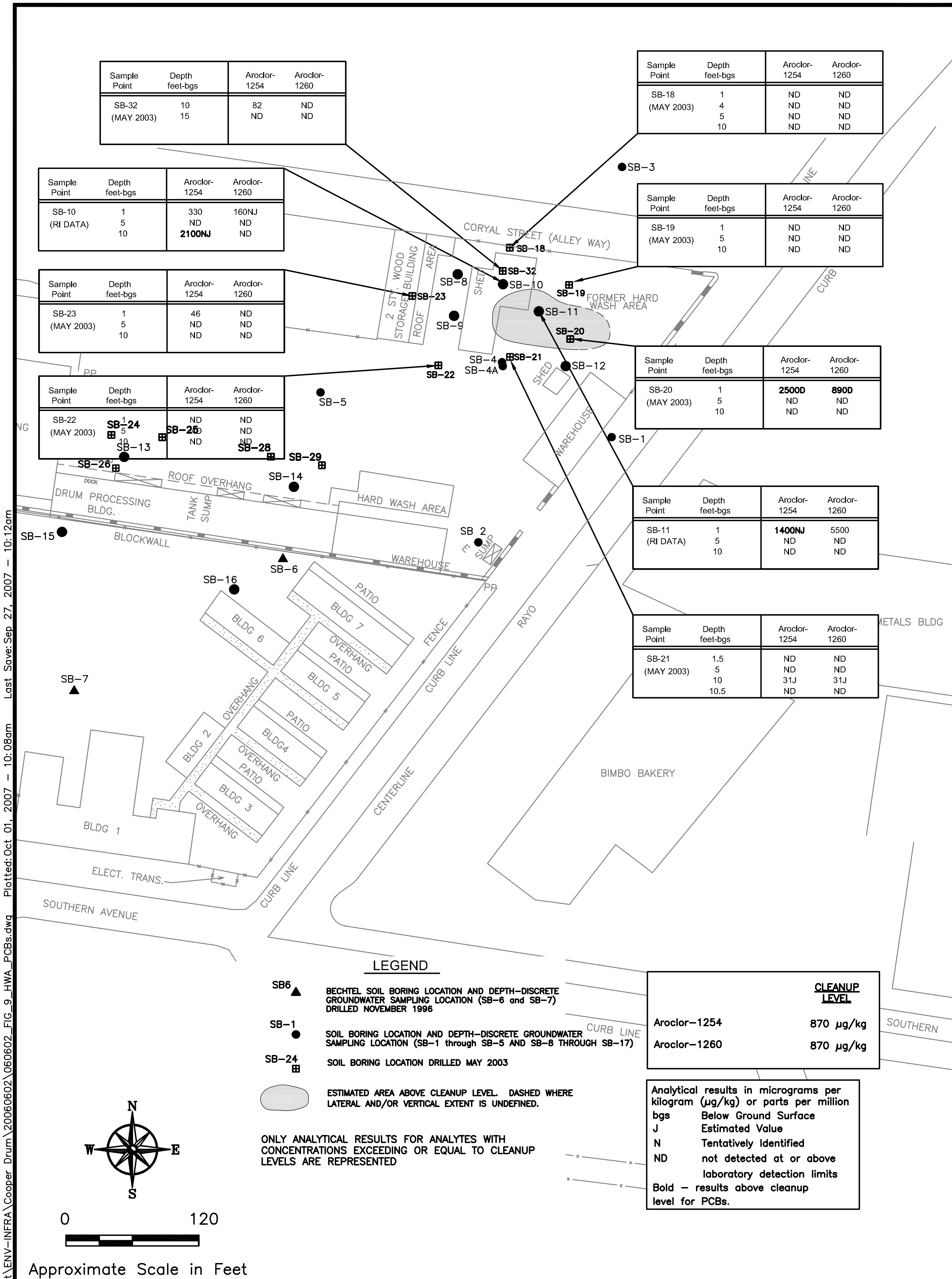
FIGURE 3-1
Soil Sampling Results - PAHs
Former Hard Wash Area

H:\CADD\Current\ENV-INFRA\Cooper Drum\20060602\060602_FIG_8_HWA_PAHs.dwg Plotted: Oct 01, 2007 - 9:58am Last Save: Sep 27, 2007 - 10:12am



Sample Point	Depth feet-bgs	Aroclor-1254	Aroclor-1260
SB-32 (MAY 2003)	10	82	ND
	15	ND	ND

Sample Point	Depth feet-bgs	Aroclor-1254	Aroclor-1260
SB-18 (MAY 2003)	1	ND	ND
	4	ND	ND
	5	ND	ND
	10	ND	ND

Sample Point	Depth feet-bgs	Aroclor-1254	Aroclor-1260
SB-10 (RI DATA)	1	330	160NJ
	5	ND	ND
	10	**2100NJ**	ND

Sample Point	Depth feet-bgs	Aroclor-1254	Aroclor-1260
SB-19 (MAY 2003)	1	ND	ND
	5	ND	ND
	10	ND	ND

Sample Point	Depth feet-bgs	Aroclor-1254	Aroclor-1260
SB-23 (MAY 2003)	1	46	ND
	5	ND	ND
	10	ND	ND

Sample Point	Depth feet-bgs	Aroclor-1254	Aroclor-1260
SB-20 (MAY 2003)	1	**2500D**	**890D**
	5	ND	ND
	10	ND	ND

Sample Point	Depth feet-bgs	Aroclor-1254	Aroclor-1260
SB-22 (MAY 2003)	1	ND	ND
	5	ND	ND
	10	ND	ND

Sample Point	Depth feet-bgs	Aroclor-1254	Aroclor-1260
SB-11 (RI DATA)	1	**1400NJ**	5500
	5	ND	ND
	10	ND	ND

Sample Point	Depth feet-bgs	Aroclor-1254	Aroclor-1260
SB-21 (MAY 2003)	1.5	ND	ND
	5	ND	ND
	10	31J	31J
	10.5	ND	ND

LEGEND

- SB6 ▲ BECHTEL SOIL BORING LOCATION AND DEPTH-DISCRETE GROUNDWATER SAMPLING LOCATION (SB-6 and SB-7) DRILLED NOVEMBER 1996
- SB-1 ● SOIL BORING LOCATION AND DEPTH-DISCRETE GROUNDWATER SAMPLING LOCATION (SB-1 through SB-5 AND SB-8 THROUGH SB-17)
- SB-24 ⊞ SOIL BORING LOCATION DRILLED MAY 2003
- ESTIMATED AREA ABOVE CLEANUP LEVEL. DASHED WHERE LATERAL AND/OR VERTICAL EXTENT IS UNDEFINED.

ONLY ANALYTICAL RESULTS FOR ANALYTES WITH CONCENTRATIONS EXCEEDING OR EQUAL TO CLEANUP LEVELS ARE REPRESENTED

	CLEANUP LEVEL
Aroclor-1254	870 µg/kg
Aroclor-1260	870 µg/kg

Analytical results in micrograms per kilogram (µg/kg) or parts per million
bgs Below Ground Surface
J Estimated Value
N Tentatively Identified
ND not detected at or above laboratory detection limits
Bold – results above cleanup level for PCBs.

H:\CADD\Current\ENV-INFRA\Cooper Drum\20060602\060602_FIG_9_HWA_PCBs.dwg Plotted:Oct 01, 2007 – 10:08am Last Save:Sep 27, 2007 – 10:12am

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Cooper Drum Company
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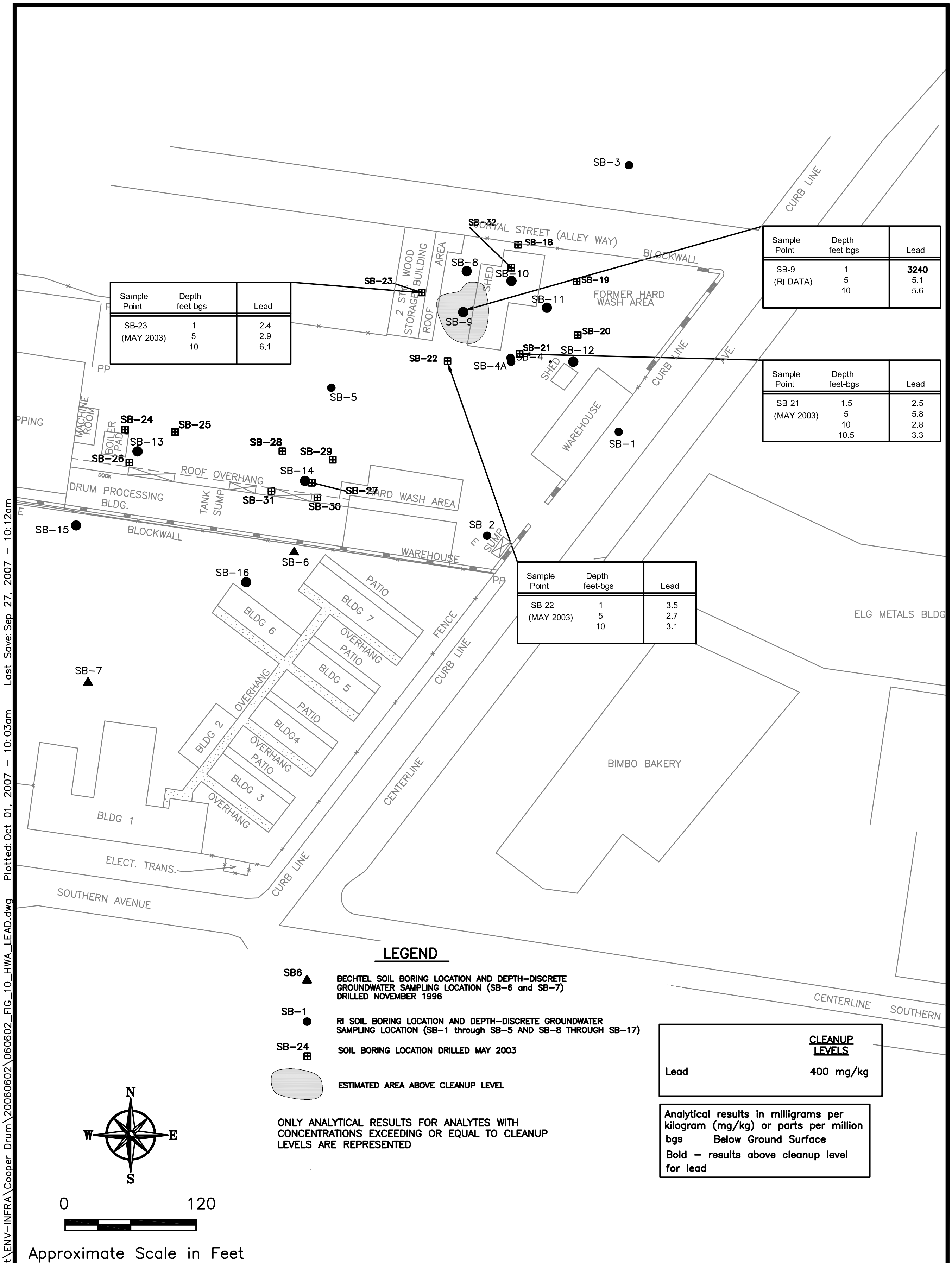
FIGURE 3-2
Soil Sampling Results - PCBs
Former Hard Wash Area



Sample Point	Depth feet-bgs	Lead
SB-23 (MAY 2003)	1	2.4
	5	2.9
	10	6.1

Sample Point	Depth feet-bgs	Lead
SB-9 (RI DATA)	1	**3240**
	5	5.1
	10	5.6

Sample Point	Depth feet-bgs	Lead
SB-21 (MAY 2003)	1.5	2.5
	5	5.8
	10	2.8
	10.5	3.3

Sample Point	Depth feet-bgs	Lead
SB-22 (MAY 2003)	1	3.5
	5	2.7
	10	3.1

LEGEND

SB6 ▲ BECHTEL SOIL BORING LOCATION AND DEPTH-DISCRETE GROUNDWATER SAMPLING LOCATION (SB-6 and SB-7) DRILLED NOVEMBER 1996

SB-1 ● RI SOIL BORING LOCATION AND DEPTH-DISCRETE GROUNDWATER SAMPLING LOCATION (SB-1 through SB-5 AND SB-8 THROUGH SB-17)

SB-24 ⊞ SOIL BORING LOCATION DRILLED MAY 2003

ESTIMATED AREA ABOVE CLEANUP LEVEL

ONLY ANALYTICAL RESULTS FOR ANALYTES WITH CONCENTRATIONS EXCEEDING OR EQUAL TO CLEANUP LEVELS ARE REPRESENTED

	CLEANUP LEVELS
Lead	400 mg/kg

Analytical results in milligrams per kilogram (mg/kg) or parts per million
bgs Below Ground Surface
Bold – results above cleanup level for lead

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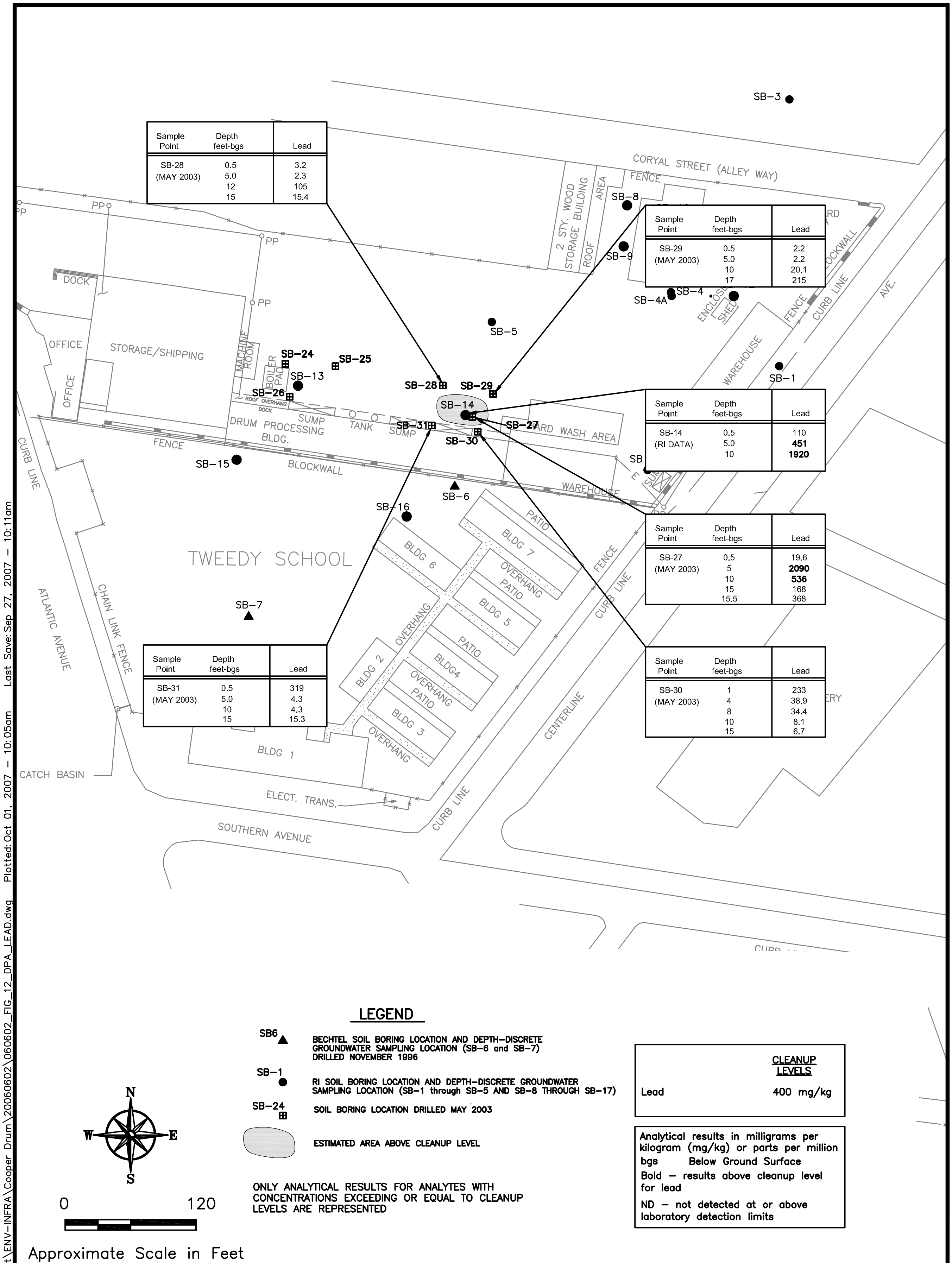
FIGURE 3-3
Soil Sampling Results - Lead
Former Hard Wash Area

H:\CADD\Current\ENV-INFRA\Cooper Drum\20060602\060602_FIG_10_HWA_LEAD.dwg Plotted: Oct 01, 2007 – 10:03am Last Save: Sep 27, 2007 – 10:12am



H:\CADD\Current\ENV-INFRA\Cooper Drum\20060602\060602_FIG_12_DPA_LEAD.dwg Plotted: Oct 01, 2007 - 10:05am Last Save: Sep 27, 2007 - 10:11am

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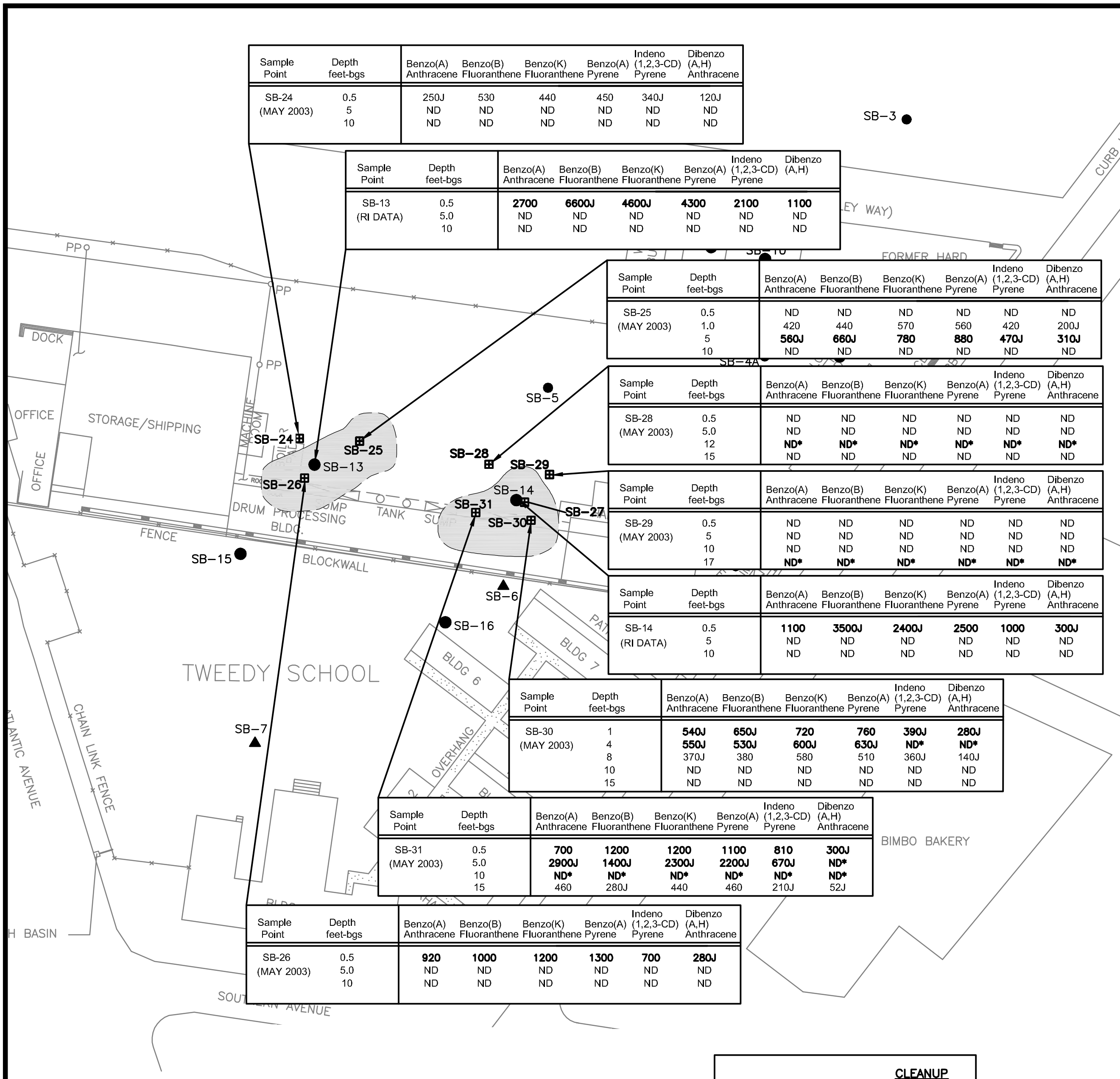
FIGURE 3-4
Soil Sampling Results - Lead
Drum Processing Area



Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	Dibenzo (A,H) Anthracene
SB-24 (MAY 2003)	0.5	250J	530	440	450	340J	120J
	5	ND	ND	ND	ND	ND	ND
	10	ND	ND	ND	ND	ND	ND

Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	Dibenzo (A,H) Anthracene
SB-13 (RI DATA)	0.5	**2700**	**6600J**	**4600J**	**4300**	**2100**	**1100**
	5.0	ND	ND	ND	ND	ND	ND
	10	ND	ND	ND	ND	ND	ND

Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	Dibenzo (A,H) Anthracene
SB-25 (MAY 2003)	0.5	ND	ND	ND	ND	ND	ND
	1.0	420	440	570	560	420	200J
	5	**560J**	**660J**	**780**	**880**	**470J**	**310J**
	10	ND	ND	ND	ND	ND	ND

Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	Dibenzo (A,H) Anthracene
SB-28 (MAY 2003)	0.5	ND	ND	ND	ND	ND	ND
	5.0	ND	ND	ND	ND	ND	ND
	12	**ND***	**ND***	**ND***	**ND***	**ND***	**ND***
	15	ND	ND	ND	ND	ND	ND

Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	Dibenzo (A,H) Anthracene
SB-29 (MAY 2003)	0.5	ND	ND	ND	ND	ND	ND
	5	ND	ND	ND	ND	ND	ND
	10	ND	ND	ND	ND	ND	ND
	17	**ND***	**ND***	**ND***	**ND***	**ND***	**ND***

Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	Dibenzo (A,H) Anthracene
SB-14 (RI DATA)	0.5	**1100**	**3500J**	**2400J**	**2500**	**1000**	**300J**
	5	ND	ND	ND	ND	ND	ND
	10	ND	ND	ND	ND	ND	ND

Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	Dibenzo (A,H) Anthracene
SB-30 (MAY 2003)	1	**540J**	**650J**	**720**	**760**	**390J**	**280J**
	4	**550J**	**530J**	**600J**	**630J**	**ND***	**ND***
	8	370J	380	580	510	360J	140J
	10	ND	ND	ND	ND	ND	ND
	15	ND	ND	ND	ND	ND	ND

Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	Dibenzo (A,H) Anthracene
SB-31 (MAY 2003)	0.5	**700**	**1200**	**1200**	**1100**	**810**	**300J**
	5.0	**2900J**	**1400J**	**2300J**	**2200J**	**670J**	**ND***
	10	**ND***	**ND***	**ND***	**ND***	**ND***	**ND***
	15	460	280J	440	460	210J	52J

Sample Point	Depth feet-bgs	Benzo(A) Anthracene	Benzo(B) Fluoranthene	Benzo(K) Fluoranthene	Benzo(A) Pyrene	Indeno (1,2,3-CD) Pyrene	Dibenzo (A,H) Anthracene
SB-26 (MAY 2003)	0.5	**920**	**1000**	**1200**	**1300**	**700**	**280J**
	5.0	ND	ND	ND	ND	ND	ND
	10	ND	ND	ND	ND	ND	ND

LEGEND

SB6 ▲ BECHTEL SOIL BORING LOCATION AND DEPTH-DISCRETE GROUNDWATER SAMPLING LOCATION (SB-6 and SB-7) DRILLED NOVEMBER 1996.

SB-1 ● RI SOIL BORING LOCATION AND DEPTH-DISCRETE GROUNDWATER SAMPLING LOCATION (SB-1 through SB-5 AND SB-8 THROUGH SB17).

SB-24 ⊞ SOIL BORING LOCATION DRILLED MAY 2003

ESTIMATED AREA ABOVE CLEANUP LEVEL. DASHED WHERE LATERAL AND/OR VERTICAL EXTENT IS UNDEFINED.

ONLY ANALYTICAL RESULTS FOR ANALYTES WITH CONCENTRATIONS EXCEEDING OR EQUAL TO CALCULATED CLEANUP LEVELS ARE REPRESENTED

	CLEANUP LEVELS
Benzo(a)anthracene	900 µg/kg**
Benzo(b)fluorathene	900 µg/kg**
Benzo(k)fluorathene	900 µg/kg**
Benzo(a)pyrene	900 µg/kg**
Ideno(1,2,3-cd)pyrene	900 µg/kg**
Dibenz(a,h)anthracene	900 µg/kg**

Analytical results in micrograms per kilogram (µg/kg) or parts per million

bgs Below Ground Surface
J Estimated Value
ND not detected at or above laboratory detection limits

Bold – results above calculated cleanup level for PAHs.

*Denotes detection limit above cleanup level.

**See text for calculating cleanup level

N S E W

0 120

Approximate Scale in Feet

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FIGURE 3-5
Soil Sampling Results - PAHs
Drum Processing Area

H:\CADD\CURRENT\ENV-INFRA\COOPER DRUM\20060602\060602_FIG_11_DPA_PAHS.DWG

PLOT BY: ROBERT_P_TAYLOR - Sep 27, 2007 - 7:03:09am
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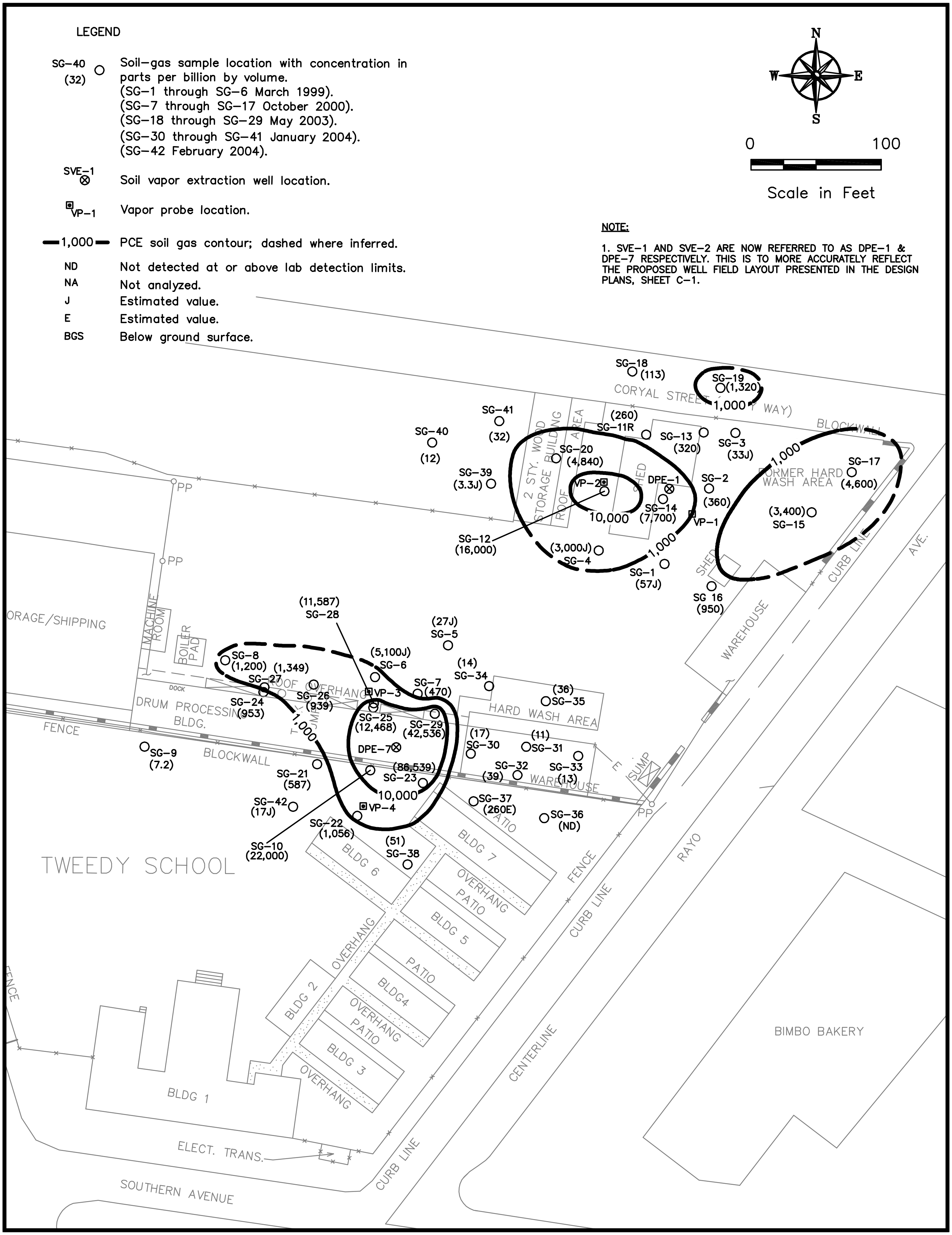
DRAWING: 040605FIG3-6_PCE_10bgs.dwg
DRAWING: J:\Cooper Drum\CADD\Archival\20040605\



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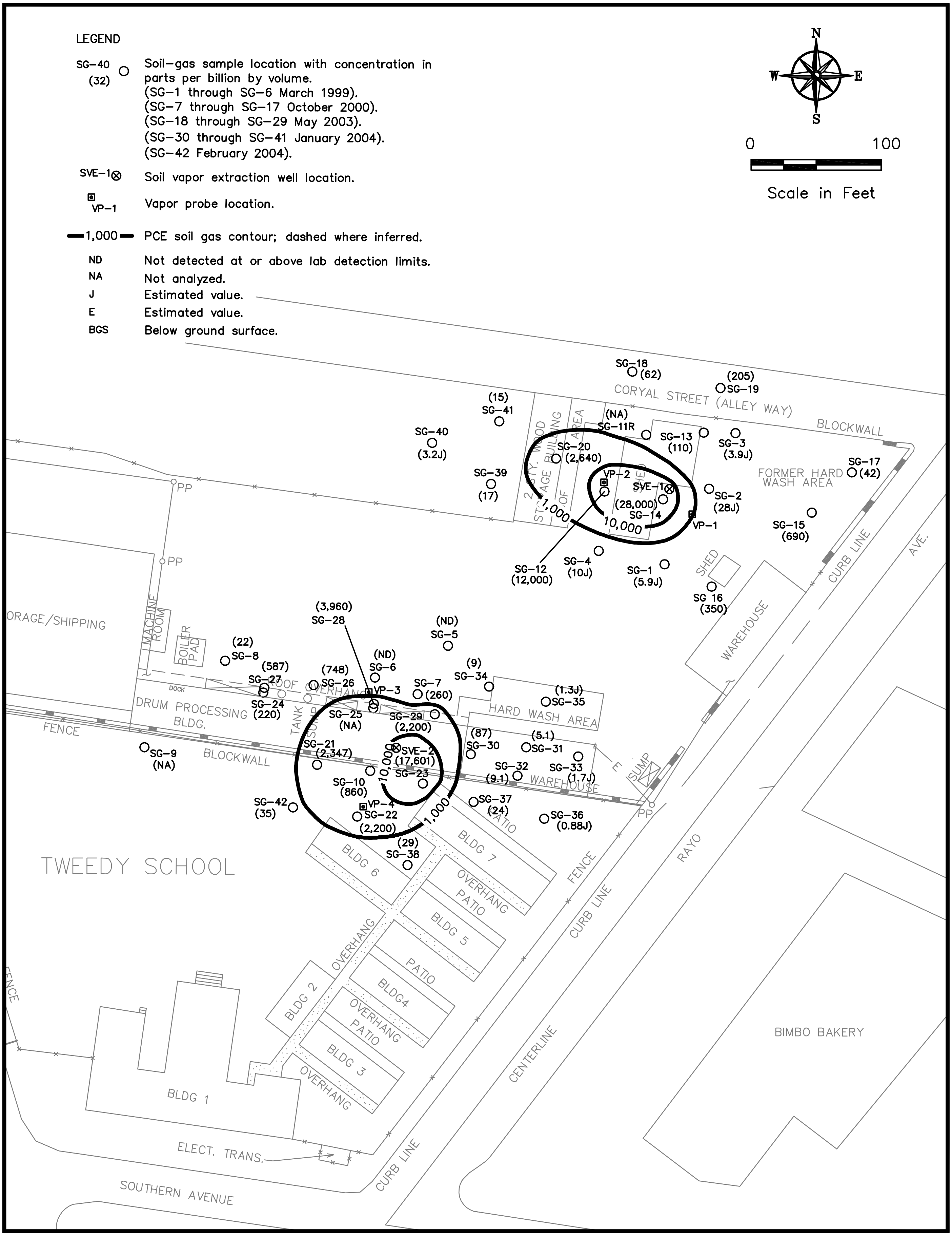
PCE Soil Gas Contours at 10 Feet BGS

Figure 3-6



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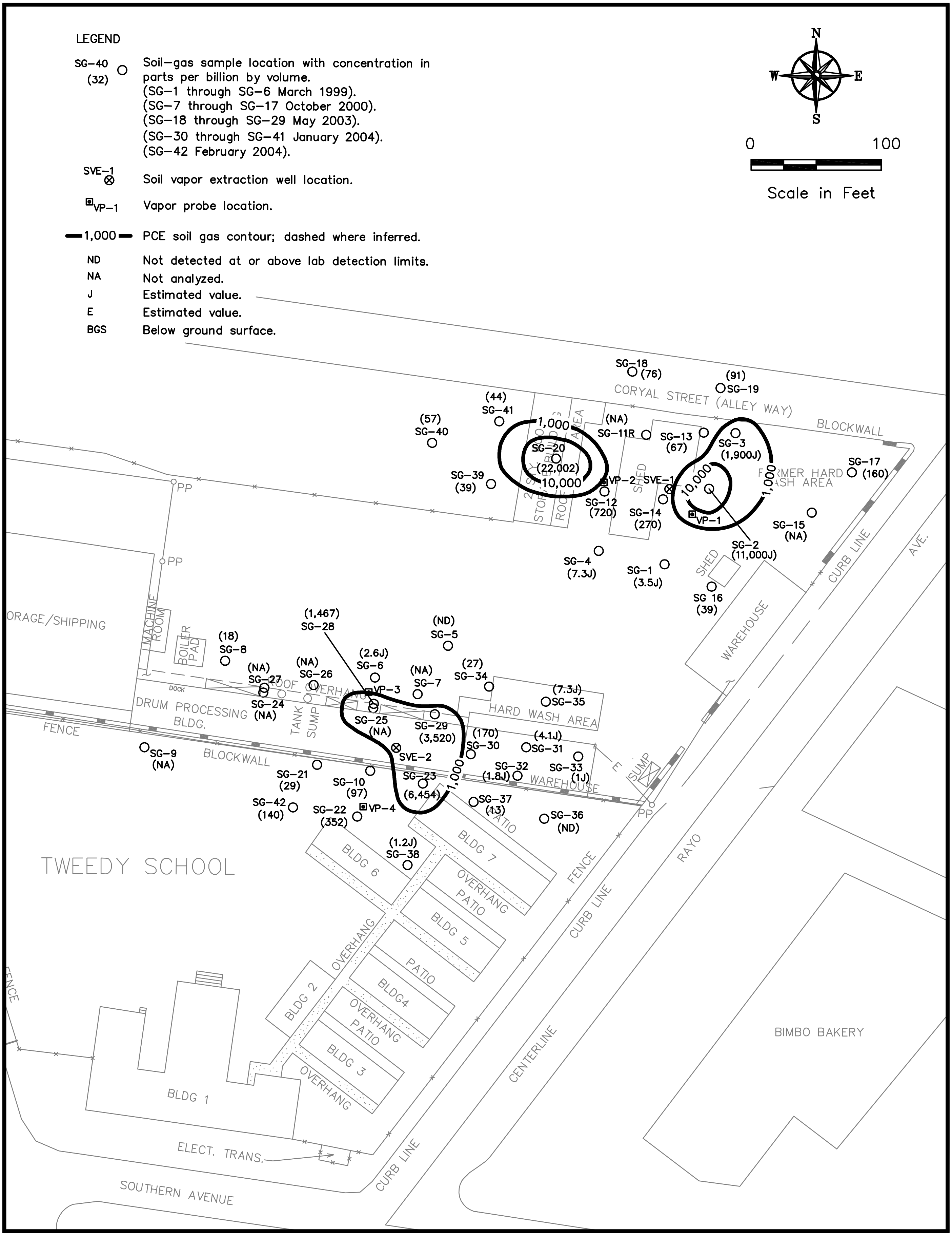
PCE Soil Gas Contours at 20 Feet BGS

Figure 3-7



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XREFS: L:\Projects\Cooper\20020212\xrefbase.dwg

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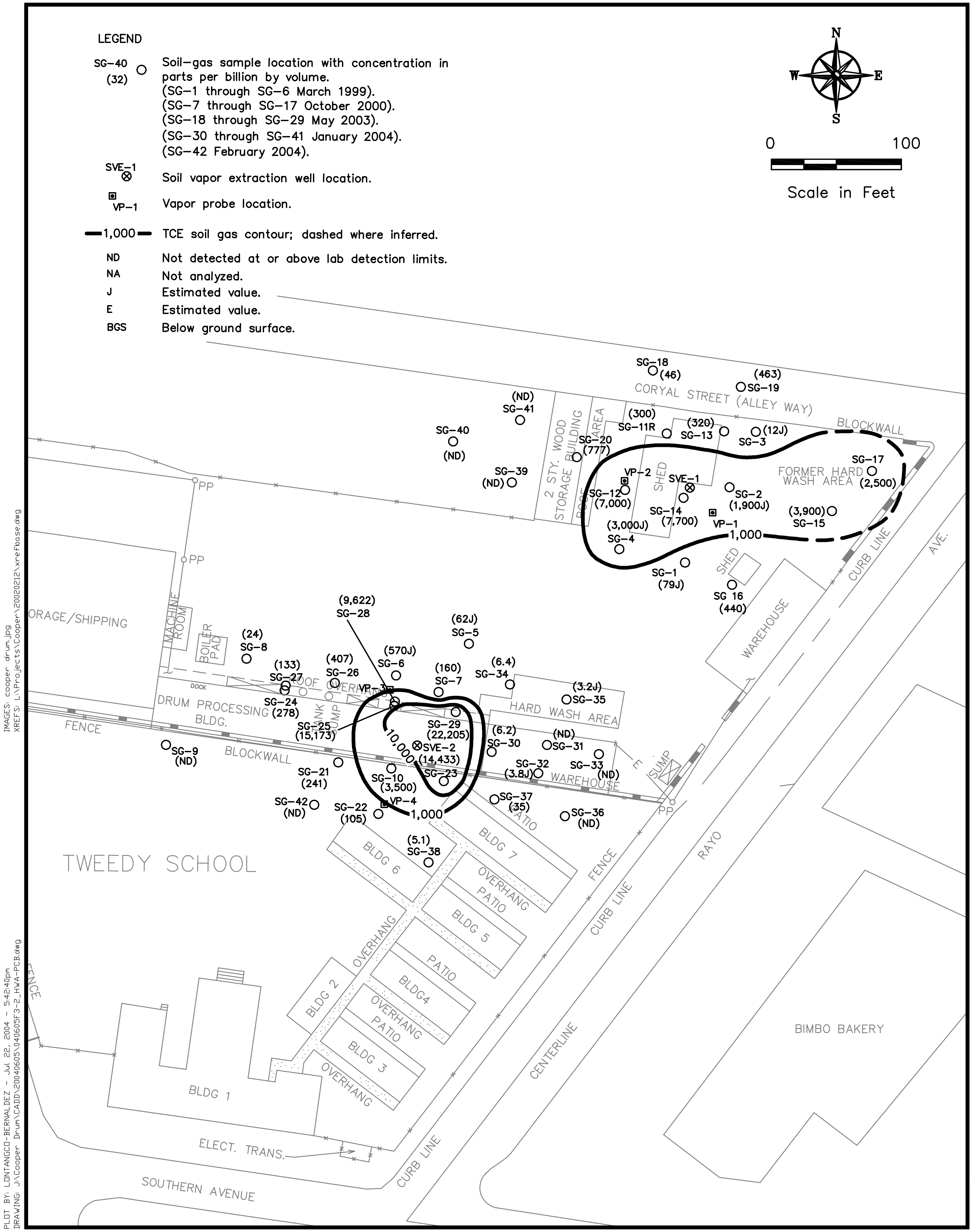
PCE Soil Gas Contours at 30 Feet BGS

Figure 3-8



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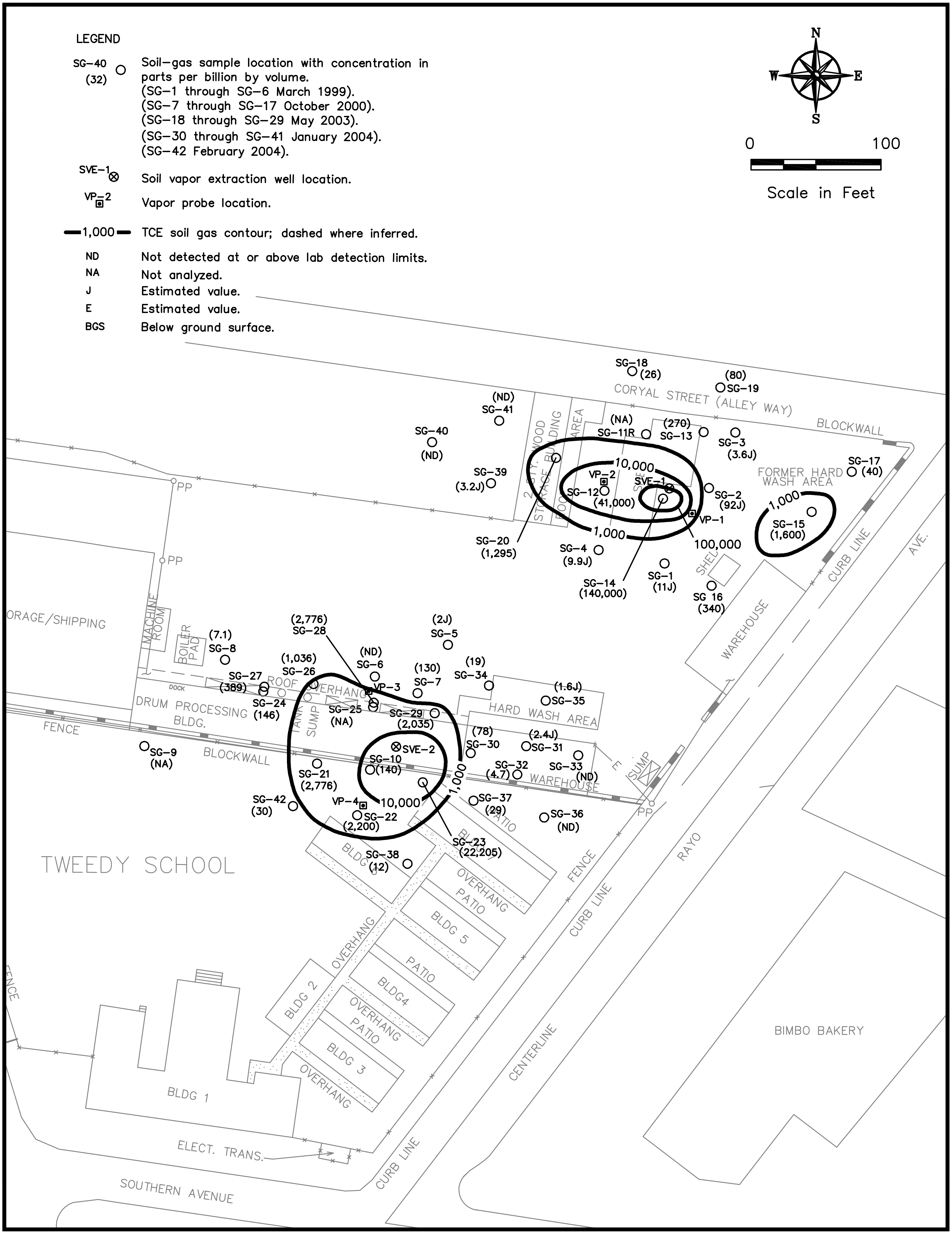
TCE Soil Gas Contours at 10 Feet BGS

Figure 3-9



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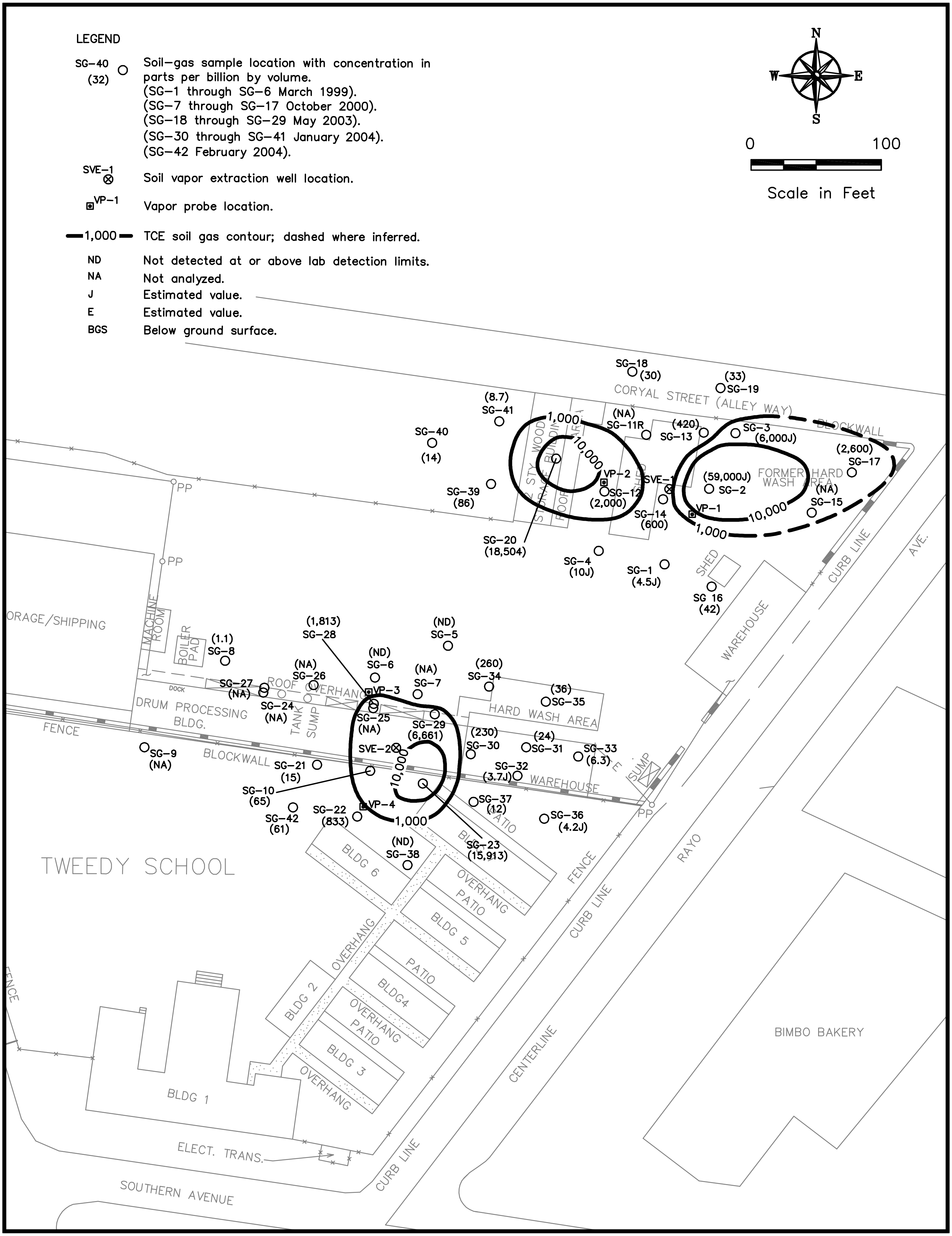
TCE Soil Gas Contours at 20 Feet BGS

Figure 3-10



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PLOT BY: LONTANGCO-BERNALDEZ - Jul 22, 2004 - 5:42:40pm
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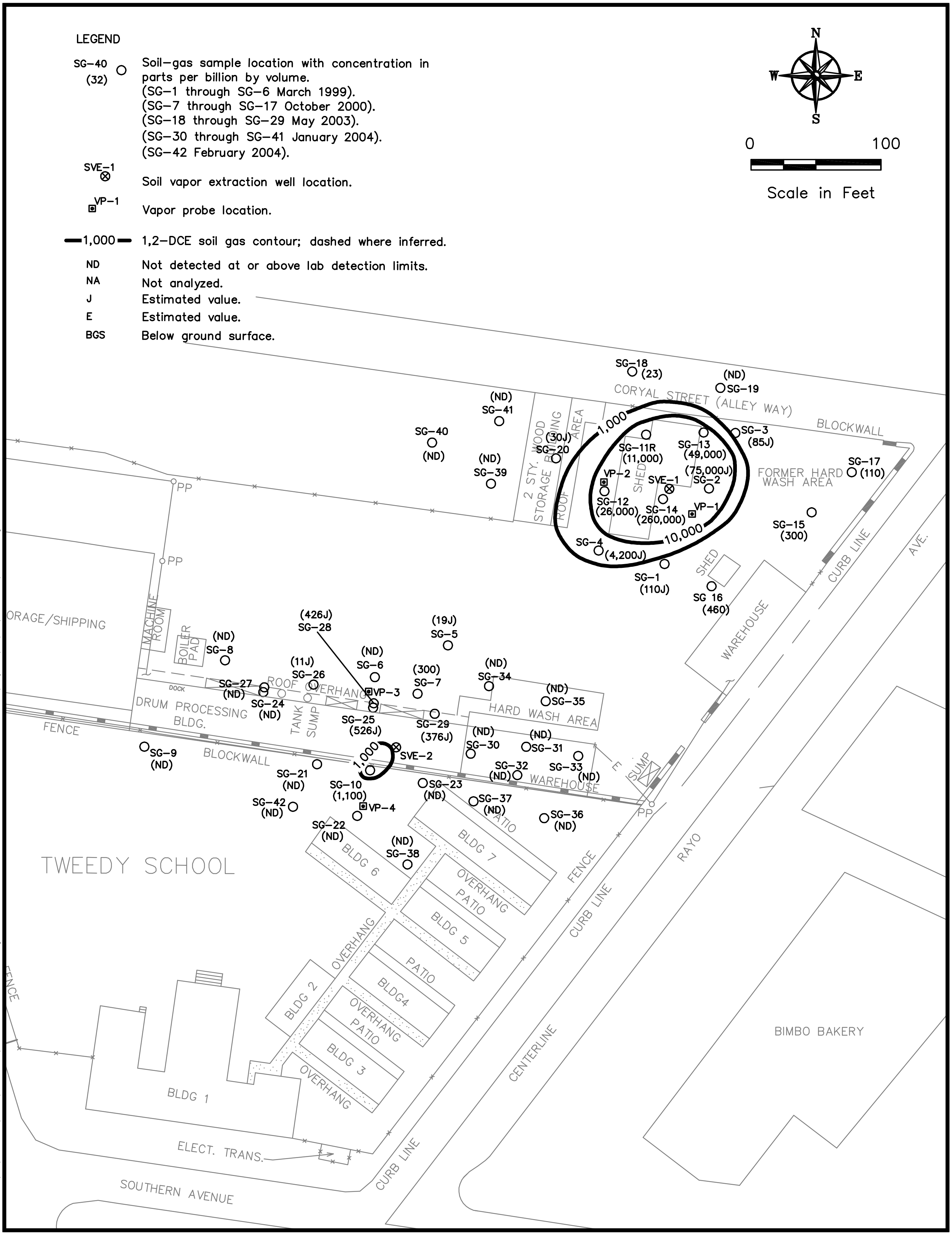
TCE Soil Gas Contours at 30 Feet BGS

Figure 3-11



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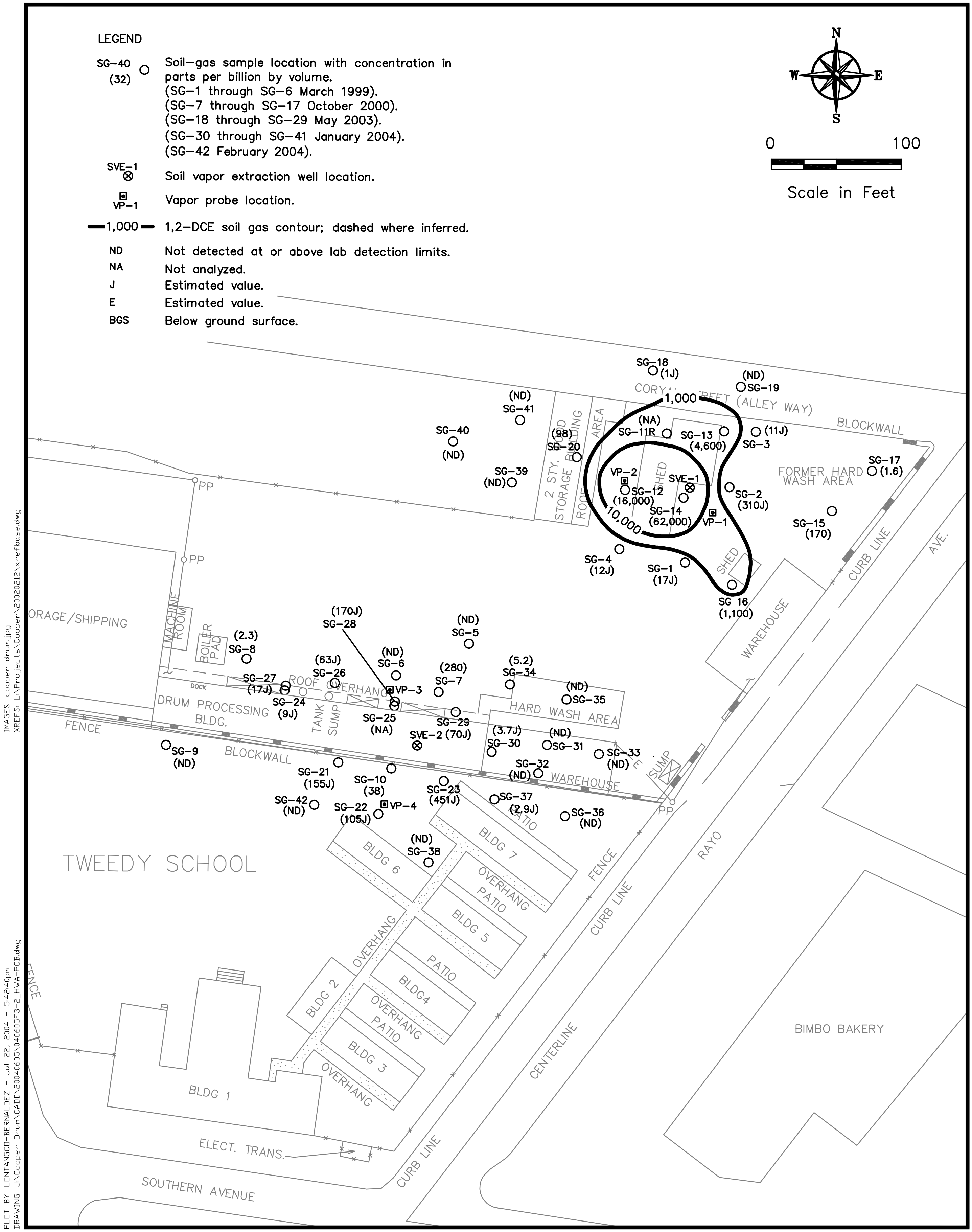
1,2-DCE Soil Gas Contours at 10 Feet BGS

Figure 3-12



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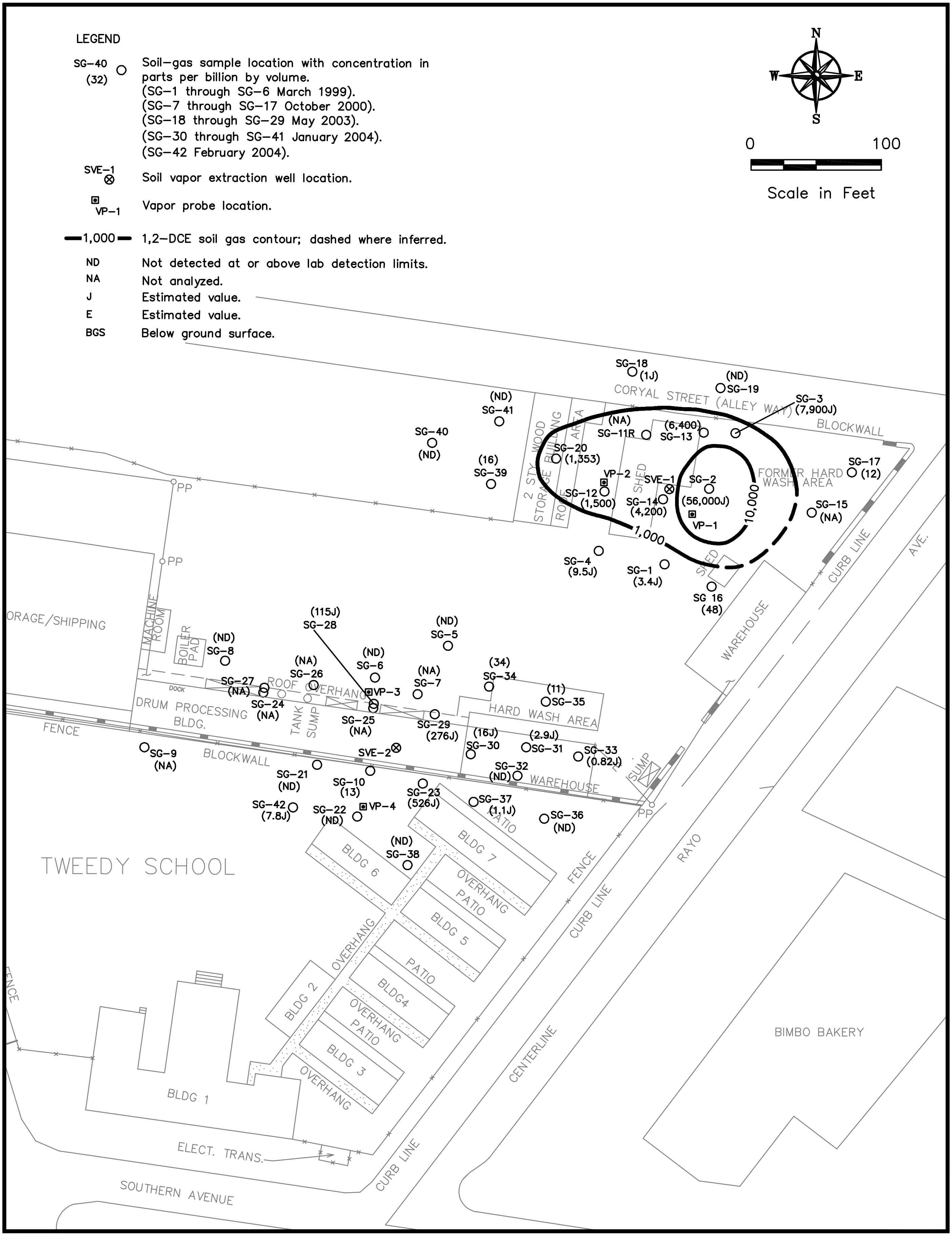
1,2-DCE Soil Gas Contours at 20 Feet BGS

Figure 3-13



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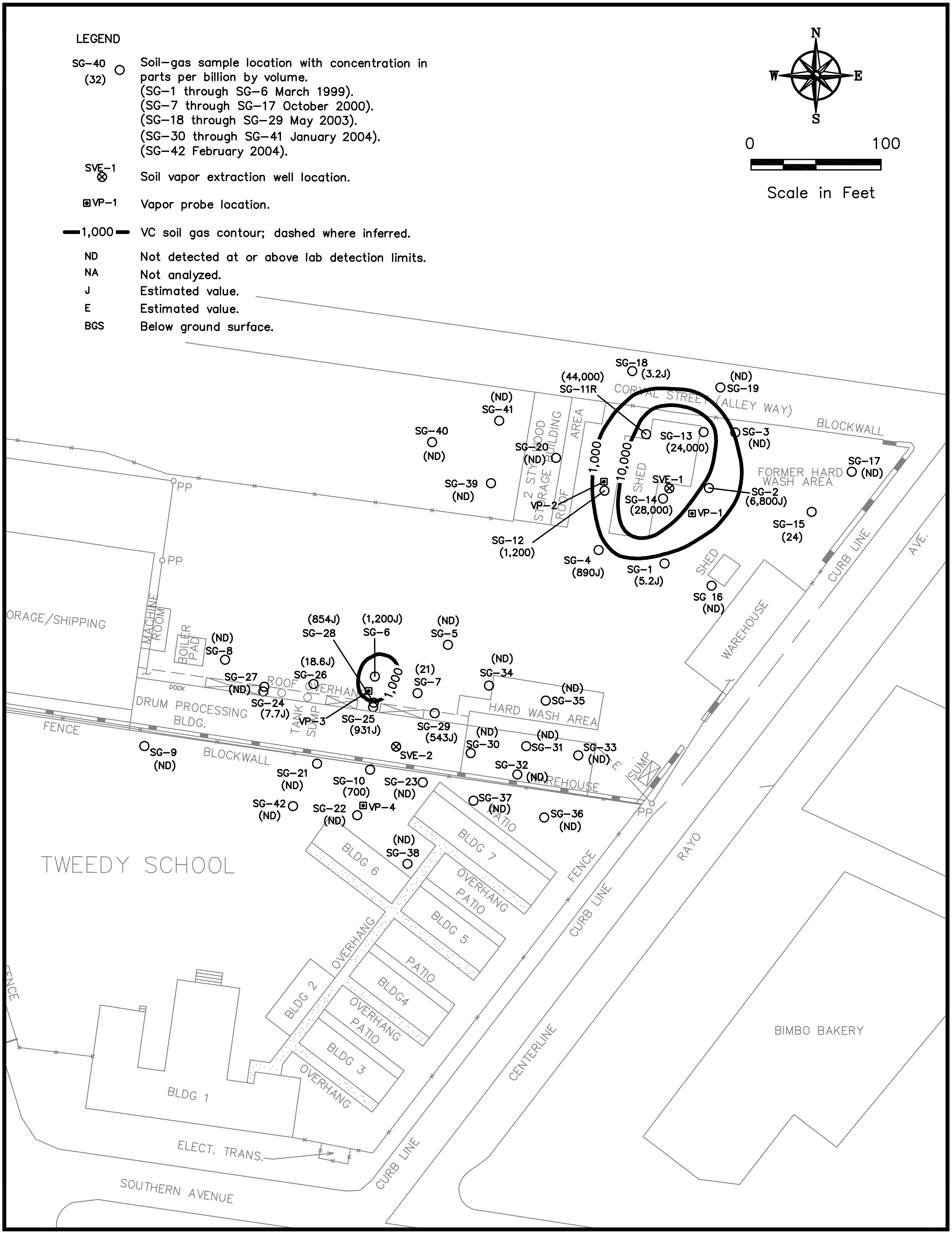
1,2-DCE Soil Gas Contours at 30 Feet BGS

Figure 3-14



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PLOT BY: LONTANGCO-BERNALDEZ – Jul 22, 2004 – 5:42:40pm
DRAWING: J:\Cooper Drum\CADD\20040605\040605F3-2_HWA-PCB.dwg

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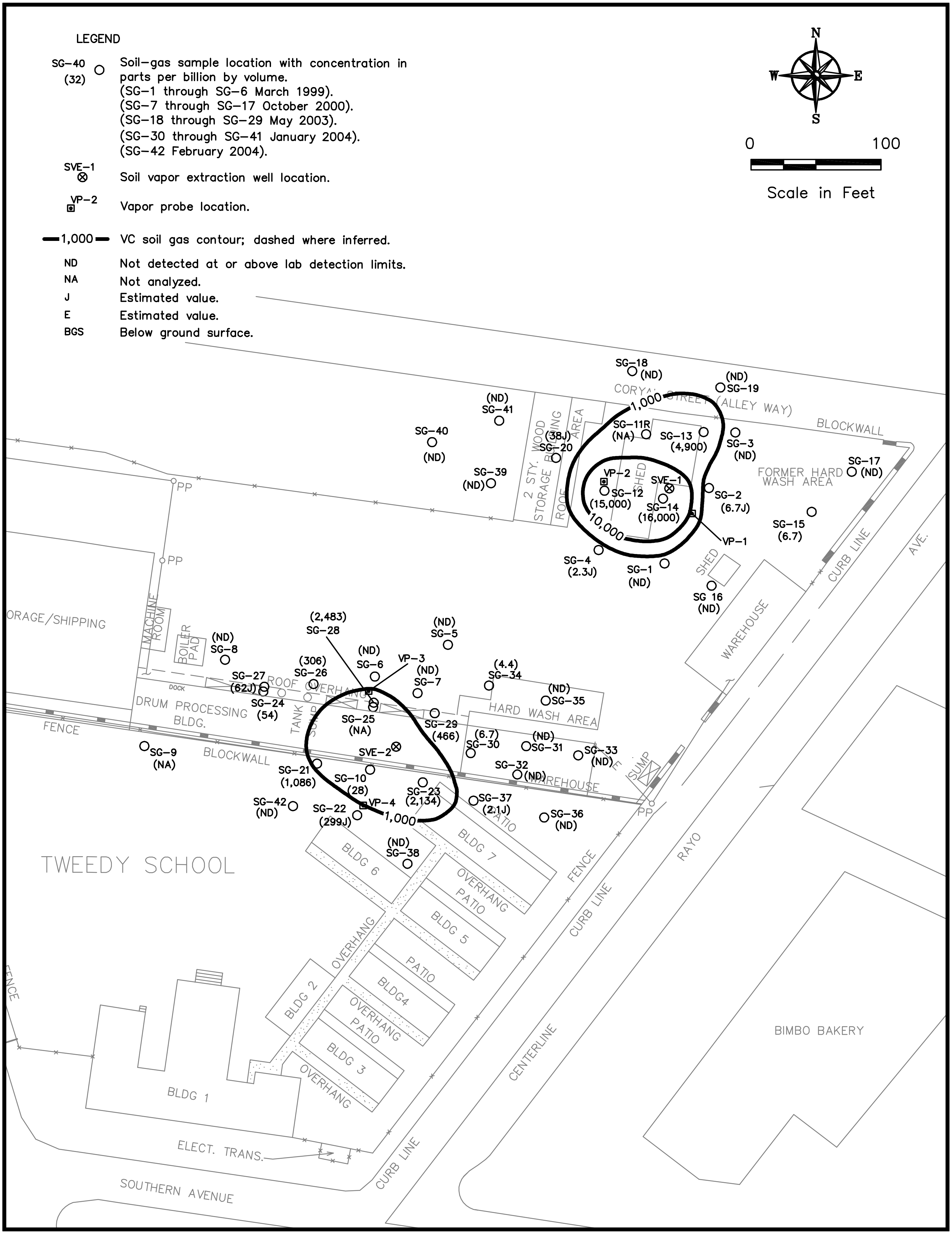
Vinyl Chloride Soil Gas Contours at 10 Feet BGS

Figure 3-15



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PLOT BY: LONTANGCO-BERNALDEZ - Jul 22, 2004 - 5:42:40pm
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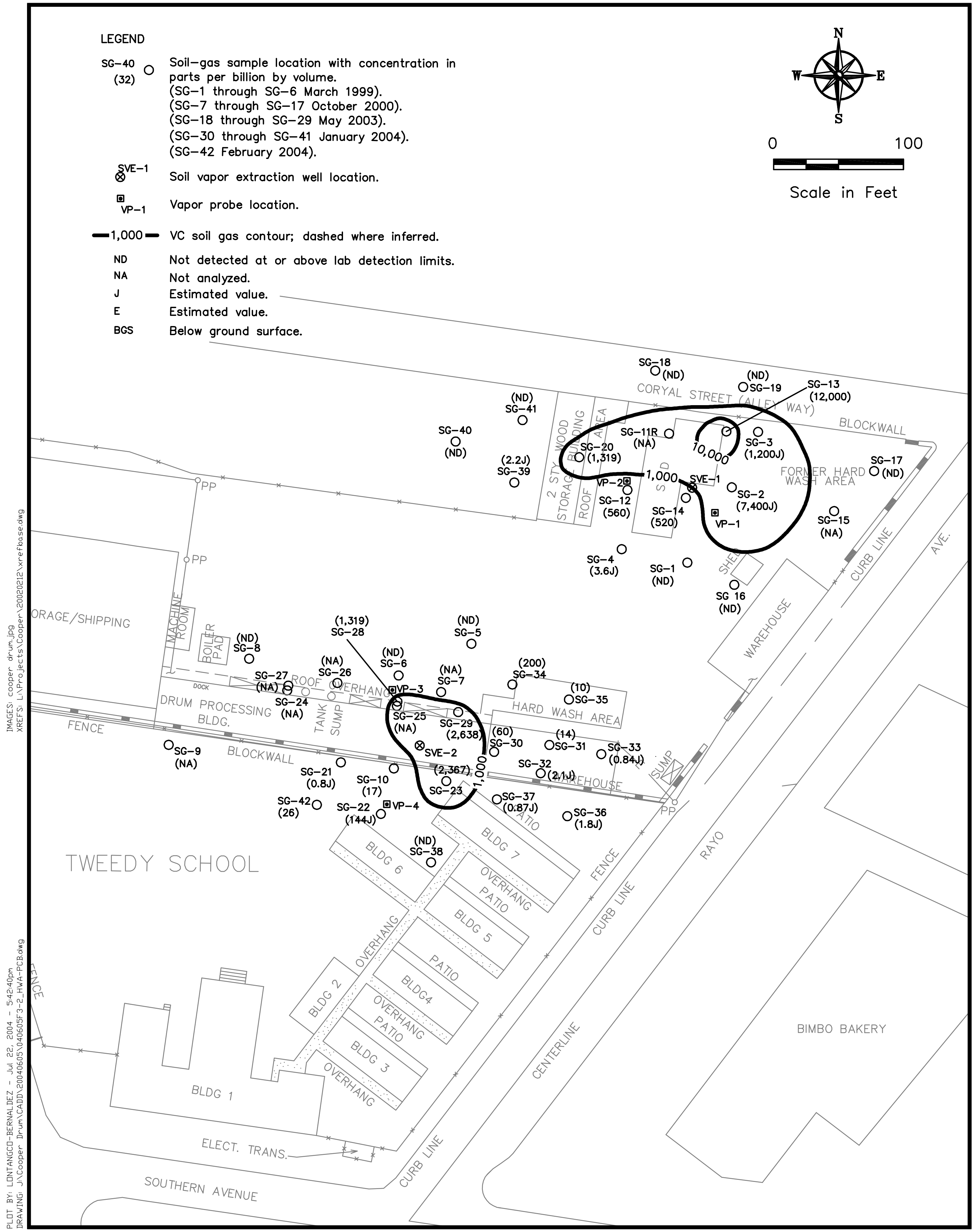
Vinyl Chloride Soil Gas Contours at 20 Feet BGS

Figure 3-16



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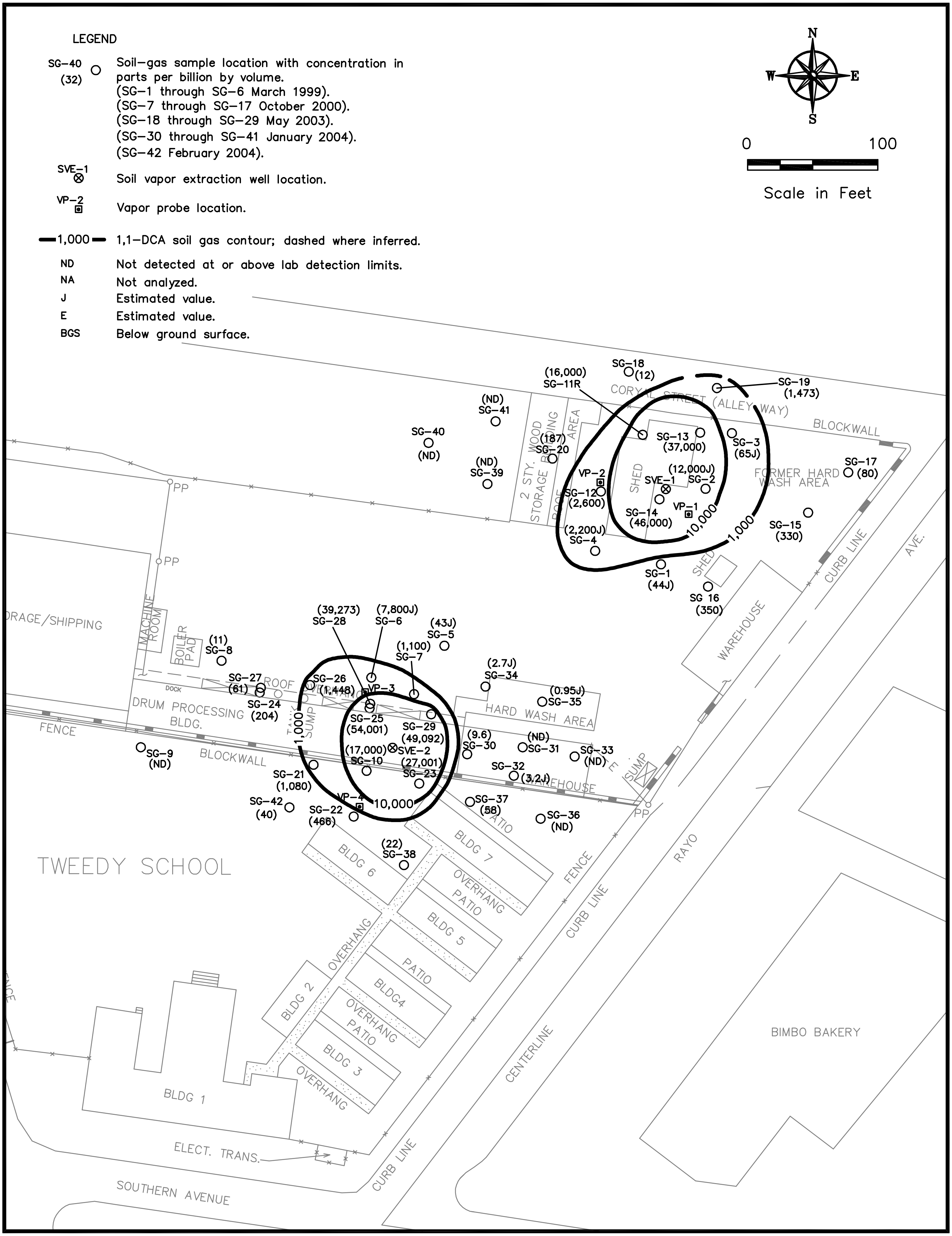
Vinyl Chloride Soil Gas Contours at 30 Feet BGS

Figure 3-17



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PLOT BY: LONTANGCO-BERNALDEZ - Jul 22, 2004 - 5:42:40pm
DRAWING: J:\Cooper Drum\CADD\20040605\040605F3-2_HWA-PCB.dwg

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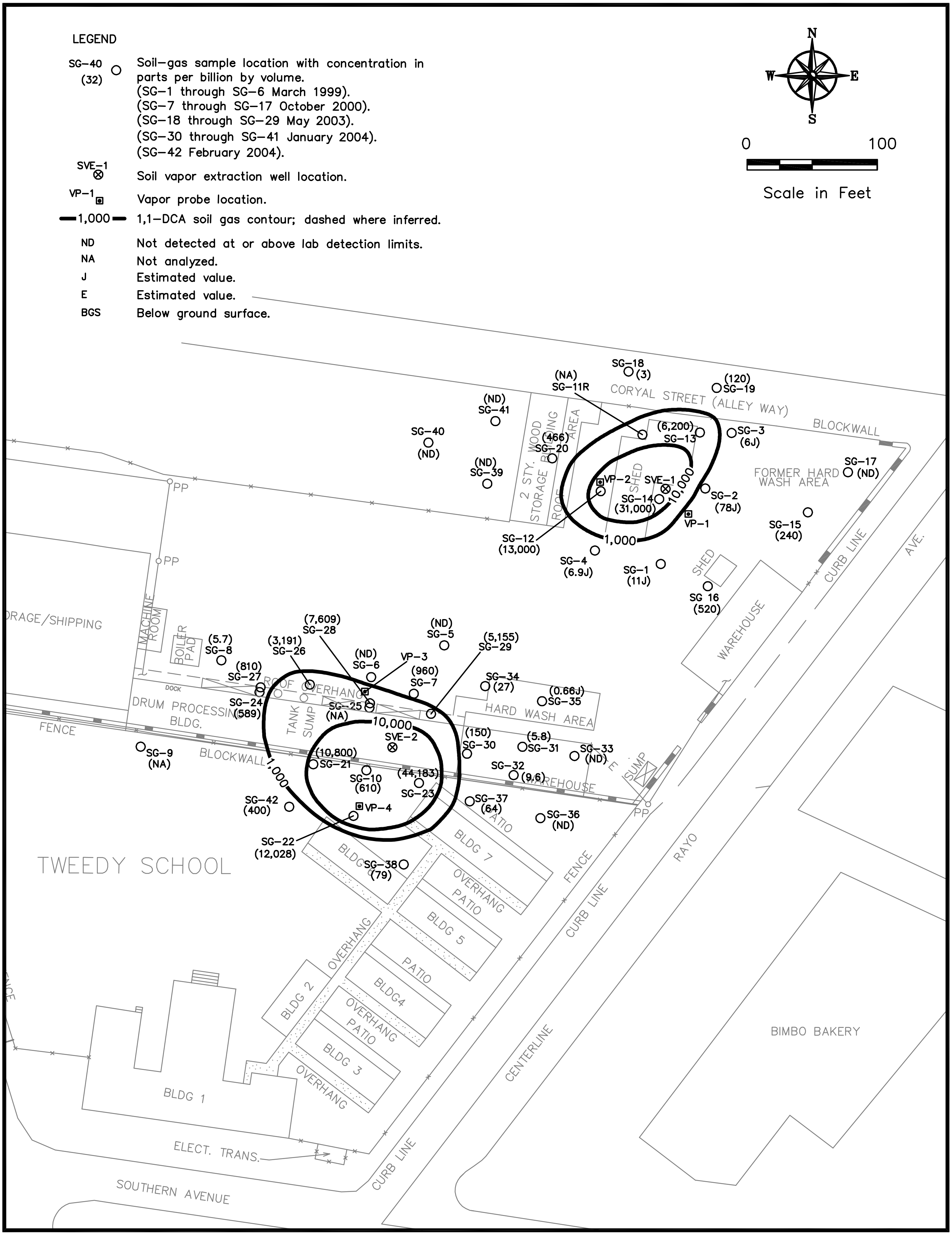
1,1-DCA Soil Gas Contours at 10 Feet BGS

Figure 3-18



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PLOT BY: LONTANGCO-BERNALDEZ - Jul 22, 2004 - 5:42:40pm
DRAWING: J:\Cooper Drum\CADD\20040605\040605F3-2_HWA-PCB.dwg

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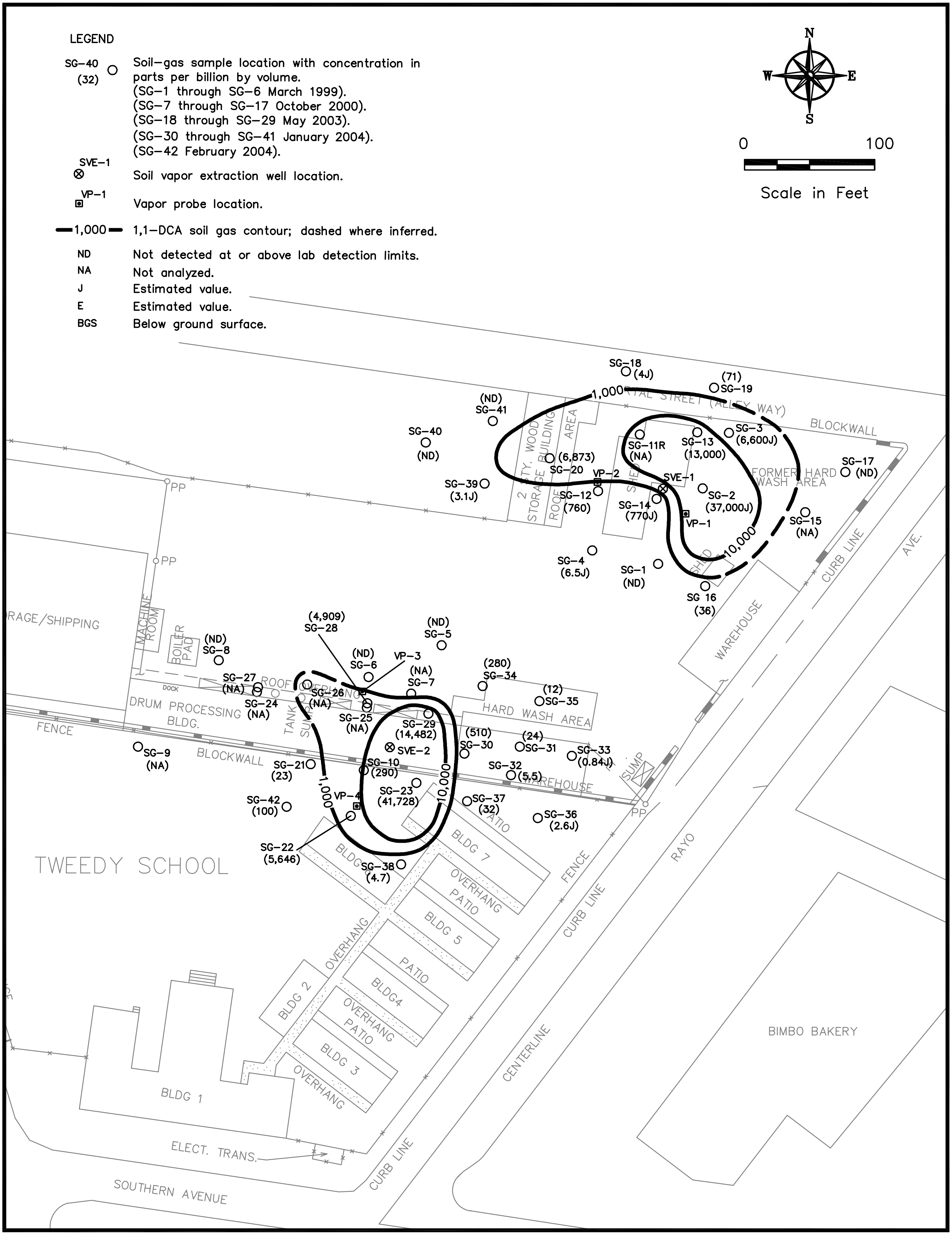
1,1-DCA Soil Gas Contours at 20 Feet BGS

Figure 3-19



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XREFS: L:\Projects\Cooper\20020212\xrefbase.dwg

PLOT BY: LONTANGCO-BERNALDEZ - Jul 22, 2004 - 5:42:40pm
DRAWING: J:\Cooper Drum\CADD\20040605\040605F3-2_HWA-PCB.dwg

URS

1,1-DCA Soil Gas Contours at 30 Feet BGS

Figure 3-20

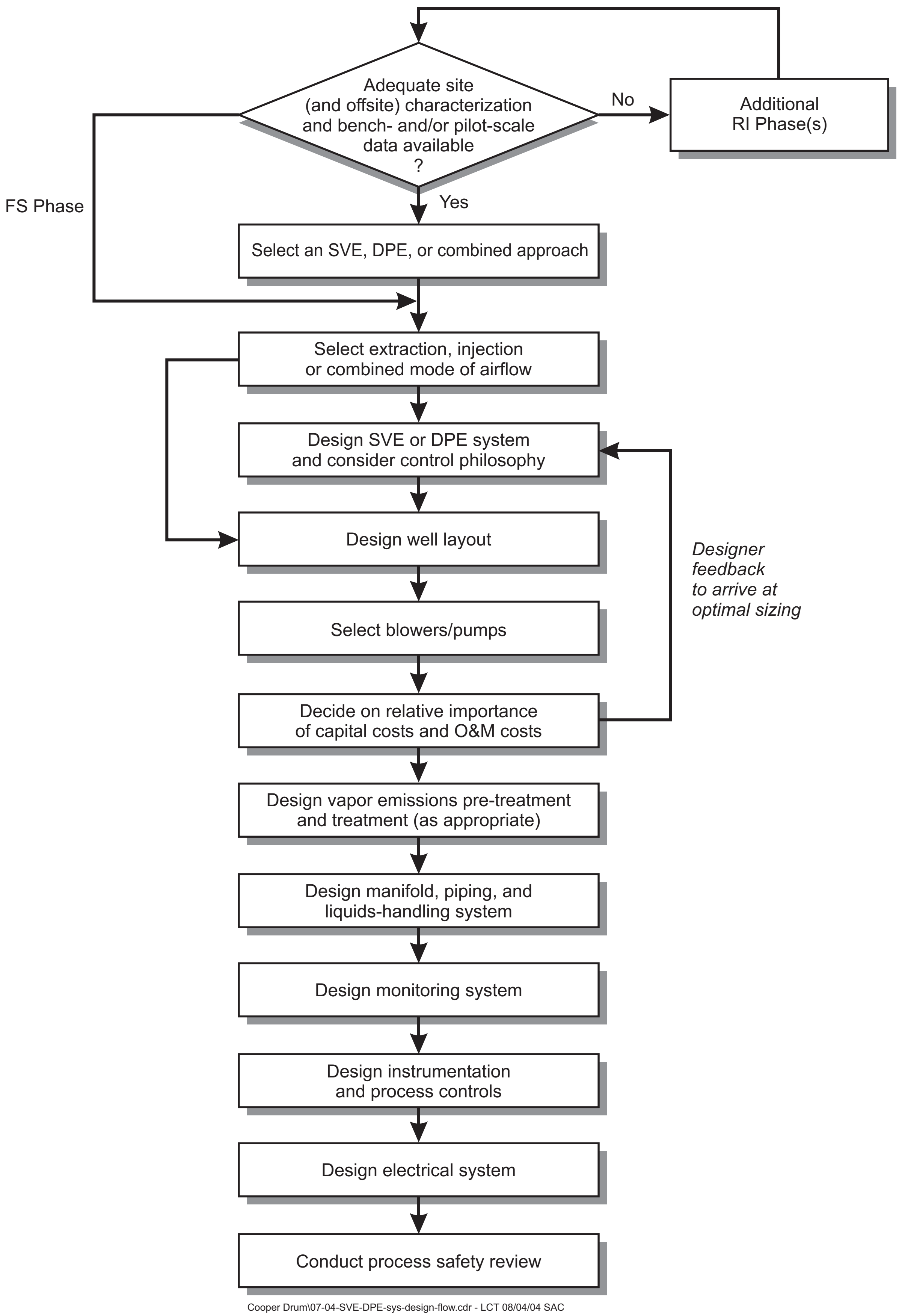


Figure 3-21. Task Flow for SVE/DPE System Design

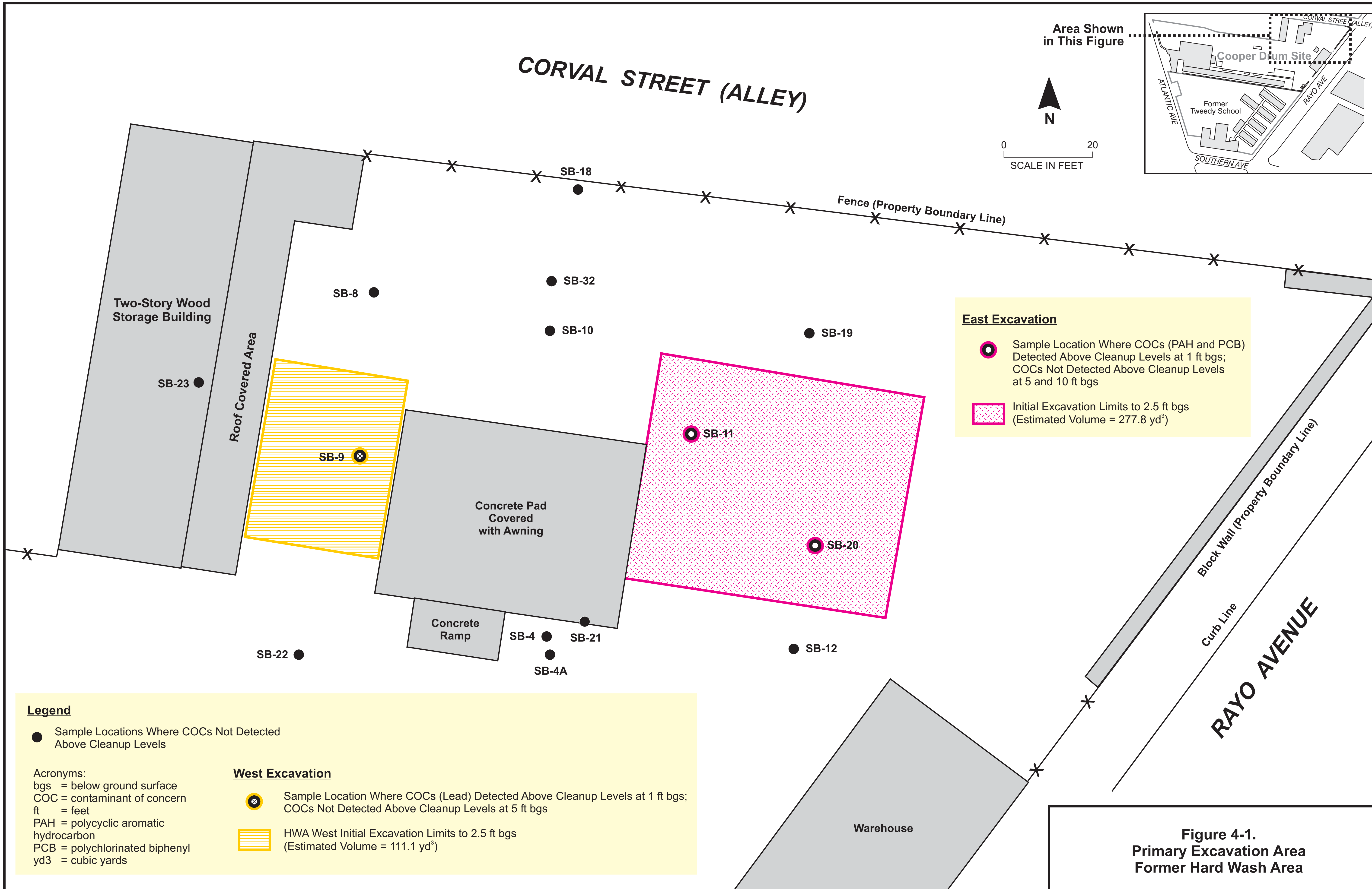


Figure 4-1. Primary Excavation Area Former Hard Wash Area

07-04-Cooper-Drum-HWA-site-plan.cdr - LCT 11.27.06 SAC

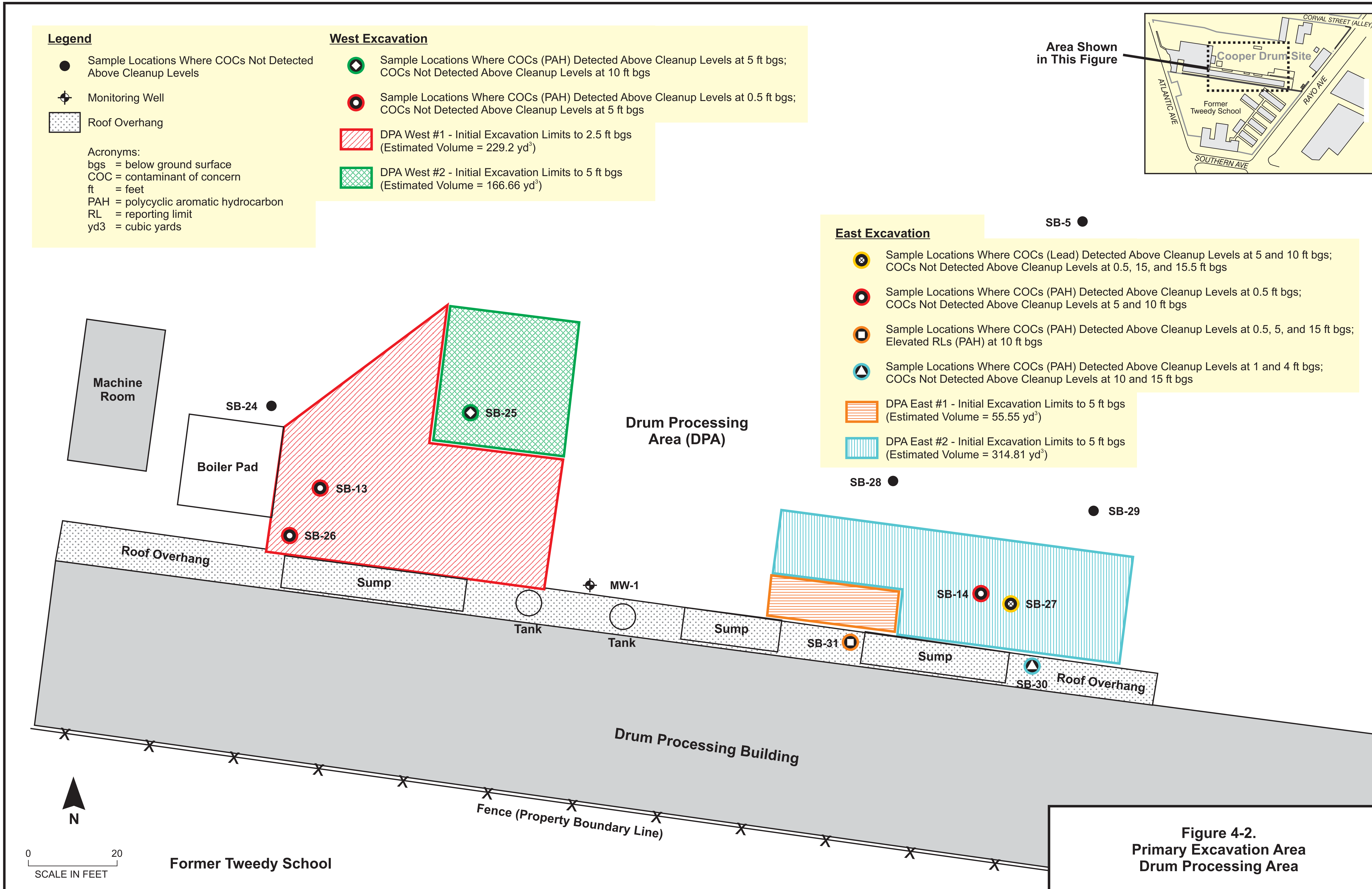


Figure 4-2.
Primary Excavation Area
Drum Processing Area

10-06-Cooper-Drum-DPA-site-plan.cdr - LCT 11.27.06 SAC

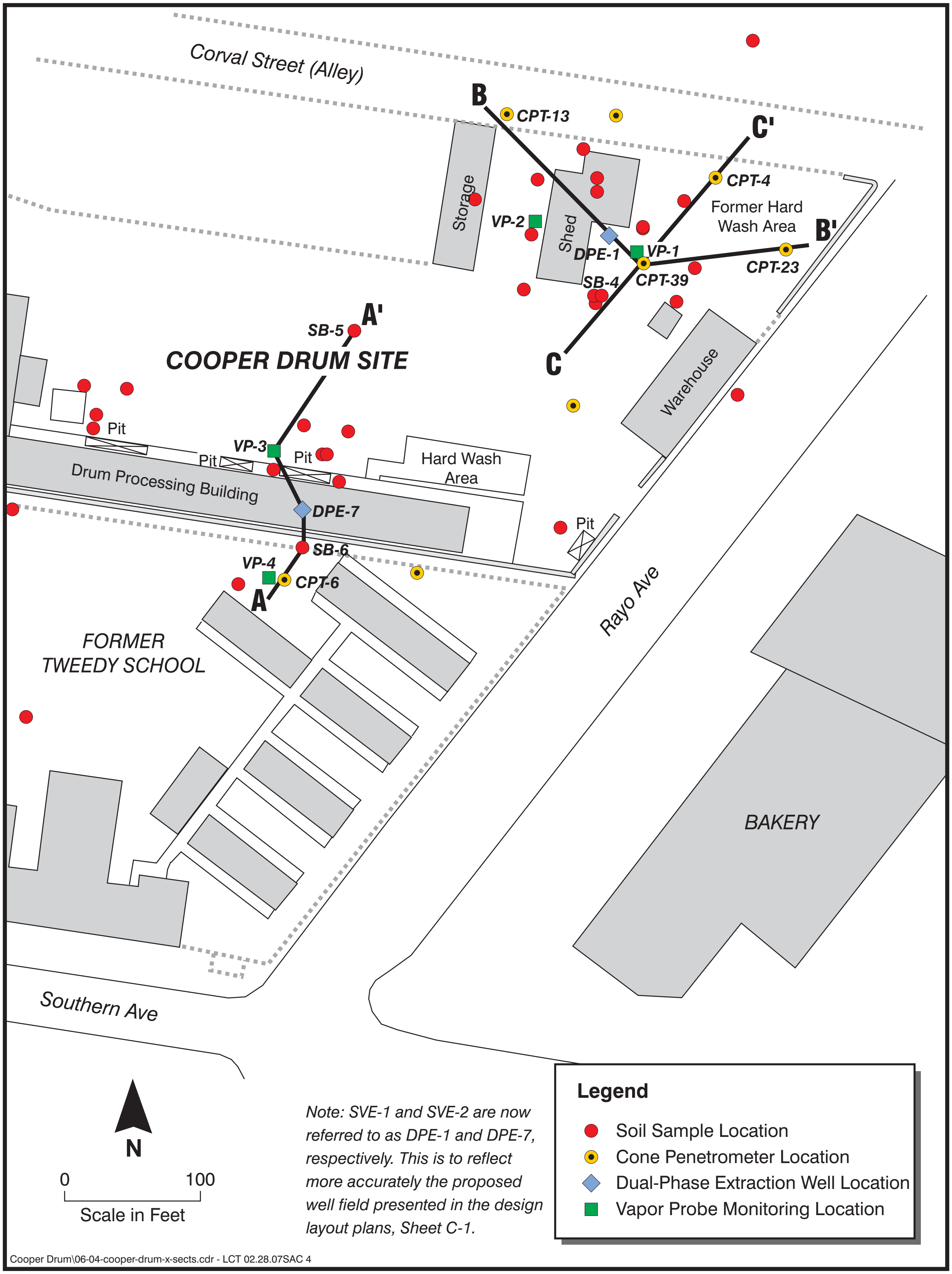


Figure 5-1. Location of Cross-Sections

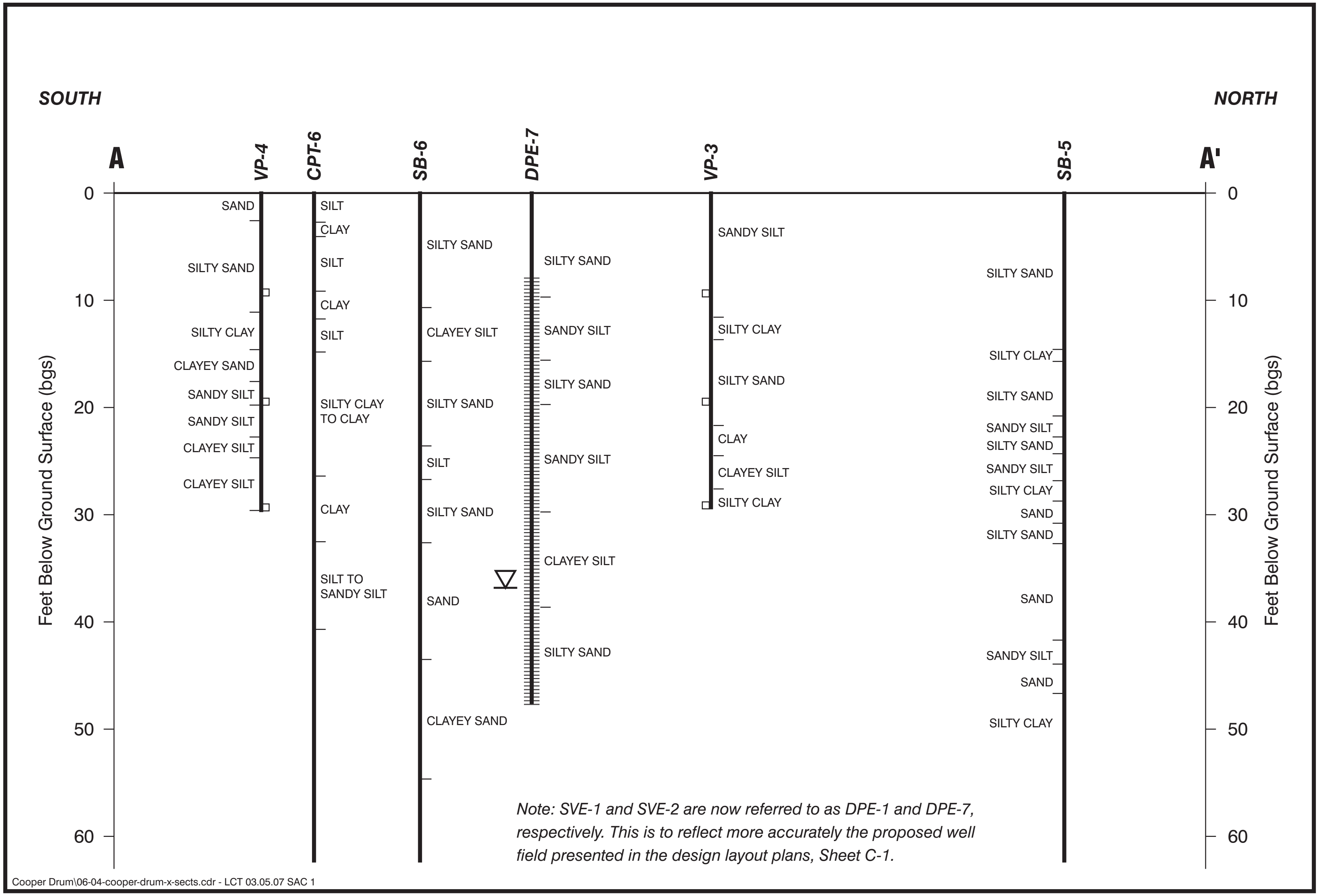


Figure 5-2. A-A' Cross-Section, Drum Processing Area

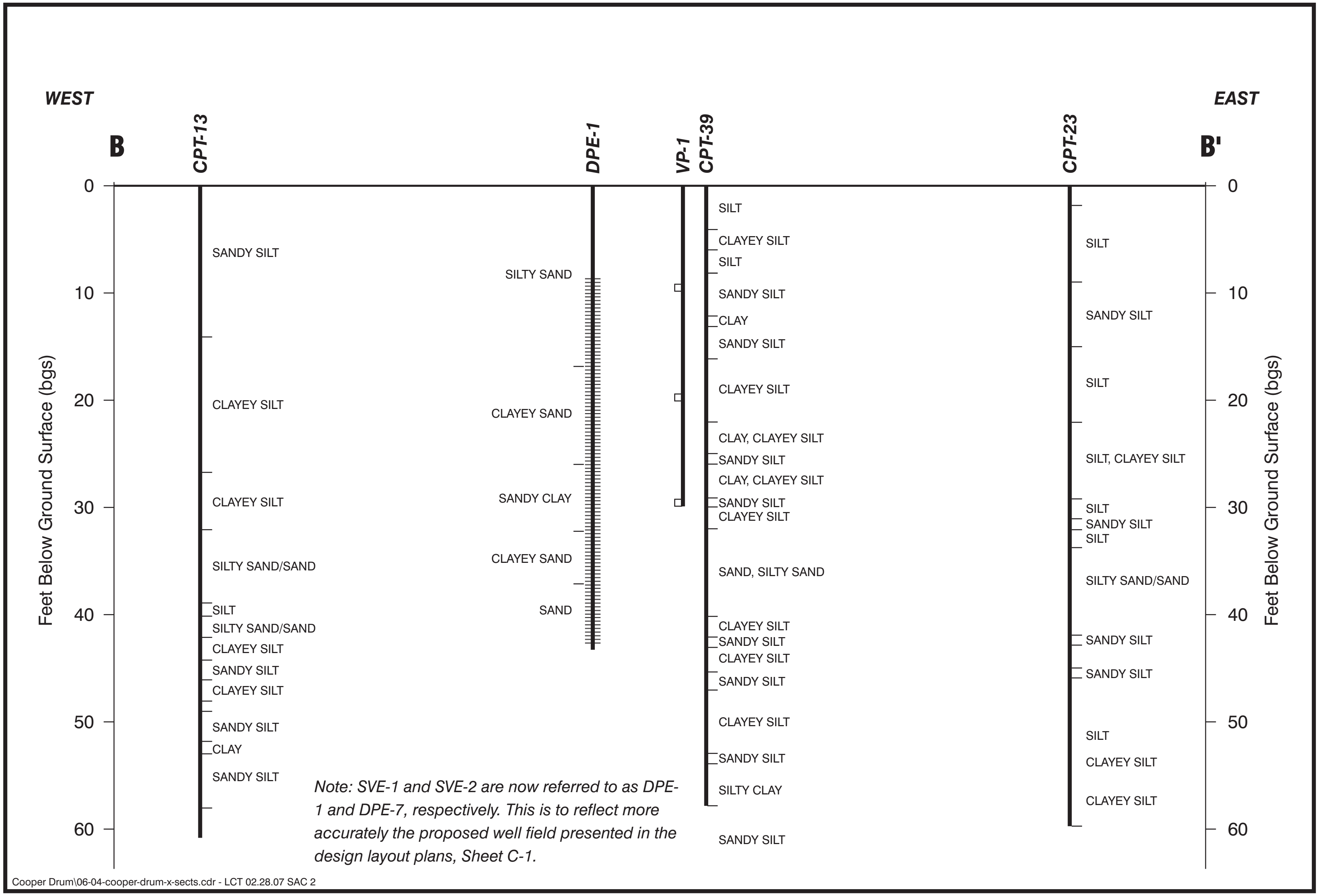


Figure 5-3. B-B' Cross-Section, Former Hard-Wash Area

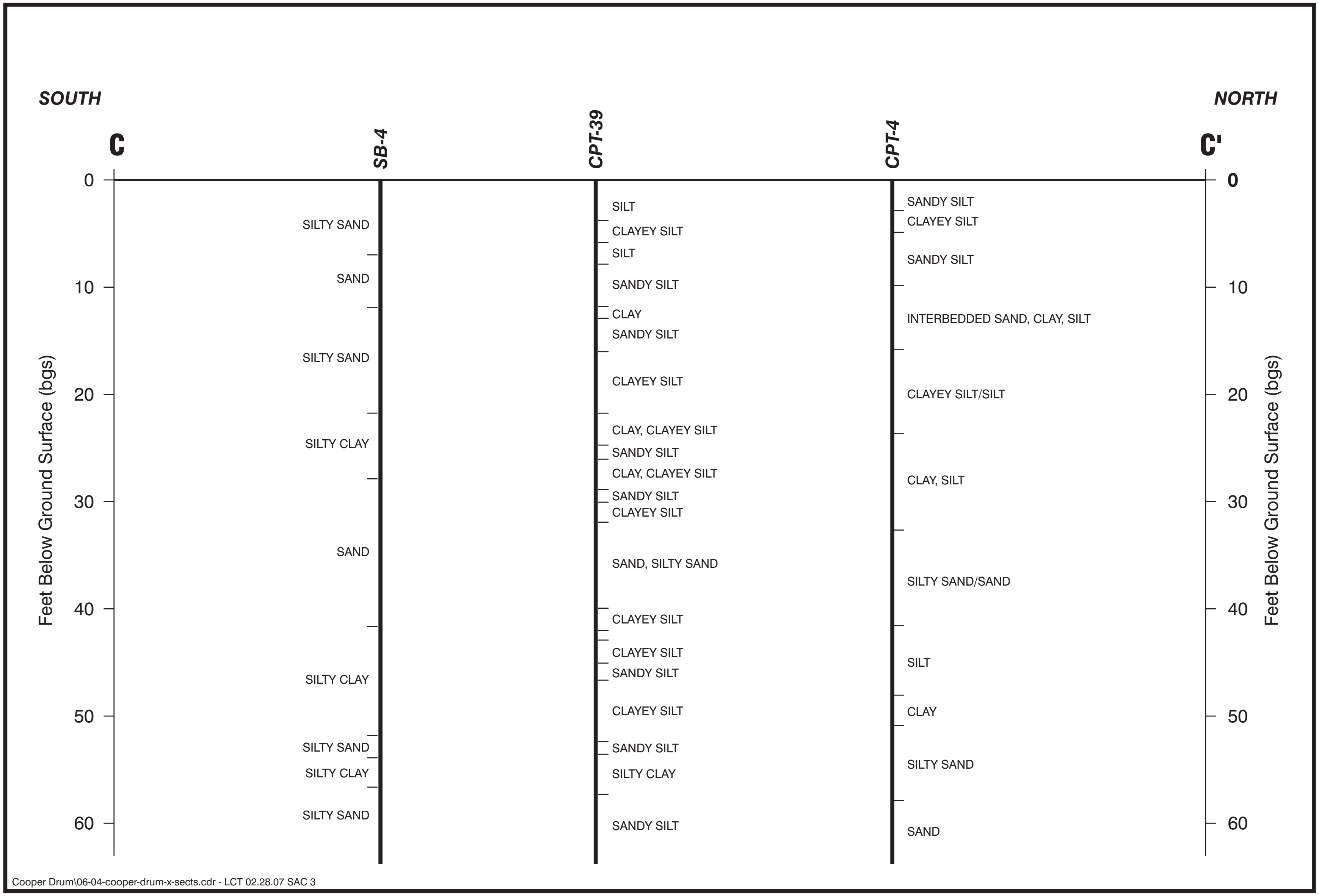


Figure 5-4. C-C' Cross-Section, Former Hard-Wash Area

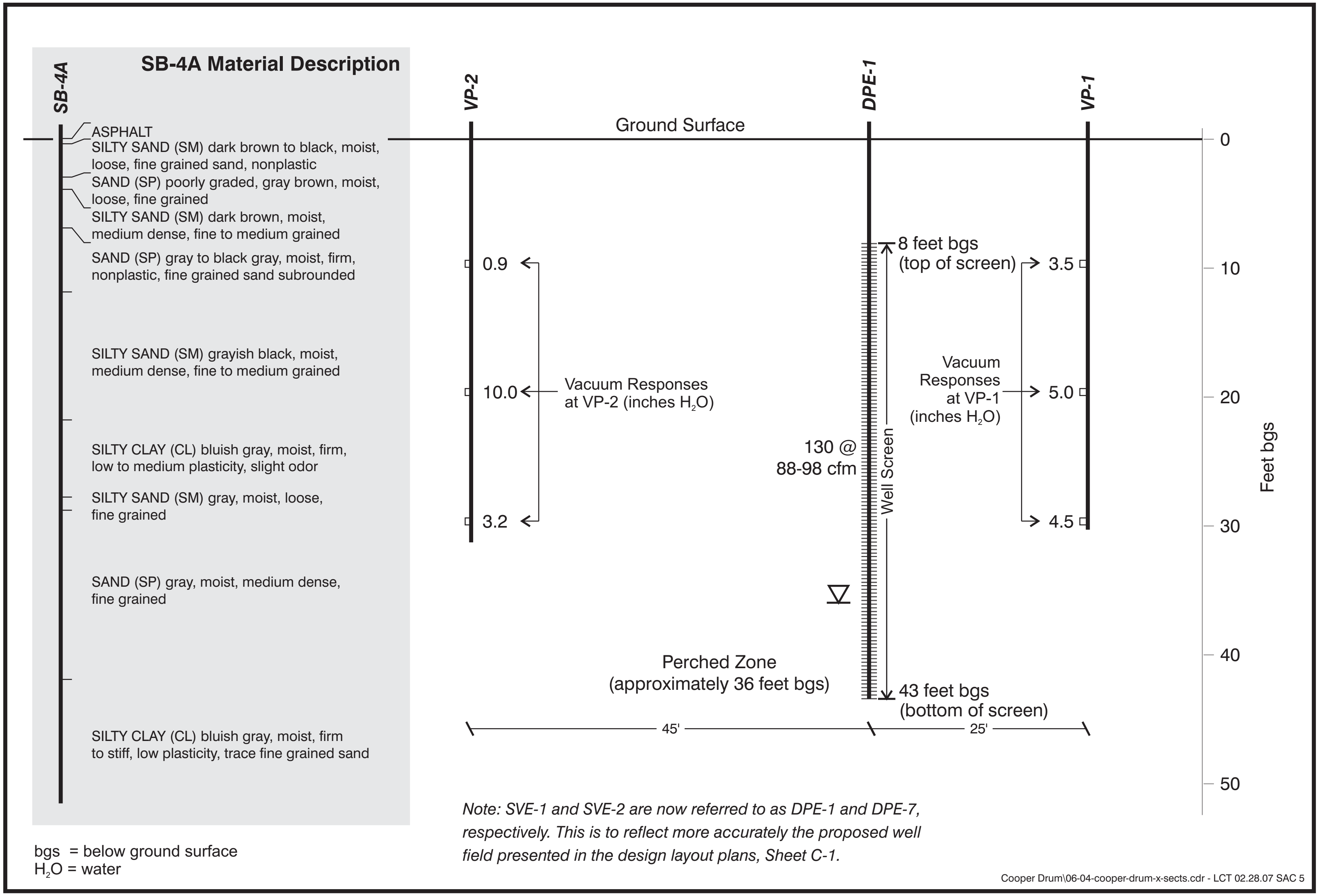


Figure 5-5. Soil Vapor Extraction Test (Hard-Wash Area) Vacuum Response at End of Test (Inches H_20)

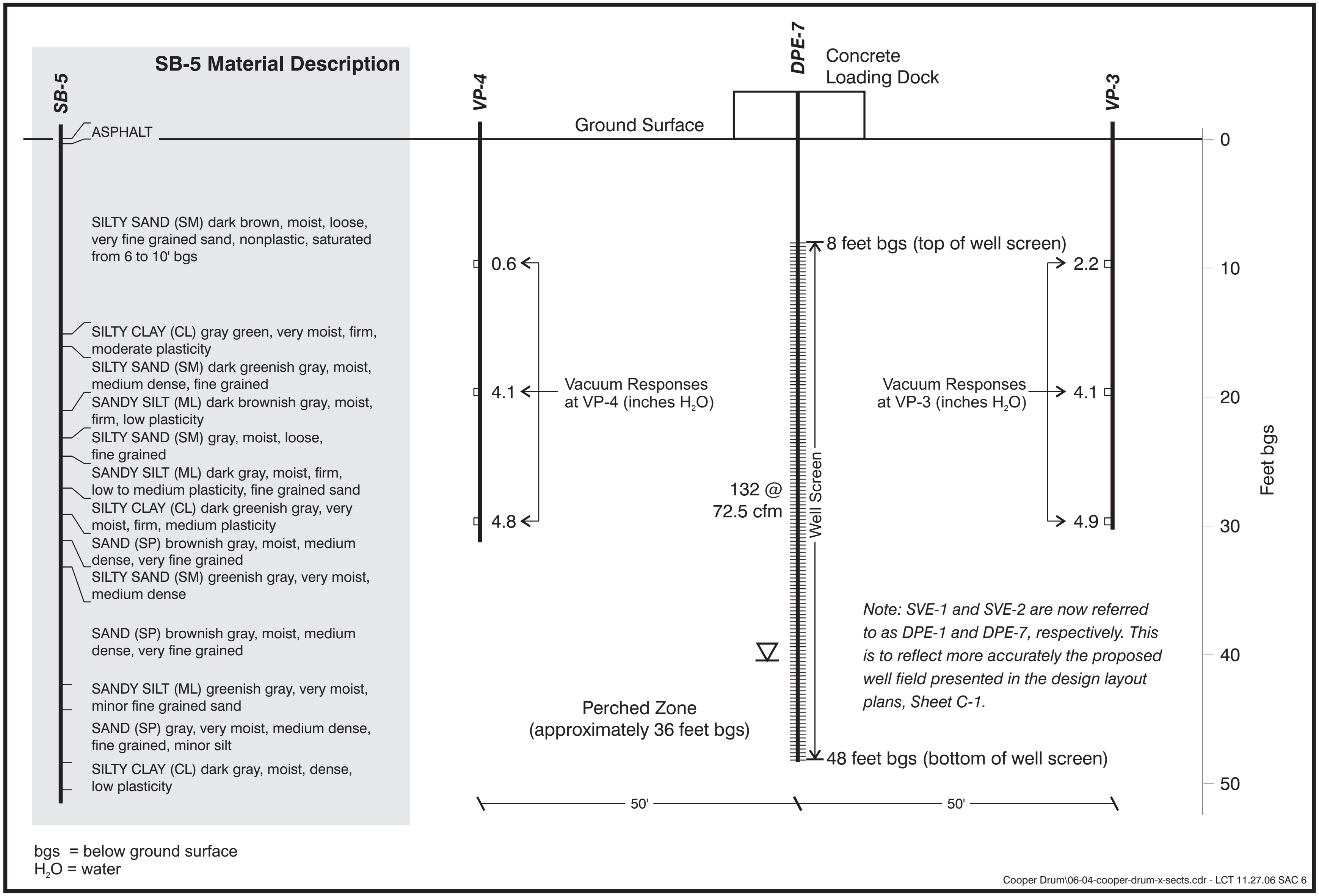
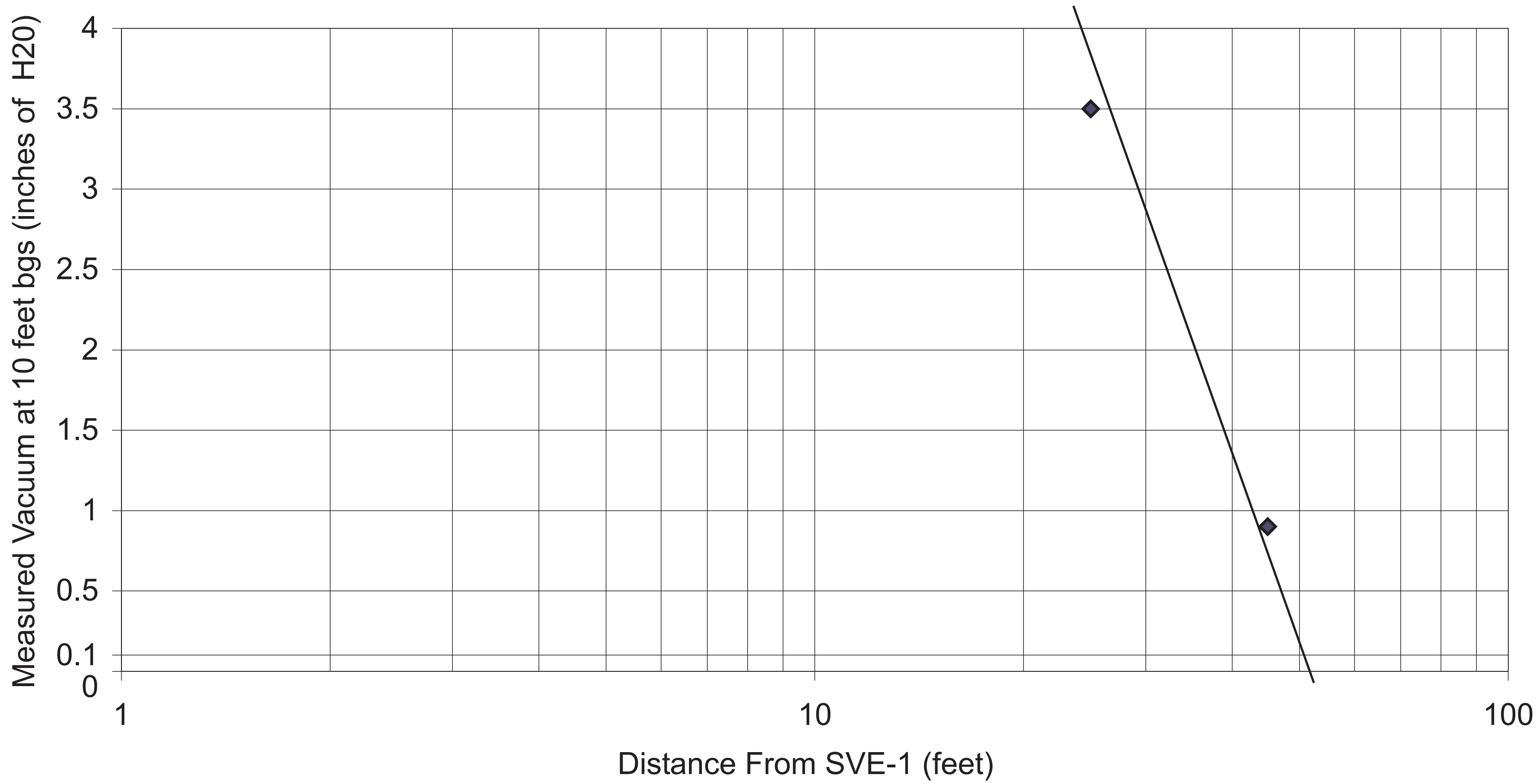


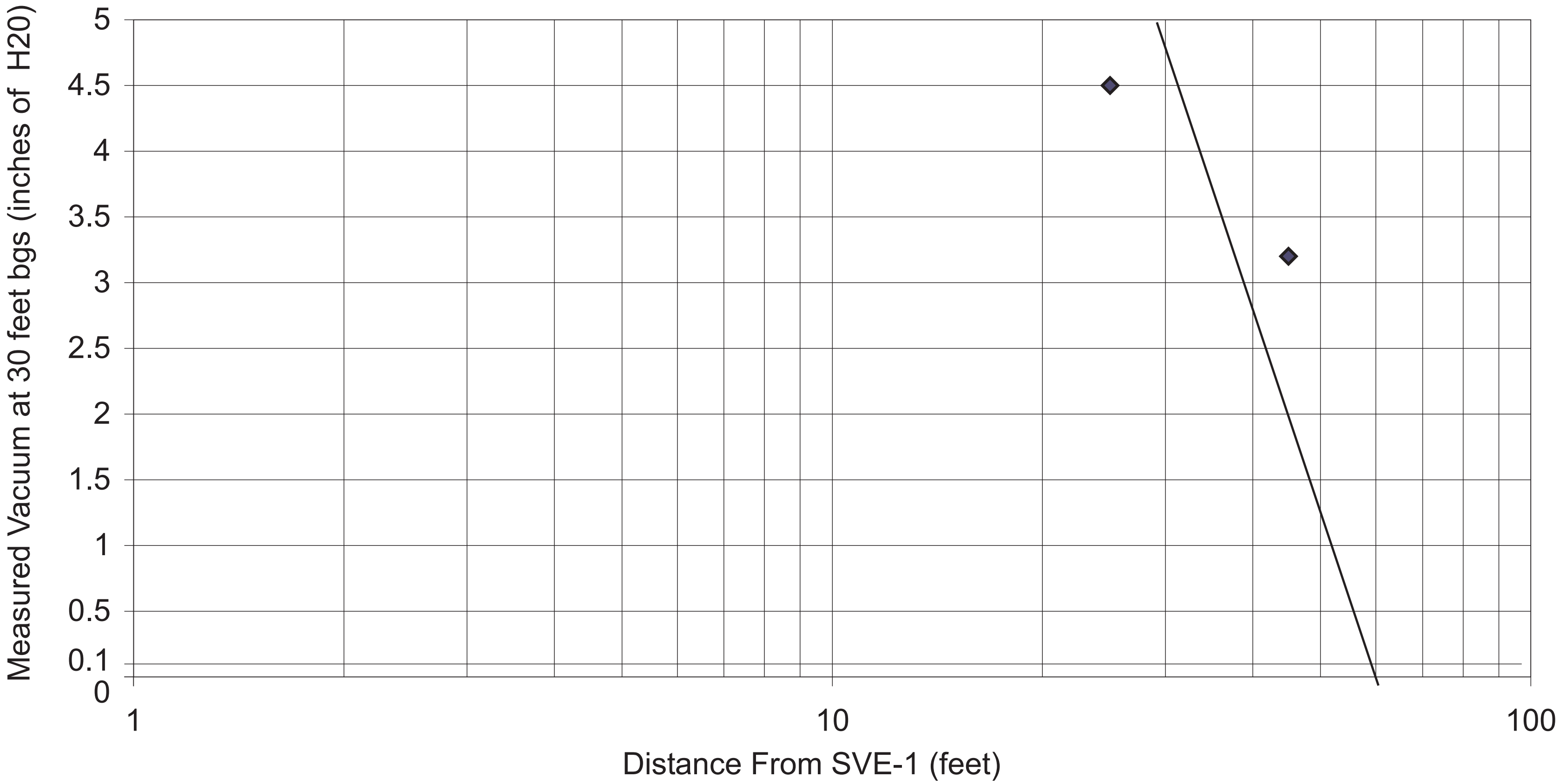
Figure 5-6. Soil Vapor Extraction Test (Drum Processing Area) Vacuum Response at End of Test (Inches H_20)



Effective SVE radius of influence corresponding to 0.1

Cooper Drum\08-04-Cooper-Drum-charts.cdr - LCT 11.27.06 SAC 1

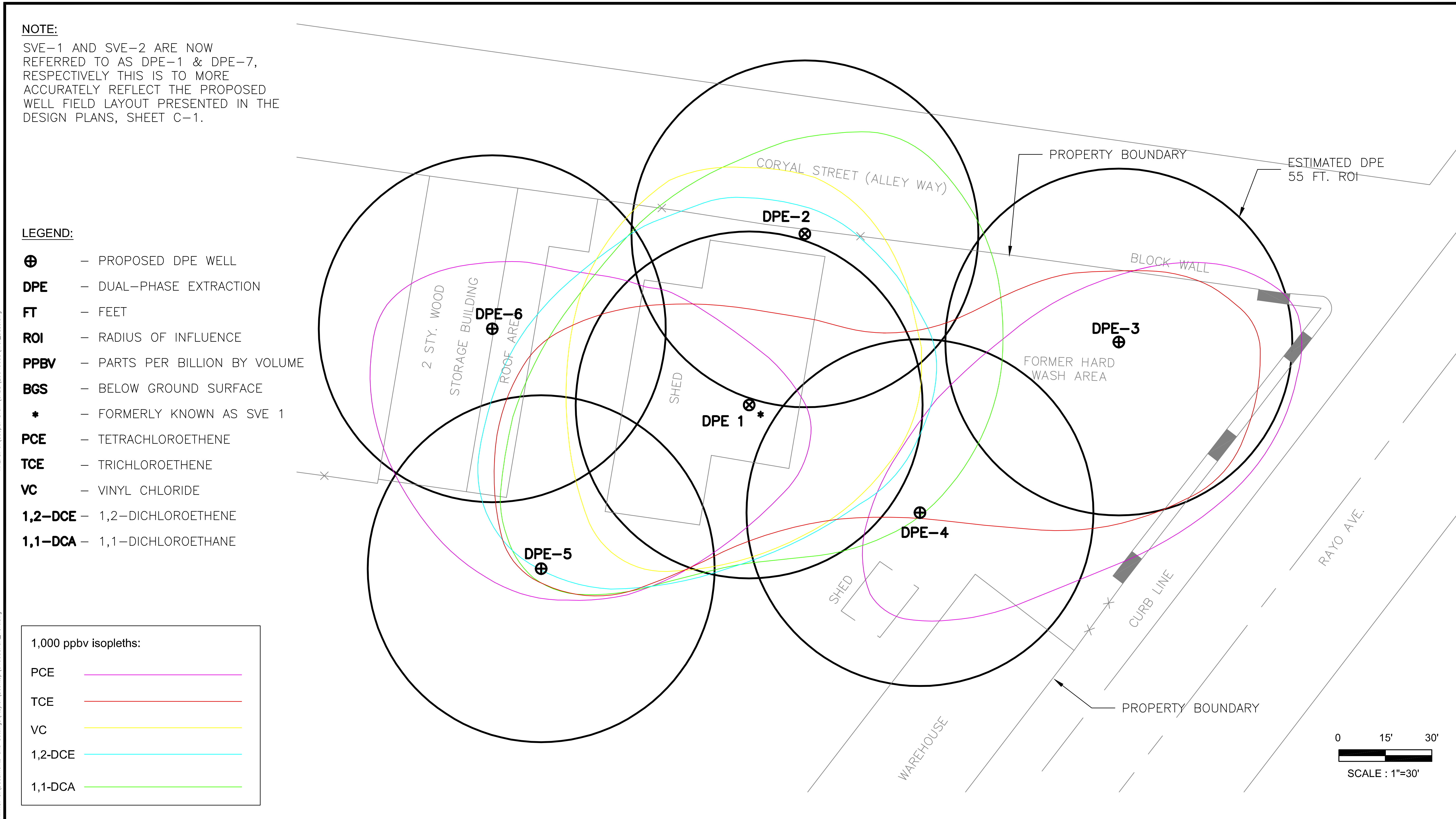
Figure 5-7. Determining Radius of Influence for SVE-1 (at 10 feet bgs)



Effective radius of influence corresponding to 0.1

Cooper Drum\08-04-Cooper-Drum-charts.cdr - LCT 11.27.06 SAC 2

Figure 5-8. Determining Radius of Influence for SVE-1 (at 30 feet bgs)



URS

Hard-Wash Area
1,000 ppbv VOCs at 10 Feet BGS

Figure 5-9

NOTE:

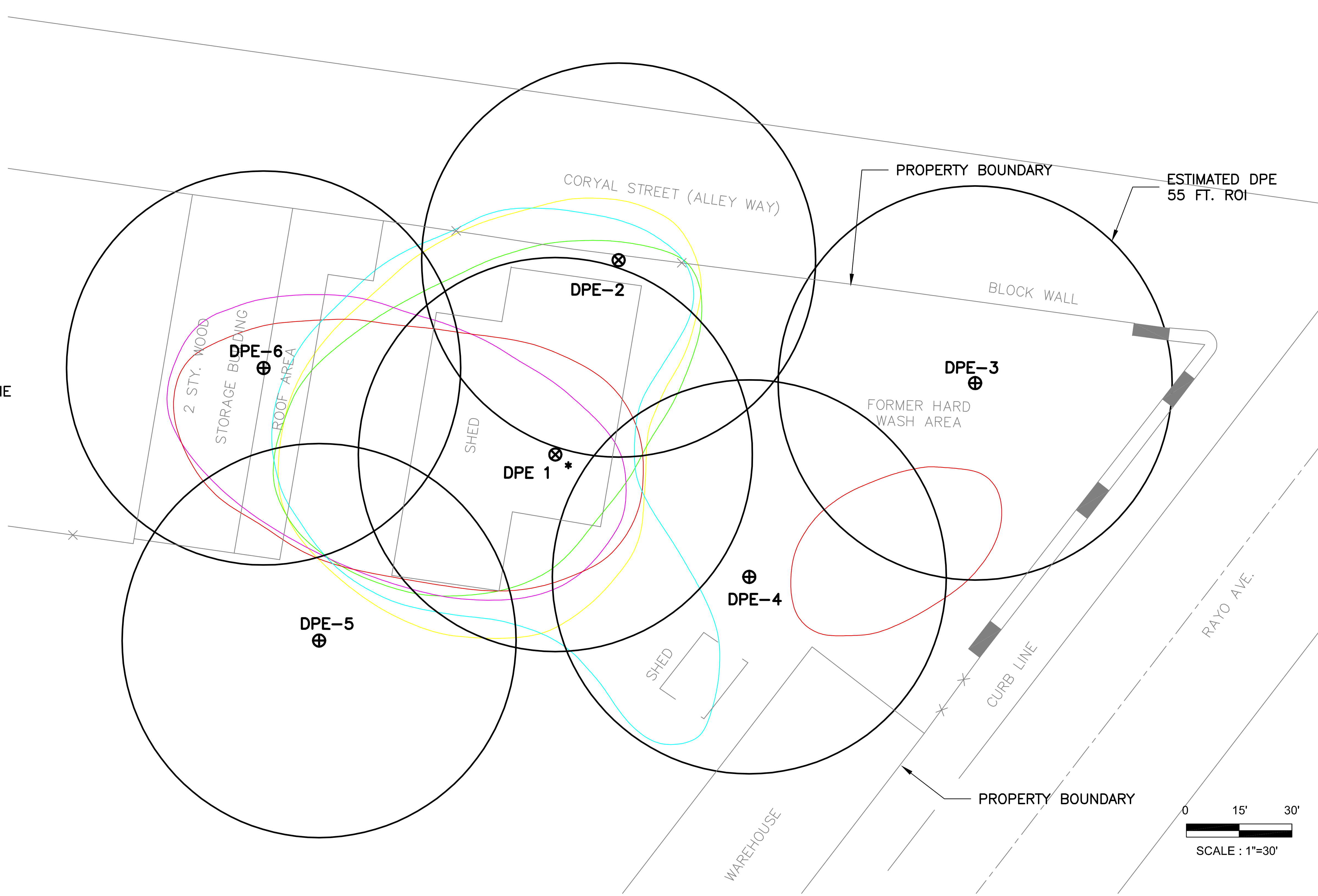
SVE–1 AND SVE–2 ARE NOW REFERRED TO AS DPE–1 & DPE–7, RESPECTIVELY THIS IS TO MORE ACCURATELY REFLECT THE PROPOSED WELL FIELD LAYOUT PRESENTED IN THE DESIGN PLANS, SHEET C–1.

LEGEND:

- ⊕ – PROPOSED DPE WELL
- **DPE** – DUAL–PHASE EXTRACTION
- **FT** – FEET
- **ROI** – RADIUS OF INFLUENCE
- **PPBV** – PARTS PER BILLION BY VOLUME
- **BGS** – BELOW GROUND SURFACE
- * – FORMERLY KNOWN AS SVE 1
- **PCE** – TETRACHLOROETHENE
- **TCE** – TRICHLOROETHENE
- **VC** – VINYL CHLORIDE
- **1,2–DCE** – 1,2–DICHLOROETHENE
- **1,1–DCA** – 1,1–DICHLOROETHANE

1,000 ppbv isopleths:

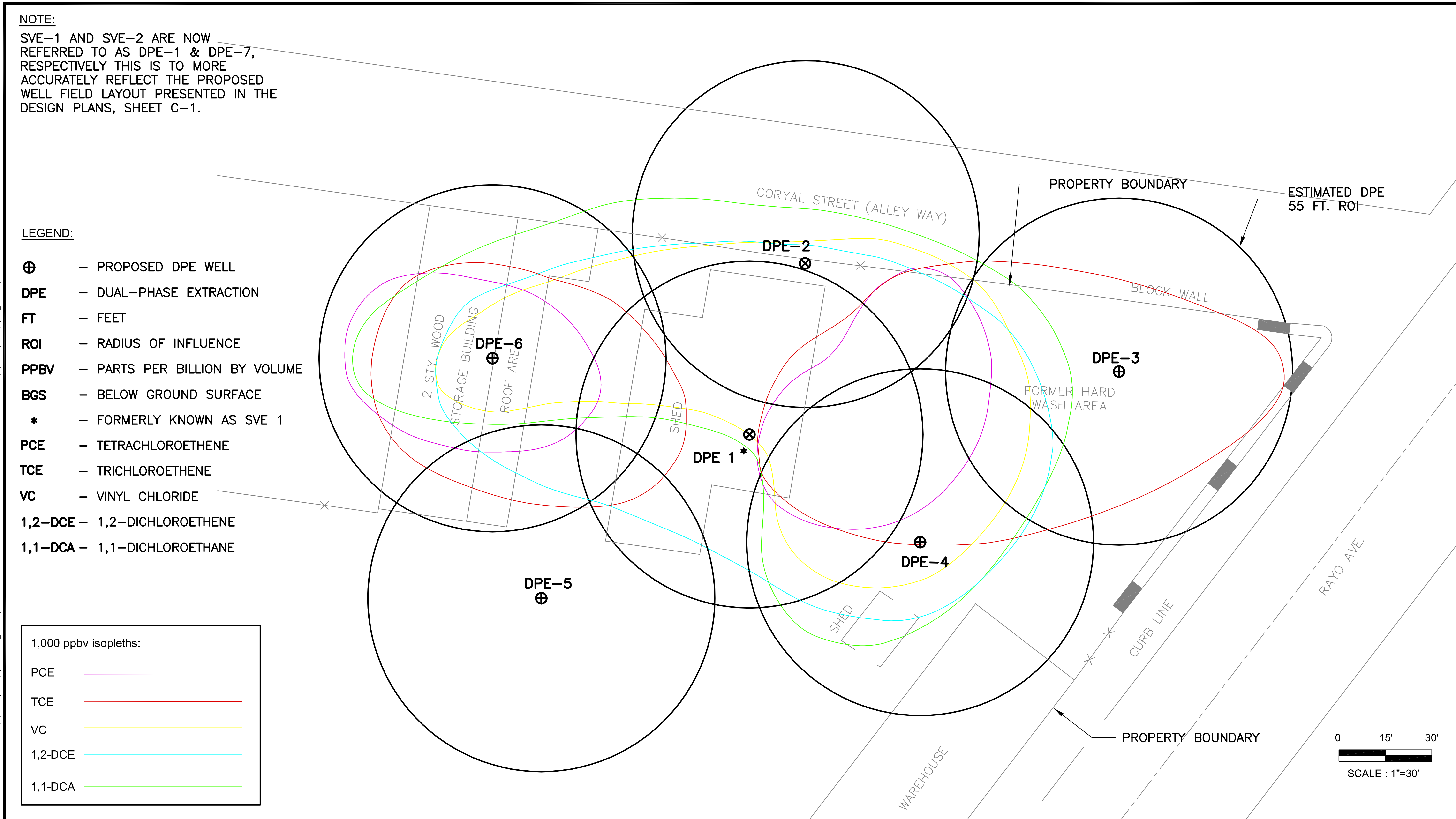
- PCE
- TCE
- VC
- 1,2-DCE
- 1,1-DCA



URS

Hard-Wash Area
1,000 ppbv VOCs at 20 Feet BGS

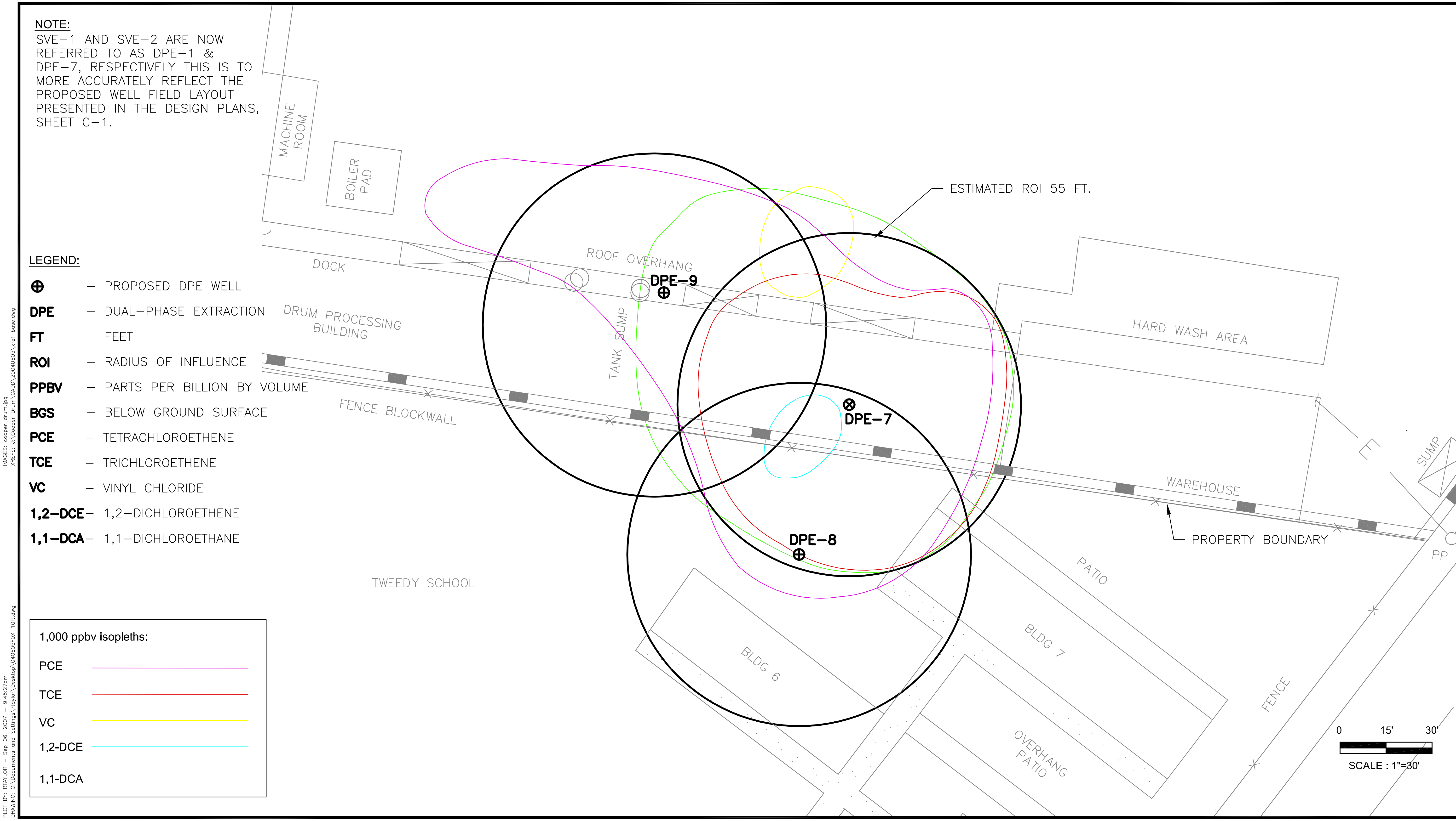
Figure 5-10



URS

Hard-Wash Area
1,000 ppbv VOCs at 30 Feet BGS

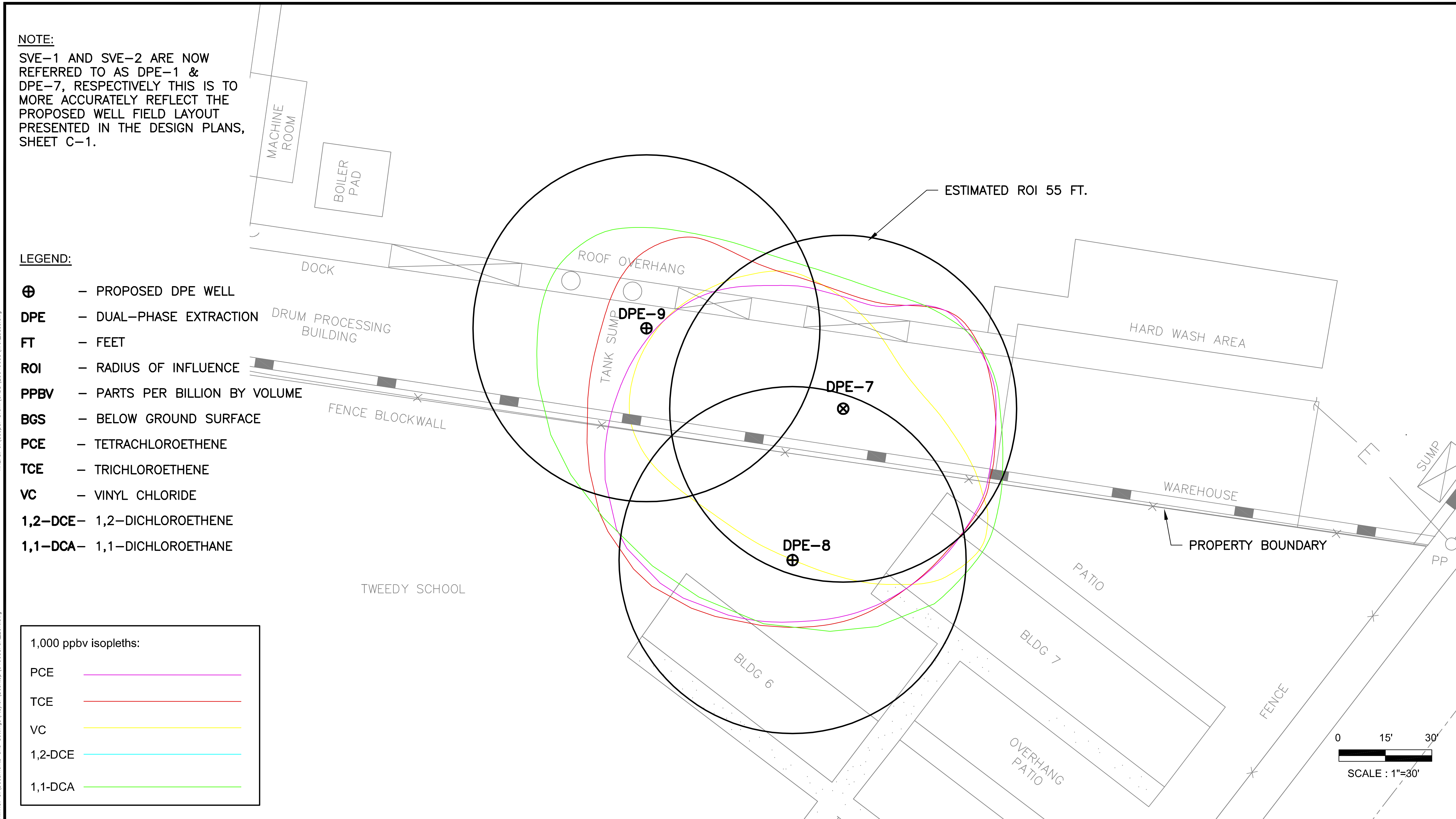
Figure 5-11



URS

Drum Processing Area
1,000 ppbv VOCs at 10 Feet BGS

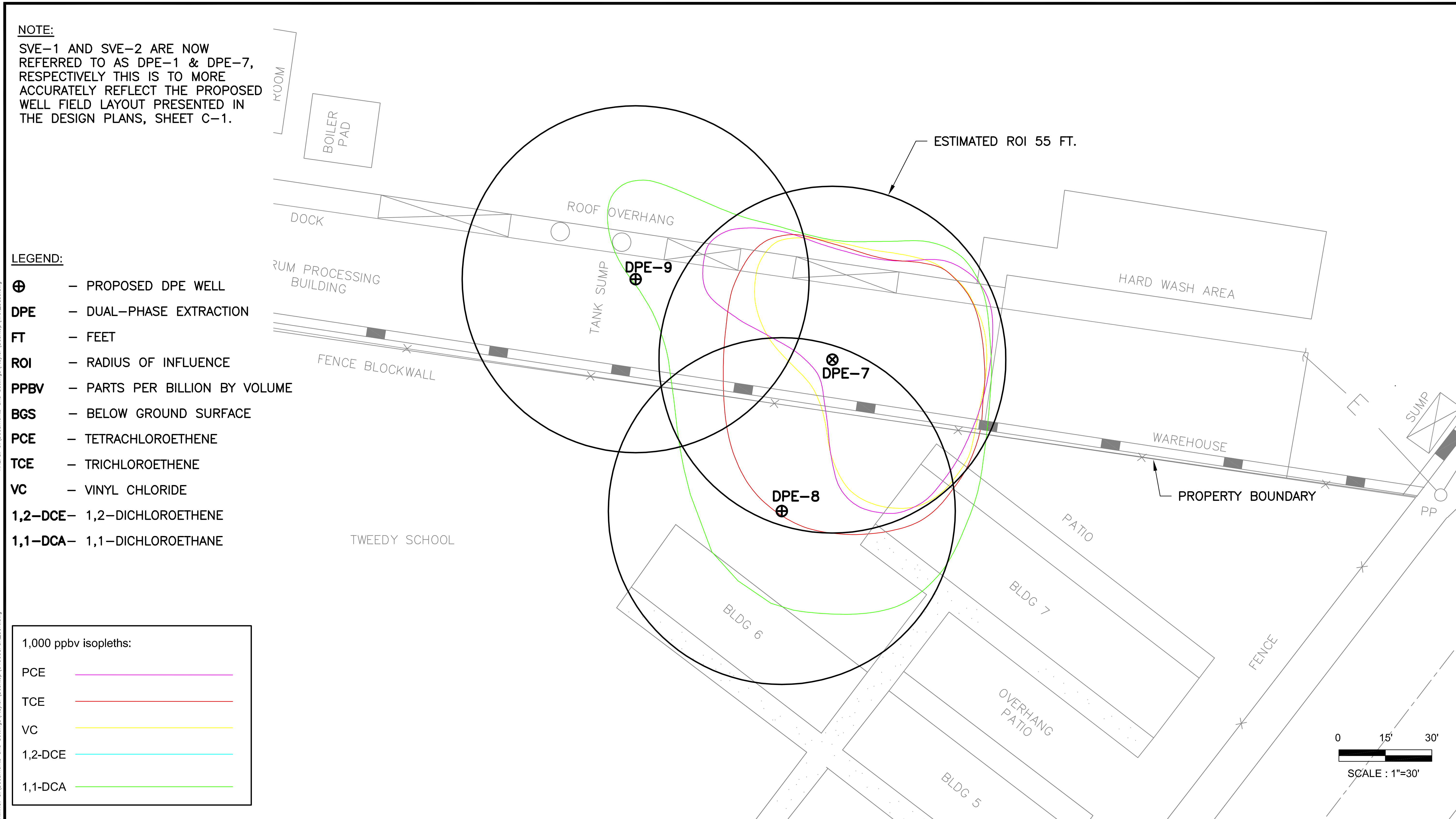
Figure 5-12



URS

Drum Processing Area
1,000 ppbv VOCs at 20 Feet BGS

Figure 5-13

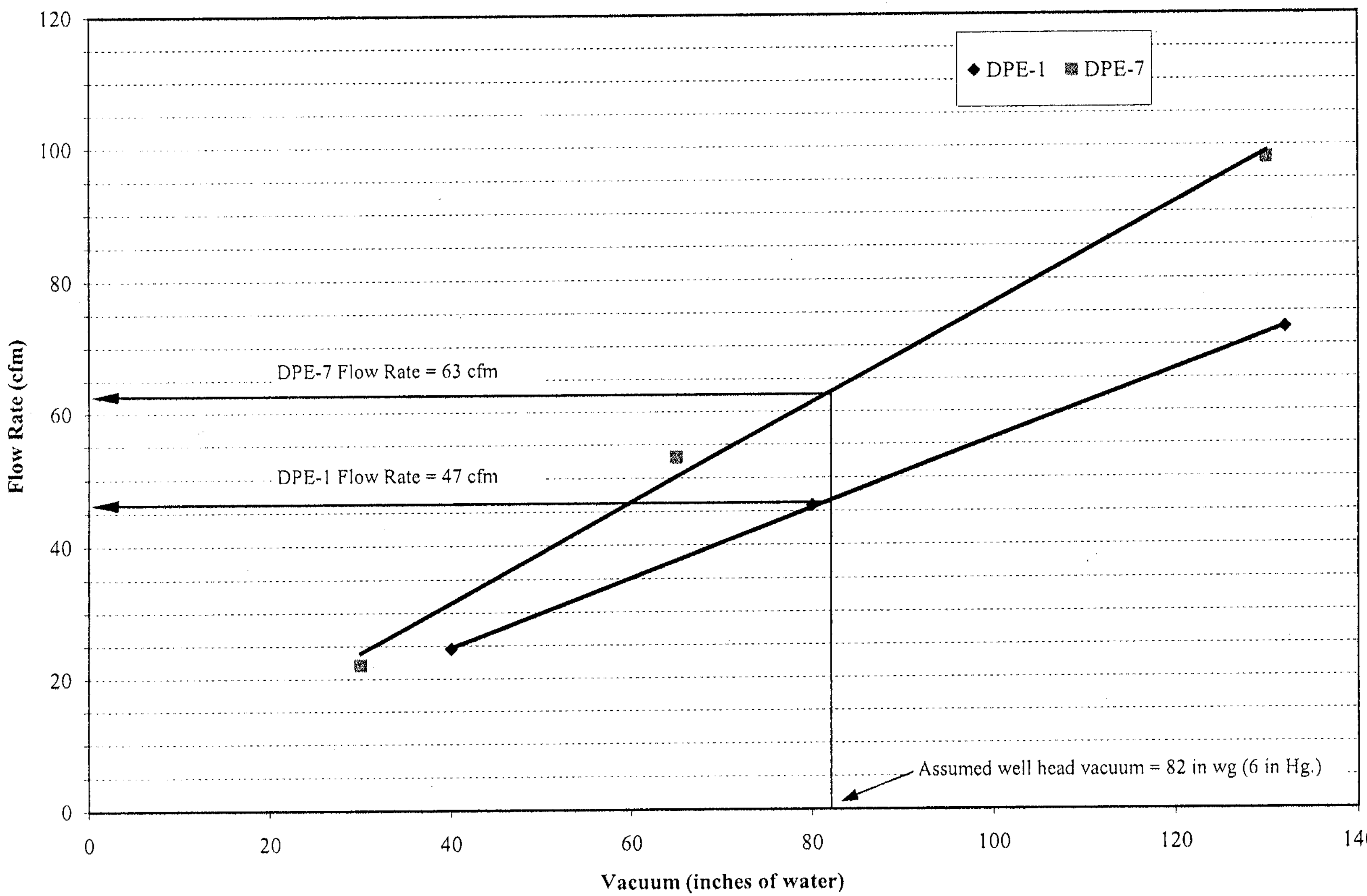


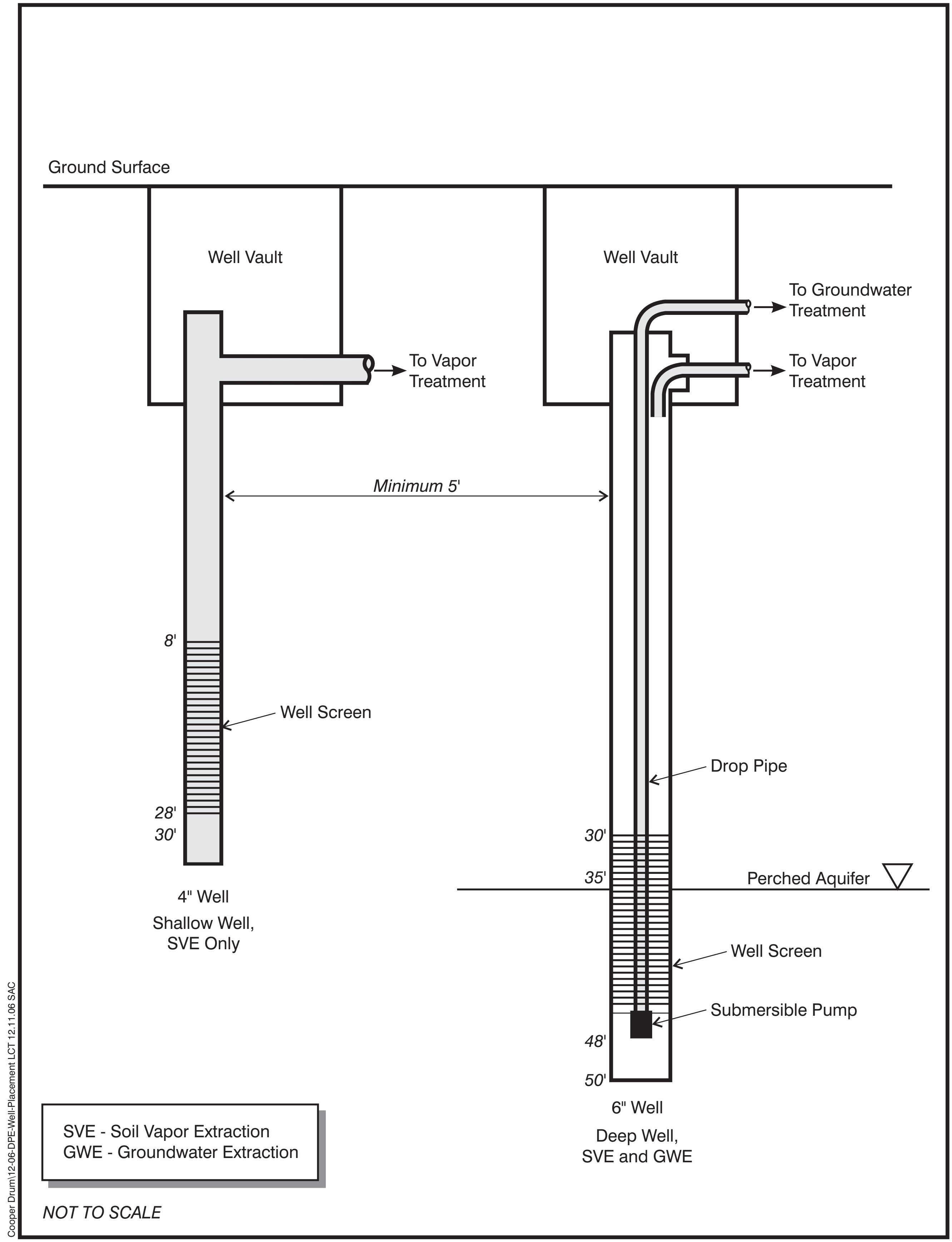
URS

Drum Processing Area
1,000 ppbv VOCs at 30 Feet BGS

Figure 5-14

Figure 5-15.
Flow Rate vs. Vacuum during Pilot Test





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DPE Well Configuration

Figure 5-16

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX

SOIL REMEDIAL DESIGN

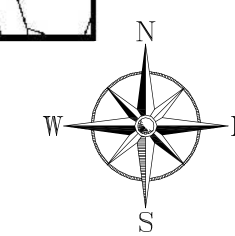
OPERABLE UNIT 2
COOPER DRUM COMPANY SUPERFUND SITE

PREPARED BY
URS GROUP, INC.

SEPTEMBER 2007

VICINITY MAP

LOCATION MAP



SHEET INDEX

G-1	TITLE SHEET
G-2	SITE LOCATION MAP, SHEET INDEX AND GENERAL NOTES
P-1	SIMPLIFIED SOIL GAS AND GROUNDWATER REMEDIATION SYSTEM PROCESS FLOW DIAGRAM
C-1	TREATMENT COMPOUND LOCATION AND SITE PLAN
C-2	SOIL REMOVAL ACTION PRIMARY EXCAVATION PLAN
C-3	TRENCH DETAILS
C-4	FENCE DETAILS
C-5	DPE AND VAPOR MONITORING WELL CONSTRUCTION DETAILS
S-0	STRUCTURAL GENERAL NOTES
S-1	TREATMENT COMPOUND DETAIL
S-2	CONCRETE DETAILS
M-1	TYPICAL DPE WELL HEAD DETAILS
E-1	ELECTRICAL GENERAL NOTES AND SYMBOLS
E-2	ELECTRICAL SITE PLAN
E-3	SINGLE LINE DIAGRAM

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION

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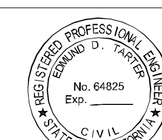

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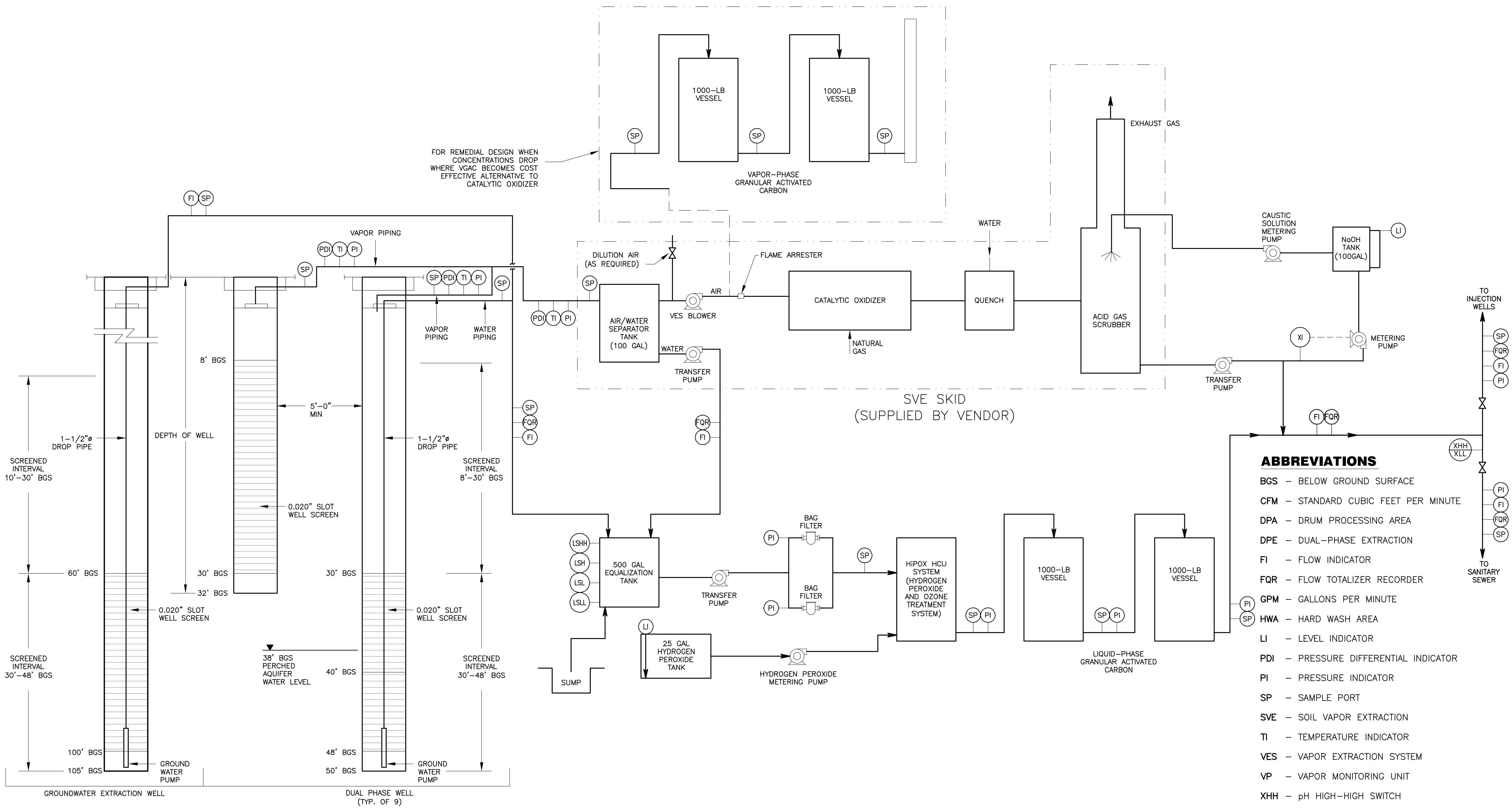
LOS ANGELES COUNTY , CALIFORNIA 90280

SITE LOCATION MAP, SHEET INDEX AND GENERAL NOTES

SCALE:	DATE:	DWG. FILE:	SHEET NO.
N.T.S.	8/22/2007	G-2.dwg	G-2



ABBREVIATIONS

- **BGS** – BELOW GROUND SURFACE
- **CFM** – STANDARD CUBIC FEET PER MINUTE
- **DPA** – DRUM PROCESSING AREA
- **DPE** – DUAL-PHASE EXTRACTION
- **FI** – FLOW INDICATOR
- **FQR** – FLOW TOTALIZER RECORDER
- **GPM** – GALLONS PER MINUTE
- **HWA** – HARD WASH AREA
- **LI** – LEVEL INDICATOR
- **PDI** – PRESSURE DIFFERENTIAL INDICATOR
- **PI** – PRESSURE INDICATOR
- **SP** – SAMPLE PORT
- **SVE** – SOIL VAPOR EXTRACTION
- **TI** – TEMPERATURE INDICATOR
- **VES** – VAPOR EXTRACTION SYSTEM
- **VP** – VAPOR MONITORING UNIT
- **XHH** – pH HIGH-HIGH SWITCH
- **XLL** – pH LOW-LOW SWITCH
- **XI** – pH INDICATOR

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SIMPLIFIED SOIL GAS AND GROUNDWATER REMEDIATION SYSTEM PROCESS FLOW DIAGRAM

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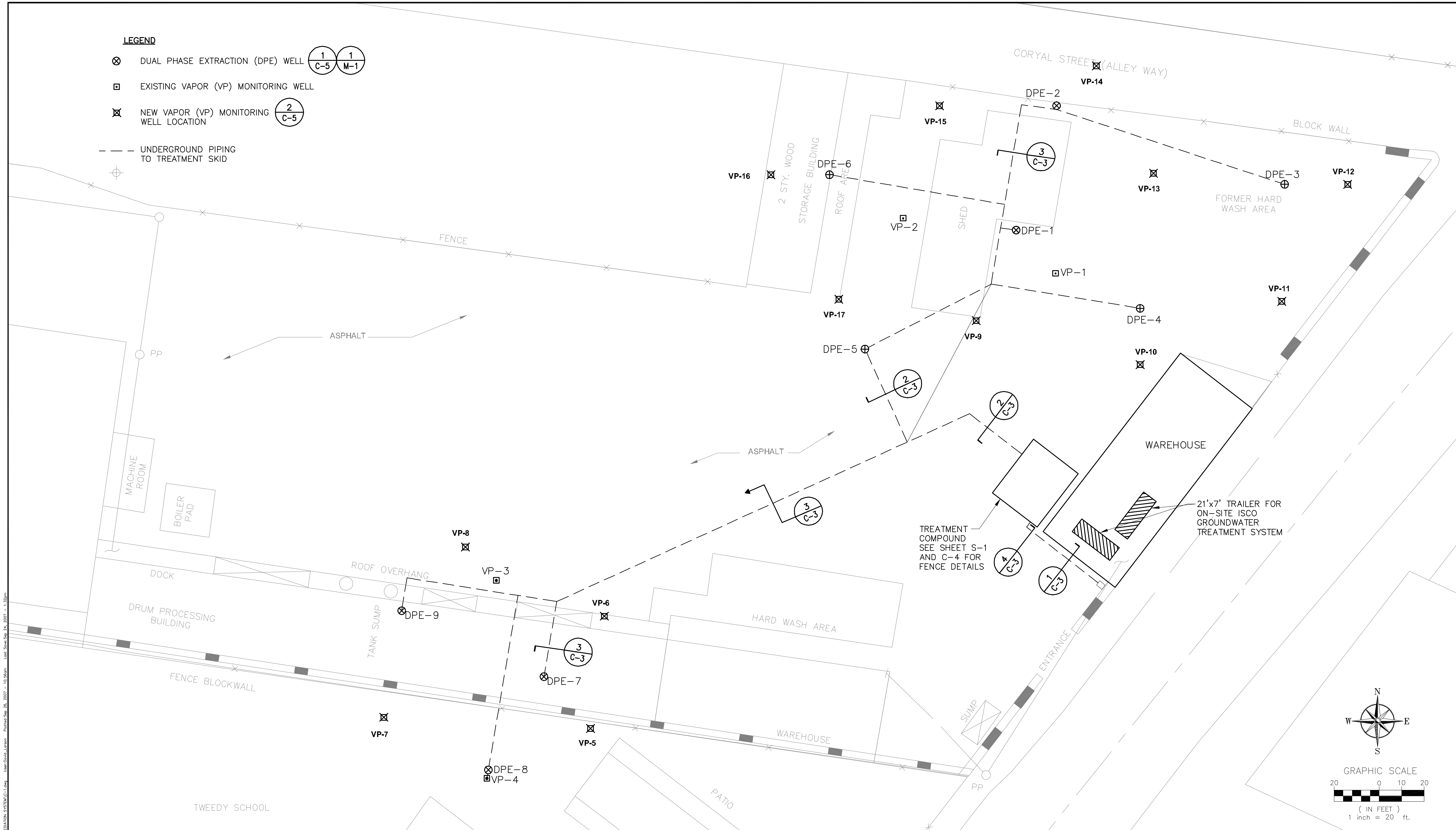
N.T.S.	8/22/2007	P-1.dwg	P-1



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TREATMENT COMPOUND LOCATION AND SITE PLAN

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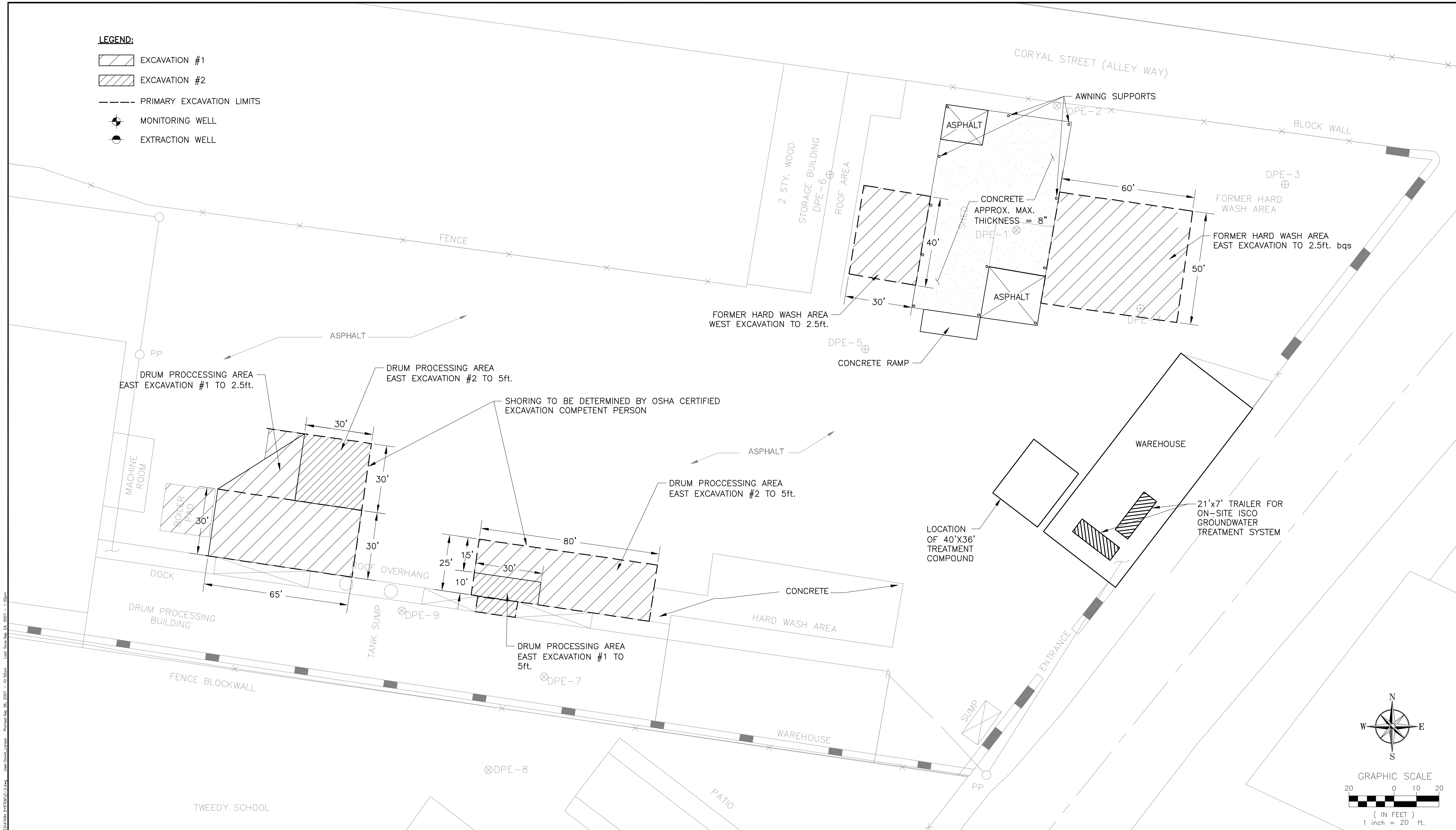

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SOIL REMOVAL ACTION
PRIMARY EXCAVATION PLAN

SCALE:	DATE:	DWG. FILE:	SHEET NO.
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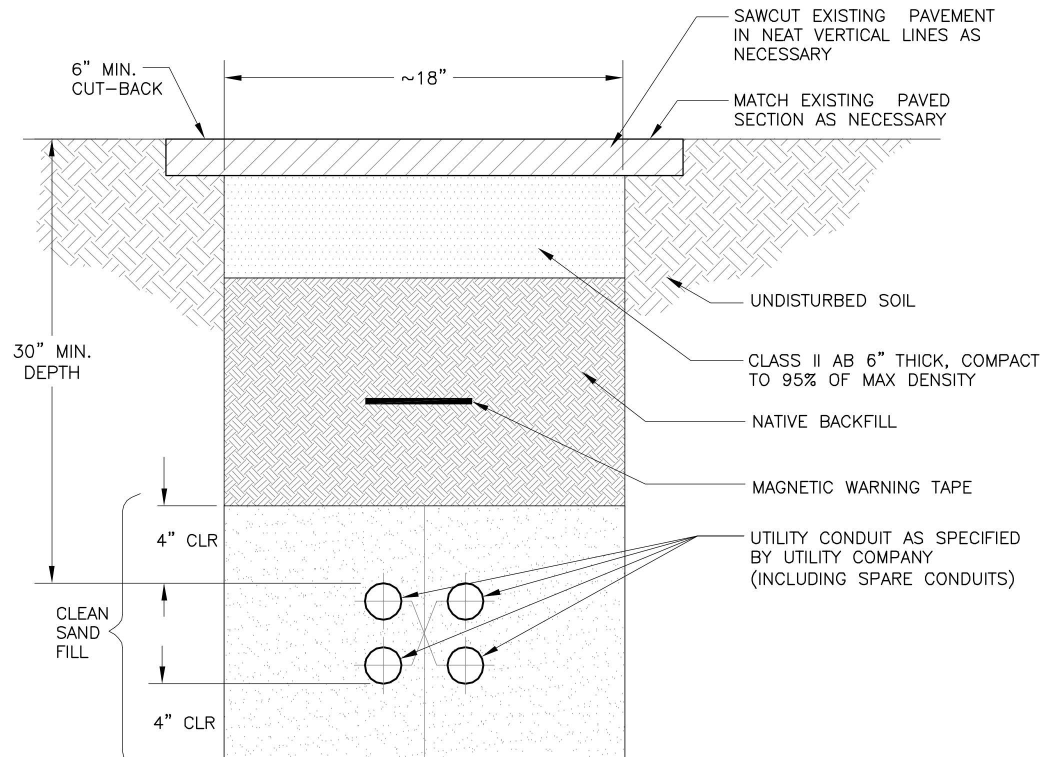
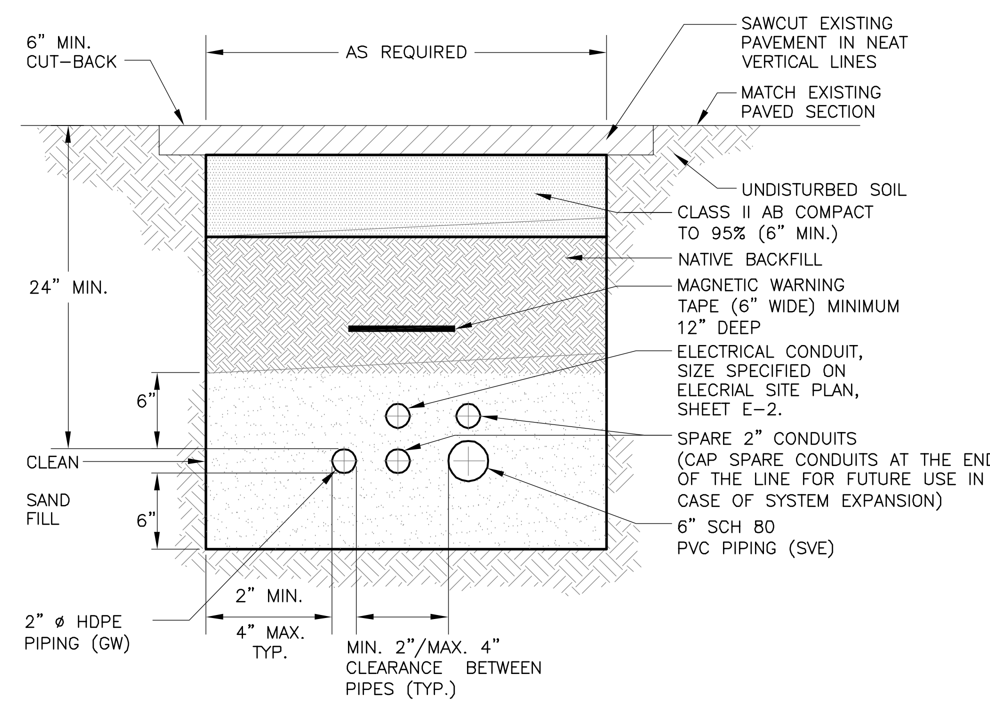
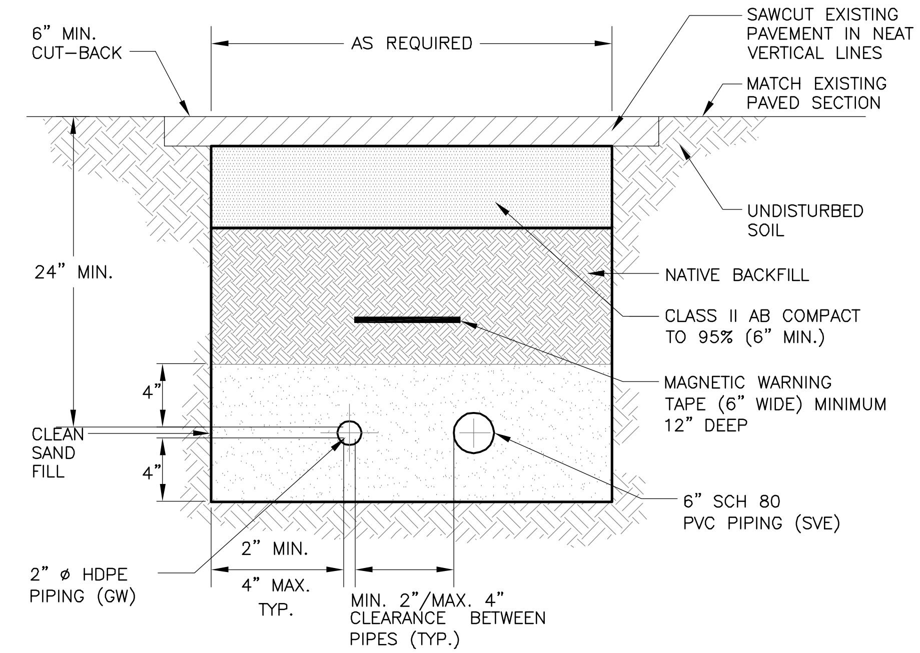


NOTES
1. TYPICAL FOR ELECTRICAL, ULITITY WATER, SEWER, AND NATURAL GAS

1 C-3 **UTILITY TRENCH DETAIL**
NOT TO SCALE

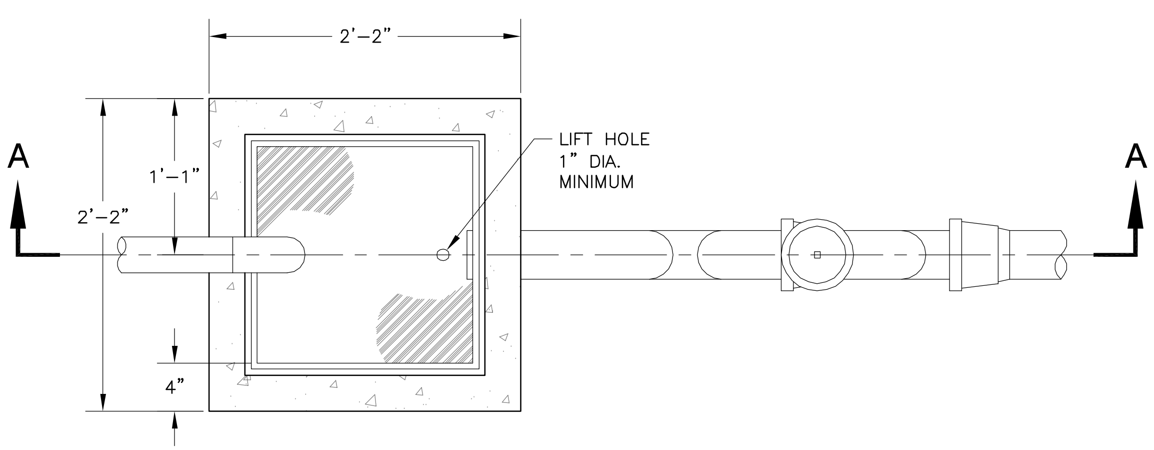


2 C-3 **DPE WELL - TRENCH DETAIL (MAIN CONVEYANCE)**
NOT TO SCALE

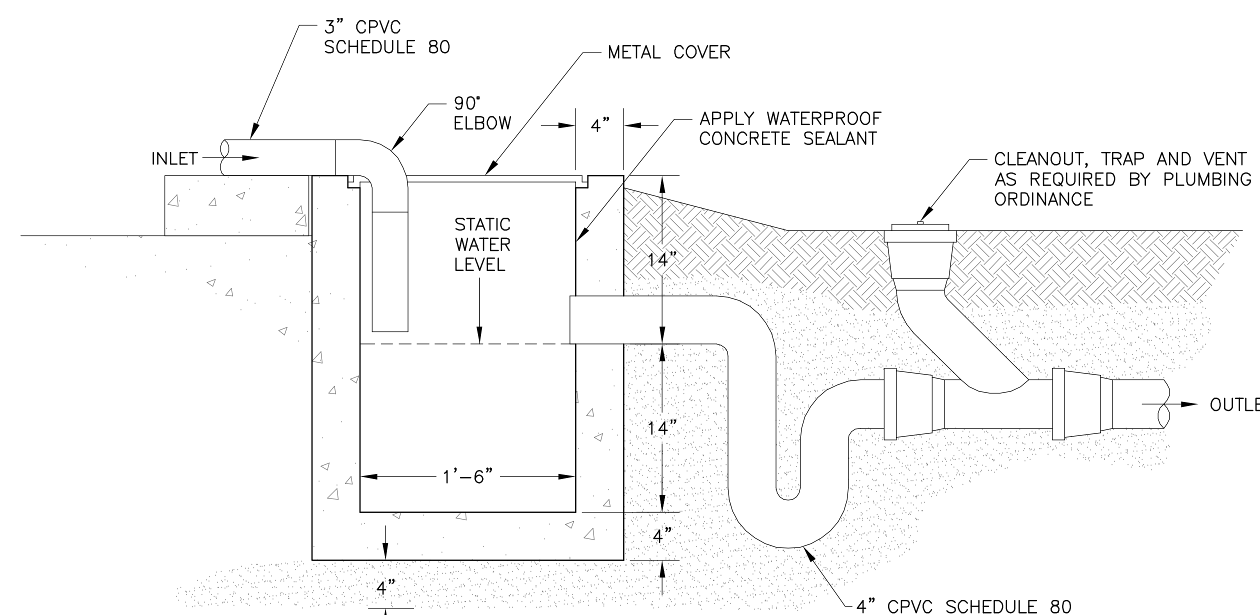


NOTES
1. IMMEDIATELY FOLLOWING THE DPE-1 JUNCTION TO THE CONVEYANCE LINE, WYE OUTLET, THE PIPE DIAMETER SHALL BE INCREASED FROM 1" TO 2" SCH 80 PVC. FOR THE GW LINE.
2. FROM EACH DPE WELL THE GROUNDWATER PIPE SHALL OF 1" SCH 80 PVC PIPE.
3. IMMEDIATELY PRIOR TO THE JUNCTION CONNECTION DPE-7, 8, AND 9 AND THE OTHER DPE WELLS, THE PIPE SIZE SHALL BE INCREASED FROM 1" SCH 80 PVC TO 2" SCH 80 PVC.

3 C-3 **DPE WELL - TRENCH DETAIL (TYPICAL)**
NOT TO SCALE



4 C-3 **SAMPLING BOX PLAN**
NOT TO SCALE



SECTION A-A
NOT TO SCALE

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TRENCH DETAILS

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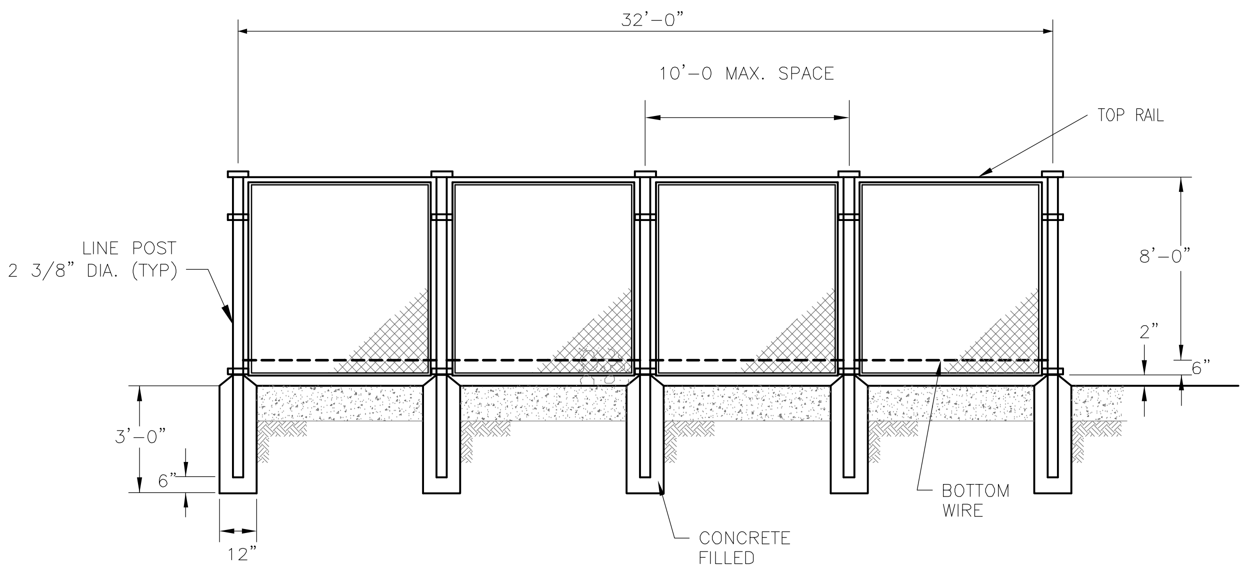
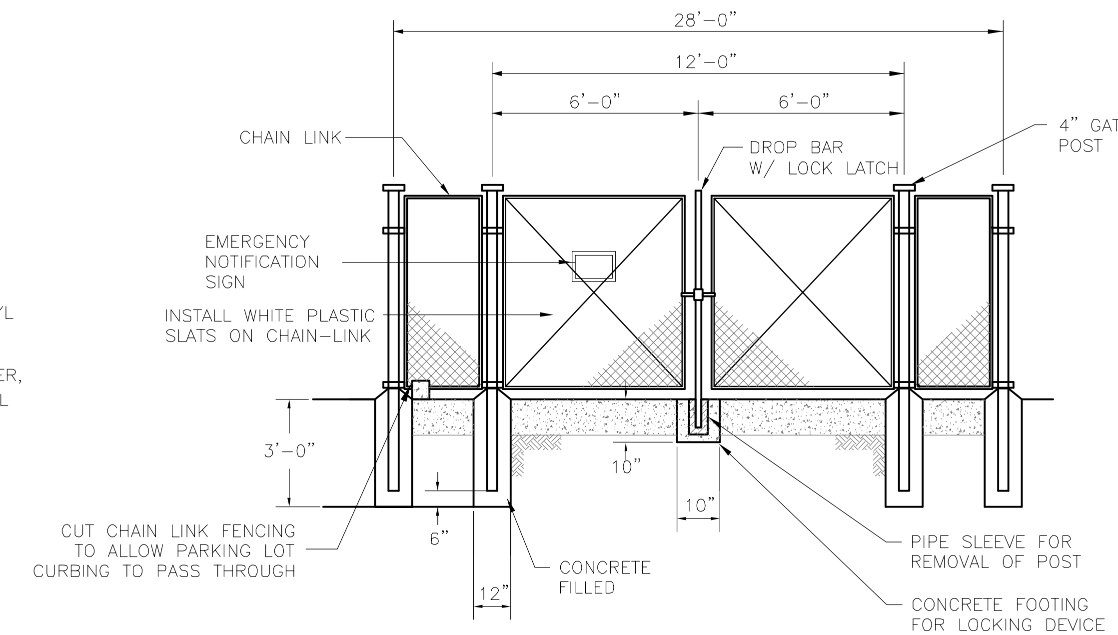


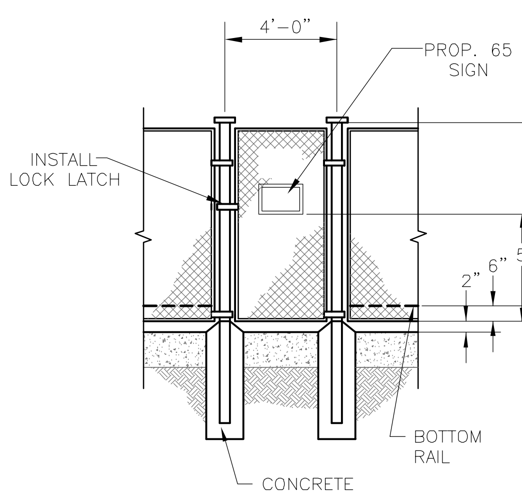
NOTES:

1. PROVIDE POST CAP FOR GATE POSTS, CORNER POSTS AND LINE POSTS.
2. PROVIDE 12'-0" GATE AS SPECIFIED BY PLAN, DETAIL 5.
3. FENCING AND GATE SHALL BE 8 FEET HIGH, 9 GAUGE GALVANIZED, CHAIN-LINK, PERMANENT CONSTRUCTION WITH PRE INSTALLED WHITE VINYL SECURITY SLOTS.
4. LINE POSTS SHALL BE 2" NOMINAL DIA., CORNER, END AND BRACE POSTS SHALL BE 2½" NOMINAL DIA., GATE POST SHALL BE 4" NOMINAL DIA.
5. SEE SHEET S-1 FOR SITE LAYOUT AND FENCE POSITION.

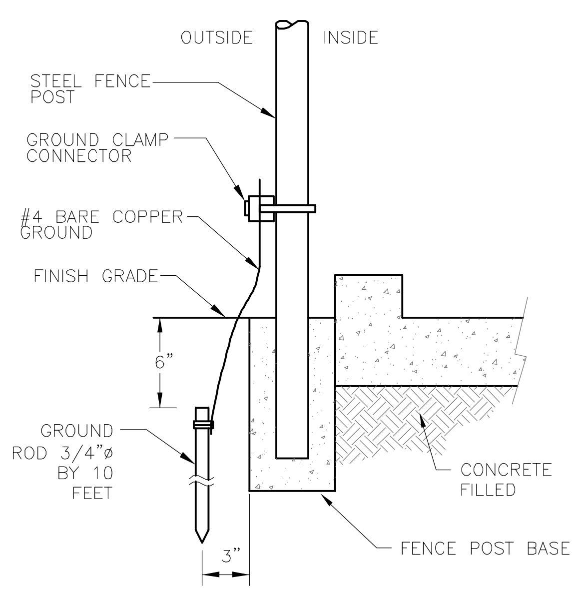


1 / S-1 CHAIN LINK FENCE DETAIL
NOT TO SCALE

3 / S-1 TYPICAL GATE DETAIL
NOT TO SCALE



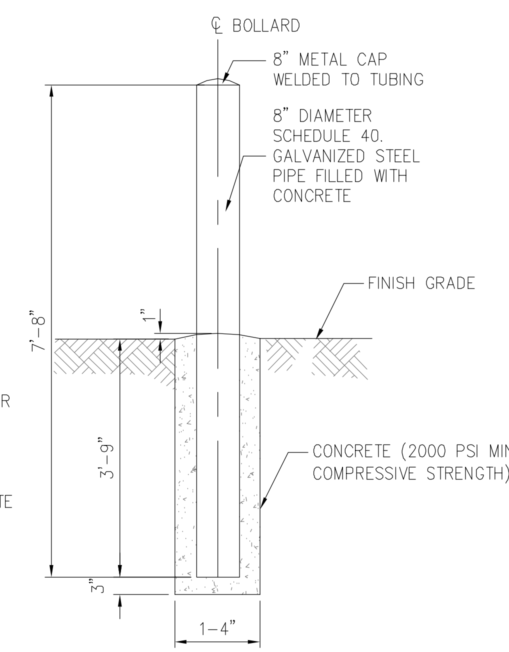
2 / S-1 PERSONNEL GATE
NOT TO SCALE



4 / S-1 FENCE GROUNDING DETAIL
NOT TO SCALE

NOTES:

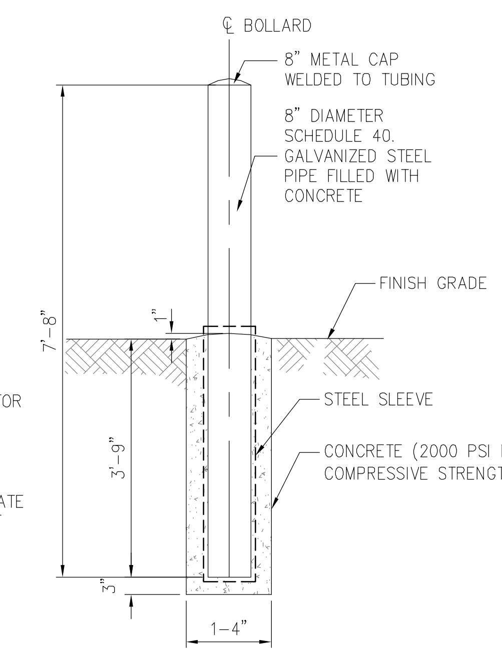
1. SEE S-1 FOR NUMBER OF GUARD POST TO BE USED.
2. THE EXACT LOCATION OF BOLLARD MAY BE CHANGED BY THE INSPECTOR IN THE FIELD.
3. THE STEEL PIPE ABOVE GROUND SHALL BE PAINTED A MINIMUM OF TWO FIELD COATS OF ZINC CHROMATE PRIMER, AND YELLOW COLOR PAINT COVER.



5 / S-1 TYPICAL BOLLARD DETAIL
NOT TO SCALE

NOTES:

1. SEE S-1 FOR NUMBER OF GUARD POST TO BE USED.
2. THE EXACT LOCATION OF BOLLARD MAY BE CHANGED BY THE INSPECTOR IN THE FIELD.
3. THE STEEL PIPE ABOVE GROUND SHALL BE PAINTED A MINIMUM OF TWO FIELD COATS OF ZINC CHROMATE PRIMER, AND YELLOW COLOR PAINT COVER.



6 / S-1 TYPICAL REMOVABLE BOLLARD DETAIL
NOT TO SCALE

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION

REVISIONS

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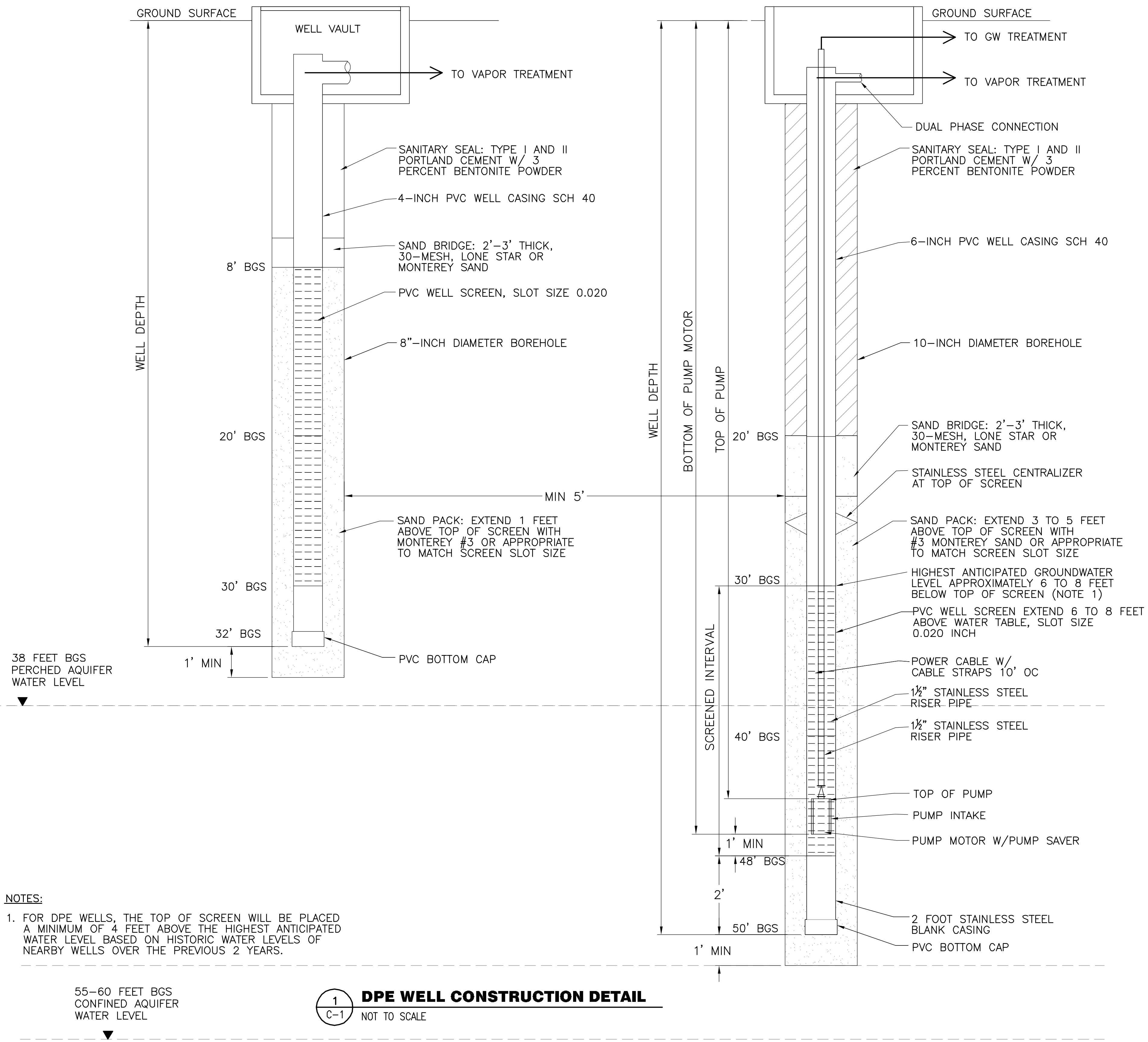
FENCE DETAILS

SCALE:	DATE:	DWG. FILE:	SHEET NO.
N.T.S.	8/22/2007	C-4.dwg	C-4

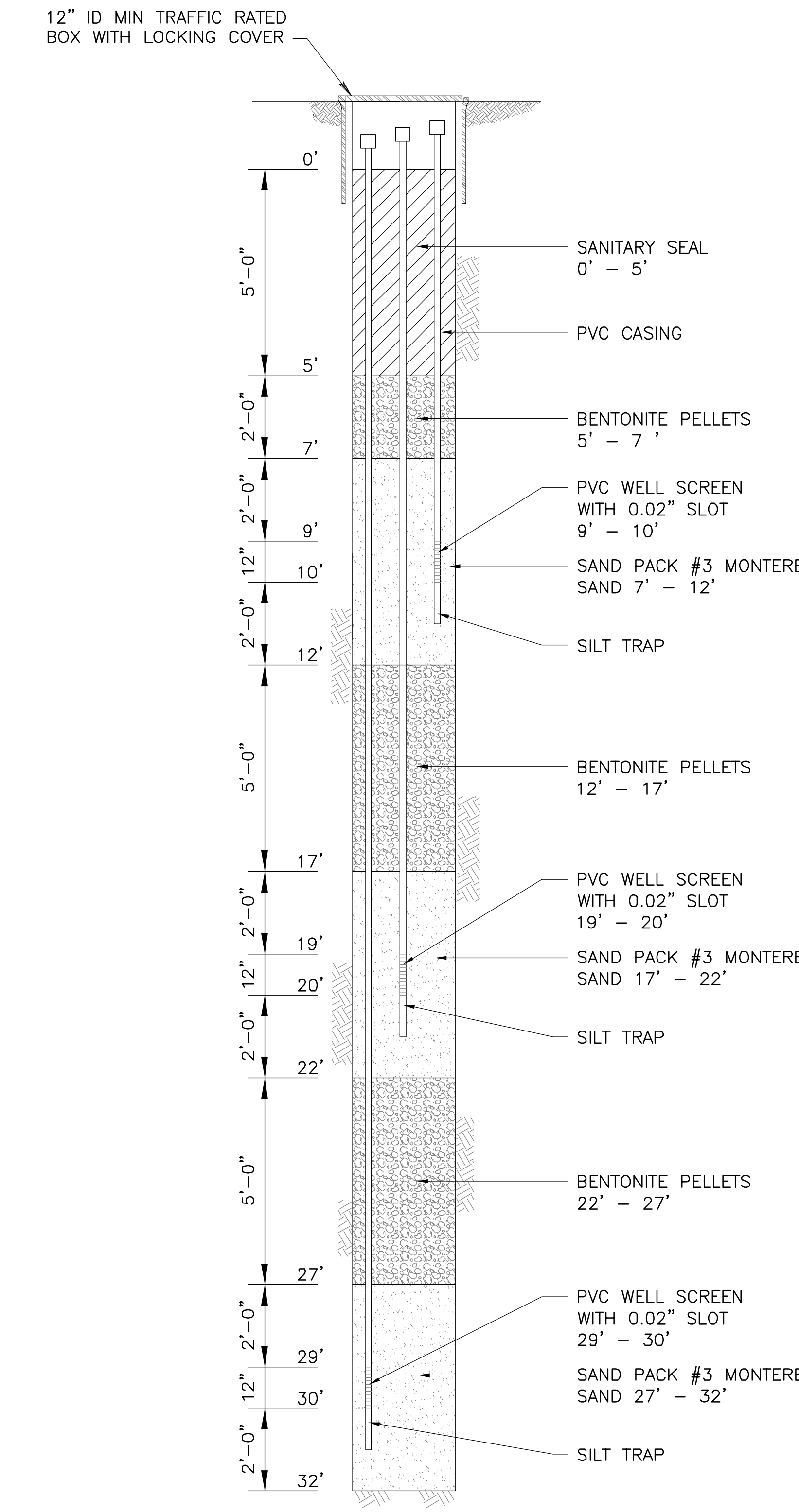


NOTES:

1. FOR DPE WELLS, THE TOP OF SCREEN WILL BE PLACED A MINIMUM OF 4 FEET ABOVE THE HIGHEST ANTICIPATED WATER LEVEL BASED ON HISTORIC WATER LEVELS OF NEARBY WELLS OVER THE PREVIOUS 2 YEARS.

1 / C-1 DPE WELL CONSTRUCTION DETAIL

NOT TO SCALE



2 / C-1 VAPOR MONITORING WELL DETAIL

NOT TO SCALE

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION

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DPE AND VAPOR MONITORING WELL CONSTRUCTION DETAILS

SCALE:	DATE:	DWG. FILE:	SHEET NO.
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STRUCTURAL ABBREVIATIONS

@	AT	HORZ	HORIZONTAL
ABV	ABOVE	HT	HEIGHT
AB	ANCHOR BOLTS	HB	HIGH STRENGTH BOLT (A325)
ACI	AMERICAN CONCRETE INSTITUTE	ICBO	INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS
ADDNL	ADDITIONAL	ID	INSIDE DIAMETER
AFF	ABOVE FINISH FLOOR	IN (")	INCH
AGG	AGGREGATE	INTR	INTERIOR
AISC	AMERICAN INSTITUTE FOR STEEL CONSTRUCTION	INFO	INFORMATION
ALT	ALTERNATE	JT	JOINT
APPROX	APPROXIMATE	LL	LIVE LOAD
ARCH	ARCHITECT/ ARCHITECTURAL	LGTH	LENGTH
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS	LONG	LONGITUDINAL
AWS	AMERICAN WELDING SOCIETY	LT WT	LIGHT WEIGHT
BLW	BELOW	LWC	LIGHT WEIGHT CONCRETE
BLDG	BUILDING BLDG	MAX	MAXIMUM
BLK	BLOCK BLOCKING BLKG	MB	MACHINE BOLT
BOC	BOTTOM OF CONCRETE	MCJ	MASONRY CONTROL JOINT
BOF	BOTTOM OF FOOTING	MECH	MECHANICAL
BOTT	BOTTOM	MFR	MANUFACTURER
BRG	BEARING	MIN	MINIMUM
BTW	BETWEEN	MISC	MISCELLANEOUS MISC
CBC	CALIFORNIA BUILDING CODE	MTL	METAL
CC	CENTER TO CENTER	NIC	NOT IN CONTRACT
CE	CIVIL ENGINEER	NO (#)	NUMBER OR POUNDS
CIP	CAST IN PLACE	NOM	NOMINAL
CJ	CONSTRUCTION	NSG	NON SHRINK GROUT
CMU	MCONCRETE MASONRY UNIT	NTS	NOT TO SCALE NTS
CONC	CONCRETE	OC	CENTER
CONN	CONNECTION	OD	OUTSIDE DIAMETER
CONT	CONTINUOUS	OPG	OPENING
CTR	CENTER CTR CENTERED	PC	PIECE
DIA (ø)	DIAMETER	PCC	PRECAST CONCRETE
DL	DEAD LOAD	PERP	PERPENDICULAR
DN	DOWN	PSI	POUNDS PER SQUARE INCH
DSA	DIVIDION OF STATE ARCHITECTS	PT	POINT
DTL	DETAIL	R	RADIUS
DWG	DRAWING	REINF	REINFORCING
EA	EACH	REQ	REQUIRED
EF	EACH FACE	SAD	SEE ARCHITECTURAL DRAWINGS
EJ	EXPANSION JOINT	SCHED	SCHEDULE
ELV	ELEVATION ELEV	SE	STRUCTURAL ENGINEER
EOS	EDGE OF SLAB	SEIS	SEISMIC
EOR	ENGINEER OF RECORD	JT	JOINT
EQ (=)	EQUAL	SHRWL	SHEARWALL
EW EF	EACH WAY EACH FACE	SIM	SIMILAR
EW	EACH WAY	SJ	SHRINKAGE JOINT
EXTR	EXTERIOR	SOG	SLAB ON GRADE
f'c	MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE	SPEC	SPECIFICATION
FD	FLOOR DRAIN	SQ	SQUARE
FF	FINISH FLOOR	STD	STANDARD
FFE	FINISH FLOOR ELEVATION	STL	STEEL
FG	FINISH GRADE	STRUC	STRUCTURAL
f'm	MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF MASONRY	SYM	SYMMETRICAL
FNDN	FOUNDATION	T24	TITLE 24 CALIFORNIA CODE
FOC	FACE OF CONCRETE FOC	THK	THICK/THICKNESS
FOM	FACE OF MASONRY	TOC	TOP OF CONCRETE TOC
FRMG	FRAMING FRMG	TOF	TOP OF FOOTING/TOP OF FRAMING
FT (')	FOOT/FEET	T.O. SLAB	TOP OF SLAB
FTG	FOOTING	TOS	TOP OF STEEL
Fy	SPECIFIED YIELD STRENGTH OF REIFORCING, PSI OR SPECIFIED MINIMUM	TOT	TOTAL
KSI	YIELD STRESS OF STEEL	TOW	TOP OF WALL
GRD	GRADE	TRAN	TRANSVERSE
GT	GROUT	TYP	TYPICAL
HC	HANDICAP	T&B	TOP AND BOTTOM
HD	HOLD DOWN	UBC	UNIFORM BUILDING CODE
HDR	HEADER	UNO	UNLESS NOTED OTHERWISE
HK	HOOK	VERT	VERTICAL
		VIF	VERIFIY IN FIELD
		w/	WITH
		WT	WEIGHT
		WWF	WELDED WIRE FABRIC

INSPECTION NOTES:

1. GENERAL: IN ADDITION TO THE INSPECTIONS REQUIRED BY SECTION 108 OF THE 2006 IBC, THE GOVERNMENT SHALL EMPLOY AN IBC APPROVED SPECIAL INSPECTOR TO PERFORM SPECIAL INSPECTIONS AND TESTS AS INDICATED IN THE SCHEDULE BELOW.
2. INSPECTORS: ALL TESTS AND INSPECTIONS SHALL BE PERFORMED BY AN INDEPENDENT INSPECTION AGENCY WHICH IS IN THE EMPLOYMENT OF THE GOVERNMENT.
3. ALL SPECIAL INSPECTION AND TESTING AGENCIES SHALL BE QUALIFIED PER ASTM E329 AND APPROVED BY THE GOVERNMENT.
4. PROVIDE INSPECTION REPORTS TO BUILDING DEPARTMENT, GOVERNMENT, ARCHITECT AND ENGINEER WITHIN TWO WEEKS OF PERFORMANCE INSPECTION OR TEST.
5. REFER TO CHAPTER 17 OF THE CODE FOR OTHER REQUIRED SPECIAL INSPECTIONS
6. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO SEE THAT THE TESTS AND INSPECTIONS ARE PERFORMED. JOB SITE VISITS BY THE STRUCTURAL ENGINEER DO NOT CONSTITUTE AND ARE NOT A SUBSTITUTE FOR INSPECTIONS.
7. WHERE THE CONTRACTOR CHOOSES TO USE OPTIONAL OR ALTERNATIVE MEANS OF FASTENING OR ANCHORING MATERIALS AS SHOWN ON THE PLANS AND DETAILS AND REQUIRES SPECIAL FIELD INSPECTION, SUCH AS FIELD WELDING, ADHESIVE OR EXPANSION ANCHORS, ETC. ALL ADDITIONAL SPECIAL INSPECTION AND TESTING COSTS SHALL BE PAID FOR BY THE GOVERNMENT AND REIMBURSED BY THE CONTRACTOR.

FOUNDATIONS:

1. REFER TO RECOMMENDATIONS IN SOILS REPORT, FILE NO. __N/A__ BY __N/A__ DATED __N/A_______. ALLOWABLE SOIL BEARING PRESSURE FOR FOUNDATION IS 1,500 PSF (DL + LL) AND 2,000 PSF (DL + LL + SEISMIC OR WIND).
   1.1 SOIL CLASSIFICATION IS CL FOR TRACY SITE.
2. ALL SITEWORK AND GRADING SHALL BE DONE IN COMPLIANCE WITH THE SOILS REPORT AND SPECIFICATIONS OR ENGINEER'S RECOMMENDATIONS.
3. SOILS ENGINEER SHALL VERIFY CONDITION AND/OR ADEQUACY OF ALL FOUNDATION EXCAVATIONS PRIOR TO PLACEMENT OF CONCRETE.
4. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO SHORE AND BRACE ALL EXCAVATIONS AS REQUIRED.
5. ALL FOUNDATIONS ARE SHOWN AND DIMENSIONED AS BEING FORMED. FOUNDATIONS MAY BE PLACED IN NEAT EXCAVATIONS PROVIDED FOOTINGS ARE INCREASED 2" IN WIDTH, SEE TYPICAL EXCAVATION DETAIL.
6. EXCAVATIONS SHALL BE CLEANED OF ALL DEBRIS AND LOOSE SOIL. STANDING WATER SHALL BE REMOVED PRIOR TO CONCRETE PLACEMENT.
7. FOUNDATION DEPTHS INDICATED ON PLANS ARE MINIMUMS. ACTUAL DEPTHS ARE TO BE CONFIRMED BY SOILS ENGINEER ON THE JOB SITE.
8. BOTTOMS OF ALL FOUNDATIONS SHALL BE LEVEL. CHANGES IN BOTTOM OF FOUNDATION ELEVATION SHALL BE MADE ACCORDING TO STEPPED FOOTING DETAILS.
9. FOOTINGS SHALL BE CENTERED UNDER WALLS AND/OR COLUMNS UNLESS OTHERWISE INDICATED ON DRAWINGS.
10. CONTRACTOR SHALL CHECK FOOTING FORMS TO VERIFY THAT THEY ARE SQUARE & PLUMB. THE CONTRACTOR SHALL ALSO VERIFY THAT ALL INSERTS & EMBEDS ARE IN THEIR CORRECT LOCATION & ORIENTATION PRIOR TO PLACING CONCRETE.
11. NOTIFY THE STRUCTURAL ENGINEER 48 HOURS IN ADVANCE OF PLACING CONCRETE.

1. CONTRACTOR SHALL BE RESPONSIBLE FOR ARRANGING SPECIAL INSPECTION.

DUTIES & RESPONSIBILITIES OF THE INSPECTOR ARE COVERED IN SECTION 1704.1 OF IBC.

	ITEM	CONTINUOUS INSPECTION	PERIODIC INSPECTION	REMARKS
CONCRETE	SLAB ON GRADE (f'c = 4000 PSI)	– –	YES	PRIOR TO POURING OF CONCRETE & DURING THE TAKING OF TEST SPECIMENS
CONCRETE	WALL (f'c = 4000 PSI)	– –	YES	PRIOR TO POURING OF CONCRETE & DURING THE TAKING OF TEST SPECIMENS
CONCRETE	GRADE BEAM AND FOUNDATION (f'c = 3000 PSI)	– –	YES	PRIOR TO POURING OF CONCRETE & DURING THE TAKING OF TEST SPECIMENS & PLACING OF REINF'D CONCRETE
CONCRETE	STRUCTURAL CONCRETE CONC. ON METAL DECK (f'c = 3000 PSI) (SECTION 1704.4)	YES	– –	PRIOR TO POURING OF CONCRETE DURING THE TAKING OF TEST SPECIMENS CHECK REINFORCEMENT LOCATION
	BOLTS IN CONCRETE (SECTION 1704.4)	– –	YES	PRIOR TO AND DURING THE PLACEMENT OF CONCRETE AROUND BOLTS
FIELD WELDING	STRUCTURAL STEEL (ELECTRODE = E70XX)	YES	– –	DURING THE WELDING
FIELD WELDING	REINFORCING STEEL (ELECTRODE = E90XX) (SECTION 1704.4)	YES	– –	DURING THE WELDING
FIELD WELDING	METAL ROOF DECK WELDING	– –	YES	DURING THE WELDING
	STRUCTURAL WELDING (INCLUDING HSA WELDING) (SECTION 1704.3)	YES	– –	EXCEPT FOR WELDING PERFORMED IN THE SHOP OF AN APPROVED FABRICATOR
	REINFORCING STEEL (SECTION 1704.4)	– –	YES	PRIOR TO COVER UP
	HIGH STRENGTH BOLTS (A325 & A490) (SECTION 1704.3)	– –	YES	DURING INSTALLATION OF BOLTS & TIGHTENING
	SPRAY APPLIED FIREPROOFING (SECTION 1704.11)	– –	YES	DURING THE SPRAYING

2. A CERTIFICATE OF SATISFACTORY COMPLETION OF WORK REQUIRING SPECIAL INSPECTION MUST BE COMPLETED AND SUBMITTED TO THE FIELD INSPECTION DIVISION.
3. AN APPLICATION FOR OFF-SITE FABRICATION MUST BE SUBMITTED TO THE FIELD INSPECTION DIVISION FOR APPROVAL PRIOR TO FABRICATION.
4. A CERTIFICATE OF COMPLIANCE FOR OFF-SITE FABRICATION MUST BE COMPLETED AND SUBMITTED TO THE FIELD INSPECTION DIVISION PRIOR TO ERECTION OF PREFABRICATED COMPONENTS.

DESIGN CRITERIA (2006 IBC & UFC 1-200-01):

2.0 REFERENCED STRUCTURAL STANDARDS IN THE 2006 IBC
- 2.01 DESIGN LOADS............................ASCE 7-05
- 2.02 CONCRETE..................................ACI 318-05
- 2.03 MASONRY..................................ACI 530-05/ASCE 5-05/TMS 402-05
- 2.04 STEEL (ASD) ....AISC 360-05
- 2.05 STEEL (SEISMIC)..........................AISC 341-05
- 2.06 STEEL (COLD-FORMED LGS)........NAS 01 INCL. 2004 SUPPLEMENT
  - 2.06.1 GENERAL.............................AISI GENERAL-04
  - 2.06.2 HEADER...............................AISI HEADER-04
  - 2.06.3 TRUSS.................................AISI TRUSS-04
  - 2.06.4 WALL STUD.........................AISI WSD-04
  - 2.06.5 LATERAL.............................AISI LATERAL-04
- 2.07 WOOD (ASD)...................................AF&PA NDS-05

1. BUILDING CODE: 2006 IBC & UFC 1-200-01
2. GRAVITY LOADS:
   - (DL):
     - ROOF 20 psf
     - EXTERIOR WALLS 15 psf
     - INTERIOR WALLS 10 psf
   - (LL):
     - ROOF (REDUCIBLE): 20 psf
     - GROUND SNOW, Po (BASE): 0 psf
3. WIND LOADS:
   - BASIC WIND SPEED = 85 MPH (3 SECOND GUST)
   - EXPOSURE = C
   - IMPORTANCE = 1.0
4. Earthquake:
   - Ss = 0.61
   - S1 = 0.18
   - SEISMIC USE GROUP = I
   - IMPORTANCE FACTOR = 1.0
   - SITE CLASS = D
   - SEISMIC DESIGN CATEGORY = D
   - RESPONSE COEEFICIENT, R = 5.5
   - OVERSTRENGTH FACTOR, Wo = 2.5

GENERAL:
1. ALL DESIGN AND CONSTRUCTION SHALL COMPLY WITH THE 2006 INTERNATIONAL BUILDING CODE AND ALL APPLICABLE LOCAL ORDINANCES.

CONCRETE NOTES

1. THE EXTENT OF THE CONCRETE WORK IS SHOWN ON THE DRAWINGS.
2. SUBMITTALS ARE REQUIRED FOR REINFORCEMENT, CONCRETE MIXES, ADMIXTURES, CURING COMPOUNDS AND ANY OTHER ITEM AS REQUESTED BY THE C.Q.C.
3. CONCRETE TESTING SHALL BE PERFORMED PER ACI REQUIREMENTS:
   - 3.1) A MINIMUM OF ONE SAMPLE A DAY WITH NO LESS THAN 5 SAMPLES FOR A GIVEN CLASS OF CONCRETE, TAKEN FROM 5 RANDOMLY SELECTED BATCHES, OR FROM EACH BATCH IF LESS THAN 5 BATCHES ARE USED.
   - 3.2) A MINIMUM OF ONE SAMPLE PER 150 CUBIC YARDS.
   - 3.3) A MINIMUM OF ONE SAMPLE FOR EACH 5,000 SQUARE FEET OF SLAB OR WALL.
   - 3.4) IF LESS THAN 50 CUBIC YARDS OF A GIVEN CLASS OF CONCRETE IS NEEDED, THE NEED FOR STRENGTH TESTS MAY BE WAIVED WITH THE APPROVAL OF THE ENGINEER.
4. MATERIALS SHALL COMPLY WITH ACI 318-02. PORTLAND CEMENT SHALL BE PER ASTM C 150, TYPE I WITH NORMAL WEIGHT AGGREGATE PER ASTM C33. A 5% (±1.5) AIR ENTRAINING AGENT MAY BE USED IN ALL EXTERIOR CONCRETE. THIS AGENT SHALL BE PER ASTM C 260.
5. COMPRESSIVE STRENGTH OF CONCRETE (28 DAY STRENGTH) AS FOLLOWS:
   - 5.1) FOOTINGS: 3,000 PSI
   - 5.2) SLAB-ON-GRADE: 4,000 PSI
   - 5.3) LEAN CONC. 2,500 PSI
6. PROPORTION ALL MIX DESIGNS TO HAVE A MAXIMUM SLUMP OF 4 INCHES UNLESS SPECIFICALLY APPROVED BY THE ENGINEER.
7. THE MAXIMUM WATER/CEMENT RATIO SHALL BE LIMITED TO 0.45 UNLESS SPECIFICALLY APPROVED BY THE ENGINEER.
8. REINFORCEMENT STEEL: GRADE 60 FY = 60,000 PSI MIN. (ASTM A 615) WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185
9. ANCHOR BOLTS SHALL BE F1554-36 MATERIAL AND SHALL HAVE A MINIMUM EMBEDMENT OF THE GREATER OF 7 INCHES OR 12 DIAMETERS INTO THE CONCRETE UNLESS CALLED FOR OTHERWISE ON THE DRAWINGS. ALL THREADS SHALL BE CUT AND NOT ROLLED. THE EMBEDDED END SHALL CONSIST OF A HEAVY HEX NUT OR OTHER MECHANICAL ANCHOR. HOOK BOLTS ARE NOT ACCEPTABLE. ALL ANCHOR BOLTS MUST BE CLEANED OF OIL, RUST AND OTHER DELETERIOUS COATINGS PRIOR TO PLACEMENT. SET ALL EMBEDMENTS BY MEANS OF A TEMPLATE WHERE POSSIBLE.
10. DETAILING: ALL REINFORCING SHALL BE DETAILED, BOLSTERED AND SUPPORTED WITH ACI STANDARDS #315, "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCING CONCRETE STRUCTURES." NO LAP SPLICES SHALL BE USED IN VERTICAL PIER STEEL. STAGGER ALL SPLICES OF ALL HORIZONTAL REINFORCING.
11. CARE SHALL BE TAKEN TO PREVENT CURLING IN THE SLAB DURING CURING. BURLAP CURING OR OTHER MOISTURE CURE METHOD AS DESCRIBED IN SPECS SHALL BE UTILIZED.
12. PROVIDE CORNER REINFORCING TO MATCH CONTINOUS REINFORCMENT SIZE AND QUANITY AT INTERSECTIONS AND CORNERS OF WALLS AND FOOTINGS.
13. WALL, PIER AND COLUMN DOWELS SHALL BE THE SAME SIZE AND SPACING AS WALL, PIER AND COLUMN REINFORCING, UNLESS NOTED OTHERWISE.

EXECUTION:

14. THE CONCRETE FOUNDATIONS AND SLAB-ON-GRADE MUST BE PLACED ON ENGINEERED FILL, REFER TO SOILS REPORT OR ENGINEER'S RECOMMENDATIONS AS APPROPRIATE.
15. PLACEMENT OF CONCRETE SHALL BE PER ACI 318-05. CONCRETE SHALL BE DEPOSITED AS NEAR TO ITS FINAL POSITION AS POSSIBLE. ALL CONCRETE SHALL BE THOROUGHLY CONSOLIDATED AROUND REINFORCEMENT AND EMBEDDED ITEMS. ALL REINFORCING STEEL MUST BE FREE FROM DIRT, RUST AND OTHER DELETERIOUS MATERIAL PRIOR TO PLACEMENT. DOWELS, ANCHOR BOLTS, INSERTS, ETC. SHALL BE SECURELY TIED IN PLACE PRIOR TO POURING OF CONCRETE OR GROUT.
16. MINIMUM CONCRETE COVERS AS FOLLOWS:
    - 16.1) CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH: 3"
      CONCRETE PERMANENTLY EXPOSED TO EARTH OR WEATHER:
    - 16.2) NO. 5 BAR OR SMALLER: 1-1/2"
    - 16.3) NO. 6 BAR OR LARGER: 2"
      CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT
    - 16.4) WITH GROUND (TO NO. 11 BARS): 3/4"
17. PROVIDE CONTINUOUS 2" X 4" KEY-WAY IN ALL HORIZONTAL AND VERTICAL CONSTRUCTION JOINTS. OTHERWISE, ROUGHEN AND CLEAN ALL CONSTRUCTION JOINTS.
18. NO PIPES, DUCTS OR CONDUIT SHALL BE PLACED IN CONCRETE UNLESS SPECIFICALLY DETAILED OR NOTED.
19. NO ADMIXTURES SHALL BE USED WITHOUT THE APPROVAL OF THE ENGINEER. NO CALCIUM CHLORIDE SHALL BE USED.
20. PROVIDE CURING AND SEALING COMPOUND TO ALL EXPOSED INTERIOR SLABS AND TO ALL EXTERIOR SLABS, WALKS AND CURBS AS SOON AS FINAL FINISHING IS COMPLETE.
21. NOTIFY THE EOR AND THE BUILDING OFFICIAL WHEN REQ'D AT LEAST 48 HOURS PRIOR TO PLACING CONCRETE.

GENERAL NOTES:

1. ALL DRAWINGS ARE CONSIDERED TO BE A PART OF THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REVIEW AND COORDINATION OF ALL DRAWINGS AND SPECIFICATIONS PRIOR TO THE START OF CONSTRUCTION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO THE START OF CONSTRUCTION SO THAT A CLARIFICATION CAN BE ISSUED. ANY WORK PERFORMED IN CONFLICT WITH THE CONTRACT DOCUMENTS OR CODE REQUIREMENTS SHALL BE CORRECTED BY THE CONTRACTOR AT CONTRACTOR'S EXPENSE AND AT NO EXPENSE TO THE GOVERNMENT.
2. TYPICAL NOTES AND DETAILS SHALL APPLY UNLESS OTHERWISE SHOWN OR NOTED ON DRAWINGS.
3. DETAILS OF CONSTRUCTION NOT FULLY SHOWN SHALL BE OF THE SAME NATURE AS SHOWN FOR SIMILAR CONDITION.
4. ALL WORK SHALL CONFORM TO THE MINIMUM STANDARDS OF THE FOLLOWING CODES: 2006 INTERNATIONAL BUILDING CODE (IBC), AND LATEST REVISIONS REFERRED TO HERE AS "THE CODE", AND OTHER REGULATING AGENCIES WHICH HAVE AUTHORITY OVER ANY PORTION OF THE WORK, INCLUDING THE STATE OF CALIFORNIA DIVISION OF INDUSTRIAL SAFETY, AND THOSE CODES AND STANDARDS LISTED IN THESE NOTES AND SPECIFICATIONS.
5. NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS. WHERE NO DETAILS ARE GIVEN, CONSTRUCTION SHALL BE AS SHOWN FOR SIMILAR WORK. IF CONFLICTS OCCUR BETWEEN DRAWINGS AND SPECIFICATIONS, THE MORE RESTRICTIVE REQUIREMENT SHALL GOVERN. STRUCTURAL ENGINEER SHALL BE NOTIFIED OF CONFLICTS AND THAT PORTION OF WORK SHOULD NOT PROCEED UNTIL THE CONFLICT IS RESOLVED.
6. SEE ARCHITECTURAL DRAWINGS FOR THE FOLLOWING:
   - 6.1. SIZE AND LOCATION OF ALL DOOR AND WINDOW OPENINGS.
   - 6.2. SIZE AND LOCATIONS OF ALL INTERIOR AND EXTERIOR NON-BEARING PARTITIONS.
   - 6.3. SIZE AND LOCATION OF ALL CONCRETE CURBS, EQUIPMENT PADS, PITS, FLOOR DRAINS, SLOPES, DEPRESSED AREAS, CHANGE IN LEVEL, CHAMFERS, GROOVES, INSERTS, ETC.
   - 6.4. SIZE AND LOCATION OF ALL FLOOR AND ROOF OPENINGS EXCEPT AS SHOWN.
   - 6.5. FLOOR AND ROOF FINISHES.
   - 6.6. DIMENSIONS NOT SHOWN ON STRUCTURAL DRAWINGS.
7. SEE MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR THE FOLLOWING:
   - 7.1. PIPE RUNS, SLEEVES, HANGERS, TRENCHES, WALL AND SLAB OPENINGS, ETC. EXCEPT AS SHOWN OR NOTED.
   - 7.2. ELECTRICAL CONDUIT RUNS, BOXES, OUTLETS IN WALL OR SLABS.
   - 7.3. CONCRETE INSERTS FOR ELECTRICAL, MECHANICAL OR PLUMBING FIXTURES.
   - 7.4. SIZE AND LOCATION OF MACHINE OR EQUIPMENT BASES AND ANCHOR BOLTS FOR MOTOR MOUNTS.
8. THE CONTRACT STRUCTURAL DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION.
9. ASTM SPECIFICATIONS ON THE DRAWINGS SHALL BE OF THE LATEST REVISION.
10. CONSTRUCTION MATERIAL SHALL BE SPREAD OUT IF PLACED ON FRAMED ROOF OR FLOOR. LOAD SHALL NOT EXCEED DESIGN LIVE LOAD PER SQUARE FOOT. PROVIDE ADEQUATE SHORING AND/OR BRACING WHERE STRUCTURE HAS NOT ATTAINED DESIGN STRENGTH.
11. HEAVY EQUIPMENT, CRANES AND MATERIAL STOCKPILES SHALL NOT BE LOCATED ON OR ADJACENT TO SHORING.
12. SUBSTITUTIONS FOR STRUCTURAL MEMBERS, HARDWARE, OR DETAILS SHALL BE REVIEWED BY THE ARCHITECT AND STRUCTURAL ENGINEER AND APPROVED BY THE APPROPRIATE AGENCY. FOR A SUBSTITUTION TO BE REVIEWED THE CONTRACTOR SHALL AGREE AND COMPLY WITH THE FOLLOWING:
    - 12.1. THE CONTRACTOR SHALL BE BILLED ON A TIME AND MATERIALS BASIS FOR THE REVIEW OF THE SUBSTITUTION WITH NO GUARANTEE OF APPROVAL.
    - 12.2. VERIFY THAT THE SUBSTITUTION DOES NOT AFFECT DIMENSIONS SHOWN ON DRAWINGS.
    - 12.3. THE CONTRACTOR SHALL ALSO PAY FOR CHANGES TO THE BUILDING DESIGN, WHICH INCLUDES BUT IS NOT LIMITED TO; ENGINEERING DESIGN, DETAILING, APPROVAL AGENCY PROCESS AND CONSTRUCTION COSTS CAUSED BY THE REQUESTED SUBSTITUTION.
    - 12.4. THE PROPOSED SUBSTITUTION IS TO HAVE NO ADVERSE AFFECT ON OTHER TRADES, THE CONSTRUCTION SCHEDULE, OR THE SPECIFIED WARRANTY REQUIREMENTS.
13. NO STRUCTURAL MEMBERS SHALL BE CUT, NOTCHED OR OTHERWISE PENETRATED UNLESS SPECIFICALLY APPROVED BY THE STRUCTURAL ENGINEER IN ADVANCE OR SHOWN ON THESE DRAWINGS.
14. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO STARTING CONSTRUCTION. DIMENSIONS AND ELEVATIONS MUST BE VERIFIED WITH ARCHITECTURAL DRAWINGS. IN THE EVENT OF A CONFLICT, THE STRUCTURAL ENGINEER AND ARCHITECT ARE TO BE NOTIFIED IMMEDIATELY. DRAWING SCALES GIVEN ARE APPROXIMATE- DO NOT SCALE PLANS OR DETAILS.
15. SITE VISITS BY STRUCTURAL ENGINEER SHALL NOT BE IN LIEU OF INSPECTIONS.
16. LAP SPLICES SHALL BE IN ACCORDANCE WITH THE FOLLOWING TABLE, UNLESS NOTED OTHERWISE. WHERE CLASSES ARE NOT CALLED OUT ON THE DRAWINGS, USE CLASS "B" SPLICES.

BAR SIZE	TENSION SPLICES (INCHES) TOP BARS "A"	"B"	OTHER BARS "A"	"B"	COMPRESSION SPLICES (INCHES)
#3	16	21	12	16	12
#4	21	28	16	21	15
#5	27	35	21	27	19
#6	35	46	27	35	23
#7	48	62	37	48	26
#8	63	82	48	63	30
#9	80	104	61	80	34
#10	101	131	78	101	38
#11	125	162	96	125	42

COMPRESSION DOWEL EMBEDMENT: 22 BAR DIAMETERS. LAP WELDED FABRIC ONE SPACING OF CROSS WIRES PLUS 2 INCHES.

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ABBREVIATIONS, GENERAL NOTES,DESIGN CRITERIA FOUNDATION, CONCRETE AND REBAR NOTES

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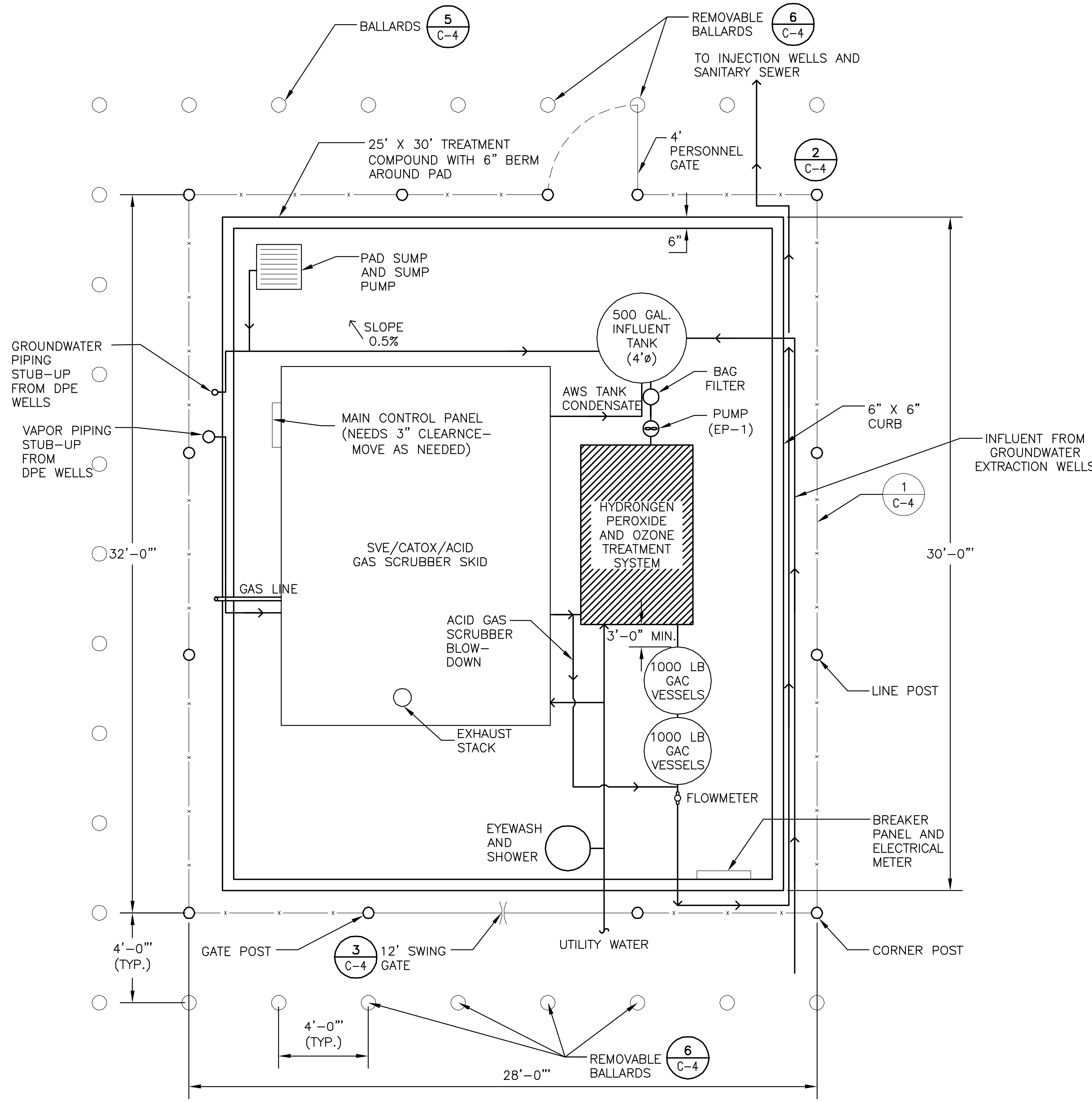
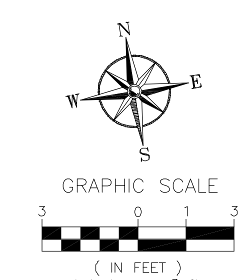
N.T.S.	8/30/2007	S-3.dwg	S-0





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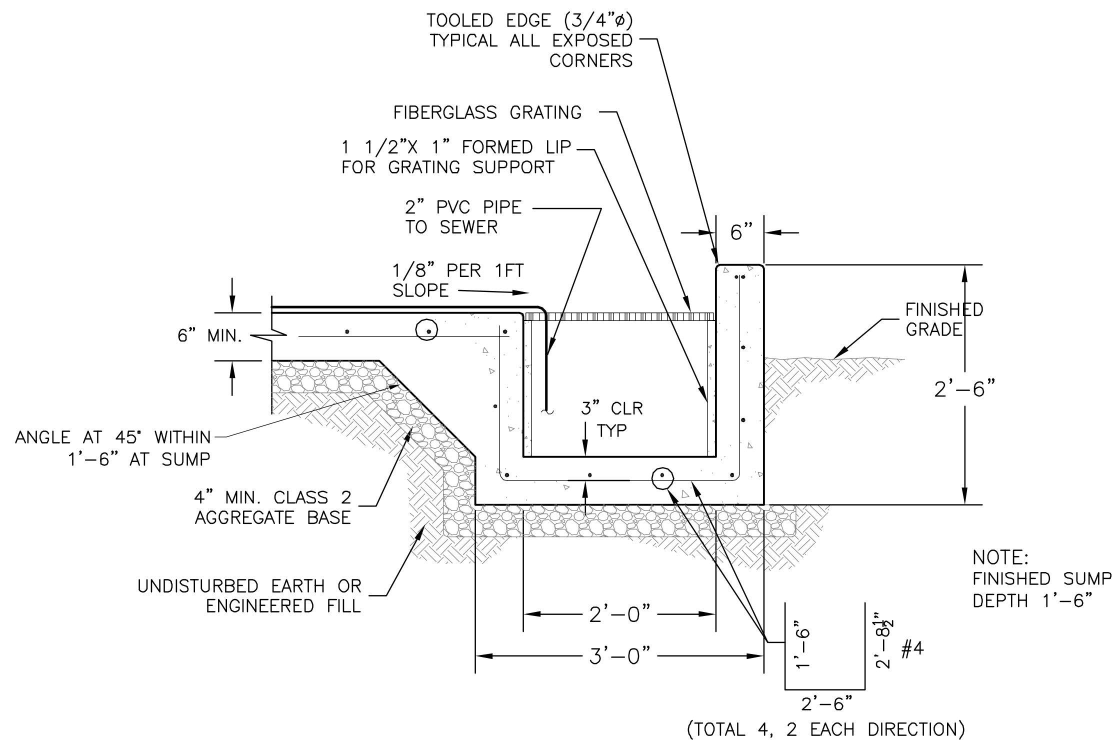
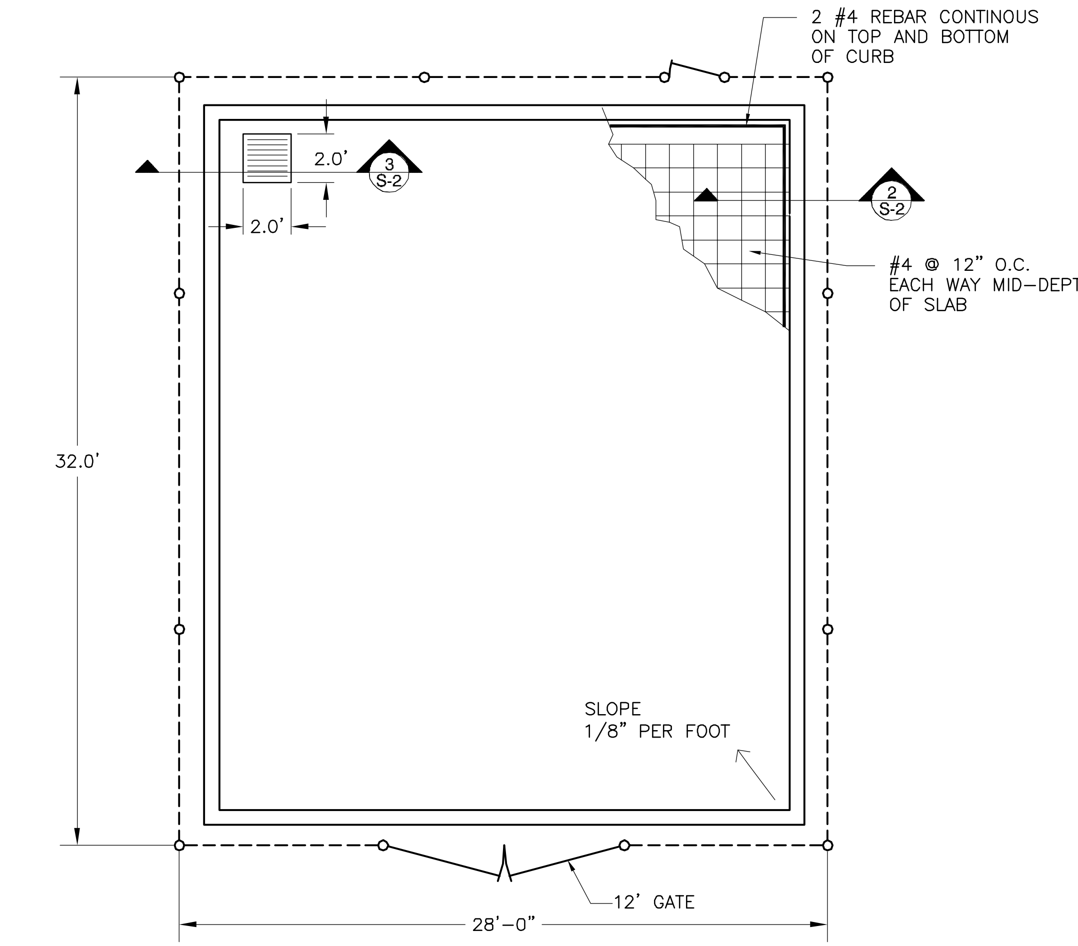
TREATMENT COMPOUND PLAN

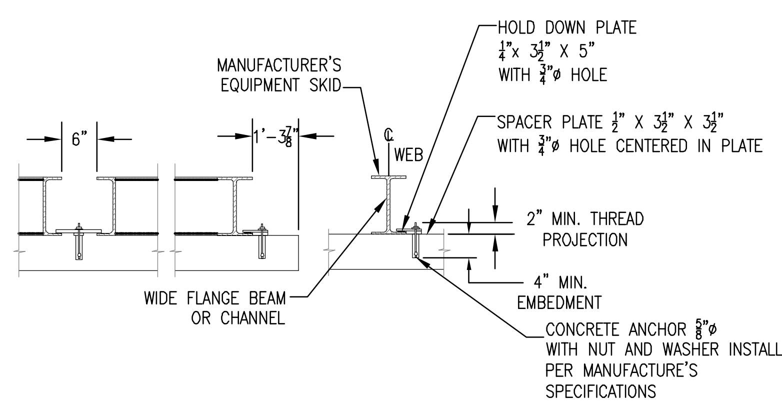
SCALE:	DATE:	DWG. FILE:	SHEET NO.
1"=3'-0"	8/22/2007	S-1.dwg	S-1



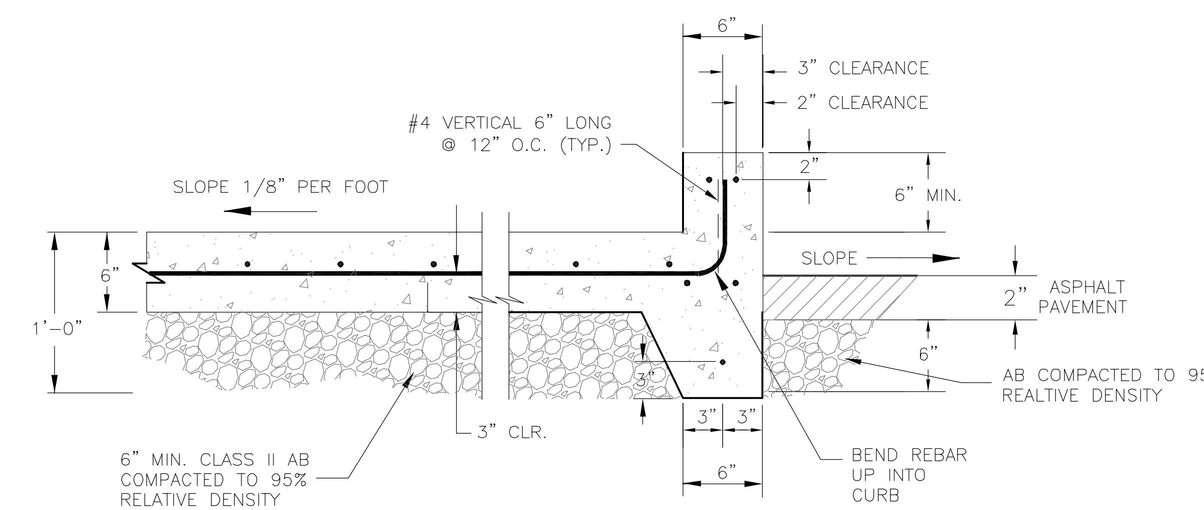
3 / S-2 **SUMP DETAIL**
(NOT TO SCALE)



1 / S-2 **TREATMENT COMPOUND SLAB (PLAN VIEW)**
(NOT TO SCALE)



4 / S-2 **PROPOSED EQUIPMENT SKID HOLD DOWN PLATE DETAIL**
(NOT TO SCALE)



NOTES:

1) USE 2,500 PSI CONCRETE @ 28 DAYS

2 / S-2 **FOOTING AND SLAB (CROSS-SECTION)**
(NOT TO SCALE)

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION

REVISIONS

DESIGNED BY: M. WIDMANN
DRAWN BY: D. LARSON
CHECKED BY: N/A

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REGISTERED PROFESSIONAL ENGINEER — M. Kisabull No. S-4087 EXP. 09-30-07 — STRUCTURAL — STATE OF CALIFORNIA

SOIL REMEDIAL DESIGN
COOPER DRUM COMPANY SUPERFUND SITE
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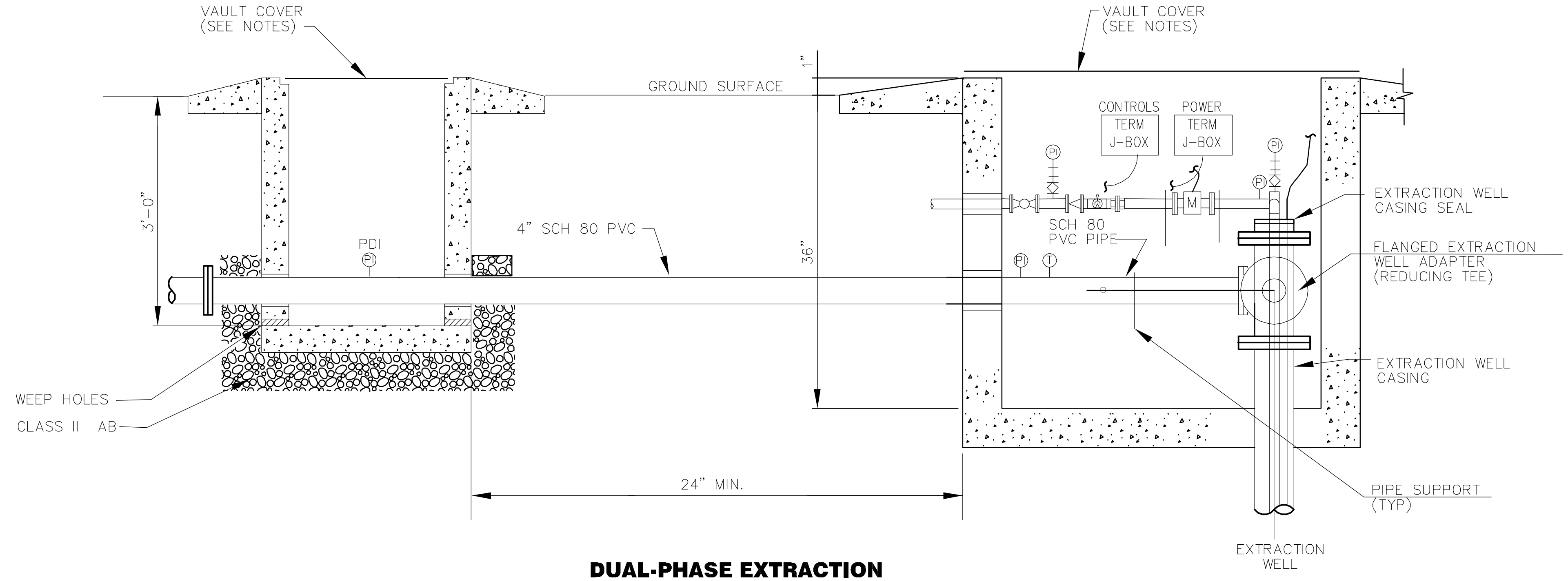
LOS ANGELES COUNTY , CALIFORNIA 90280

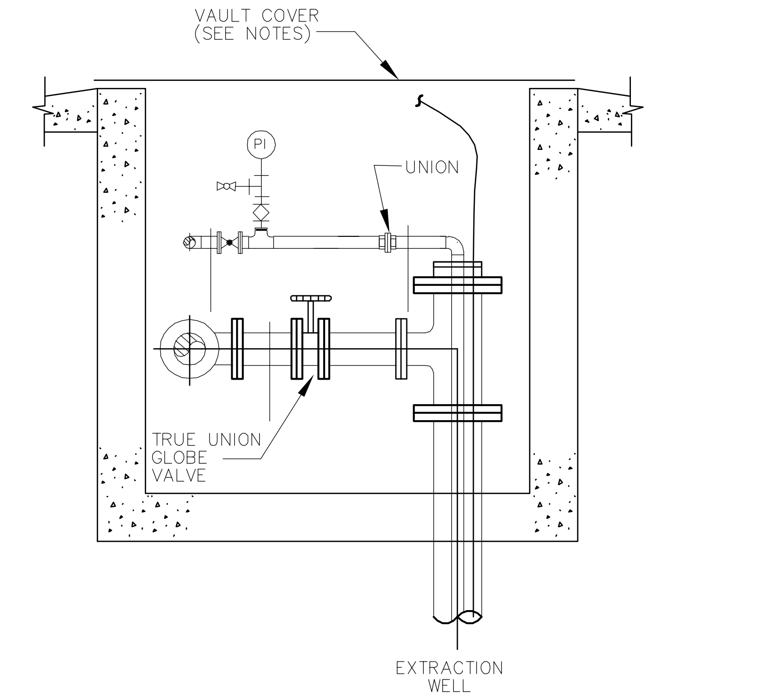
CONCRETE DETAILS

SCALE:	DATE:	DWG. FILE:	SHEET NO.
N.T.S.	8/22/2007	S-2.dwg	S-2



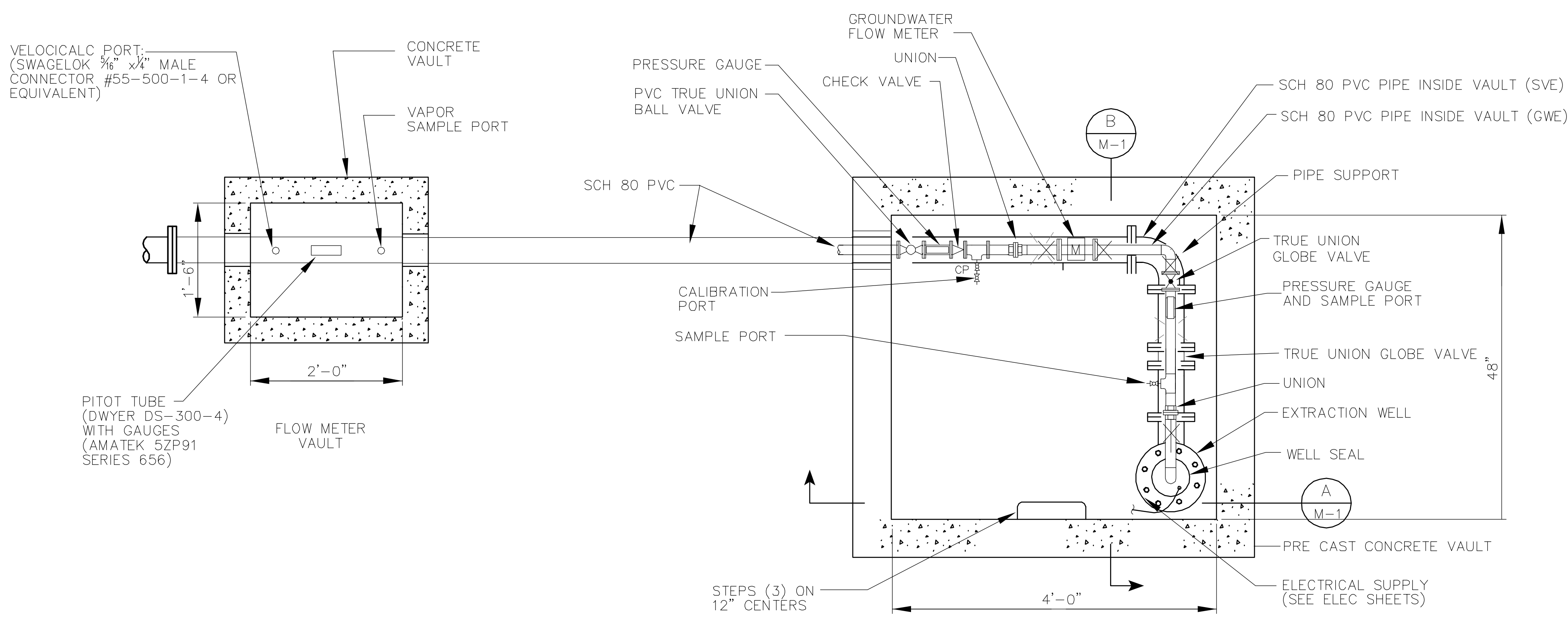
DUAL-PHASE EXTRACTION WELL-HEAD DETAIL (SECTION)

A / M-1 NOT TO SCALE



DUAL-PHASE EXTRACTION WELL-HEAD DETAIL (SECTION)

B / M-1 NOT TO SCALE



DUAL-PHASE EXTRACTION WELL-HEAD DETAIL (PLAN)

1 / C-1 NOT TO SCALE

NOTES:

1. ALL VAULTS SHALL BE RATED FOR TRAFFIC AND WATER RESISTANT.
2. CONCRETE REQUIREMENTS:
   - A. CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4,000 PSI.
   - B. THE VAULT SHALL BE DESIGNED IN ACCORDANCE WITH ACI 318-89 FOR THE FOLLOWING LOADINGS: LATERAL SOIL LOAD – 70 PCF EQUIVALENT FLUID PRESSURE SURCHARGE – 240 PSF
3. SEAL ALL VAULTS PENETRATIONS W/ WATERPROOF CONCRETE GROUTSEAL.
4. PIPE SUPPORTS MAY BE EITHER WALL OR FLOOR MOUNTED.
5. VAULT COVER SHALL BE GALVANIZED STEEL.
6. ALL HARDWARE FOR THE COVER SHALL BE STAINLESS STEEL.
7. COVER SHALL BE TORSION SPRING ASSISTED.
8. VAULT COVER SHALL BE SET FLUSH WITH GROUND SURFACE IN TRAFFIC AREAS OR WHERE OTHERWISE DIRECTED BY ENGINEER.
9. COVERS SHALL BE EQUIPPED WITH A JOINT GUTTER AND A MOAT TYPE EDGE DRAIN.

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION

REVISIONS

DESIGNED BY: M. WIDMANN
DRAWN BY: D. LARSON
CHECKED BY: N/A

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REGISTERED PROFESSIONAL ENGINEER — EDMOND D. TARTER — No. 64825 — Exp. — CIVIL — STATE OF CALIFORNIA

SOIL REMEDIAL DESIGN
COOPER DRUM COMPANY SUPERFUND SITE
9316 SOUTH ATLANTIC AVE, SOUTH GATE
LOS ANGELES COUNTY , CALIFORNIA 90280

TYPICAL DPE WELL HEAD DETAILS

SCALE:	DATE:	DWG. FILE:	SHEET NO.
N.T.S.	8/22/2007	M-1.dwg	M-1

GENERAL NOTES:

1. FURNISH AND INSTALL ALL NECESSARY LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS REQUIRED TO INSTALL COMPLETE AND OPERATIONAL ELECTRICAL SYSTEMS ACCORDING TO THE INTENT OF THESE DRAWINGS AND ASSOCIATED SPECIFICATIONS WHETHER ITEMIZED OR NOT.
2. EXAMINE THE DRAWINGS FOR MECHANICAL EQUIPMENT AND PROVIDE STARTERS, CIRCUIT BREAKERS, SWITCHES, PUSHBUTTONS AND APPURTENANCES WHICH ARE NOT SPECIFIED TO BE WITH THE MECHANICAL EQUIPMENT. ERECT ALL ELECTRICAL EQUIPMENT NOT DEFINITELY STATED TO BE ERECTED BY OTHERS, FURNISH AND INSTALL CONDUIT WIRE AND CABLE AND MAKE CONNECTIONS REQUIRED TO PLACE ALL EQUIPMENT IN COMPLETE OPERATION.
3. THE ELECTRICAL CONTRACTOR SHALL HAVE THOROUGHLY EXAMINED THE SITE AND FAMILIARIZED HIMSELF WITH THE EXISTING CONDITIONS, AND SHALL HAVE MADE ALLOWANCE THEREFORE IN PREPARING HIS PROPOSAL . HE SHALL VERIFY EXISTING CONDITIONS, PULLBOXES, ELECTRICAL DISTRIBUTION SYSTEMS AND DEMOLITION REQUIREMENTS PRIOR TO SUBMITTING A BID.
4. IN THE EVENT OF DISCREPENCIES BETWEEN EXISTING CONDITIONS AND THE DRAWINGS, THE ELECTRICAL CONTRACTOR SHALL BID NEW CONDITIONS, WIRES AND NECESSARY EQUIPMENT IN ORDER TO COMPLETE THE JOB AND PROVIDE A FULLY OPERABLE AND AND ACCEPTABLE SYSTEMS. EXTRAS WILL NOT BE ALLOWED FOR WORK NOT INDICATED OR NOTED ON THE DRAWINGS WHEN SUCH WORK IS APPARENT FROM AN INSPECTION OF THE PREMISES AT THAT TIME .
5. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING CONTINUITY OF EXISTING ELECTRICAL CIRCUITS BEING USED FOR EXISTING LIGHTING AND RECEPTACLES TO REMAIN WHETHER INDICATED OR NOT. VERIFY USAGE FOR ALL BRANCH CIRCUITS IN EXISTING PANELBOARDS AND ADJUST CIRCUITS AS NECESSARY. DOCUMENT PANEL CIRCUIT DIRECTORIES ON AS BUILT DRAWINGS AND PROVIED TYPE WRITTEN DIRECTORY CARDS FOR ALL PANELBOARDS.
6. ALL MATERIALS USED ON THIS PROJECT SHALL BE LISTED AND BEAR THE LABEL OF UNDERWRITERS LABORTORIES. AND APPROVED FOR ITS INTENDED USE .
7. ELECTRICAL WORK SHALL CONFORM TO THE 2004 CALIFORNIA ELECTRICAL CODE AND COUNTY OF LOS ANGELES CODES.
8. FIRE SEAL AROUND ALL CONDUITS PENETRATIONS THROUGH FIRE BARRIERS WITH AN APPROVED FIRE SEALANT EQUAL TO THE RATING OF THE SURFACE PENETRATED. FIRE SEAL INSIDE OF CONDUIT AFTER CONDUCTOR INSTALLATION .

ABBREVIATIONS:

120V	120 VOLTS
C O	CONDUIT ONLY
C	CONDUIT
CONT	CONTROLS
(E)	EXISTING
EL	EMERGENCY LIGHT
EOL	INDICATES DEVICE w/ END-OF-LINE RESISTOR
FACP	FIRE ALARM CONTROL PANEL
MT	EMPTY CONDUIT WITH PULLSTRING
(N)	NEW
NIES	NOT INCLUDED ELECTRICAL SCOPE
NL	NIGHT LIGHT
PFB	PROVIDE FOR FUTURE BREAKER
(R)	REMOVE
(RE)	RELOCATE EXISTING
UNO	UNLESS NOTED OTHERWISE
WP	WEATHERPROOF

LEGEND:

- FLUORESCENT LIGHT FIXTURE – RECESSED WITH INTEGRAL BATTERY PACK FOR EMERGENCY OPERATION
- 2a FLUORESCENT LIGHT FIXTURE – RECESSED, NUMBER DENOTES CIRCUIT, LETTER DENOTES SWITCH DESIGNATION
- FLUORESCENT HID LIGHT FIXTURE – RECESSED
- HID LIGHT FIXTURE – WALL MOUNTED
- SINGLE POLE TOGGLE SWITCH, @ +46" UNO
- TWO POLE TOGGLE SWITCH, @ +46" UNO
- THREE-WAY TOGGLE SWITCH, @ +46" UNO
- MOTOR RATED SINGLE POLE SWITCH, @ UNIT UNO
- (A) FIXTURE TAG: LETTER INDICATES TYPE
- JUNCTION BOX, SIZE & TYPE AS INDICATED OR AS REQUIRED
- 20 AMP 125V 3W DUPLEX RECEPTACLE, @ +18" UNO
- 20 AMP 125V 3W DUPLEX RECEPTACLE WITH GFCI, ABOVE COUNTER SPLASH
- DEDICATED CIRCUIT RECEPTACLE, 20 AMP 125V 3W DUPLEX, @ +18" UNO
- 20 AMP 125V 3W DOUBLE DUPLEX RECEPTACLE, @ +18" UNO
- NON-FUSED DISCONNECT SWITCH
- CIRCUIT BREAKER DISCONNECT SWITCH
- FUSED DISCONNECT SWITCH, SIZE PER UNIT LABEL
- MOTOR, N.I.E.S. CONNECT AS REQUIRED, NUMBER INDICATES HP
- CONTROL EQUIPMENT. CONNECT AS REQUIRED
- PANELBOARD – SURFACE MOUNTED – SEE SCHEDULE
- TELEPHONE OUTLET, 4" SQ. BOX w/ SINGLE DEVICE RING & PLATE @ +18" UNO
- DATA OUTLET, 4" SQ. BOX w/ SINGLE DEVICE RING & PLATE @ +18" UNO
- CONDUIT CONCEALED IN CEILING OR WALL
- HOMERUN TO RESPECTIVE PANEL OR TERMINAL CABINET – OVERHEAD
- HOMERUN TO RESPECTIVE PANEL OR TERMINAL CABINET – UNDERGROUND
- CONDUIT RISER – UP
- CONDUIT RISER – DOWN

BRANCH CIRCUIT WITHOUT FURTHER DESIGNATION INDICATES A 2 #12 WIRE CIRCUIT AND 1#12 GROUND WIRE. ALL CONDUITS AND RACEWAY MUST HAVE AN INSULATED GROUND WIRE SIZED PER NEC 250.122, CONDUIT SIZE SHALL BE 3/4" UNO.

- UNDERGROUND CONDUIT OU1 RA
- UNDERGROUND CONDUIT OU2 RA
- FLAG NOTE SHOWN ON SAME SHEET
- A / E1.0 SECTION DESIGNATION; TOP LETTER INDICATES SECTION, BOTTOM LETTER/NUMBER INDICATES SHEET
- 1 / E1.0 DETAIL DESIGNATION; TOP NUMBER INDICATES DETAIL, BOTTOM LETTER/NUMBER INDICATES SHEET
- MECHANICAL & PLUMBING EQUIPMENT DESIGNATION
- LINE VOLTAGE THERMOSTAT, NIES, INSTALL & CONNECT AS REQUIRED
- TELEVISION OUTLET
- EMERGENCY CALL OUTLET
- PUBLIC TELEPHONE OUTLET
- SPECIAL OUTLET. SEE PLANS FOR SPECIFICATION
- SEALING FITTING WITH SEALING COMPOUND FOR CLASS 1, DIV. 1

NOTE: SYMBOLS INDICATED ABOVE MAY NOT NECESSARILY APPEAR AS PART OF THESE DRAWINGS IF NOT REQUIRED.

J:\Cooper Drum\CADD\Drawings\SOIL REMEDIATION SYSTEM\E-1.dwg User:David_Larson Plotted:Sep 26, 2007 – 11:02am Last Save:Sep 24, 2007 – 1:31pm

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION

REVISIONS

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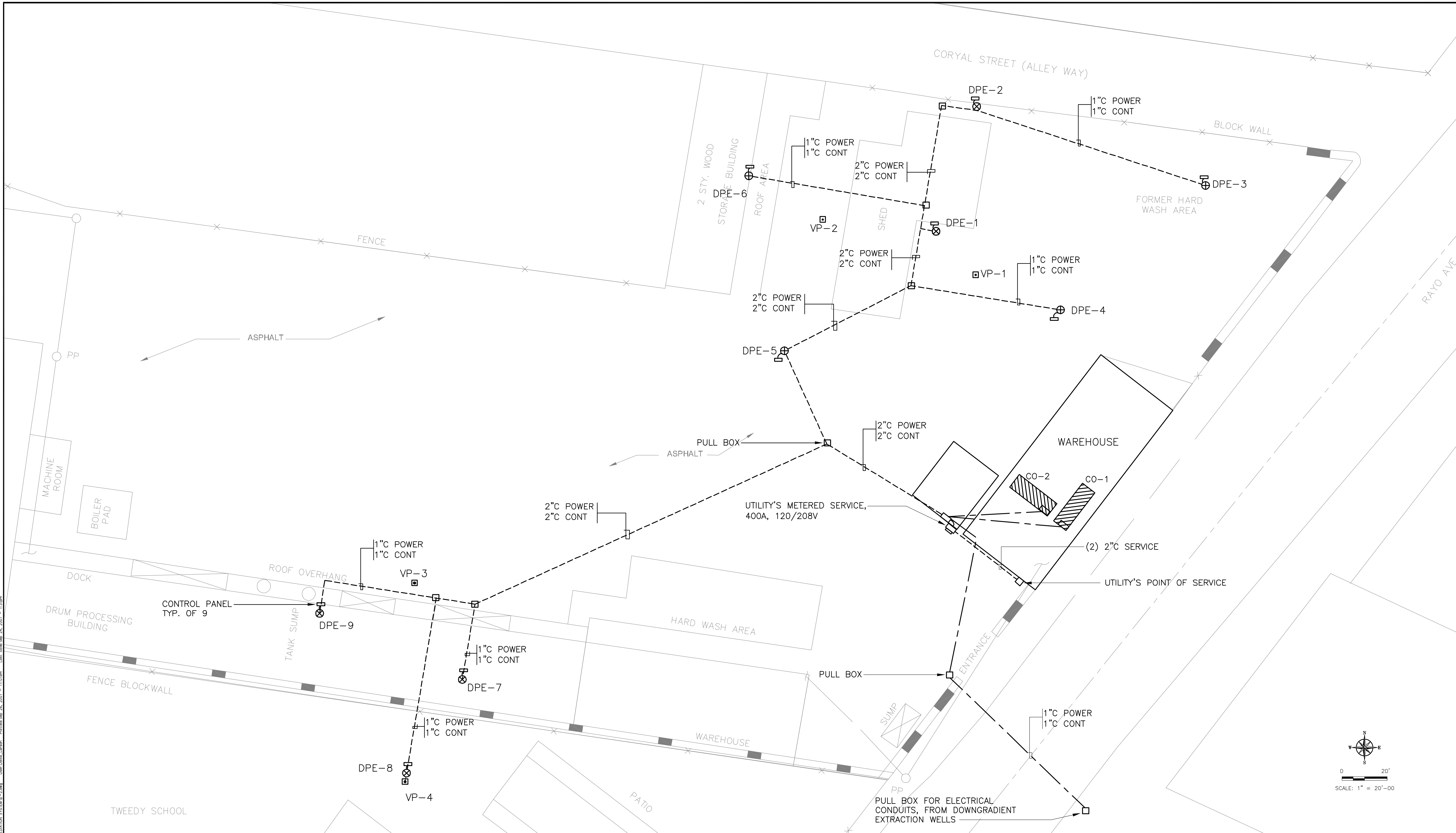
REGISTERED PROFESSIONAL ENGINEER HENRY FELIX OQUENDO No. E14642 Exp. 12-31-06 ELECTRICAL STATE OF CALIFORNIA

SOIL REMEDIAL DESIGN
COOPER DRUM COMPANY SUPERFUND SITE
9316 SOUTH ATLANTIC AVE, SOUTH GATE
LOS ANGELES COUNTY , CALIFORNIA 90280

ELECTRICAL GENERAL NOTES AND SYMBOLS

SCALE:	DATE:	DWG. FILE:	SHEET NO.
N.T.S.	8/22/2007	E-1.dwg	E-1



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REGISTERED PROFESSIONAL ENGINEER — HENRY FELIX QUIÑONES — No. E14642 — Exp. 12-31-06 — ELECTRICAL — STATE OF CALIFORNIA

SOIL REMEDIAL DESIGN
COOPER DRUM COMPANY SUPERFUND SITE
9316 SOUTH ATLANTIC AVE, SOUTH GATE
LOS ANGELES COUNTY , CALIFORNIA 90280

ELECTRICAL SITE PLAN

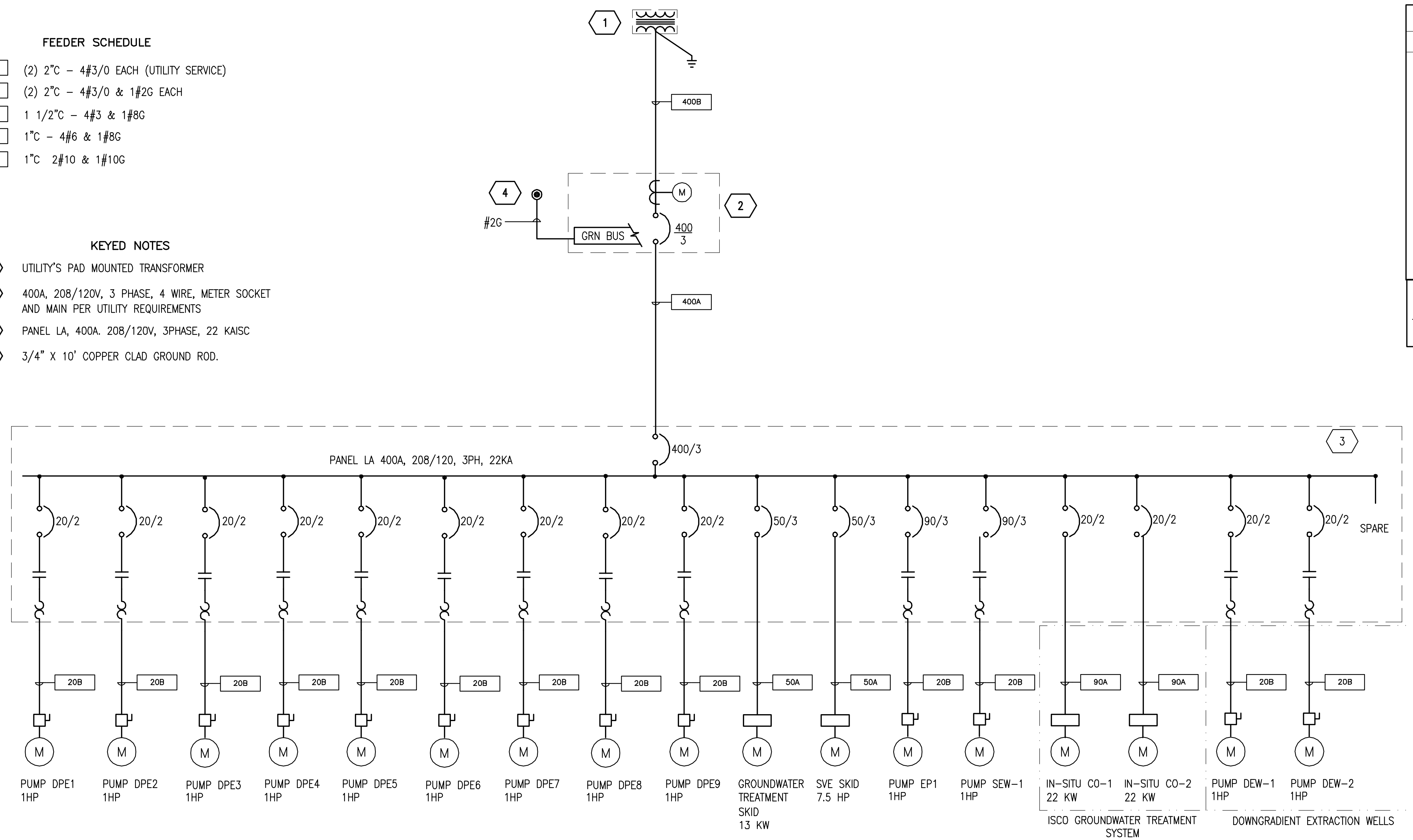
SCALE:	DATE:	DWG. FILE:	SHEET NO.
1"=20'-0"	8/22/2007	E-2.dwg	E-2

FEEDER SCHEDULE

400B	(2) 2"C – 4#3/0 EACH (UTILITY SERVICE)
400A	(2) 2"C – 4#3/0 & 1#2G EACH
90A	1 1/2"C – 4#3 & 1#8G
50A	1"C – 4#6 & 1#8G
20B	1"C 2#10 & 1#10G

KEYED NOTES

1. UTILITY'S PAD MOUNTED TRANSFORMER
2. 400A, 208/120V, 3 PHASE, 4 WIRE, METER SOCKET AND MAIN PER UTILITY REQUIREMENTS
3. PANEL LA, 400A. 208/120V, 3PHASE, 22 KAISC
4. 3/4" X 10' COPPER CLAD GROUND ROD.



SINGLE LINE DIAGRAM

LOAD SUMMARY

EQUIPMENT	RATING	LOAD
WELL SUMP PUMP DPE-1 TO DPE-9	(9) 2 HP	18,000 VA
SVE SKID	7 1/2 HP	7,500 VA
GROUNDWATER TREATMENT SKID	13 KW	13,000 VA
EXTRACTION PUMPS	(2) 2 HP	4,000 VA
PUMP DEW-1 AND DEW-2	(2) 2 HP	4,000 VA
IN-SITU CHEM. OXIDATION 1	22 KW	22,000 VA
IN-SITU CHEM. OXIDATION 2	22 KW	22,000 VA
RECEPTACLES	.2 KW	200 VA
MISCELLANEOUS	.2 KW	400 VA
TOTAL		91,100 VA
TOTAL AMPS AT 208V, 3PH		253 AMPS

PANEL "LA" SCHEDULE

POWER SOURCE: SERVICE			LOCATION: ELECT RM		208
TYPE: POWRLINE	BUS: 400A	MAIN 400A	VOLTAGE: 208Y/120 VOLT, 3 PHASE, 4 WIRES	MOUNTING: SURFACE	REMARKS: 22k AIC MIN. SYMM

LOAD SERVED	kvA	CB	CT	PHASE	CT	CB	kvA	LOAD SERVED
SUB PUMP DPE-1	0.9	20/2	1	A	2	50/3	3.1	SVE SKID
	0.9		3	B	4		3.1	
SUB PUMP DPE-2	0.9	20/2	5	C	6		3.1	
	0.9		7	A	8	50/3	4.4	HCU SKID
SUB PUMP DPE-3	0.9	20/2	9	B	10		4.4	
	0.9		11	C	12		4.4	
SUB PUMP DPE-4	0.9	20/2	13	A	14	20/1	0.9	DEW-2
	0.9		15	B	16	20/1	0.9	
SUB PUMP DPE-5	0.9	20/2	17	C	18	20/1		SPARE
	0.9		19	A	20	20/2	0.9	PUMP EPE-1
SUB PUMP DPE-6	0.9	20/2	21	B	22		0.9	
	0.9		23	C	24	20/2	0.9	PUMP SEW-1
SUB PUMP DPE-7	0.9	20/2	25	A	26		0.9	
	0.9		27	B	28	20/2	0.9	PUMP DEW-2
SUB PUMP DPE-8	0.9	20/2	29	C	30		0.9	
	0.9		31	A	32	90/3	7.3	IN-SITU C0-1
SUB PUMP DPE-9	0.9	20/2	33	B	34		7.3	
	0.9		35	C	36		7.3	
RECEP.	0.2	20/1	37	A	38	90/3	7.3	IN-SITU CO-2
MISC.	0.2	20/1	39	B	40		7.3	
SCADA	0.2	20/1	41	C	42		7.3	

NOTE(S):

PHASE A=	30.4	kvA
PHASE B=	30.4	kvA
PHASE C=	29.5	kvA
TOTAL =	90.3	kvA
TOTAL =	250.8	Amperes

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION

REVISIONS

DESIGNED BY: M. WIDMANN
DRAWN BY: D. LARSON
CHECKED BY: N/A

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REGISTERED PROFESSIONAL ENGINEER HENRY FELIX QUIERNO No. E14642 Exp. 12-31-06 ELECTRICAL STATE OF CALIFORNIA

SOIL REMEDIAL DESIGN
COOPER DRUM COMPANY SUPERFUND SITE
9316 SOUTH ATLANTIC AVE, SOUTH GATE
LOS ANGELES COUNTY , CALIFORNIA 90280

SINGLE LINE DIAGRAM

SCALE:	DATE:	DWG. FILE:	SHEET NO.
N.T.S.	8/22/2007	E-3.dwg	E-3

Cost Estimate Summary For The Selected Remedy For Soil

Description	Cost
Capital Costs	
Excavation	
Mobilization and Demobilization	$31,961
Excavation and Hauling	$842,785
Confirmation Sampling (Excavation)	$45,500
Dual Phase Extraction	
Permitting	$131,320
Remediation Equipment	$506,889
Treatment Compound Slab	$22,368
Treatment Compound Fence and Bollards	$23,250
Extraction Well Install and Monitoring	$146,630
Treatment Trenching and Piping	$54,914
Wellheads and Equipment Install	$150,777
Initial Startup Test	$8,519
Subtotal (construction)	$1,964,913
Bid contingencies(5% of total)	$98,246
Report preparation (RAWP, HASP, Plans, Final O&M)(5% of total)	$98,246
Field and laboratory testing during construction (1% of total)	$19,649
Reporting during construction (1% of total)	$19,649
Total Capital Cost	**$2,200,703**
OPERATIONS AND MAINTENANCE COSTS	`
O&M labor	$40,800
SVE treatment system Sampling	$13,880
O&M material	$9,120
Electrical Utility	$72,883
O&M Analytical	$71,520
O&M Source Testing	$16,510
O&M Reporting	$38,272
Subtotal O&M (Annual Cost)	$262,985
Subtotal O&M (discounted)[a]	**$749,264**
Closure Plans and Sampling [b]	**$86,702**
TOTAL PRESENT VALUE	**$3,036,669**

Date: September 18, 2007

Note: Inflation rates for 2007 through 2009 (As provided in the ROD) was factored into the 7% discount

[a] A 7% discount assumed for 3 years of O&M operation

[b] Closure sampling is assumed to occur in 2010

Cooper Drum
9316 South Atlantic Avenue, South Gate, CA
DUAL PHASE EXTRACTION

Description	Qty	Unit	$/unit	Ext. Cost
Permitting				
Labor:				
PM/Engineer - Senior	40	hr	$ 100.00	$4,000
Engineer - Senior	20	hr	$ 100.00	$2,000
Scientist - Sr	5	hr	$ 100.00	$500
Engineer - Staff	40	hr	$ 75.00	$3,000
Scientist - Staff	40	hr	$ 75.00	$3,000
Procurement	20	hr	$ 60.00	$1,200
Subtotal				$13,700
Permits:				
South Coast AQMD	1	LS	$2,682	$2,682
Utility Costs	24	mo	$3,500	$84,000
Electrical	1	LS	$10,000	$10,000
Natural Gas	1	LS	$5,000	$5,000
Sewer	1	LS	$2,000	$2,000
Bldg. & Planning Dept Permit	1	LS	$2,000	$2,000
Subtotal				$105,682
SUBTOTAL				$119,382
CONTINGENCY (10%)				$11,938
Subtotal				**$131,320**
Remediation Equipment				
Skid Mounted 2 Phase System	1	LS	$274,808	$274,808
See attached estimate				
Hipox Unit and Consumables	1	24 Mo.	$186,000	$186,000
SUBTOTAL				$460,808
CONTINGENCY (10%)				$46,081
Subtotal				**$506,889**
Treatment Compound Slab				
Labor:				
PM/Engineer - Senior	4	hr	$ 110.00	$440
Super/Field Tech - Senior	60	hr	$ 75.00	$4,500
Laborer/Field Tech	60	hr	$ 50.00	$3,000
Laborer/Field Tech	40	hr	$ 50.00	$2,000
Laborer/Field Tech	10	hr	$ 45.00	$450
Laborer/Field Tech	10	hr	$ 45.00	$450
Subtotal				$10,840
Equipment:				
Backhoe	1	week	$ 646.50	$647
Backhoe				$91
Wacker	2	day	$ 48.49	$97
Vibrator	1	day	$ 50.00	$50
Laser	1	each	$ 100.00	$100
Service Truck	2	week	$ 290.00	$580
Service Truck	1	day	$ 73.00	$73
FOGM	6	day	$ 100.00	$600
Misc Tools	1	each	$ 100.00	$100
OVA/PID	1	each	$ 100.00	$100
Subtotal				$2,437
Materials:				
Class II AB	38	ton	$ 24.25	$922
Rebar	1	each	$ 750.00	$750
Concrete	28	cy	$ 112.00	$3,136
Form wood/dobies	1	each	$ 750.00	$750
Visqueen plastic	1	each	$ 150.00	$150
Subtotal				$5,708
Subcontractors:				
A/C and Clean Soil Off-haul	3	load	$ 100.00	$300
A/C and Clean Soil Disposal	3	load	$ 100.00	$300
Temp Fence	1	each	$ 350.00	$350
Utility Locator	1	each	$ 400.00	$400
Subtotal				$1,350
COST SUBTOTAL				$20,334
CONTINGENCY (10%)				$2,033
Subtotal				**$22,368**

Cooper Drum
9316 South Atlantic Avenue, South Gate, CA
DUAL PHASE EXTRACTION

Description	Qty	Unit	$/unit	Ext. Cost
Treatment Compound Fence and Bollard				
Fence	1	LS	$10,000	$10,000
Bollard	1	LS	$13,000	$12,250
COST SUBTOTAL				$22,250
CONTINGENCY (10%)				$1,000
Subtotal				**$23,250**
Extraction well install				
Extraction wells	880	LS	$100	$88,000
Extraction wells labor	150	LS	$90	$12,250
Monitoring wells	416	LS	$50	$20,800
Monitoring wells labor	75	LS	$13,000	$12,250
COST SUBTOTAL				$133,300
CONTINGENCY (10%)				$13,330.0
Subtotal				**$146,630**
Trenching, UG Piping Installation				
Labor:				
PM/Engineer - Senior	20	hr	$110	$2,200
Super/Field Tech - Senior	90	hr	$75	$6,750
Laborer/Field Tech	90	hr	$50	$4,500
Laborer/Field Tech	90	hr	$50	$4,500
Procurement	8	hr	$60	$480
Subtotal				$18,430
Equipment:				
Backhoe	2	weeks	$ 646.50	$1,293
				$181
Wacker	2	weeks	$ 134.69	$269
Vibratory Plate	2	weeks	$ 134.69	$269
Trench Plates	2	weeks	$ 88.62	$177
Trench Plate Mob/Demob	4	hour	$ 45.00	$180
Equipment Mob/Demob	4	each	$ 50.00	$200
Speed Shoring	1	each	$ 200.00	$200
Service Truck	16	day	$ 75.00	$1,200
FOGM	16	day	$ 100.00	$1,600
Subtotal				$5,570
Materials:				
Primer & Glue	6	each	$ 65.00	$390
Sand Bedding	90	ton	$ 22.00	$1,980
Class II AB	30	ton	$ 24.25	$728
Magnetic Warning Tape	1000	lf	$ 0.50	$500
2-in sch 80 PVC (GW)	1000	lf	$ 4.08	$4,080
4-in sch 80 PVC (SVE)	500	lf	$ 9.11	$4,555
6-in sch 80 PVC (SVE)	500	lf	$ 17.39	$8,695
1-in Electrical conduit	1000	lf	$ 1.32	$1,320
Sales Tax				$1,724
Subtotal				$23,972
Subcontractors:				
Temp Fence	1	each	$ 350.00	$350
Clean Soil Off-haul	8	load	$ 100.00	$800
Clean Soil Disposal	8	load	$ 100.00	$800
Subtotal				$1,950
COST SUBTOTAL				$49,922
CONTINGENCY (10%)				$4,992
Subtotal				**$54,914**

Cooper Drum
9316 South Atlantic Avenue, South Gate, CA
DUAL PHASE EXTRACTION

Description	Qty	Unit	$/unit	Ext. Cost
Wellheads and Equipment Placement at Pad				
Labor:				
PM/Engineer - Senior	5	hr	$110	$550
Super/Field Tech - Senior	80	hr	$75	$6,000
Laborer/Field Tech	80	hr	$50	$4,000
Laborer/Field Tech	80	hr	$50	$4,000
Subtotal				$14,550
Equipment:				
Fork Lift	2	days	$ 312.48	$625
Service Truck	2	weeks	$ 290.00	$580
FOGM	10	day	$ 100.00	$1,000
Subtotal				$2,205
Materials:				
Miscellaneous	1	LS	$ 1,000.00	$1,000
Grundfos pumps	9	each	$1,035	$9,315
Well Vault	9	each	$2,500	$22,500
Well Vault Components (piping, controls, gauges)	9	each	$2,500	$22,500
Monitoring Well Vault	13	each	$2,500	$32,500
Monitoring Well Vault (piping, controls, gauges)	13	each	$2,500	$32,500
Subtotal				$137,070
CONTINGENCY (10%)				$13,707
Subtotal				**$150,777**
STARTUP - 3 day Shakedown				
Labor:				
PM/Engineer - Senior	15	hr	$110	$1,650
Super/Field Tech - Senior	30	hr	$75	$2,250
Super/Field Tech - Senior	30	hr	$76	$2,280
Subtotal				$6,180
Equipment:				
Service Truck	3	day	$ 75.00	$225
FOGM	3	day	$ 100.00	$300
Subtotal				$525
Utilities:				
Electricity	2,400	kwh	$0.14	$336
Natural Gas	300	therm	$0.72	$216
Sewer	86	Kgal	$5.64	$487
Subtotal				$1,039
SUBTOTAL				$7,744
CONTINGENCY (10%)				$774
Subtotal				**$8,519**
TOTAL				**$1,044,666**

Remediation Equipment Costs

Company	Description of Equipment	Cost ($)	Comments
Applied	Hipox Rental 2 years	108,000.00	
Applied	Freight in and out	5,000.00	
Applied	isntallation/start up	6,000.00	
Applied	demobe	1,000.00	
Applied	preventative maintenance	12,000.00	
Applied	electricity (8,000 kw/month)	19,200.00	
Applied	peroxide (35%) 2.3 gal/day	8,400.00	
Applied	liquid oxygen	26,400.00	
	Subtotal	**186,000.00**	
Baker Furnace	Thermal Oxidizer/Scrubber	250,000.00	
	Tax (7.75%)	19,375.00	
	Freight	1,000.00	
	Subtotal for Oxidizer Only	**270,375.00**	
Soil Therm	Oxidizer/Scrubber	168,900.00	
Soil Therm	Heat Exchanger	18,000.00	
	Tax (7.75%)	1,395.00	
	Freight	1,000.00	
	Subtotal for Oxidizer Only	**189,295.00**	
Baker Furnace	Scrubber sump	21,145.00	
Baker Furnace	9 grundfos pumps	9,315.00	
Baker Furnace	2 1,000 lb GAC vessels	9,600.00	
Baker Furnace	500 Gallon Poly Tank	750.00	
	Tax (7.75%)	3,162.78	
	Freight	1,000.00	
	Subtotal for Addtional Components	**44,972.78**	
	Total for System (no Hipox)	**274,807.78**	
Average price for Oxidizer and Baker Components			

Cooper Drum
9316 South Atlantic Avenue, South Gate, CA
EXCAVATION

Description	Qty	Unit	$/unit	Ext. Cost
MOBILIZATION/DEMOBILIZATION				
HASP Preparation				
Labor:				
PM/Sr.Geologist - Senior	40	hr	$ 100.00	$4,000
Geo/Engineer - Senior	20	hr	$ 100.00	$2,000
CIH	20	hr	$ 100.00	$2,000
Engineer - Staff	40	hr	$ 75.00	$3,000
Scientist - Staff	40	hr	$ 75.00	$3,000
Subtotal				$14,000
Permitting				
Labor:				
PM/Engineer - Senior	5	hr	$ 100.00	$500
Engineer - Staff	10	hr	$ 75.00	$750
Scientist - Staff	10	hr	$ 75.00	$750
Permits:				
Bldg. & Planning Dept Permit	1	LS	$ 2,000.00	$2,000
Subtotal				$4,000
Site Setup and Close				
Labor:				
PM/Engineer - Senior	10	hr	$ 100.00	$1,000
Engineer - Staff	20	hr	$ 75.00	$1,500
Laborer/Field Tech	80	hr	$ 60.00	$4,800
Procurement	8	hr	$ 60.00	$480
Equipment:				
Service Truck	5	day	$ 75.00	$375
FOGM	5	day	$ 100.00	$500
ODCs:				
Airline Ticket (Roundtrip)	3	ea	$ 300.00	$900
Hotel Room	10	night	$ 150.00	$1,500
Subtotal				$11,055
SUBTOTAL				$29,055
CONTINGENCY (10%)				$2,906
Subtotal				**$31,961**
EXCAVATION				
Labor:				
PM - Senior	15	hr	$ 110.00	$1,650
Super/Field Tech - Senior	160	hr	$ 75.00	$12,000
Super/Field Tech - Senior	40	hr	$ 112.50	$4,500
Laborer/Field Tech	160	hr	$ 50.00	$8,000
Laborer/Field Tech	40	hr	$ 75.00	$3,000
Laborer/Field Tech	160	hr	$ 50.00	$8,000
Laborer/Field Tech	40	hr	$ 75.00	$3,000
Chemist	39	hr	$ 90.00	$3,510
Subtotal				$43,660
ODCs:				
Airline Ticket (Roundtrip)	45	ea	$ 300.00	$13,500
Hotel Room	60	night	$ 150.00	$9,000
Car Rental	15	wk	$ 250.00	$3,750
Field Trailer	1.25	mo	$ 350.00	$438
Subtotal				$26,688

Cooper Drum
9316 South Atlantic Avenue, South Gate, CA
EXCAVATION

Description	Qty	Unit	$/unit	Ext. Cost
Analytical:				
Field Test Kit - PCB	65	ea	$ 30.00	$1,950
Field Test Kit - PAH	65	ea	$ 100.00	$6,500
Field Test Kit - Lead	65	ea	$ 100.00	$6,500
Field Test - Lead XRF	1	mo	$ 750.00	$750
Lead (6010 B)	13	ea	$ 150.00	$1,950
PCBs (8082)	13	ea	$ 420.00	$5,460
PAHs (8310)	13	ea	$ 195.00	$2,535
Waste Characterization Sampling	9	ea	$ 150.00	$1,350
Subtotal				$26,995
Unit Costs for Excavation Activities:				
Removal of Excavated Soil	1,271	cy	$ 20.00	$25,420
Removal of Excavated Soil - Contingency (30%)	381	cy	$ 20.00	$7,626
Demolish Asphalt in Excavated Areas	175	cy	$ 70.00	$12,250
Loading and Hauling of Asphalt Material	228	tons	$ 60.00	$13,650
Asphalt Patching of Excavated Area	9,575	sf	$ 5.00	$47,875
Disposal of Asphalt	228	tons	$ 15.00	$3,413
Transportation of Contaminated Soil to Class I Landfill	1,652	tons	$ 215.00	$355,245
Shoring	460	lf	$ 15.00	$6,900
Utility Clearance	1	LS	$ 1,000.00	$1,000
Import Clean Fill and Backfill	1,271	cy	$ 56.00	$71,176
Compaction Testing	16	ea	$ 400.00	$6,400
Subtotal				$550,954
COST SUBTOTAL				$648,297
CONTINGENCY (30%)				$194,489
Subtotal				**$842,785**

Assumptions

Excavation:

Estimated excavated volume of contaminated soil: 1270 yd^3 (Assumes no additional soil to be excavated).

DPA West - 395 yd^3
DPA East - 370 yd^3
HWA West - 110 yd^3
HWA East - 280 yd^3
Soil Expansion (10%) - 116 yd^3

Project Duration - 5 weeks (20, 10-hr work days)

Transportation of Material

Asphalt material:
Asphalt to be disposed at local landfill (assumed one way distance = 50 miles).

Contaminated Soil:
Assume 1,270 yd^3 (approximately 1650 tons) to be transported to Class I landfill (Buttonwillow, CA).
Costs include loading, hauling, and disposal fees.
Mass of Soil = 1.3 tons/yd^3

Project Staffing:

Onsite Personnel: 3 full time personnel (48 hours/week, including travel).
Project Chemist: Assume 0.2 hours/sample for project setup, lab coordination, QA/QC of data.
Project Management Oversight: 3 hour/week.

Contractor Travel:

3 personnel onsite for full duration of project.
Per Diem of $130/day = 60 days total.
Weekly Travel from SMF to LAX (3 trips per person = 12 total).
Car rental during duration of project.

Other:

Access to site utilities for field trailer and bathroom.

Cooper Drum
9316 South Atlantic Avenue, South Gate, CA
EXCAVATION - CONFIRMATION SAMPLING

Initial Sampling:

Site Location	Excavation Wall Lengths (ft)		Excavation Perimeter Area (ft^2)	Initial Sampling Effort PAH	Lead	PCB	Initial Confirmation Sampling Totals	2nd Round Sampling Effort PAH	Lead	PCB	Second Round Confirmation Sampling Totals
DPA West	65	60	3900	16	16	16	48	8	8	8	24
DPA East	80	25	2000	11	11	11	33	1	1	1	3
HWA West	30	40	1200	8	8	8	24	1	1	1	3
HWA East	60	50	3000	13	13	13	39	7	7	7	21
Totals				48	48	48	144	17	17	17	51

	PAH	Lead	PCB	
Totals:	65	65	65	
Sample Costs	$195.00	$420.00	$85.00	
Ext. Costs	$12,675	$27,300	$5,525	
Total Cost:				**$45,500**

Confirmation Samples collected every 40 ft on the sidewalls, below the zone of contamination and on 20 ft centers on the excavation floor

Assume 50% of samples will be "hot" in uncharacterized areas (DPA West and HWA East) and resampling will be required.
Assume 10% of samples will be "hot" in characterized areas (DPA East and HWA West) and resampling will be required.

O&M - 3 years

Assumptions:
O&M period will be for 3 years
O&M Contractor will provide materials, equipment and labor to operate and maintain soils remedy.
Costs do not include treatment system installation.
Project staff will conduct preventative maintenance and repairs for the systems and related equipment. This includes all vapor pipelines and utility pipelines that are not utility-owned and maintained. Utility marking for USA dig clearances will also be included in the project.
The project engineer will troubleshoot problems with the system operators, perform RPO analysis, and analyze operations data.

General Support - URS will provide a technician to assist system operators with procurement, supply errands spare parts inventory, vehicle maintenance, and field financial tracking.
The project manager will be responsible for providing direction to field staff, resolving technical problems, communicating with the client and engineering staff. 1 hour weekly meetings will be conducted with field staff. Weekly URS internal management meetings will also be conducted with the project management team
Engineering support will assist operators with process problems, optimization, and resolution of technical issues.
Maintain property inventory, prepare yearly property report, conduct inventory audits.

O&M General Support

Role	Rate	Hrs/month	# of Months	Total
Technician	$50.00	8	36	$1,800
Field Engineer	$75.00	8	36	$2,700
Project Manager	$100.00	20	36	$3,600
Procurement	$60.00	6	36	$2,160
Property Administration	$60.00	0.5	36	$2,160
Subtotal		42.5		$12,420

Health and Safety - O&M Contractor will conduct 4 quarterly audits with written findings and recommended corrective actions. H&S staff will also be asked to review and assist with routine and non-routine operations throughout the year.

Health & Safety

Role	Rate	Hrs/event	# of Events	Total
H&S Officer - 4 events/year	$100.00	16	12	$1,200
H&S Officer - 12 events/year	$100.00	8	36	$3,600
H&S Technician	$60.00	8	36	$2,160
Subtotal		16		$6,960

QA Audits - O&M Contractor will conduct quarterly QA audits on standard operating procedures.
Findings and corrective actions will be documented in the quarterly report.

QA Audits

Role	Rate	Hrs	# of Events	Total
QA Manager - 4 events	$100.00	6	4	$2,400
Field Engineer	$75.00	6	6	$2,700
Chemist	$90.00	12	4	$4,320
Subtotal		24		$9,420

DPE System
10 hours per week for routine operations and maintenance - includes 1 using SCADA to collect readings and inspect operation of system. Routine maintenance includes - oil changes, cleaning of the site, performance of semiannual system interlock checks, quarterly blower and pump vibration testing, calibration/replacement of pH probes, cleanout and acid washing of scrubber, replacement/repair of malfunctioning instrumentation, inspection/replacement of blower belt, and draining of low point drains.

2 hours per week of nonroutine repairs, restarts, troubleshooting

Role	Rate	Hrs	# of Weeks	Total
Field Technician	$50.00	12	156	$93,600
Subtotal 3 year				$122,400
Total Annual				$40,800

Task 4 RAO Non-Labor Items

Materials/Supplies	Rate Frequency	Quantity	Cost/Item	Total	Justification
Supplies / Expenses					
Cellular Phone(1000 minute plans)	Each	12	$56.91	$682.92	12 months
System Phone Lines	Phone/Month	12	$44.71	$536.52	Jan 07 - AT&T
Fed Ex (50lb) Standard Overnight	Each	24	$43.45	$1,042.80	2 per month
1 Liter Amber Glass (QC Class)	Case (12)	1	$32.00	$32.00	.5 per month
8 oz glass jars	Case(12)	1	$19.20	$19.20	.5 per month
1 Liter Wide Mouth (poly)	Case (24)	1	$49.09	$49.09	.5 per month
40ml Voa Vials w/0.5hcl (amber, QC Class)	Case (72)	1	$116.90	$116.90	.5 per month
Acid - Muriatic	Gallon	1	$12.00	$12.00	2 per month
Additional Field Supplies	Each	1	$500.00	$500.00	2 per year
Air Filters (Catox)	Each	3	$120.29	$360.87	1 every 2 months
Blower Belts	Each	3	$114.00	$342.00	2 per year
Caustic Pump repair kit	Each	4	$83.00	$332.00	4 per year
Exhaust Fan	Each	1	$82.00	$82.00	1 per year
Fire Extinguisher	Each	4	$30.00	$120.00	2 per quarter
Flow Meter (soil vapor)	Each	1	$166.00	$166.00	2 per year
Flow sensors	Each	1	$145.00	$145.00	1 per system per year
Fuses	Each	2	$12.50	$25.00	2 per year
Hose	Each	1	$31.55	$31.55	1 per system
Hour Meter	Each	6	$60.00	$360.00	1 per year
Level Switches	Each	12	$67.00	$804.00	3 per quarter
Light bulbs	Each	24	$1.50	$36.00	2 per month
Oil	Each	4	$10.00	$40.00	1 quart per system per quarter
pH Buffers - pH10	Gallon	4	$33.85	$135.40	1 per quarter
pH Buffers - pH4	Gallon	4	$33.85	$135.40	1 per quarter
pH Buffers - pH7	Gallon	4	$33.85	$135.40	1 per quarter
pH Probes (FTO)	Each	1	$205.00	$205.00	4 per oxidizer
PID	Each	0	$3,749.70	$0.00	1 per year
Pressure Gauges	Each	6	$26.93	$161.58	6 per year
Pressure Switches	Each	4	$225.00	$900.00	4 per year
PVC check valves	Each	2	$45.00	$90.00	1 per month
PVC fittings	LS	1	$2,400.00	$2,400.00	1 per year
PVC Glue/Primer/Sealant	LS	1	$2,200.00	$500.00	1 per year
PVC pipe	LS	1	$2,400.00	$2,400.00	1 per year
PVC Valve Replacement	Each	2	$80.00	$160.00	2 per system per year
Rotameter	Each	4	$65.95	$263.80	1 per quarter
Sealant	Each	3	$12.00	$36.00	2 per month
Silicone Tubing	Foot	12	$50.77	$609.24	1 per month
Silicone	Each	12	$4.25	$51.00	6 per month
Site Signs	Each	2	$75.00	$150.00	2 per system
Sodium Hydroxide	Gallon	1200	$1.30	$1,560.00	100 gallons per month
Solenoid Valve - 1/2"	Each	2	$123.00	$246.00	2 per year
Solenoid Valve - 1"	Each	2	$195.00	$390.00	3 per year
Spill Kits	Each	1	$200.00	$200.00	4 per year
Teflon Tape 1/2"	Roll	48	$2.00	$96.00	4 per month
Temperature Gauges	Each	2	$35.00	$70.00	4 per system per year
Temperature Switches	Each	2	$132.60	$265.20	2 per year
Thermocouples	Each	3	$96.00	$288.00	6 per year
Valve Replacement	Each	4	$150.00	$600.00	1 per quarter
Vapor Hose	Each	50	$5.50	$275.00	50 per year
Vacuum Gauges	Each	1	$34.00	$34.00	1 per system per year
Zip lock Bags (12"x15")	Box of 500	2	$189.00	$378.00	2 per year

Task 4 RAO Non-Labor Items

Materials/Supplies	Rate Frequency	Quantity	Cost/Item	Total	Justification
			TOTAL	**$18,570.87**	
SUBCONTRACTORS					
Fire Extinguisher Inspection	Each	1	$9.00	$9.00	1 per year
Hazardous Waste Disposal - Solids	Each	2	$250.00	$500.00	1 drum per quarter
Hazardous Waste Disposal - Oil	Each	2	$130.00	$260.00	1 per quarter
TRAVEL					
Van/Truck Gasoline	Gallon	900	$3.00	$2,700.00	75 gallons per truck per month
Van/Truck Rental	Month	12	$534.97	$6,419.64	1 trucks per month
			TOTAL	**$9,119.64**	
			TOTAL	**$9,119.64**	per year
Electrical utility					
Based on 22kw 24/7 -365 year	kWh	560640	$0.13	**$72,883.20**	1 per year
			Years of O&M	**3**	years
			GRAND TOTAL	**$246,008.52**	

Sampling & Analysis - 3 years O&M, 1 year rebound sampling, 1 closure sampling

Analytical Assumptions:
The analytical laboratory costs are based on quotes obtained in January 2006.
18 monthly SVE well samples, 2 system samples monthly
36 quarterly SVM well samples

Basis of Estimate

Method	Samples	Unit Cost	Total Cost	Laboratory
TO-15S (Short List)	576	$110	$63,360	Air Toxics
TO-15/TVH (Full Scan)	720	$210	$151,200	Air Toxics
ASTM D1946 (fixed Gas Analysis)		$55	$0	Air Toxics
SW 8260 Halocarbons Water Analysis		$105	$0	EMAX
EPA 1613 (D/F water analysis)		$825	$0	EMAX
EPA 6010 TAL Metals		$160	$0	EMAX
SW 7196 Hex. Chromium Water Analysis		$60	$0	EMAX
Method 160.1 / 160.2 (TDS / SS Water)		$20	$0	EMAX
Method 300.0 (Chloride) Analysis		$20	$0	EMAX
Method 7470 (Hg) water analysis		$28	$0	EMAX
LC 50 Bioassay water analysis			$0	
WET/TCLP VOCs (8260) Residuals		$175	$0	EMAX
WET/TCLP Metals		$125	$0	EMAX
TOTAL 3 Years	1,296		**$214,560**	
TOTAL O&M Analytical Anuual			**$71,520**	

Closure Plans and Sampling
Direct Push collection at 10 locations with soil gas samples at 4 discrete depths per location
Assumptions:
Assumes O&M sampling for 3 years, duration of O&M, then shut down the system and collect quarterly sampling for 1 year to evaluate any concentration rebound in existing wells, then perform closure sampling. Closure sampling will be conducted by collecting soil gas samples away form existing wells to evaluate site closure. Collect system samples and online wells monthly, and well monitoring samples quarterly.

Basis of Estimate:

Role	Rate	Hrs	# of Months	Cost
Field Sampler to perform soil gas sampling	$50.00	2	36	$3,600.00
Field Sampler to document field sampling activities, COC completion, shipping, labeling	$50.00	1	36	$1,800.00
Project Chemist to review/validate analytical data	$90.00	1	36	$3,240.00
Data Manager to collect/organize lab data, and enter data	$75.00	1	36	$2,700.00
Subtotal				**$11,340**

Sampling Plan

Role	Rate	Hours	
Engineering to prepare quarterly sample plan	$75.00	4	$300.00
Project Manager to review quarterly sample plan	$100.00	4	$400.00
Independent Technical Review of plan	$100.00	4	$400.00
Project Chemist to prepare sample plan	$90.00	16	$1,440.00
Subtotal			**$2,540**
Total Annual Sampling Cost			**$13,880**

Create a Post Remedial Soil Confirmation and Groundwater Monitoring Plan
Basis of Estimate :
Labor

Role	Category	Draft	Final	Total Hours	Unit Cost	Total Cost
Project Mgr	Geologist - Sr	24	16	40	$ 90.00	$ 3,600.00
Author/Review Engineer - Sr	Engineer - Sr	24	16	40	$ 107.00	$ 4,280.00
Author - Engineer	Engineer - Jr	80	24	104	$ 68.00	$ 7,072.00
Author - Geologist	Geologist - Jr	80	24	104	$ 60.00	$ 6,240.00
Author - Geo Sr	Geologist - Sr	24	4	28	$ 90.00	$ 2,520.00
Geo SR - field oversight	Geologist - Sr	16	4	20	$ 90.00	$ 1,800.00
CADD/Graphics	CADD - Mid	40	8	48	$ 80.00	$ 3,840.00
Chemistry	Chemist - Mid	24	4	28	$ 63.00	$ 1,764.00
Word Processor	Clerical - Mid	16	8	24	$ 50.00	$ 1,200.00
Tech Editing	Clerical - Mid	16	8	24	$ 50.00	$ 1,200.00
Document Reproduction	Clerical - Jr	8	8	16	$ 40.00	$ 640.00
Data Management	Scientist - Mid	4	4	8	$ 73.00	$ 584.00
Total Labor		**356**	**128**	**484**		**$ 34,740.00**

ODCs

Item	Units	Quantity	Unit cost	Total	Basis
Sample shipping	each	1	$ 200.00	$ 200.00	
Copies	pages	75			Internal draft x 3 copies x 25 pages
	pages	75			Client draft x 3 copies x 25 pages
	pages	75			Internal final x 3 copies x 25 pages
	pages	100			Client final x 4 copies x 25 pages
Total B&W Copies		260	$ 0.07	$ 18.20	
Total Color Copies		65	$ 0.60	$ 39.00	
Total ODCs				**$ 257.20**	

Direct Push Field Effort Subcontractors

Description	Unit	Qty	Cost per Unit	Total Cost
Direct Push	ft	1,600	$12.50	$20,000
Grout	ft	1,600	$2.00	$3,200
Soil Gas Sample	ea	40	$145.00	$5,800
Mob/Demob	hr	3	$185.00	$555
Per Diem (per 2 man crew)	day	8	$170.00	$1,360
TOTAL				**$30,915**

Remediation Completion Report

Document the closure sampling effort in a Remediation Completion Report (RCR) and receive CVRWQCB approval. The RCR shall summarize:

Implementation of the FRP;

Post-Remedial Soil Confirmation and Groundwater Monitoring activities; and

Closure sampling results and conclusions

Basis of Estimate :

Labor

Role	Category	Draft	Final	Total Hours	Unit Cost	Total Cost
Project Manager	Geologist - Sr	40	40	80	$ 90.00	$ 7,200.00
Author	Engineer - Jr	80	40	120	$ 68.00	$ 8,160.00
Graphics	CADD - Mid	40	20	60	$ 80.00	$ 4,800.00
Technical Editing	Clerical - Mid	8	8	16	$ 50.00	$ 800.00
QA Manager	Engineer - Sr	8	8	16	$ 107.00	$ 1,712.00
Word Processing	Clerical - Mid	8	4	12	$ 50.00	$ 600.00
Document Reproduction	Clerical - Jr	2	2	4	$ 40.00	$ 160.00
Data Management	Scientist - Mid		4	4	$ 73.00	$ 292.00
Total Labor		**346**	**210**	**556**		**$ 43,104.00**

ODCs

Item	Units	Quantity	Unit cost	Total	Basis	
Copies	pages	75			Internal draft x 3 copies x 25 pages	
	pages	75			Client draft x 3 copies x 25 pages	
	pages	75			Internal final x 3 copies x 25 pages	
	pages	100			Client final x 4 copies x 25 pages	
Total B&W Copies		260	$ 0.07	$18.20		
Total Color Copies		65	$ 0.60	$39.00		
Total ODCs				**$57.20**		

Total for Closure Sampling 3 year	**$109,073**
Discounted total for Closure Sampling 3 year	**$86,702**

Source Testing - Annual for 3 years

Assumptions:

The oxidizer system will be sampled annually.

Parameters to be sampled during annual testing will include:
- Dioxins/furans, HCl-HF, particulate matter, and CEM (NOx, SO2, and CO) testing.

QC samples will be collected on a frequency of ~10% of total sample number (rounding down).
At least one QC sample (i.e., field blank sampling train) will be collected for each parameter over the sampling year.
Dioxin/furan samples will be collected according to EPA Method 23 procedures.
HCl-HF samples will be collected according to CARB Method 421 procedures.
Particulate matter will be collected according to CARB Method 5 procedures.
CO, NOx, and SO2 will be collected according to CARB Method 100 procedures. Three 40-minute runs will be performed.
Ambient HCl-HF screening level measurements will be determined using indicator tubes.
HCl-HF samples will be collected at inlet and outlet locations. Three 1-hour samples will be collected at the location.
Costs for a test plan or interactions with regulatory agencies have not been included.
Electrical power will be provided at test site.
A unique report will be prepared.
Field team of three people will be able to conduct the testing.
A lift will be needed to access the exhaust stack of the SVE system for a total of 3 days.

Basis of Estimate

Source Testing

Assumes 1 oxidizer system will be tested
Each system will be sampled for dioxins/furans, HCl/HF, PM, NOx, SO2, and CO (separate from the Sampling task analytical).
One report will be prepared.

Field Work

	Category	Hours	# of Units	Total Hours	Cost
Source Tester 1 - Mob/Demob	Sr Enviro Engr	4	1	4	$400
Source Tester 2 - Mob/Demob	Engr Tech - Jr	4	1	4	$300
Sampling - Source Tester 1	Sr Enviro Engr	20	1	20	$2,000
Sampling - Source Tester 2	Engr Tech - Jr	20	1	20	$1,500
CEM Support - Mob/Demob	Jr Enviro Engr	4	1	4	$300
CEM Sampling	Jr Enviro Engr	16	1	16	$1,200
Subtotal				68	$5,700

Reporting

	Category	Hours	# of Units	Total Hours	Cost
Primary Author	Sr Enviro Engr	8	2	16	$1,600
Primary Author	Engr Tech - Jr	4	4	16	$1,200
Primary Author - CEM	Jr Enviro Engr	2	6	12	$1,200
Peer Review	Sr Enviro Engr	2	2	4	$400
Word Processing	Clerical - Sr	2	4	8	$400
Subtotal				56	$4,800

Materials/Supplies	Category	Rate Frequency	Quantity	Cost/Item	Total
OFFICE COSTS					
Fed Ex (50lb) Standard Overnight	Freight	Each	1	$ 43.45	$ 43.45
				Subtotal	$ 43.45

Supplies					
1 Liter Amber Glass (QC Class)	Supplies	Case (12)	1	$ 32.00	$ 32.00
1 Liter Polyethylene Bottles	Supplies	Case (12)	1	$ 30.00	$ 30.00
Gloves - latex disposable	Supplies	Box of 100	1	$ 9.50	$ 9.50
Ice - 7lb Bag	Supplies	Bag	10	$ 1.50	$ 15.00
Paper Towels	Supplies	Roll	1	$ 1.45	$ 1.45
Tape (2" clear packing)	Supplies	Roll	1	$ 5.42	$ 5.42
Tape (duct)	Supplies	Each	1	$ 3.13	$ 3.13
Teflon Tape 1	Supplies	Roll	1	$ 12.00	$ 12.00
Trash Bag - 33gal	Supplies	Box of 100	0	$ 28.40	$ -
Water (Distilled) HPLC	Supplies	Each	1	$ 40.06	$ 40.06
Sampling Filters	Supplies	Box of 25	1	$ 80.00	$ 80.00
Silica Gel	Supplies	Each	0.5	$ 60.00	$ 30.00
Sodium Bicarbonate	Supplies	Each	0.5	$ 45.00	$ 22.50
Sodium Carbonate	Supplies	Each	0.5	$ 40.00	$ 20.00
Acetone	Supplies	Gallon	1	$ 45.00	$ 45.00
Methylene Chloride	Supplies	Gallon	1	$ 45.00	$ 45.00
Toluene	Supplies	Gallon	0.5	$ 45.00	$ 22.50
HCl Indicator Tubes	Supplies	Box	0.5	$ 60.00	$ 30.00
HF Indicator Tubes	Supplies	Box	0.5	$ 60.00	$ 30.00
Orsat Chemicals	Supplies	Each	1	$ 45.00	$ 45.00
Zip lock Bags (12"x15")	Supplies	Box of 500	0.25	$ 189.00	$ 47.25
				Subtotal	$ 565.81
RENTALS					
CEM Truck (with SO2 CEM)	Rental	Day	0	$ 500.00	$ -
Calibration Gases	Rental	Day	2	$ 125.00	$ 250.00
Scissors lift	Rental	Day	2	$ 200.00	$ 400.00
				Subtotal	$ 650.00
REPRODUCTION					
Blue Lines	Repro	Each		$ 2.00	$ -
Color Copies 8.5 x 11	Repro	Each	0	$ 1.35	$ -
Color Copies 11 x 17	Repro	Each		$ 2.70	$ -
Grey Scale Copies	Repro	Copy		$ 20.00	$ -
Mylar Sheets	Repro	Sheet		$ 3.12	$ -
Overhead Frames	Repro	Each		$ 0.50	$ -
Plate Holders	Repro	Each		$ 0.14	$ -
Plate Reproduction	Repro	Plate		$ 2.20	$ -
Reproduction	Repro	Each	0	$ 0.06	$ -
Transparencies	Repro	Each		$ 1.00	$ -
Tabs	Repro	Each	0	$ 0.25	$ -
				Subtotal	**$ -**
TRAVEL					
M&IE	Travel	Day	0	$ -	$ -
Per Diem	Travel	Day	3	$ 159.00	$ 477.00
Lodging	Travel	Day	0	$ -	$ -
Local Mileage	Travel	Miles	672	$ 0.445	$ 299.04
Van/Truck Gasoline	Travel	Gallon	0	$ 2.50	$ -
Van/Truck Rental	Travel	Month	0	$ 1,200.00	$ -
				Subtotal	$ 776.04
				Subtotal	$ 2,035.30

Analytical - Source Testing

Compound	$/sample	# samples	QC	Total $	
PCDD/PCDF	$ 975.00	1	1	$ 1,950.00	STL - Sacramento
XAD trap prep	$ 100.00	2	2	$ 400.00	STL - Sacramento
HCl/HF	$ 75.00	6	4	$ 750.00	STL - Sacramento
Particulate matter	$ 175.00	3	2	$ 875.00	
Subtotal				$ 3,975.00	

Total	**$ 16,510.30**

OHM Reports

Quarterly SVE Vadose Zone Monitoring Report

Assumptions:

Reported quarterly (final due no later than 60 days from the end of the quarter)

Reports will be 2Q2006 through 1Q2007.

Any comments from the regulatory agencies will be addressed in the pursuant report in a response to comments table.

Basis of Estimate :

Role	Category	Total Hours Per Report	# of Reports	Total Hours	Cost
Project / Jr Engineer/Geologist to update system and site spreadsheets, update site-specific	Enviro Engr - Jr	48	4	192	$14,400.00
Senior to update and review soil and groundwater isoconcentration maps + evaluate	Geologist - Sr	8	4	32	$3,200.00
Technical Editor to conduct a technical review of each site	Tech Writer - Mid	12	4	48	$2,400.00
Author to address any comments/issues brought up from peer review	Enviro Engr - Jr	8	4	32	$2,400.00
Word Processor to make updates from technical Editor and Peer Review	Clerical - Sr	18	4	72	$5,400.00
Project Chemist to prepare Data Quality Assessment (DQA)	Chemist - Mid	8	4	32	$2,880.00
External Independent Technical Review of Entire Report	Enviro Engr - Sr	16	4	64	$6,400.00
TOTAL		102		472	$37,080.00

ODCs

Item	Units	Quantity	Unit cost	Total	
Copies - B&W	pages	8,000	$ 0.07	$560.00	Quarterly Report, 200 pages, 10 copies
Color Copies	pages	150	$ 0.75	$112.50	figures, well status table, covers
3", D-Ring Binders	ea	15	$ 3.94	$59.10	Express
5-cut tabs	ea	300	$ 0.49	$147.00	tabs/report
Fed Ex (Up to 5 lbs)	ea	24	$ 5.98	$143.52	
Compact Discs, box of 10	ea	6	$ 28.30	$169.80	
		TOTAL		$1,191.92	

O&M Reports Total	$38,271.92

OU 1 and OU 2
Remedial Action Schedule
Cooper Drum Company Superfund Site

ID	Task Name	Duration	Predecessors
1	**Cooper Drum Remedial Actions**	**6723 days**	
2	**OU 1 (Groundwater) RA**	**6674 days**	
3	**RA Solicitation**	**54 days**	
4	Post solicitation	30 edays	
5	Receive proposals	0 days	4
6	Review soliciatiation proposals	10 days	5
7	Award solicitation	0 days	6
8	Notice-to-Proceed	0 days	7FS+30 edays
9	Preparation of Draft Plans (RAWP, SAP, HASP)	60 days	8
10	Regulatory Agencies Review of Draft Plans	60 edays	9
11	Incorporate Comments and Submit Draft Final Plans	30 days	10
12	Regulatory Agencies Review of Draft Final Plans	60 edays	11
13	Incorporate Comments and Submit Final Plans	30 days	12
14	Permitting for RA (WDR, NPDES, Building Dept, etc)	90 edays	13FF
15	Installation of Remedy	30 days	14
16	Initial Startup and Testing	15 days	15
17	**Full Scale O&M of RA Remedy**	**5995 days**	
18	Source Area in situ ISCO system	1095 edays	16
19	Downgradient P&T System	8395 edays	16
20	**Biobarrier Injections**	**561 days**	
21	First Injection	30 edays	19SS+30 edays
22	Second Injection	25 edays	21FS+730 edays
23	Remedy Performance Monitoring	8395 edays	16
24	Site Closure Work Plan	30 days	23
25	Site Closure Sampling/Monitoring	365 edays	24FS+30 edays
26	Site Closure Monitoring Results Report	30 days	25
27	Receive Site Closure	0 days	26FS+45 edays
28	**OU 2 (Soil) RA**	**1620 days**	
29	**RA Solicitation**	**62 days**	
30	Post solicitation	30 days	
31	Receive proposals	0 days	30
32	Review soliciatiation proposals	10 days	31
33	Award solicitation	0 days	32
34	Notice-to-Proceed	0 days	33FS+30 edays
35	Preparation of Draft Plans (RAWP, SAP, HASP)	60 days	34
36	Regulatory Agencies Review of Draft Plans	60 edays	35
37	Incorporate Comments and Submit Draft Final Plans	30 days	36
38	Regulatory Agencies Review of Draft Final Plans	60 edays	37
39	Incorporate Comments and Submit Final Plans	30 days	38
40	Permitting for RA (WDR, NPDES, Building Dept, etc)	90 edays	39FF
41	Installation of Remedy	30 days	40
42	Initial Startup and Testing	15 days	41
43	Full Scale O&M of RA Remedy	1095 edays	42
44	**Remedy STOP Evaluation**	**394 days**	
45	Site Closure Sampling/Monitoring	550 edays	43
46	Submit Remedy STOP Report	0 days	44FS+60 days
47	Receive Approval to STOP OU 2 RA	0 days	46FS+45 edays