# Section 1
# OBJECTIVES

This Field Sampling Plan (FSP) for Site 2, the Magazine Road Landfill, outlines the field procedures and methodology applicable to this site. The FSP follows the United States Environmental Protection Agency (U.S. EPA) Region IX guidelines for preparing sample plans (U.S. EPA 1992). This FSP is written to aid field personnel unfamiliar with the site in gathering the required samples and field data. The purpose of this plan is to help assure that data collection activities will satisfy the field investigation design developed in the data quality objectives (DQOs) for the site (BNI 1995a, Appendix B).

The DQOs for this site were developed using the U.S. EPA seven-step DQO process. The field investigation is designed to determine if the site poses a human health or environmental risk, and to provide data for selecting any necessary remedial alternative(s).

## 1.1 SAMPLING OBJECTIVES

The overall objective of this FSP is to direct collection of data sufficient to allow application of the Presumptive Remedy as established by the U.S. EPA for municipal landfills at Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites (U.S. EPA 1993). Site 2 can be classified as a municipal landfill because the wastes present are a large-volume, heterogeneous mixture of municipal waste (e.g., nontoxic household, construction, and landscaping debris) as well as industrial and hazardous wastes (including fuel hydrocarbons, solvents, pesticides, and metals). The Presumptive Remedy allows for unit closure after resolving hot spot issues and taking engineered or institutional steps to limit the release of contaminants to the environment.

Under the Presumptive Remedy approach, engineered designs are prepared to limit the release of contaminants to the atmosphere, surface water, and groundwater. The primary containment measures are:

- capping the landfill to limit direct contact with disposed waste, infiltration, and resulting contaminant leaching to groundwater, and to control surface water runoff and erosion;
- any necessary groundwater treatment to reduce the impact of released contaminants; and
- any necessary gas control and treatment to reduce uncontrolled atmospheric releases and the mass of subsurface volatile contaminants.

Also under the Presumptive Remedy, institutional controls are implemented to limit the exposure to landfilled waste. The most common institutional control is a deed restriction. Related Phase II data collection activities should thus include the delineation of landfill boundaries to allow the preparation of legal descriptions for the deed restrictions.

Additional input information supporting Presumptive Remedy decisions include the following:

- location, nature, and extent of potential hot spots;
- existence, areal extent, depth, nature, and condition of landfill cap; and
- delineation of landfilled wastes using historic, nonintrusive (e.g., electromagnetic [EM]), or intrusive (e.g., trenching) techniques.

## 1.2 DATA USAGE

To satisfy the objectives of this FSP, field data will be used for the purposes detailed below.

- Surface geophysical and topographic surveys will be conducted to define the limits of landfilled waste and to record site elevations. The boundaries of landfilled waste and the resulting topographic map will support the landfill cap design, define the area requiring institutional controls, and assist in placing sample locations during the Phase II Remedial Investigation (RI).
- A soil gas survey will be performed to evaluate the potential presence of hot spots according to the U.S. EPA Presumptive Remedy requirement. Hot spot data will be used to identify areas that may require further characterization. If the data indicate the presence of a hot spot that could threaten the integrity of the containment system, treatment or removal may be necessary.
- Air monitoring and sampling will be performed to reassess the migration of landfill gas into the atmosphere by verifying and supplementing existing emission data. The resulting data will be used to assess the effectiveness of the existing cap, evaluate whether additional control measures are necessary, and support the streamlined risk assessment.
- Groundwater monitoring wells will be installed and sampled. The resulting data will be used to assess potential impacts to groundwater, and to conduct subsequent compliance monitoring.
- Surface water hydrology of Borrego Canyon Wash will be evaluated to support the design of a landfill cap.
- Ecological samples to assess ecological risk.

# Section 2
# BACKGROUND

This section presents a discussion on the general description and the results of previous investigations at the Site 2. The purpose of this section is to provide a brief compilation of the data used to develop the site-specific FSP for Phase II RI/Feasibility Study (FS) activities. Previous investigations and reports do provide a more thorough discussion of site history and activities.

## 2.1 SITE DESCRIPTION

Site 2 occupies approximately 22 acres and is situated between Borrego Canyon Wash and one of its tributaries (Map B3-1). The site is bisected by a man-made drainage channel that trends in a northeast-southwest direction. A small dirt road runs along the southern and eastern edge of the landfill. No activities currently take place in the landfill, and it has become overgrown with chaparral. A cover of fill of unknown thickness has been placed over the landfill. Neither liners nor a gas-venting system have been used at this landfill.

### 2.1.1 History

The landfill is in an area that was used as a gravel borrow pit. The remains of the old borrow pit are still visible as a depression at the upper end of the man-made drainage channel. Site 2 was used from the late 1950s until about 1980, although some disposal may have occurred on an intermittent basis until recently. During the 1970s, all solid waste from Marine Corps Air Station (MCAS) El Toro and some waste from MCAS Tustin were disposed in this landfill. Previous reports estimate 800,000 to 1,000,000 cubic yards of waste were placed in the landfill during its operational life (Strata 1991). The suspected types of waste include construction debris, municipal waste, batteries, waste oils, hydraulic fluids, paint residues, transformers, and waste solvents.

### 2.1.2 Geology

Boring logs from the Phase I RI indicate that the subsurface soil consists of sand, sand with gravel, silty sand, sandy silt, and silty sand with gravel. Occasional layers of silt and clay were also found. This alluvial material rests upon semiconsolidated sandstone and siltstone at shallow depths. Bedrock was encountered in well boring 02_DGMW60 at approximately 60 feet below ground surface (bgs) (Jacobs Engineering 1993).

### 2.1.3 Hydrogeology

Site 2 is situated in the foothills of the Santa Ana Mountains at an elevation of about 500 feet mean sea level. This area is at the boundary of the Tustin Plain and the Santa Ana Mountains. The hills adjacent to the Magazine Road Landfill are composed of Tertiary sandstones, siltstones, and shales.

Based on Phase I RI data, groundwater at Site 2 lies at depths of as little as 10 feet below bgs to as much as 70 feet bgs (Jacobs Engineering 1993). However the Groundwater

Quality Data Report (Jacobs Engineering 1994a) indicates that the shallowest groundwater is present at upgradient well 02_UGMW25 at approximately 35 feet bgs. Wide fluctuations in the depth to water occur in response to storm events and may be affected by geologic structure. The groundwater flow direction appears to be mainly to the southwest along the axis of the wash, although some variation (southwesterly to westerly) has been observed. Because it is located in a wash, the soil around and beneath the landfill is permeable to infiltration.

## 2.2 PHASE I REMEDIAL INVESTIGATION RESULTS

The activities conducted as part of the Phase I RI included:

- collecting shallow soil samples from seven locations;
- drilling and sampling one deep boring;
- drilling, sampling, and installing one upgradient monitoring well;
- drilling, sampling, and installing three downgradient wells;
- collecting dry wash sediment samples from six locations in Borrego Canyon Wash; and
- collecting surface water runoff samples from four locations in Borrego Canyon Wash.

A summary of the Phase I RI analytical results is presented below (Jacobs Engineering 1993, Tables A2-1a through A2-1e). The summary includes minimum and maximum detected concentrations for each chemical listed. The minimum concentration is recorded as less than the detection limit if the chemical constituent was not detected. Metal concentrations are listed only if they exceeded U.S. EPA Region IX Preliminary Remediation Goals (PRGs) or ecological screening criteria (Jacobs Engineering 1993, Tables A-3a through A-3d, A-7a through A-7c, A2-b, and A2-3c). Target analyte list (TAL) metals that were analyzed during the Phase I RI are beryllium, barium, arsenic, antimony, aluminum, cadmium, calcium, chromium, cobalt, copper, iron, lead magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc. The locations of Phase I RI investigations are shown on Map B3-2.

### 2.2.1 Surface Water

Surface water samples were collected during three storm events. Two rounds of samples were collected in March 1992, and one round was collected in December 1992.

- metals: aluminum (< 39.4 to 269,000 micrograms per liter [µg/L]), beryllium (< 0.22 to 17.7 µg/L), radium (< 3 to 43.2 µg/L), copper (3.3 to 233 µg/L), zinc (9.6 to 1,240 µg/L), selenium (< 2.1 to 223b µg/L), and 14 other TAL metals; and
- volatile organic compounds (VOCs): acetone (< 2 to 6 micrograms per kilogram [µg/kg]).

## 2.2.2 Sediment

- metals: 23 of 23 TAL metals;
- VOCs: acetone (< 10 to 8J µg/kg), toluene (< 10 to 3J µg/kg), benzene (< 10 to 3J µg/kg), carbon tetrachloride (< 10 to 11 µg/kg), methylene chloride (< 11 to 92B µg/kg), trichloroethene (< 10 to 3J µg/kg);
- semivolatile organic compound (SVOCs): benzyl butyl phthalate (< 670 to 1,200 µg/kg), bis(2-ethylhexyl) phthalate (< 670 to 350J µg/kg);
- herbicides: 2-methyl-4-chlorophenoxyproprionic acid (MCPP) (< 24,400 to 140,000 µg/kg), 2,4-DB (< 48.8 to 455 µg/kg);
- pesticides and polychlorinated biphenyls (PCBs): 4,4'-dichlorodiphenyltrichloroethane (DDT) (< 3.3 to 5.04 µg/kg), alpha-chlordane (< 1.7 to 2.4 µg/kg), gamma-chlordane (< 1.71 to 1.73 µg/kg);
- fuel and petroleum hydrocarbons: total fuel hydrocarbons (TFH)-gasoline (< 0.051 to 0.064 milligrams per kilogram [mg/kg]), total recoverable petroleum hydrocarbons (TRPH) (< 20 to 4,555 mg/kg).

## 2.2.3 Shallow Soil

- metals: mercury (< 0.01 to 0.57 mg/kg) and 22 other TAL metals;
- VOCs: 2-hexanone (< 10 to 17 µg/kg), 2-butanone (< 10 to 4J µg/kg), acetone (< 10 to 32 µg/kg), toluene (< 10 to 15 µg/kg), 4-methyl-2-pentanone (< 10 to 5J µg/kg), xylenes (< 10 to 6J µg/kg), ethylbenzene (< 10 to 6J µg/kg);
- SVOCs: benzyl butyl phthalate (< 670 to 4,200 µg/kg);
- herbicides: MCPP (< 25,400 to 48,700 µg/kg), dalapon (< 50.7 to 81.5 µg/kg), dichloroprop (< 101 to 507 µg/kg);
- pesticides and PCBs: aldrin (< 1.7 to 3.01J µg/kg), 4,4'-DDT (< 3.3 to 18.2 µg/kg), 4,4'-dichlorodiphenyldichloroethane (< 3.35 to 0.839J µg/kg), 4,4'-dichlorodiphenyldichloroethene (< 3.35 to 4.45 µg/kg);
- fuel and petroleum hydrocarbons: TFH-gasoline (< 0.05 to 0.958 mg/kg), TFH-diesel (< 12.4 to 97.5 mg/kg).

## 2.2.4 Subsurface Soil

- metals: 22 of 23 TAL metals;
- VOCs: toluene (< 10 to 7J µg/kg), acetone (< 10 to 90 µg/kg);
- SVOCs: bis(2-ethylhexyl) phthalate (< 680 to 360J µg/kg); and
- herbicides: dalapon (< 50.9 to 82.7 µg/kg), 2,4-DB (< 50.9 to 198 µg/kg), 2-methyl-4-chlorophenoxyproprionic acetic (< 25,400 to 225,000 µg/kg).

### 2.2.5 Groundwater

- metals: arsenic (0.7b to 4.7b µg/L), beryllium (< 0.5 to 0.64 µg/L), and 14 other TAL metals;
- VOCs: chloroform (< 1 to 6 µg/L), 1,2-onsite (< 1 to 0.9J µg/L), 1,2-dichloroethene (< 1 to 8 µg/L), tetrachloroethene (< 1 to 8 µg/L), trichloroethene (0.6J to 82 µg/L), 1,1,2-trichloroethane (< 1 to 2 µg/L); and
- gross alpha and gross beta: gross alpha (6.5 to 24 picocuries per liter [pci/L]), gross beta (5.2 to 30.2 pci/L).

## 2.3 AIR SWAT

The following activities were conducted as part of the Air Solid Waste Assessment Test (Air SWAT) (Strata 1991):

- landfill gas sampling,
- ambient air sampling,
- integrated surface sampling, and
- landfill gas migration testing.

A summary of the Air SWAT analytical results is presented below. The Air SWAT report did not quantify analyte detection limits. If the analyte was not detected the concentration was reported as nondetect (ND).

### 2.3.1 Landfill gas

- VOCs: dichloromethane (ND to 460 parts per billion by volume [$ppb_v$]), chloroform (ND to 21 $ppb_v$), benzene (ND to 330 $ppb_v$), trichloroethene (ND to 150 $ppb_v$), tetrachloroethene (ND to 140 $ppb_v$)and,
- other gases: methane (2.3 to 45 percent by volume [$\%_v$]), carbon dioxide (19 to 35$\%_v$).

### 2.3.2 Ambient Air

- VOCs: dichloromethane (ND to 4.8 $ppb_v$), 1,1,1-trichloroethane (ND to 2.5 $ppb_v$), tetrachloroethene (ND to 0.53 $ppb_v$)

### 2.3.3 Integrated Surface Sampling

- total organic compounds as methane (TOCs) (2.9 parts per million by volume [$ppm_v$])

### 2.3.4 Landfill Gas Migration Sample Points

- TOC (5.2 to 25,000 $ppm_v$)

## Section 3
# MAPS

The maps on the following pages present the location of the site on MCAS El Toro, site boundaries, site units, physical features of the site, previous sampling locations, and proposed Phase II sampling locations (where known). These maps are referenced in other sections of this FSP.

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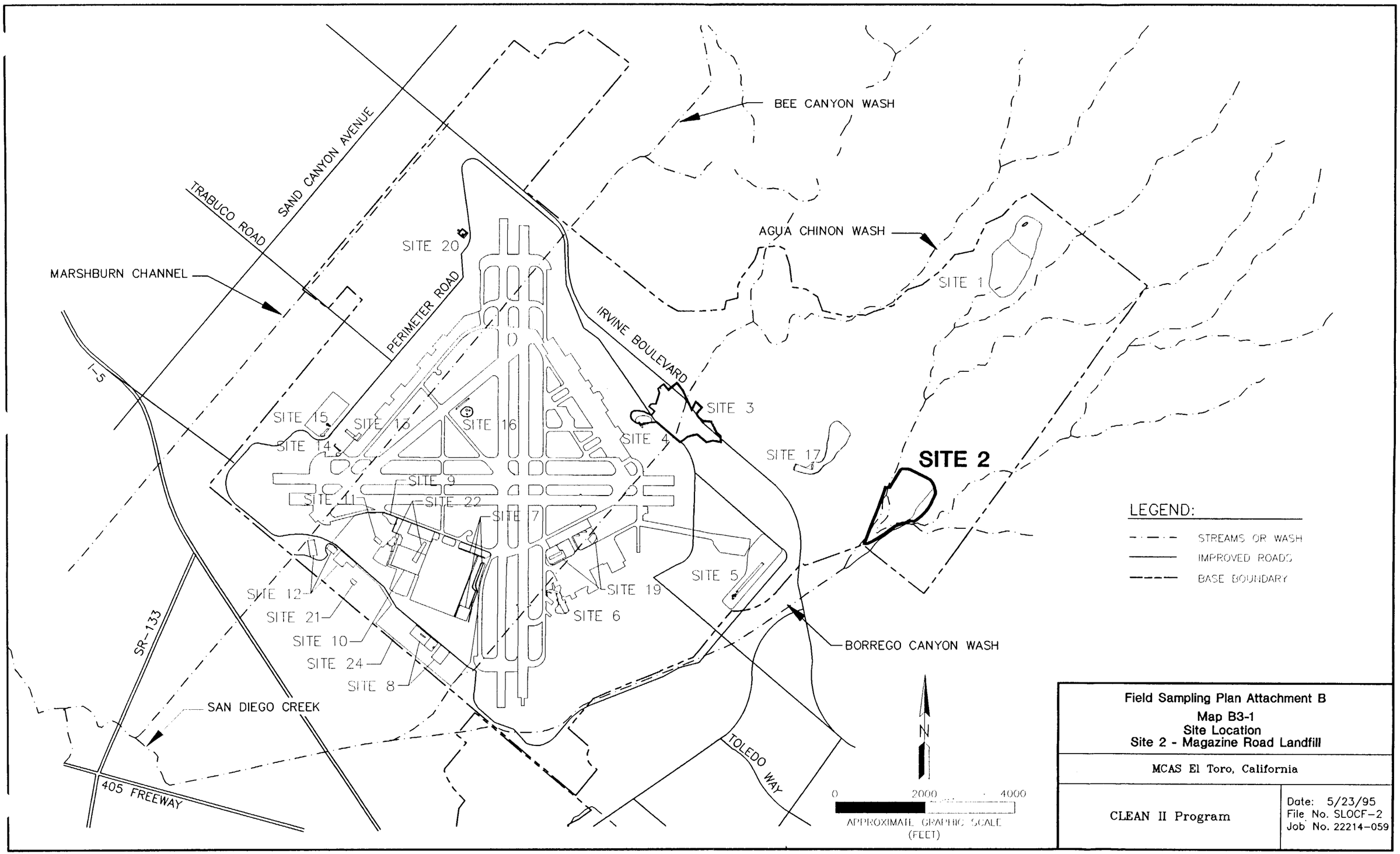


**Field Sampling Plan Attachment B**
**Map B3-1**
**Site Location**
**Site 2 - Magazine Road Landfill**

MCAS El Toro, California

CLEAN II Program

Date: 5/23/95
File No. SLOCF-2
Job No. 22214-059

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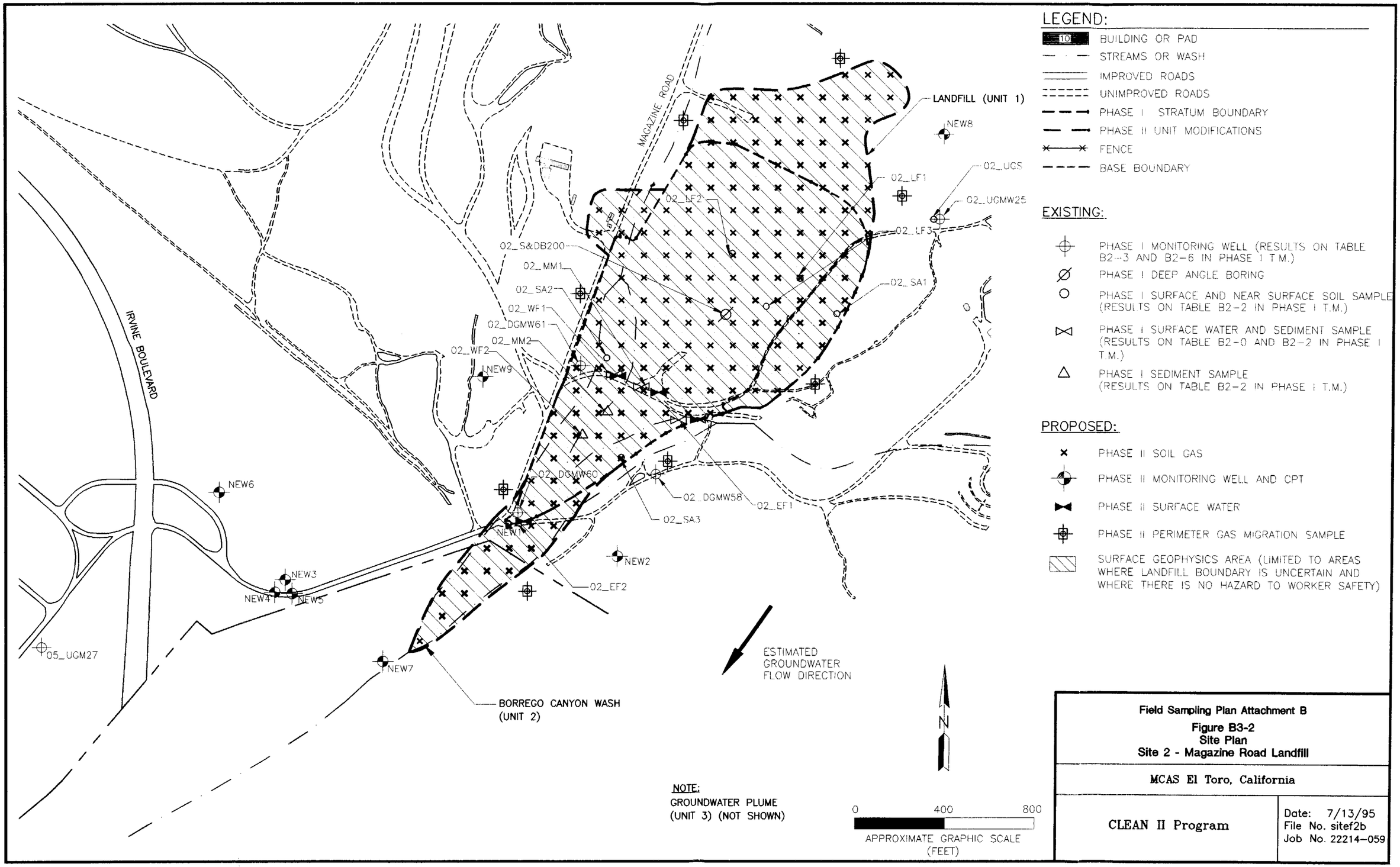


**Field Sampling Plan Attachment B**

**Figure B3-2**
**Site Plan**
**Site 2 - Magazine Road Landfill**

**MCAS El Toro, California**

**CLEAN II Program**

Date: 7/13/95
File No. sitef2b
Job No. 22214-059

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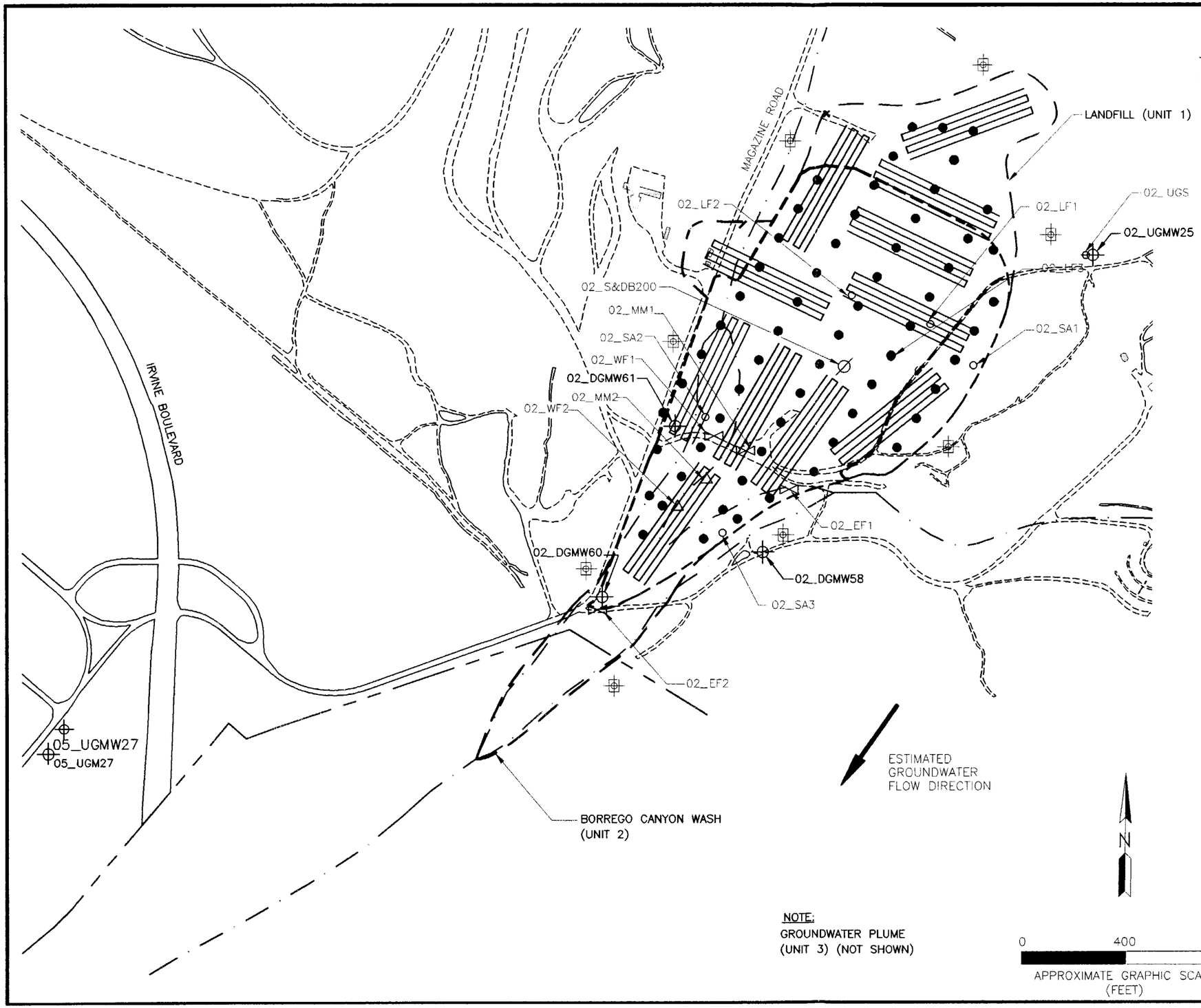


## LEGEND:

- BUILDING OR PAD
- STREAMS OR WASH
- IMPROVED ROADS
- UNIMPROVED ROADS
- PHASE I STRATUM BOUNDARY
- PHASE II UNIT MODIFICATIONS
- FENCE
- BASE BOUNDARY

## EXISTING:

- SOIL GAS SURVEY POINT
- PHASE I MONITORING WELL (RESULTS ON TABLES B2-3 AND B2-6 IN PHASE I T.M.)
- PHASE I DEEP ANGLE BORING
- PHASE I SURFACE AND NEAR SURFACE SOIL SAMPLE (RESULTS ON TABLE B2-2 IN PHASE I T.M.)
- PHASE I SURFACE WATER AND SEDIMENT SAMPLE (RESULTS ON TABLE B2-0 AND B2-2 IN PHASE I T.M.)
- PHASE I SEDIMENT SAMPLE (RESULTS ON TABLE B2-2 IN PHASE I T.M.)

## PROPOSED:

- INTEGRATED SURFACE SAMPLE LINES
- INSTANTANEOUS MONITORING SAMPLE LINES
- PHASE II PROPOSED GAS MIGRATION SAMPLE

NOTE:
GROUNDWATER PLUME (UNIT 3) (NOT SHOWN)

**Field Sampling Plan Attachment B**

**Map B3-3**
**Air Sampling Plan**
**Site 2 - Magazine Road Landfill**

**MCAS El Toro, California**

CLEAN II Program

Date: 7/13/95
File No. sitef2c
Job No. 22214-059

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# Section 4
# RATIONALE FOR SAMPLING LOCATIONS

The rationale for sampling at Site 2 is based on site conditions, previous investigations, and the DQOs as presented in Appendix B of the Phase II Work Plan (BNI 1995a). The data collection activities at Site 2 are designed to be sufficient to allow application of the U.S. EPA Presumptive Remedy for municipal landfill sites (U.S. EPA 1993).

## 4.1 SAMPLING PROGRAMS, SAMPLE TYPES, AND LOCATIONS

Sampling programs, sample types, and locations are presented on the basis of a site unit. Selection of specific sampling programs, sample types, and locations are based on:

- site history,
- types of media suspected or known to be impacted from previous investigations, and
- objectives of site-specific RI/FS efforts.

At Site 2, the following site units have been defined:

- Unit 1: area occupied by the landfill;
- Unit 2: Borrego Canyon Wash; and
- Unit 3: groundwater plume.

The sampling program will be implemented by following a tiered approach. At the conclusion of each tier, collected data will be evaluated. Based on the results of the evaluation, decisions will be made on whether or how to proceed with additional field activities outlined in subsequent tiers.

- Tier 1 sampling activities include assessing the need to collect additional samples to assess whether the site is a risk and includes nonintrusive investigations, limited intrusive sampling (e.g., soil gas surveys), and the sampling of existing systems (e.g., wells).
- Tier 2 activities include more extensive and intrusive investigations, such as subsurface borings and sampling of soils, or the installation and sampling of wells.
- Tier 3 activities, if they occur, typically are remedial-design oriented such as soil vapor extraction or aquifer tests.

Because implementation of the Presumptive Remedy is the objective of this RI/FS, the following sections discuss specifics of several sampling methods and their relevance to this objective.

### 4.1.1 Surface Geophysical Survey

An EM surface geophysical survey will be conducted to better define the limits of landfilled waste. The area to be included in the survey is based on Phase I RI (Jacobs Engineering 1993), employee interviews (Jacobs Engineering 1994b), and aerial surveys

(SAIC 1993). The boundaries of landfilled waste will be used to design a landfill cap and will define the area requiring institutional controls (including deed restrictions).

### 4.1.2 Soil Gas Survey

A soil gas survey will be performed to evaluate the potential presence of hot spots in accordance with the U.S. EPA Presumptive Remedy requirements (U.S. EPA 1993). The soil gas data will be used to identify potential hot spots. Hot spots may require further characterization, and treatment or removal if assessment of the data show the hot spot threatens the integrity of the landfill containment system. Soil gas samples will be collected and analyzed in a manner consistent with California Regional Water Quality Control Board (RWQCB) Los Angeles Region requirements for active soil gas investigations (RWQCB 1994).

### 4.1.3 Air Monitoring and Sampling

Air monitoring and sampling will be performed to reassess the migration of landfill gas into the atmosphere by verifying and supplementing existing emission data. The resulting data will be used to assess the effectiveness of the existing cap and to evaluate whether additional control of landfill gas emission is necessary. Sample types and locations were selected using South Coast Air Quality Management District (SCAQMD) Rule 1150.1 guidelines (SCAQMD 1989).

### 4.1.4 Groundwater Monitoring and Sampling

Groundwater monitoring wells will be installed and sampled, and the resulting data will be used to assess potential impacts to groundwater as well as compliance monitoring required for landfill closure (CCR 1991).

### 4.1.5 Vadose Zone Monitoring and Sampling

Vadose monitoring equipment will not be installed at Site 2 because groundwater quality data have demonstrated that contaminants have already migrated from the landfill, through the vadose zone, and to the groundwater.

### 4.1.6 Ecological Samples

Samples of biota will be collected at Site 2 to provide additional data to the proposed predictive model of the Phase II RI/FS ecological risk assessment (BNI 1995b). The purpose of the proposed biota is twofold:

- provide a quantitative assessment of potential uptake of contaminants into the food chain; and
- provide data that will be used to evaluate remedial alternatives.

## 4.2 TIER 1

Tier 1 sampling activities at Site 3 may include:

- land surveying,

- land surveying,
- surface geophysical surveying,
- soil gas sampling,
- air monitoring and sampling,
- soil sampling,
- surface water sampling, and
- ecological sampling.

## 4.2.1 Unit 1: Landfill Area

The location of Unit 1 is shown on Map B3-2. Unit 1 field investigations and data collection will focus on ascertaining information to supplement Phase I RI data and to facilitate cost-effective closure criteria set forth by RWQCB.

The proposed scope for Tier 1 at Unit 1 includes the following tasks:

- land surveying,
- surface geophysical surveying,
- soil gas sampling, and
- air sampling.

### 4.2.1.1 LAND SURVEYING

At the beginning and at the completion of the field investigation, Site 2 will be surveyed to establish horizontal and vertical controls. The initial field survey will establish proposed locations for the soil gas and geophysical survey, soil borings, and groundwater monitoring wells. In addition, the data will be used to generate a topographic map of the site. Topographic data will be used in the landfill cap design.

At the completion of the Phase II activities, a final survey will be conducted to identify sampling stations that were changed. The final survey will also establish well casing elevations and will locate landfilled waste boundaries as delineated by the surface geophysical survey and trenching data.

### 4.2.1.2 SURFACE GEOPHYSICAL SURVEYING

Previous surface geophysical surveys were conducted using ground-penetrating radar (GPR) during the Air SWAT investigation (Strata 1991) and both GPR and EM surveys during the Phase I investigation (Jacobs Engineering 1991). These geophysical surveys were limited, leaving uncertainty regarding the boundaries of the landfill. The Phase I team reported having more success with EM investigations. Therefore, at the completion of the initial land survey, an EM survey will be conducted to better define landfilled waste boundaries.

The EM surface geophysical survey will be performed on a layout consisting of lines spaced at 50 feet. The area to be included in the surface geophysical survey are shown on Map B3-2.

### 4.2.1.3 SOIL GAS SAMPLING

Soil gas samples will be collected from a 100-foot, on-center grid (Map B3-2). Samples will be collected from a depth of approximately 15 feet. Samples will be analyzed using an on-site mobile laboratory. Laboratory test results will be used to identify potential soil gas hot spots. Localized areas of containing potential hot spots will then be further characterized from a 25-foot on-center grid.

To assess off-site migration of landfill gas, soil gas samples will be collected at a spacing of not less than 1,000 feet outside the fill areas and along the perimeter of the site from approximate depths of 10, 25, and 40 feet.

The soil gas and gas migration sample locations are shown on Map B3-2.

### 4.2.1.4 AIR SAMPLING

The air sampling program consists of an instantaneous gas sampling survey, integrated surface gas sampling, flux chamber monitoring, ambient air sampling, and collection of local meteorological data. Meteorological data will be used to identify the optimum number and locations of the ambient air samples. Lateral migration of landfill gas will be evaluated by sampling at the perimeter of the landfill and outside the refuse boundaries as described in Section 4.2.1.3.

#### *Instantaneous Gas Sampling*

An instantaneous gas emissions survey will be performed over the landfill area. The instantaneous sampling survey consists of sampling grid lines where the concentration of the gas immediately above the surface of the landfill is monitored with a portable flame ionization detector (FID). Sample locations are shown on Map B3-3.

#### *Integrated Surface Samples*

Eleven integrated surface samples will be collected to check that the average concentration of TOCs over a certain area (50,000 feet$^2$) does not exceed 50 $ppm_v$. Sample locations are shown on Map B3-3.

#### *Meteorological Data*

Before and during ambient air sampling, mechanical weather stations will be installed at the perimeter of the landfill to measure wind speed and direction. The initial data will be reviewed to identify the optimum number and locations of the ambient air samples.

#### *Ambient Air Sampling*

Upwind and downwind ambient air samples will be collected at the perimeter of Site 2. The samples will be collected over a 24-hour period beginning between 10 and 11 a.m.

***Flux Chamber Monitoring***

The location and number of flux chamber samples will be determined in a manner consistent with the U.S. EPA Isolation Flux Chamber User's Guide (U.S. EPA 1986), and after a review of the surface emission and soil gas sampling results.

***Landfill Gas Migration Samples***

As described in Section 4.2.1.3, landfill gas migration samples will be collected during the soil gas investigation.

#### 4.2.1.5 ECOLOGICAL SAMPLING

To assess potential ecological risk and to provide data that will be useful for evaluation of remedial alternatives, soil invertebrates, such as earthworms or deer mice, will be collected from each site and a reference site near Site 2 that is not suspected of being contaminated. Up to 15 samples will be collected from the site and submitted for whole-body chemical analysis. Sampling location will be established by constructing a grid to provide 50 evenly spaced sampling points. The 15 sampling locations will be randomly selected at each site. The types of biota and sampling procedures are presented in the Risk Assessment Plan (BNI 1995b).

### 4.2.2 Unit 2: Borrego Canyon Wash

The location of Unit 2 is shown on Map B3-2. The Unit 2 study area includes the portion of Borrego Canyon Wash that is adjacent to or bisects the Magazine Road Landfill. Sampling in this unit will focus on ascertaining information to supplement Phase I RI data and to facilitate the selection of cost-effective remedial options.

The proposed scope for Tier 1 at Unit 2 includes the following tasks:

- land surveying,
- soil gas sampling, and
- surface water sampling.

#### 4.2.2.1 LAND SURVEYING

An initial survey will be performed to identify proposed sample locations. The survey will be used to document horizontal and vertical location of the samples, referenced to a United States Geological Survey benchmark. If sample locations change, a final survey will be conducted to document the actual sample positions. Both surveys will include horizontal and vertical controls.

#### 4.2.2.2 SOIL GAS SAMPLING

The soil gas sampling program described for Unit 1, Tier 1, will include Borrego Canyon Wash. Soil gas samples will be collected from a 100-foot, on-center grid. Samples will be collected from a depth of approximately 15 feet. Laboratory test results will be used

to identify potential soil gas hot spots. Localized areas of containing potential hot spots will then be further characterized from a 25-foot, on-center grid. Sample locations are shown on Map B3-2.

#### 4.2.2.3 SURFACE WATER SAMPLING

One round of four surface water samples will be collected at the locations where Phase I RI samples were collected. Surface water samples will be collected during the first rainfall that produces runoff during the Phase II investigation. Sample locations are shown on Map B3-2.

### 4.2.3 Unit 3: Groundwater Aquifer

The area of study identified as Unit 3 includes the groundwater aquifer under Site 2. Groundwater beneath and adjacent to Site 2 contains concentrations of tetrachloroethene (PCE) and trichloroethene (TCE) that exceed federal drinking water standards. Based on a review of groundwater quality data, the contaminant plume may extend from Site 2 to a monitoring well upgradient from Site 5 (Well 05_UGMW27). The purpose of the Unit 3 field investigation is to obtain site specific data for the following objectives:

- estimating the lateral and vertical extent of groundwater contamination;
- documenting seasonal variations in groundwater elevations;
- assessing potential buried waste saturation due to groundwater recharge in Borrego Canyon Wash;
- collecting hydrogeological parameters necessary for evaluating possible groundwater containment or remediation; and
- establishing a compliance groundwater monitoring network.

To streamline and better direct subsequent tiers of the investigation groundwater samples from all existing Site 2 wells will be collected and analyzed during Tier 1.

#### 4.2.3.1 GROUNDWATER SAMPLING FROM EXISTING WELLS

Groundwater samples will be collected from existing wells and analyzed for COPCs.

## 4.3 TIER 2

The Tier 2 sampling activities will be implemented based on the results of Tier 1 activities. The primary objective of Tier 2 activities will be to estimate the extent of contamination. These activities may include:

- trenching,
- soil sampling, and
- groundwater sampling.

## 4.3.1 Unit 1: Landfill Area

The scope of Tier 2 investigations at Unit 1 depends on the findings of the Tier 1 investigation. At the completion of Tier 1, the data will be evaluated to focus the following Tier 2 tasks:

- trenching, and
- subsurface soil sampling.

### 4.3.1.1 TRENCHING

The lateral extent of disposal activities will be confirmed by trenching across locations along the landfills perimeter where geophysical anomalies exist. To avoid contaminating the native soil, the backhoe will excavate the waste material from the perimeter of disposal areas toward the center of the disposal area.

### 4.3.1.2 SUBSURFACE SAMPLING

If potential hot spots are identified during Tier 1 soil gas sampling, hollow-stem auger borings may be collected. The number, location, and depth of these borings will depend on Tier 1 findings and field conditions. Information from these borings will help answer the following questions (U.S. EPA 1993):

1. Does evidence exists that indicates the presence and approximate location of localized waste?
2. Is the localized waste a "principal threat waste" such as a chlorinated solvent?
3. Is the localized waste in a discrete, accessible part of the landfill?
4. Is the localized waste significant enough of a threat, yet small enough in volume to be removed from the landfill in a cost-effective manner?

## 4.3.2 Unit 3: Groundwater Aquifer

Initial characterization of the horizontal and vertical extent of VOC groundwater contamination will be performed to determine the necessary number and location of groundwater monitoring wells. Activities to be included in Unit 3, Tier 2, include the following:

- characterization of horizontal and vertical extent of contamination in groundwater,
- monitoring well installation, and
- soil sampling from monitoring well borings.

### 4.3.2.1 VERTICAL CHARACTERIZATION OF VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER

One deep monitoring well will be installed near well 02_DGMW60. The new well will be drilled to approximately 150 feet bgs, which will position the well screen

approximately 60 feet below the screen of well 02_DGMW60. This amount of separation has been demonstrated adequate to define the vertical extent of VOC contamination in well 18_BGMW03 located in Site 24. The proposed well location (NEW1) is shown on Map B3-2.

#### 4.3.2.2 INITIAL HORIZONTAL CHARACTERIZATION OF VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER

Temporary well points will be installed using the direct push method to identify the horizontal extent of VOC-contaminated groundwater. The temporary well points will be installed with the cone penetrometer test (CPT) rig, if possible, or using a hollow-stem auger pilot hole, if the CPT rig encounters refusal. The CPT locations will be where the proposed groundwater monitoring wells are shown on Map B3-2.

#### 4.3.2.3 DESCRIPTION OF PROPOSED MONITORING WELLS

One proposed monitoring well (NEW1) will be located near existing well 02_DGMW60, and will characterize the vertical extent of contamination. Well 02_DGMW60 is located near the southwestern limit of disposed waste and monitors groundwater quality as it passes beneath the landfill. This well has contained the highest concentrations of TCE and PCE detected at Site 2.

Based on a review of groundwater quality data from multiport well 18_BGMW03, it appears that the vertical extent of contaminated groundwater beneath the site is limited. Groundwater samples collected from the water table completion of 18_BGMW03 contained approximately 300 parts per billion (ppb) TCE; the next deeper sample, collected 60 feet below the bottom of the water table completion, did not contain detectable concentrations of TCE. Well NEW1 will be set approximately 60 feet below the existing well.

Another proposed well (NEW2) will characterize the horizontal extent of VOC contamination. If the analytical results from Tier 1 sampling support the presence of VOCs in well 02_DGMW59, then well NEW2 will be installed cross-gradient to and outside of the VOC plume. If VOCs are not detected in 02_DGMW59, well NEW2 will not be installed.

A proposed monitoring well (NEW3) will be installed to characterize the horizontal extent of contamination. Because it is not certain if the TCE detected at Site 5 (05-UGMW25) is connected with the TCE plume identified at Site 2 (02-DGMW60), well NEW3 will be installed between the two wells to assess the possible connection of the TCE plumes. Well NEW3 will be screened at the water table, consistent with the construction of nearby wells. Information from this well will help determine if the contamination in the groundwater aquifer plume is continuous between existing wells 05-UGMW25 and 02-DGMW60.

Two proposed monitoring wells (NEW4 and NEW5) will only be considered if VOCs are detected in the deep aquifer zone monitored by well NEW1. If VOCs are not detected in

well NEW1, it will be assumed that vertical characterization of the groundwater plume is complete, and wells NEW4 and NEW5 will not be installed.

If deeper VOC contamination is confirmed at well NEW1, well NEW4 will be drilled to further assess the vertical extent of contamination. If contamination is not detected in groundwater samples from well NEW1, then wells NEW4 and NEW5 will not be drilled.

Well NEW5 is proposed for characterizing the vertical extent of contamination, should VOCs be detected in well NEW4. If contamination is not detected in groundwater samples from well NEW4, then well NEW5 will not be installed.

Three proposed wells (NEW6, NEW7, and NEW9) will be installed for characterizing the horizontal extent of contamination in the shallow aquifer. The actual locations of these wells will be established in the field according based on CPT results from temporary well point sampling.

A final proposed well (NEW8) will characterize the horizontal extent of VOC contamination. If the analytical results from CPT sampling support the presence of VOCs in well 02_UGMW25, then well NEW8 will be installed upgradient and outside the VOC plume. If VOCs are not detected in 02_UGMW25, well NEW8 will not be installed.

#### 4.3.2.4 SOIL SAMPLING

Soil samples will be collected from the proposed monitoring well borings to obtain data to support evaluation of remedial alternatives. Soil sample analyses will include bulk density, porosity, and organic carbon.

## 4.4 TIER 3

Tier 3 activities at Site 2 involve pilot testing to estimate effectiveness of remedial technologies.

### 4.4.1 Unit 3: Groundwater Aquifer

Pilot testing that may be performed at Site 2 is described below.

#### 4.4.1.2 AQUIFER TESTING

To obtain hydrogeological data relevant to contaminant migration within the shallow aquifer, an aquifer pumping test will be performed. The existing well No. 02-DGMW60 will be pumped, and piezometric levels at the well (NEW1) will be observed. In addition, a deep well to be installed in the same area (NEW1) will be monitored during the pump test. Aquifer pumping test procedures are described in FSP Section 6.

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# Section 5
# REQUEST FOR ANALYSES

Request for analyses is based on the analytical test rationale discussed in Section 4 of the FSP, which reflect the chemicals of potential concern (COPCs) listed in the DQOs (BNI 1995c, Appendix B). These were based on the results of Phase I RI activities.

The analytical methods discussed in this section comprise those presented in the Phase II Quality Assurance Project Plan (QAPP) for quality assurance procedures. The primary objective when requesting an analytical method is to provide data that are precise, accurate, representative, complete, and comparable. The data must meet the DQOs discussed in detail in the QAPP and must follow all the guidelines established under Naval Facilities Engineering Service Center (NFESC, formerly known as Naval Energy and Environmental Support Activity [NEESA]) Level D.

## 5.1 ANALYTICAL TESTING RATIONALE

The various analyses chosen are based on the COPCs and thus are site specific. During the Phase II RI, the NFESC Level D guidelines must be followed and the analyses will be performed by an approved laboratory for Comprehensive Long-Term Environmental Action Navy (CLEAN) II. The parameters have been determined based on regulatory limits, health/risk calculations, and NFESC Level D analytical method limitations.

## 5.2 FIELD SCREENING

Field-screening analytical methods provide cost-effective, rapid turnaround of chemical results during the field investigation. The data collected from the field-screening methods can minimize the number of nondetects submitted to a stationary laboratory for analysis and can also be effectively used to estimate the nature and extent of contamination.

### 5.2.1 Metals (Title 26)

Landfills are typically sources of several types of metals. During the Phase I RI, several metals were identified in both soil and groundwater. For this reason, select soil samples will be analyzed for Title 26 metals using inductively coupled argon plasma techniques. Select soil samples will be analyzed in the on-site mobile laboratory.

### 5.2.2 Volatile Organic Compounds - PID, FID, and Portable GC or GC/MS

VOCs at Site 2 include common solvents, dry cleaning fluids, and degreasing agents. They were commonly used at MCAS El Toro, and thus were likely disposed at the landfill. Additionally, VOCs were identified as COPCs in Site 2 soils and groundwater.

All soil samples collected will be field-screened with a photoionization detector (PID) and FID. All soil samples with elevated PID and FID readings above background and 5 percent of the soil samples with nondetectable readings will be sent to the mobile

laboratory. The on-site mobile laboratory will analyze the samples for VOCs by gas chromatograph (GC) or gas chromatography/mass spectroscopy (GC/MS).

### 5.2.3 Nonhalogenated Volatiles - PID, FID, and GC or GC/MS

Fuel hydrocarbons (including gasoline and diesel fuel) were used extensively at MCAS El Toro and were probably disposed at the landfill. The Phase I investigation identified fuel hydrocarbons and TRPH at several locations at Site 2.

All soil samples collected will be field-screened with a PID and FID in the field. Soil samples with elevated PID readings above background and 5 percent of the soil samples with nondetectable readings will be sent to the mobile laboratory. The on-site mobile laboratory will analyze for nonhalogenated volatiles and fuel hydrocarbons by GC or GC/MS.

### 5.2.4 Gross Alpha and Beta - Scintillometer

Dials painted with radio active residue could have been disposed at the landfills. Gross alpha particle activity and gross beta particle activity were identified during Phase I field investigations as a COPC in groundwater.

All soil samples collected will be field-screened with the scintillometer.

### 5.2.5 TO-14 Volatile Organic Compounds - Soil Gas

Several VOCs have been identified at Site 2 in the soil gas, surface, and ambient air. This analysis will be performed on soil gas, surface, and ambient air samples.

All soil gas, surface, and ambient air samples collected will be analyzed in the on-site mobile laboratory using Method TO-14 for VOCs.

## 5.3 FIXED-BASE ANALYTICAL LABORATORY TESTS

As described in the QAPP (BNI 1995c), 20 percent of the soil samples analyzed by the mobile laboratory are required to be analyzed by a NFESC Level D laboratory for confirmation. Two-thirds of the 20 percent will include soil samples that contain detectable concentrations of VOCs, SVOCs, nonhalogenated volatiles, or concentrations of metals that exceed background. One-third of the 20 percent will include soil samples that contain nondetectable concentrations of the above constituents and soil samples that do not exceed the background formula. The analytical tests methods for NFESC Level D confirmation analysis are described below.

### 5.3.1 Metals (Title 26 Metals) - U.S. EPA Methods 6010 and 200.7

Select soil samples analyzed by a mobile laboratory for Title 26 metals will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for metals analysis.

### 5.3.2 Pesticides and PCBs - U.S. EPA Methods 8080 and 608

Although the pesticides identified during Phase I investigations are included in U.S. EPA Method 8270 (which is also being performed), the detection limits in the U.S. EPA Method 8080 are lower. To better define PRG limits, U.S. EPA Method 8080 will be performed.

Select soil samples will be sent to the NFESC Level D laboratory for analysis of PCBs and pesticides using U.S. EPA Method 8080. All collected groundwater samples will be sent to the NFESC Level D laboratory and analyzed for pesticides and PCBs using U.S. EPA Method 608.

### 5.3.3 Volatile Organic Compounds - U.S. EPA Methods 8240 and 624

Select soil samples analyzed by the mobile laboratory for VOCs will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for confirmatory analyses of VOCs.

### 5.3.4 General Minerals/Chemistry

All groundwater samples will be sent to the NFESC Level D laboratory for analysis of general minerals and water chemistry. The analyses will include alkalinity (as $CaCO_3$), alkalinity with breakdown, total phosphate, ammonia-nitrogen, total Kjeldahl nitrogen, nitrate, calcium, sodium, potassium, magnesium, iron, sulfate, chloride, bicarbonate, nitrite, fluoride, turbidity, pH, total dissolved solids, and conductivity.

### 5.3.5 Gross Alpha and Beta - U.S. EPA Method 703

Of the soil samples collected and field-screened for gross alpha/beta radioactivity, all of the samples with elevated radioactivity will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for gross alpha/beta radioactivity analyses.

### 5.3.6 Total Organic Carbon - U.S. EPA Method 9060

Analysis for total organic carbon is being performed to characterize potential soil retardation factors. Retardation factors are helpful in understating the contaminants fate and transport. For analysis, soil samples are retrieved from borings in the saturated zone. Only one sample (saturated soil) will be analyzed for total organic carbon in each well.

### 5.3.7 Semivolatile Organic Compounds - U.S. EPA Methods 8270 and 625

Select soil samples collected and analyzed in the mobile laboratory for SVOCs will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for SVOC analyses.

### 5.3.8 Nonhalogenated Volatiles - U.S. EPA Method 8015 M

Select soil samples collected and analyzed in the mobile laboratory for nonhalogenated volatiles will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for nonhalogenated volatiles analyses.

### 5.3.9 Chlorinated Herbicides - U.S. EPA Methods 8150 and 615

Agricultural activities are common both on the Station and in the vicinity of the landfill; thus, it is reasonable to expect several herbicides in the landfill. Typically, herbicides would be superficial because of their low tendency to migrate. However, because of the nature of a landfill, herbicides may have been landfilled and may occur deeper in the subsurface.

Select soil samples will be sent to the NFESC Level D laboratory for analysis of chlorinated herbicides. All groundwater samples collected will be sent to the NFESC Level D laboratory for chlorinated herbicide analyses.

## 5.4 SUMMARY OF TESTS

Tables B5-1 through B5-5 summarize the analytical tests planned for the Phase II RI.

**Table B5-1**
**Soil Sampling and Analysis – On-Site Mobile Laboratory**

| Tier | Unit/Name | No. of Locations | Samples[a]/ Location | Total Samples | ON-SITE MOBILE LABORATORY | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | VOCs[b] | SVOCs[c] | TPH[d] | Metals | Gross Alpha & Beta[e] |
| Tier 1 | Landfill Area | NA[f] | | | | | | | |
| | Borrego Canyon Wash | NA | | | | | | | |
| | Groundwater Plume | TBD[g] | | | | | | | |
| Tier 2 | Landfill Area | NA | | | | | | | |
| | Borrego Canyon Wash | NA | | | | | | | |
| | Groundwater Plume | 9 | 5 | 45 | 45 | 45 | 45 | 45 | 45 |
| *Total* | | 9 | 5 | 45 | 45 | 45 | 45 | 45 | 45 |

Notes:
[a] a minimum of 5 samples per groundwater monitoring well will be sent to the on-site mobile laboratory
[b] VOC – volatile organic compound
[c] SVOC – semivolatile organic compound
[d] TPH – total petroleum hydrocarbons
[e] field instrument
[f] NA – not applicable
[g] TBD – to be determined

**Table B5-2**
**Soil Sampling and Analysis – Off-Site Laboratory**

| Tier | Unit/Name | No. of Locations | Samples[b]/ Location | Total Samples | OFF-SITE LABORATORY[a] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VOCs[c] | SVOCs[d] | TPH[e] | Pesticides/ PCBs[f] | Herbicides | Total Organic Carbon[g] | Metals | Gross Alpha & Beta |
| Tier 1 | Landfill Area | NA[h] | | | | | | | | | | |
| | Borrego Canyon Wash | NA | | | | | | | | | | |
| | Groundwater Plume | TBD[i] | | | | | | | | | | |
| Tier 2 | Landfill Area | NA | | | | | | | | | | |
| | Borrego Canyon Wash | NA | | | | | | | | | | |
| | Groundwater Plume | 9 | 5 | 45 | 5 | 5 | 5 | 5 | 5 | 9 | 5 | 5 |
| *Total* | | 9 | 5 | 45 | 5 | 5 | 5 | 5 | 5 | 9 | 5 | 5 |

Notes:
- [a] a minimum of 10 percent of the total samples sent to the on-site mobile laboratory will be sent to an off-site laboratory for QA/QC
- [b] a minimum of five soil samples from each groundwater monitoring well will be collected for analytical testing
- [c] VOC – volatile organic compound
- [d] SVOC – semivolatile organic compound
- [e] TPH – total petroleum hydrocarbons
- [f] PCB – polychlorinated biphenyl
- [g] saturated soil sample
- [h] NA – not applicable
- [i] TBD – to be determined

**Table B5-3**
**Soil Gas Sampling and Analysis**

| | | | | | ON-SITE MOBILE LABORATORY[b] | OFF-SITE LABORATORY[c] |
|---|---|---|---|---|---|---|
| **Tier** | **Unit/Name** | **No. of Locations** | **Samples[a]/ Location** | **Total Samples** | **TO-14 (Methane)** | **TO-14 (Methane)** |
| Tier 1 | Landfill Area | 192[d] – TBD[e] | 1 or 3 | 208 | 208 | 21 |
| | Borrego Canyon Wash | | | | | |
| | Groundwater Plume | NA[f] | | | | |
| Tier 2 | Landfill Area | | | | | |
| | Borrego Canyon Wash | | | | | |
| | Groundwater Plume | NA | | | | |
| | *Total* | 192 | | 208 | 208 | 21 |

Notes:
[a] samples will be collected from 184 locations on the landfill and the Borrego Canyon Wash at depths of 15 feet; samples will be collected from 8 locations outside the landfill boundary at depths of 10, 25, and 40 feet bgs
[b] all soil gas samples collected will be sent to the on-site mobile laboratory for analysis
[c] a minimum of 10 percent of the samples sent to the on-site mobile laboratory will be sent to an off-site laboratory for QA/QC
[d] additional soil gas samples may be collected to better define hot spots within the landfill
[e] TBD – to be determined
[f] NA – not applicable

**Table B5-4**
**Groundwater Sampling and Analysis**

| Tier | Unit/Name | No. of Locations | Samples/ Location | Total Samples | Off-Site Laboratory | | | | | | | | On-Site Mobile Laboratory |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VOCs[a] | SVOCs[b] | TPH[c] | Pesticides/ PCBs[d] | Herbicides | General Chemistry | Metals | Gross Alpha & Beta | VOCs |
| Tier 1 | Landfill Area | NA[e] | | | | | | | | | | | |
| | Borrego Canyon Wash | NA | | | | | | | | | | | |
| | Groundwater Plume | 4[f] | 1 | 4 | | | | | | | | | 4 |
| Tier 2 | Landfill Area | NA | | | | | | | | | | | |
| | Borrego Canyon Wash | NA | | | | | | | | | | | |
| | Groundwater Plume | 9 | 1 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 15[g] |
| *Total* | | 13 | | 13 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 19 |

Notes:
[a] VOC – volatile organic compound
[b] SVOC – semivolatile organic compound
[c] TPH – total petroleum hydrocarbons
[d] PCB – polychlorinated biphenyl
[e] NA – not applicable
[f] existing wells
[g] includes an estimated six cone penetrometer test groundwater samples

**Table B5-5**
**Surface Water Sampling and Analysis**

| Tier | Unit/Name | No. of Locations | Samples/ Location | Total Samples | Off-Site Laboratory | | | | | | | | On-Site Mobile Laboratory |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VOCs[1] | SVOCs[b] | TPH[c] | Pesticides/ PCBs[d] | Herbicides | General Chemistry | Metals | Gross Alpha & Beta | VOCs |
| Tier 1 | Landfill Area | NA[e] | | | | | | | | | | | |
| | Borrego Canyon Wash | 4 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| | Groundwater Plume | NA | | | | | | | | | | | |
| Tier 2 | Landfill Area | NA | | | | | | | | | | | |
| | Borrego Canyon Wash | NA | | | | | | | | | | | |
| | Groundwater Plume | NA | | | | | | | | | | | |
| | *Total* | NA | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

Notes:
[a] VOC – volatile organic compound
[b] SVOC – semivolatile organic compound
[c] TPH – total petroleum hydrocarbons
[d] PCB – polychlorinated biphenyl
[e] NA – not applicable

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# Section 6
# FIELD METHODS AND PROCEDURES

This section presents site-specific field methods that will be used to collect samples and other field data. The field methods discussed in this are based on CLEAN II Standard Operating Procedures.

## 6.1 LAND SURVEY

An initial land survey will establish proposed locations for the soil gas and geophysical survey, soil borings, and groundwater monitoring wells. Each control point to be surveyed will be marked on the ground and on the draft field maps. Each point will be identified by the station identification on the map and on a flag attached to the rebar marking the sampling location.

Each sampling point will be surveyed and located to the nearest 0.1 foot, using the California Plane Coordinate System with northings and eastings. The precision of the vertical measurements will be within 0.01 feet. A surface contour map will be generated with 2-foot contour intervals.

At the completion of the Phase II activities, a final survey will be conducted to identify sampling stations that were changed. The final vertical controls will be resurveyed to the accuracy of 0.01 feet. The final survey will also establish well casing elevations, and identify landfilled waste boundaries as delineated by the surface geophysical survey and trenching data. Further land surveying details are discussed in Section 6 of the FSP.

## 6.2 SURFACE GEOPHYSICAL SURVEY

At the completion of the initial land survey, a surface geophysical survey will be conducted to define landfilled waste boundaries. Both electromagnetic induction profiling and time-domain electromagnetic surveys will be performed. Survey lines will be spaced at approximately 50-foot intervals that cross the suspected boundaries of fill areas. The area to be surveyed includes the suspected limits of waste disposal at the landfill. Operational procedures for surface geophysical surveys are described in Section 6 of the FSP.

## 6.3 TRENCHES

The rationale for limited trenching is to confirm the presence of past disposal activities at locations where surface geophysics indicate the presence of anomalies. The lateral extent of disposal activities will be confirmed by trenching across the perimeter of anomalous areas using a backhoe. To avoid contaminating the native soil, the backhoe will excavate the waste material from the perimeter of disposal areas toward the center of the disposal area.

Excavation will continue until the lateral extent of wastes are visibly determined, or the depth of approximately 10 feet bgs is reached, whichever comes first.

## 6.4 SOIL GAS

Soil gas samples will be collected using a CPT rig. Soil gas samples will be collected according to "Requirements for Active Soil Gas Investigation," produced by the RWQCB Los Angeles Region (RWQCB 1994). Guidelines that will not be followed are related to the recommended distance between sample points. A 100-foot initial grid pattern is planned for Site 2 with a secondary 25-foot grid to characterize hot spots. Soil gas sampling procedures are described in detail in FSP Section 6.

## 6.5 SOIL SAMPLES

Surface and near surface soil samples will be collected with a hand trowel or hand auger. Part of the soil sample will be directly transferred to the sample jar and placed into the cooler. Samples being analyzed for VOCs will have a portion of the sample placed in a plastic bag for field determination of organic vapor in the headspace.

Soil samples will also be collected from angled soil borings and monitoring well borings. Each boring will be hand augered to a depth of 5 feet (or refusal) to reduce the potential of drilling through subsurface utilities. A CLEAN II Team geologist will be present for drilling, soil logging and sampling, field screening, and final abandonment or completion of a monitoring or vadose well. All borings will be logged according to the Unified Soils Classification System. Soil samples will be collected at minimum 5-foot intervals by driving a modified California soil sampler. Sample intervals may be reduced at the discretion of the field geologist. Soil sampling procedures are outlined in the following FSP sections:

- Section 6.9, geophysics;
- Section 6.2, utility clearance;
- Section 6.12, decontamination;
- Section 6.3, surface samples;
- Section 6.3, hollow-stem auger borings;
- Section 6.3, hand auger borings;
- Section 5.2, field screening; and
- Section 6.14, sample handling, packaging, and shipping.

## 6.6 AIR SAMPLING

Air sampling will be performed to satisfy SCAQMD Rule 1150.2 requirements for the control of gaseous emissions from inactive landfills. The surface emission sampling program will be implemented to evaluate the landfill gas surface emissions, and the potential for off-site migration. The sampling program consists of an instantaneous gas sampling survey, integrated surface gas sampling, flux chamber monitoring, ambient air sampling, and collection of local meteorological data. Lateral migration of landfill gas

will be evaluated by sampling at the perimeter of the landfill and outside the refuse boundaries, as described in Section 4.2.1.4.

## 6.6.1 Instantaneous Gas Sampling

During the instantaneous sampling survey, the concentration of the gas immediately above the surface of the landfill is monitored with a portable FID. The FID is held no more than 3 inches above the landfill surface. Areas above which the instantaneous organic vapor analyzer reading exceeding 50 $ppm_V$ will be identified per SCAQMD Rule 1150.2.

## 6.6.2 Integrated Surface Samples

To collect integrated surface samples, Site 2 will be divided into several grids each 50,000-feet$^2$ in size. One integrated surface sample will be collected at 2 to 3 inches above the surface from each 50,000- foot$^2$ grid area. Surface samples will be collected using a portable self-contained sampling unit equipped with a collection probe and a pump. Continuous samples are collected in 10-liter Tedlar™ bags at a pump flow rate of 333 cubic centimeters per minute taken while walking through 2,600 linear feet in 25 minutes. The integrated surface sample contained in the Tedlar™ bag will be monitored with a portable FID. If the FID reading exceeds 500 $ppm_V$, the sample will be submitted to the laboratory for analysis. Surface monitoring and sampling will be performed when landfill is dry (a minimum of 72 hours after rainfall). Surface sampling will be terminated when the average wind speed exceeds 5 miles per hour (mph) (determined on a 10-minute average) or the instantaneous wind speed exceeds 10 mph.

## 6.6.3 Flux Chamber Monitoring

Although not required by SCAQMD Rule 1150.2, landfill gas emissions will be collected from an isolated soil surface area using an emission isolation flux chamber, for risk assessment purposes. Gaseous emissions are sampled by placing the flux chamber over the area to be sampled and working it into the surface to a depth of approximately 1 inch. Sweep air is injected at a flow rate of 5 liters per minute. After 24 minutes, samples are collected. To prevent cross-contamination before and between sampling, the chamber will be purged with ultra-high-purity air (less than 0.1 $ppm_V$ total hydrocarbons) and followed with running a method blank until exit concentrations are less than 10 $ppm_V$ or less than 10 percent of expected concentrations, whichever is smaller. Gas emission samples will not be collected using the flux chamber during or after a rain. Gas emission samples will be collected after a minimum of 72 hours after rainfall. Details of monitoring and sampling procedures are provided in the FSP Section 6. The location and number of flux chamber samples will be determined after the review of the surface emission and soil gas sampling results.

### 6.6.4 Ambient Air Sampling

Ambient air sampling will be performed at the perimeter of Site 2 to assess potential concentrations of landfill gas migrating off-site. Several continuous recorders will be installed and operated at the perimeter of the landfill to measure wind speed and direction throughout the sampling period. These data will be reviewed to identify the optimum number and locations of the ambient air samples. The mechanical weather stations will be installed approximately 12 feet above the ground, and more than 60 feet away from obstacles such as trees and buildings. Three ambient air samplers will be installed at the perimeter of Site 2 at downwind and upwind locations. Samples will be collected in a 10-liter Tedlar™ bag over a 24-hour period beginning between 10 and 11 a.m.

## 6.7 GROUNDWATER SAMPLES

Existing wells at the site will be sampled. Each well has a dedicated Grundfos 2-inch-diameter Rediflow or 4-inch-diameter electrical submersible pump. Each well has a T-fitting at the well head. One side of the T-fitting is the discharge port that allows attachment of a garden hose, and the other is the sampling port that allows attachment of Teflon tubing. The depths of the wells range from 95 to 295 feet below ground surface. Screened intervals in the wells are either 20 or 40 feet in length.

Groundwater sampling will follow CLEAN II SOP 8, Groundwater Sampling. Three to five casing volumes will be purged from each well using the dedicated submersible pump. Temperature, pH, conductivity, and turbidity will be measured at regular intervals. Groundwater will be sampled. When collecting samples for VOC analysis, the rate of purging will be reduced to less than 0.1 liters per minute.

Before collecting groundwater samples, depth to water level will be measured in the existing wells. Before sampling, each monitoring well will be purged. After the level of groundwater has recovered to at least 90 percent of the prepurged level, groundwater samples will be collected. The water samples will be analyzed for VOCs in the on-site mobile laboratory.

Groundwater wells drilled and installed at Site 2 will follow well-development procedures. All new wells will be developed before groundwater sampling. Groundwater sampling procedures are outlined in the following FSP sections:

- Section 6.9, geophysics;
- Section 6.2, utility clearance;
- Section 6.12, decontamination;
- Section 6.4, field measurement of water quality parameters;
- Section 6.4, groundwater sampling to evaluate water quality;
- Section 6.4, field filtration of groundwater samples; and
- Section 6.14, sample handling, packaging, and shipping.

### 6.7.1 Monitoring Well Construction

To maintain a consistent groundwater quality data collection effort, Phase II monitoring wells will be constructed similar to those installed during the Phase I RI. The wells will be constructed with flush-threaded, 4-inch-diameter, Schedule 40, polyvinyl chloride (PVC) blank casing, screened over the lower 40 feet. Flush-threaded, 4-inch diameter, stainless steel, wire-wrapped screen will be used. The screen slot size (0.010 inch or 0.020 inch) will be determined at the time of drilling. Sand filter pack will be selected such that at least 90 percent of the filter pack is retained by the well screen. Centralizers will be used at the top, bottom, and center of the well screen.

Wells over 200 feet in depth will be constructed using 5-inch-diameter, flush-threaded, Schedule 80 PVC blank casing and screened over the lower 40 feet. Flush-threaded, 5-inch-diameter, stainless steel, wire-wrapped well screen will be used. Sand filter pack will be selected such that at least 90 percent of the filter pack is retained by the well screen. Centralizers will be used at the top, bottom, and center of the well screen. The wells will be constructed by suspending the casing in the boring. Well construction procedures are described in the following sections of the FSP:

- Section 6.4, monitoring well construction; and
- Section 6.4, surface completion of monitoring wells.

### 6.7.2 Well Development and Groundwater Sampling

The well materials will be allowed to set at least 48 hours before development. Each monitoring well will be developed using a surge-and-pump method until the discharged water is relatively free of fine suspended sediment. After each well volume is removed, samples of the discharged water will be collected and analyzed in the field for conductivity, temperature, pH, and turbidity. Well development will be complete when conductivity, temperature, and pH measurements vary less than 10 percent, and the discharged water is relatively free of fine suspended sediment. The field measurements will be recorded on the well-development log.

Groundwater samples will be collected after waiting at least 7 days after development. Groundwater sampling and development procedures are described in FSP Section 6.

## 6.8 SURFACE WATER SAMPLING

Surface water sample will be collected before measurement of the flow velocity is taken. To measure the surface water flow velocity, a float will be dropped in the stream at a location above the sampling point. The distance that the float will travel will be measured to determine velocity and volume of water. The measured distance will be relatively straight and will have approximately the same cross-sectional area along its entire length. The float will be dropped at the upstream end of the distance. The time in seconds required for the float to arrive to the end of the measured distance will be recorded. This procedure will be repeated three times, and velocity will be calculated. The width of the cross section will be estimated and the depth of water at three or more

points along the cross section will be measured. Using the measured data, the volume of flow will be determined.

Procedures for surface water sampling are described in FSP Section 6.

## 6.9 ECOLOGICAL SAMPLING

Up to 15 samples will be collected from the site and submitted for whole-body chemical analysis. Sampling location will be established by constructing a grid to provide 50 evenly spaced sampling points. The 15 sampling locations will be randomly selected at each site. The types of biota and sampling procedures are presented in the Risk Assessment Plan (BNI 1995b).

Biota samples will be placed in clean glass jars and submitted for analyses of pesticides by U.S. EPA Method 8080, SVOCs by U.S. EPA Method 8270, and metals by U.S. EPA Method Series 6000/7000. Approximately 60 grams per weight of tissues are required from each sample to conduct these analyses.

The following information will be recorded in the field logbook:

- date and time of sample collection,
- general meteorological data,
- location of sample,
- vegetation,
- equipment used,
- sample number,
- dimensions of soil excavation,
- number of individuals from each location,
- deviations from sampling plan,
- sampler name, and
- sampling method.

Before chemical analyses, the sample will be homogenized to obtain a uniform tissue sample. Homogenization will occur at the analytical laboratory, so no chemical preservative will be needed during shipping; however, the samples will be shipped in a chilled cooler.

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**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**

**CLEAN II**

# FIELD SAMPLING PLAN
# ATTACHMENT C
# OPERABLE UNIT 2 –
# SITE 3 – ORIGINAL LANDFILL
# MCAS EL TORO, CALIFORNIA

**CTO-0059**

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# ACRONYMS/ABBREVIATIONS

| | |
|---|---|
| Air SWAT | Air Solid Waste Assessment Test |
| bgs | below ground surface |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| COPC | chemical of potential concern |
| DDD | dichlorodiphenyldichloroethane |
| DDE | dichlorodiphenyldichloroethene |
| DDT | dichlorodiphenyltrichloroethane |
| DQO | data quality objective |
| EM | electromagnetic |
| FID | flame ionization detector |
| FS | Feasibility Study |
| FSP | Field Sampling Plan |
| GC | gas chromatograph |
| GC/MS | gas chromatography/mass spectroscopy |
| GPR | ground-penetrating radar |
| MCAS | Marine Corps Air Station |
| MCC3 | Marine Calibration Complex 3 |
| µg/kg | micrograms per kilogram |
| µg/L | micrograms per liter |
| mg/kg | milligrams per kilogram |
| ND | not detected |
| NEESA | Naval Energy and Environmental Support Activity |
| NFESC | Naval Facilities Engineering Service Center |
| PCB | polychlorinated biphenyl |
| PCE | tetrachloroethene |
| pCi/L | picocuries per liter |
| PID | photoionization detector |
| $ppb_v$ | parts per billion by volume |
| $ppm_v$ | parts per million by volume |
| PVC | polyvinyl chloride |

# ACRONYMS/ABBREVIATIONS (continued)

| | |
|---|---|
| QAPP | Quality Assurance Project Plan |
| RBC | risk-based concentration |
| RCRA | Resource Conservation and Recovery Act |
| RFA | RCRA Facility Assessment |
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| RWQCB | (California) Regional Water Quality Control Board |
| SAIC | Science Applications International Corporation |
| SCAQMD | South Coast Air Quality Management District |
| SVOC | semivolatile organic compound |
| SWMU/AOC | solid waste management unit/area of concern |
| TAL | target analyte list |
| TFH | total fuel hydrocarbons |
| TOC | total organic compound |
| TP | trichlorophenoxyproprionic acid |
| TRPH | total recoverable petroleum hydrocarbon |
| U.S. EPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |
| VOC | volatile organic compound |

# Section 1
# OBJECTIVES

This Field Sampling Plan (FSP) for Site 3, Original Landfill, outlines the field procedures and methodology applicable to this site. The FSP follows the United States Environmental Protection Agency (U.S. EPA) Region IX guidelines for preparing sample plans (U.S. EPA 1992). This FSP is written to aid field personnel unfamiliar with the site in gathering the required samples and field data. The purpose of this plan is to help assure that data collection activities will satisfy the field investigation design developed in the data quality objectives (DQOs).

The DQOs for this site were developed using U.S. EPA a seven-step DQO process. The field investigation is designed to determine if the site poses a human health or environmental risk and to provide data for selecting any necessary remedial alternative(s).

## 1.1 SAMPLING OBJECTIVES

The overall objective of this FSP is to direct collection of data sufficient to allow application of the Presumptive Remedy as established by the U.S. EPA for municipal landfills at Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites (U.S. EPA 1993). Site 3 can be classified as a municipal landfill because the wastes present are a large-volume, heterogeneous mixture of municipal waste (e.g., nontoxic household, construction, and landscaping debris) as well as industrial and hazardous wastes (including fuel hydrocarbons, solvents, pesticides, and metals). The Presumptive Remedy allows for unit closure after resolving hot spot issues and taking engineered or institutional steps to limit the release of contaminants to the environment.

Under the Presumptive Remedy approach, engineered designs are prepared to limit the release of contaminants to the atmosphere, surface water, and groundwater. The primary containment measures are:

- capping the landfill to limit direct contact with disposed waste, infiltration, and resulting contaminant leaching to groundwater, and to control surface water runoff and erosion;
- any necessary groundwater treatment to reduce the impact of released contaminants; and
- any necessary gas control and treatment to reduce uncontrolled atmospheric releases and the mass of subsurface volatile contaminants.

Also under the Presumptive Remedy, institutional controls are implemented to limit the exposure to landfilled waste. The most common institutional control is a deed restriction. Related Phase II Remedial Investigation (RI) data collection activities should thus include the delineation of landfill boundaries to allow the preparation of legal descriptions for the deed restrictions.

Additional input information supporting Presumptive Remedy decisions include the following:

- location, nature, and extent of potential hot spots;
- existence, areal extent, depth, nature, and condition of landfill cap; and
- delineation of landfilled wastes using historic, nonintrusive (e.g., electromagnetic), or intrusive (e.g., trenching) techniques.

## 1.2 DATA USAGE

To satisfy the objectives of this FSP, field data will be used for the purposes detailed below.

- Surface geophysical and topographic surveys will be conducted to define the limits of landfilled waste and to record site elevations. The boundaries of landfilled waste and the resulting topographic map will support the landfill cap design, define the area requiring institutional controls, and assist in placing sample locations during the Phase II RI.
- A soil gas survey will be performed to evaluate the potential presence of hot spots according to the U.S. EPA Presumptive Remedy requirement. Hot spot data will be used to identify areas that may require further characterization. If the data indicate the presence of a hot spot that could threaten the integrity of the containment system, treatment or removal may be necessary.
- Air monitoring and sampling will be performed to reassess the migration of landfill gas into the atmosphere by verifying and supplementing existing emission data. The resulting data will be used to assess the effectiveness of the existing cap, evaluate whether additional control measures are necessary, and support the streamlined risk assessment.
- Existing groundwater monitoring sampled. The resulting data will be used to assess potential impacts to groundwater and the necessity of adding wells.
- Soil sampling using angled borings will be performed to assess landfill impacts to vadose zone soils. Vadose zone monitoring equipment (i.e., soil vapor probe) will be installed in selected borings to assess the migration of landfill contaminants for vadose zone compliance monitoring.
- Sediment sampling and surface water hydrology of Agua Chinon Wash will be evaluated to support the design of a landfill cap.
- Soil gas and shallow soil data will be used to evaluate risk at nonlandfill units.

# Section 2
# BACKGROUND

This section discusses and generally describes the results of previous investigations at Site 2. The purpose of this section is to provide a brief compilation of the data that were used to develop the site-specific FSP for Phase II RI/ Feasibility Study (FS) activities. Previous investigations and reports do provide a more thorough discussion of site history and activities.

## 2.1 SITE DESCRIPTION

Site 3 comprises approximately 20 acres on the Marine Corps Air Station (MCAS) El Toro, located between Perimeter Road and North Marine Way along the Agua Chinon Wash (Map C3-1). Site 3 consists of at least 11 fill areas and 4 large stained areas. The site also includes two solid waste management units/areas of concern (SWMUs/AOCs) identified during the Resource Conservation and Recovery Act (RCRA) Facilities Assessment (RFA): the solvent spill and former incinerator. The site boundaries were designated to comprise all of these areas. The site is currently being used as the RI waste staging area. West of Agua Chinon Wash, the surface consists of compacted soil and gravel. East of Agua Chinon Wash, the surface is paved with concrete. Beneath the surface is fill material of unknown thickness covering the landfill. A site plan is included as Maps C3-2 and C3-3.

### 2.1.1 Site History

From 1943 to 1955, Site 3 was operated as a cut-and-fill landfill disposal facility in conjunction with burning to reduce waste volume. An estimated 163,500 to 243,000 cubic yards of waste material were landfilled at this site. Suspected wastes and contaminants include metals, incinerator ash, solvents, paint residues, hydraulic fluids, engine coolants, construction debris, oily wastes, municipal solid wastes, and various inert solid wastes.

### 2.1.2 Geology

Site 3 lies at an elevation of about 415 feet mean sea level on the northern edge of the Tustin Plain near the foothills of the Santa Ana Mountains. A review of Phase I RI boring logs indicates that subsurface soil consists of interbedded clay, silt, sand, and gravel (Jacobs Engineering 1993a).

### 2.1.3 Hydrogeology

Site 3 lies at an elevation of about 415 feet mean sea level on the northern edge of the Tustin Plain near the foothills of the Santa Ana Mountains. The Phase I RI boring logs indicate that subsurface soil consists of interbedded clay, silt, sand, and gravel (Jacobs Engineering 1993a).

Groundwater is found at a depth of approximately 240 feet below ground surface (bgs), and flows to the northwest along the regional gradient (Jacobs Engineering 1993a).

## 2.2 PHASE I REMEDIAL INVESTIGATION

The activities conducted as part of the Phase I RI included:

- collecting surface and near-surface soil samples from five locations (three from within the site, one from the upgradient well location, and one at the location of the deep boring);
- drilling and sampling one deep boring completed as a monitoring well;
- drilling, sampling, and installing one upgradient monitoring well;
- drilling, sampling, and installing two downgradient monitoring wells;
- collecting surface water samples from Agua Chinon Wash at three locations during two storm events; and
- collecting dry wash sediment samples from Agua Chinon Wash at three locations.

A summary of the Phase I RI analytical results, including recent groundwater monitoring data, is presented below (Jacobs Engineering 1993a, Tables A3-1a through A3-1f). The summary includes minimum and maximum detected concentrations for each chemical listed. The minimum concentration is recorded as less than the detection limit if the chemical constituent was not detected. Metal concentrations are listed only if they exceeded risk-based concentrations (RBCs) or ecological screening criteria (Jacobs Engineering 1993a, Tables A-3a through A-3d, A-7a through A7-c, A3-3b and A3-3c). Target analyte list (TAL) metals that were analyzed during the Phase I RI are beryllium, barium, arsenic, antimony, aluminum, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc. The locations of the Phase I RI and RFA investigations are shown on Maps C3-2 and C3-3.

### 2.2.1 Shallow Soil

- metals: arsenic (0.51B to 4.2 milligrams per kilogram [mg/kg] [03_DBS at 0 feet]), beryllium (< 0.1 to 0.49 mg/kg [03_LF3 at 0 feet]), and 18 other TAL metals;
- volatile organic compounds (VOCs): toluene (2J to 9J micrograms per kilogram [µg/kg] [03_LF1 at 0 feet]);
- petroleum hydrocarbons: total recoverable petroleum hydrocarbons (TRPH) (< 14 to 202 mg/kg [03_LF1 at 0 feet]), total fuel hydrocarbons (TFH)-gasoline (< 0.05 to 13.8 mg/kg [03_LF1 at 0 feet]), TFH-diesel (< 12.4 to 13.8 mg/kg [03_LF1 at 0 feet]);
- pesticides, polychlorinated biphenyls (PCBs), herbicides; 4,4'-dichlorodiphenyltrichloroethane (DDT) (< 3.33 to 209J µg/kg [03_DBS at 0 feet]), 4,4'- dichlorodiphenyldichloroethane (DDD) (< 3.31 to 293J µg/kg [03_DBS at 0 feet]), 4,4'-dichlorodiphenyldichloroethene (DDE) (< 3.33 to

47.7J µg/kg [03_DBS at 0 feet]), 2,4,5-trichlorophenoxyproprionic acid (TP) (Silvex) (< 24.9 to 49.6 µg/kg [03_UGS at 0 feet]).

## 2.2.2 Subsurface Soil

- metals: arsenic (0.87B to 10.6 mg/kg [03_DGMW65 at 225 feet]), beryllium (< 0.1 to 0.76B mg/kg [03_DGMW65 at 225 feet]), and 17 other metals;
- VOCs: toluene (3J to 13J µg/kg [03_DBMW39 at 15 feet]), acetone (< 11 to 78B µg/kg [03_DGBMW64 at 40 feet]), methylene chloride (< 11 to 50B µg/kg [03_UGMW26 at 85 feet]);
- petroleum hydrocarbons: TFH-gasoline (< 0.05 to 0.13 mg/kg [03_DBMW39 at 35 feet]); and
- pesticides, PCBs, herbicides: 2-methyl-4-chlorophenoxypropionic acid (< 26,2000 to 62,700 µg/kg [03_DBMW39 at 215 feet]), 2,4,5-TP (Silvex) (< 26.9 to 61.3J µg/kg [03_DGMW6 at 185 feet]), 2,4,5-T (< 27.2 to 41.8J µg/kg [03_DGMW65 at 225 feet]).

## 2.2.3 Groundwater

- metals: arsenic (2.6B to 10.7 micrograms per liter [µg/L] [03_DBMW39]), manganese (9.9B to 238 µg/L [03_DGBMW 65X]), selenium (6.8 to 17.4 µg/L [03_DGMW64]), and 11 other TAL metals;
- VOCs: chloromethane (< 2 to 3 µg/L [03_DBMW39]), chloroform (< 1.0 to 0.6J µg/L [03_DGBMW3965]), methylene chloride (< 1.0 to 0.5J µg/L [03_DGMW65X]), xylene (< 1.0 to 0.8J µg/L [03_DGMW65X]);
- semivolatile organic compounds (SVOCs): bis(2-ethylhexyl) phthalate (< 10 to 2J µg/L [03_DGMW65X]);
- pesticides, PCBs, herbicides: dieldrin (< 0.1 to 0.11 µg/L [03_DGMW64]), heptachlor (< 0.05 to 0.07 µg/L [03_DGMW64], 4,4'-DDT) (< 0.1 to 0.11 µg/L [03_DGMW64]), lindane (< 0.1 to 0.05 µg/L [03_DGMW64]), dalapon (< 1.7 to 2.2 µg/L [03_DGMW65X]);
- radionuclides: gross alpha (8.6 to 15.9 picocuries per liter [pCi/L] [03_DBMW39]), gross beta (8.8 to 13.1 pCi/L [03_DGMW64]); and
- inorganics: nitrate/nitrite (5.73 to 15.3 mg/L [03_UGMW26]), selenium (6.8 to 17.4 mg/L [03_DGMW64]).

## 2.2.4 Surface Water

- metals: aluminum (dissolved 73.6B to 635 µg/L [03_AC3]); total < 73.6 to 99,000 µg/L [03_AC1]), cadmium (dissolved < 3 to 76.4 µg/L [03_AC2]; total 2.7B to 84.5 µg/L [03_AC2]), copper (dissolved 10.9B to 15.1B µg/L [03_AC2]; total 11B to 143 µg/L [03_AC1]), selenium (dissolved < 2.1 to 1.3B µg/L [03_AC32]; total < 0.5 to 24.3 µg/L [03_AC3]), zinc (dissolved 26.8 to

39.4 µg/L [03_AC2]); total 37.5 to 460 µg/L [03_AC3]), and 12 other TAL metals; and

- VOCs: acetone (< 12 to 39B µg/L [03_ACX]), 2-butanone (< 210 to 10 2µg/L [03_AC2/3ALL]), carbon disulfide (< 10 to 1 µg/L [03_AC1,2,3X]), chlorodibromomethane (< 10 to 1.5J µg/L [03_ACX]), chloromethane (1J to 3 µg/L).

### 2.2.5 Sediment

- metals: 17 of 23 TAL metals;
- VOCs: acetone (3J to 210B µg/kg [AC1 at 2 feet 03_LF1 at 0 feet]), 2-hexanone (< 10 to 6J µg/kg [03_AC1 at 0 feet]), toluene (< 2J to 9J µg/kg [03_AC1 at 0 feet]);
- SVOCs: bis(2-ethylhexyl) phthalate (< 490J to 1,400J µg/kg [03_AC2 at 0 feet]);
- petroleum hydrocarbons: TRPH (< 14 too 223 mg/kg [03_AC2 at 0 feet]), TFH-gasoline (< 0.05 to 5.71 mg/kg [03_AC2 at 2 feet]), TFH-diesel (< 12.4 to 79.9 mg/kg [03_AC2 at 0 feet]); and
- pesticides, PCBs, herbicides: 4,4'-DDT (< 3.331 to 9.64 µg/kg [03_AC3 at 2 feet]), 4,4'-DDD (3.31 to 3.83 µg/kg [03_AC3 at 0 feet]), 4,4'-DDE (< 3.33 to 4.46 µg/kg [03_AC3 at 02 feet]).

## 2.3 RCRA FACILITIES ASSESSMENT

An RFA was conducted by the Navy to evaluate whether an additional 140 sites at MCAS El Toro should be included under the RI/FS program (Jacobs Engineering 1993b). Three SWMUs/AOCs were investigated, and two were recommended for further investigation. The SWMUs/AOCs are discussed below.

SWMU/AOC 194 (Former Incinerator) burned trash and municipal type waste generated at MCAS El Toro to reduce the volume of waste before disposal in the adjacent Original Landfill. Currently, no visible evidence of the Former Incinerator exists. The SWMU/AOC is shown in Map C3-2. This location is only approximate and is based on the existence of former foundations. The RFA activities at SWMU/AOC 194 consisted of collecting shallow soil samples (three locations).

SWMU/AOC 300 (Solvent Spill Area) is located within the compound of the Marine Calibration Complex 3 (MCC3), in which electronic equipment is cleaned and calibrated. This area consists of a large asphalt and concrete parking lot with several mobile vans. SWMU/AOC 300 is located approximately 30 feet south of SWMU/AOC 194 and approximately 70 feet northwest of the border of Site 3 (Map C3-2). The RFA activities at SWMU/AOC 300 consisted of drilling and sampling four 25-foot-deep borings.

SWMU/AOC 300 was investigated during the RFA because a strong petroleum odor was reported in October 1992 by workers digging trenches for a water supply line. In

response, Phase I Team field personnel visited the construction area to monitor for organic vapors. A portable photoionization detector (PID) measured elevated levels of organic vapors from soil stockpiles removed from the trench, and the trenching activities were subsequently halted. Review of records and historical aerial photographs (SAIC 1993) and interviews with personnel at MCAS El Toro (Jacobs Engineering 1994) indicate that the location was formerly part of the landfill, and it may have been part of a motorpool at a later date. It was also reported that an unspecified solvent spill had occurred as a result of MCC3 operations in this area. SWMU/AOC 300 will be included for the Phase II RI because it is covered by one of the landfill trenches.

The RFA identified abandoned Well 24-4247 as SWMU/AOC 10. It was not sampled because it is within the boundaries of RI/FS Site 3 (Map C3-1). This well was an oil well drilled in 1924 to a depth of 4,247 feet; it was abandoned in 1927, apparently with mud.

## 2.4 AIR SOLID WASTE ASSESSMENT TEST

The following activities were conducted as part of the Air Solid Waste Assessment Test (Air SWAT) (Strata 1991):

- landfill gas sampling,
- ambient air sampling,
- integrated surface sampling, and
- landfill gas migration testing.

A summary of the Air SWAT analytical results is presented below. The Air SWAT report did not quantify the analyte detection limits. If the analyte was not detected, the concentration was reported as "ND."

### 2.4.1 Landfill Gas

- VOCs: dichloromethane (200 to 240 parts per billion by volume [ $ppb_v$]) (field blank 260 $ppb_v$), chloroform (260 to 3,500 $ppb_v$), trichloroethylene (1,200 to 5,500 $ppb_v$), tetrachloroethene (PCE) (ND to 27 $ppb_v$); and
- other gases: carbon dioxide (0.31 to 5.6 percent by volume).

### 2.4.2 Ambient Air

- VOCs: dichloromethane (3 to 9.1 $ppb_v$), 1,1,1-trichloroethane (ND to 5.1 $ppb_v$), PCE (ND to 0.29 $ppb_v$).

### 2.4.3 Integrated Surface Sampling

- total organic compounds (TOCs) as methane (6.1 $ppm_v$).

### 2.4.4 Landfill Gas Migration Sample Points

- TOC as methane (1.7 to 2.5 $ppm_v$).

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## Section 3
# MAPS

The maps on the following pages present the location of the site on MCAS El Toro, site boundaries, site units, physical features of the site, previous sampling locations, and proposed Phase II sampling locations, where known. These maps are referenced in other sections of this FSP.

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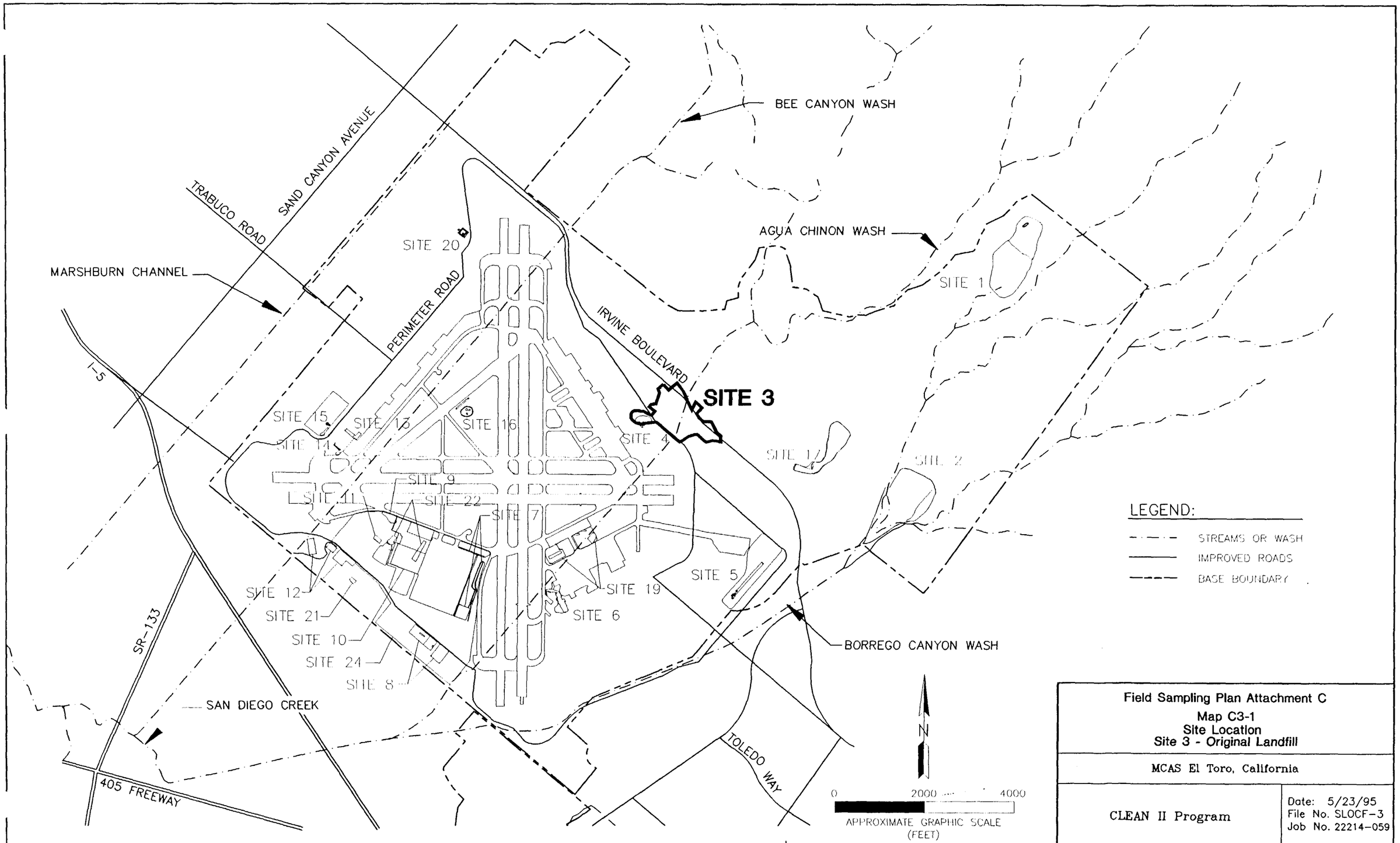


Field Sampling Plan Attachment C
Map C3-1
Site Location
Site 3 - Original Landfill

MCAS El Toro, California

CLEAN II Program

Date: 5/23/95
File No. SLOCF-3
Job No. 22214-059

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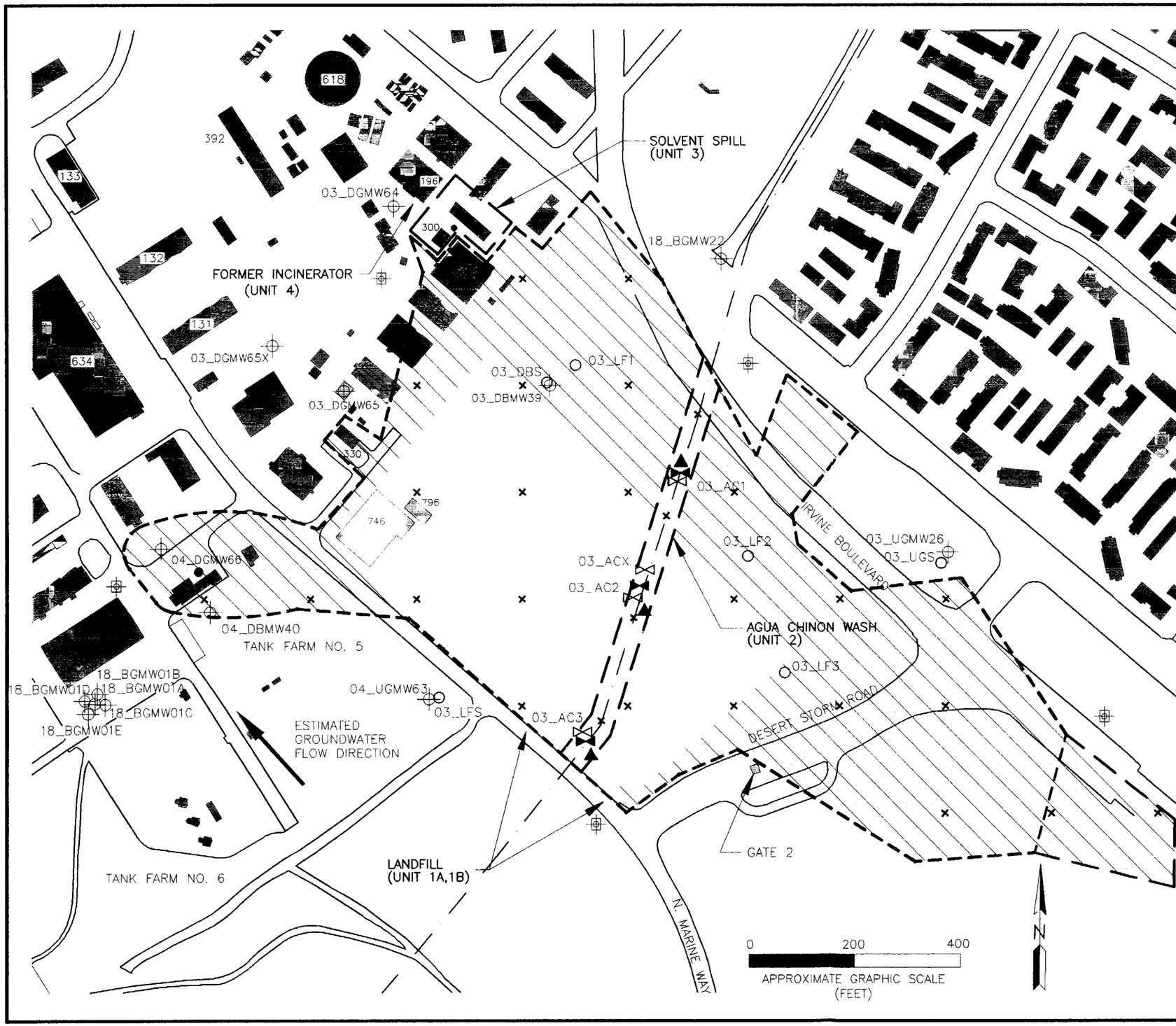


## LEGEND:

- BUILDING OR PAD
- STREAMS OR WASH
- IMPROVED ROADS
- PHASE I STRATUM BOUNDARY
- PHASE II UNIT MODIFICATIONS

## EXISTING:

- PHASE I MONITORING WELL (RESULTS ON TABLE B3-3 AND B3-6 IN PHASE I T.M.)
- PHASE I SURFACE AND NEAR SURFACE SOIL SAMPLE (RESULTS ON TABLE B3-2 IN PHASE I T.M.)
- PHASE I SURFACE WATER AND SEDIMENT SAMPLE (RESULTS ON TABLE B3-0 AND B3-2 IN PHASE I T.M.)

## PROPOSED:

- PHASE II SOIL GAS
- PHASE II SURFACE WATER
- PHASE II SEDIMENT SAMPLE
- PHASE II PERIMETER GAS MIGRATION SAMPLE
- SURFACE GEOPHYSICS AREA (LIMITED TO AREAS WHERE LANDFILL BOUNDARY IS UNCERTAIN AND WHERE THERE IS NO HAZARD TO WORKER SAFETY)

**Field Sampling Plan Attachment C**
**Map C3-2**
**Site Plan**
**Site 3 - Original Landfill**

**MCAS El Toro, California**

**CLEAN II Program**

Date: 7/13/95
File No. SITEF3B
Job No. 22214-059

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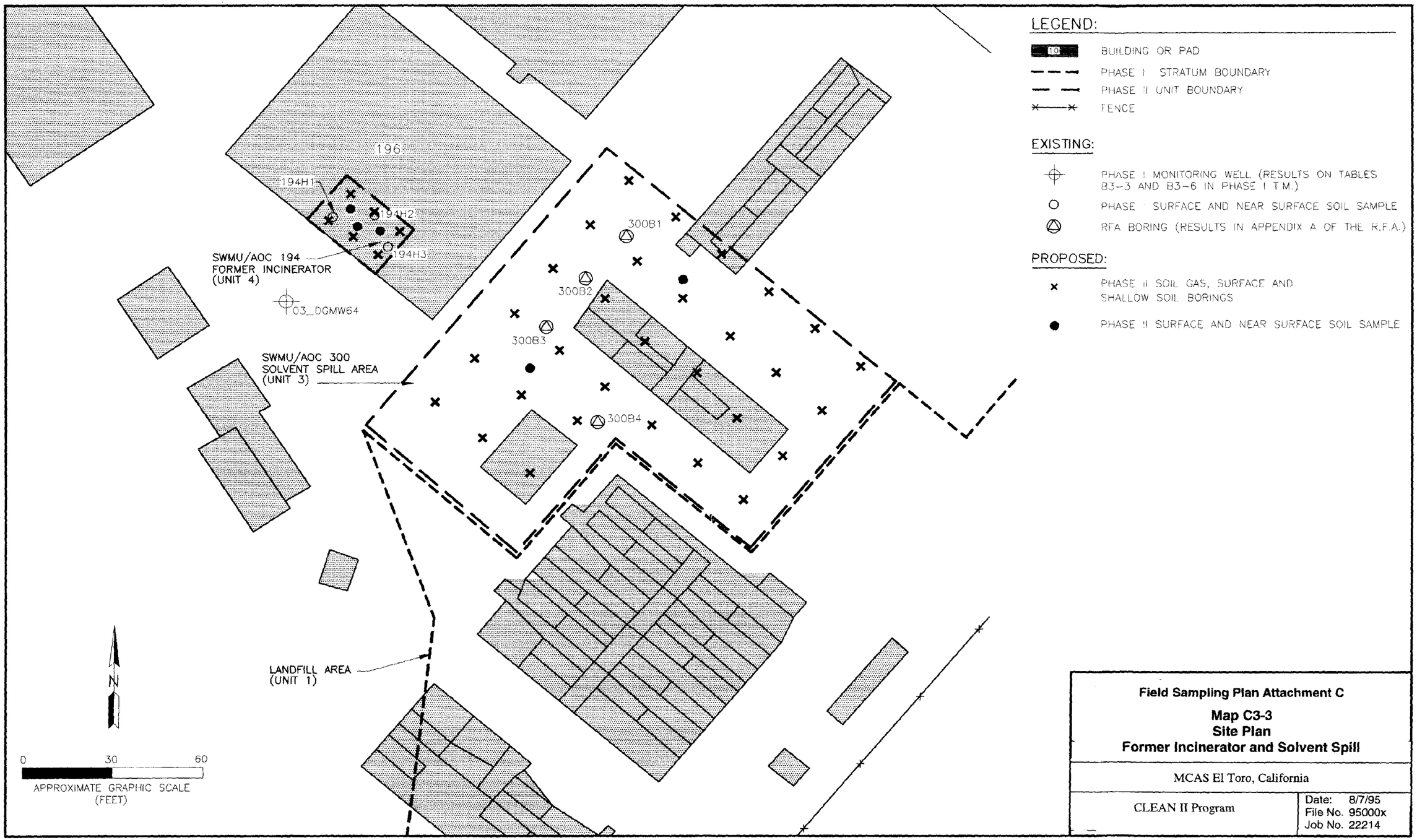


**Field Sampling Plan Attachment C**

**Map C3-3**
**Site Plan**
**Former Incinerator and Solvent Spill**

MCAS El Toro, California

CLEAN II Program

Date: 8/7/95
File No. 95000x
Job No. 22214

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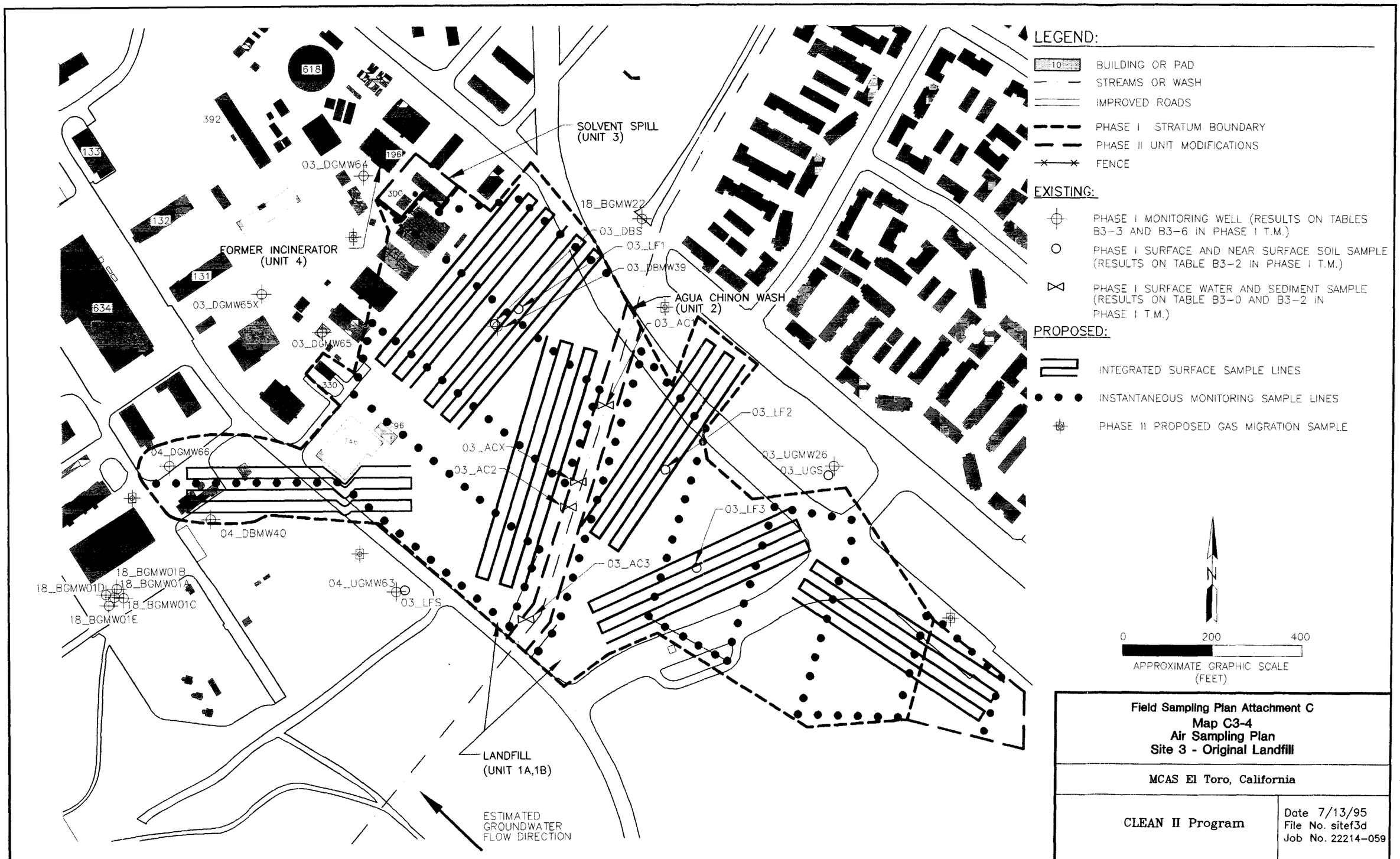


**Field Sampling Plan Attachment C**
**Map C3-4**
**Air Sampling Plan**
**Site 3 - Original Landfill**

MCAS El Toro, California

CLEAN II Program

Date 7/13/95
File No. sitef3d
Job No. 22214-059

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# Section 4
# RATIONALE FOR SAMPLING LOCATIONS

The rationale for sampling at Site 3 is based on site conditions, previous investigations, and the DQO as presented in Appendix C of the Phase II Work Plan (BNI 1995a). The data collection activities at Site 3 are designed to be sufficient to allow application of the U.S. EPA Presumptive Remedy for municipal landfill sites (U.S. EPA 1993).

## 4.1 SAMPLING PROGRAMS, SAMPLE TYPES, AND LOCATIONS

Sampling programs, sample types, and locations are presented on the basis of a site unit. Selection of specific sampling programs, sample types, and locations are based on:

- site history,
- types of media suspected or known to be impacted from previous investigations, and
- objectives of site-specific RI/FS efforts.

At Site 3, the following site units have been defined:

- Unit 1: area occupied by the landfill;
- Unit 2: Agua Chinon Wash;
- Unit 3: solvent spill; and
- Unit 4: former incinerator.

The sampling program will be implemented by following a tiered approach. At the conclusion of each tier, collected data will be evaluated. Based on the results of the evaluation, decisions will be made on whether or how to proceed with additional field activities outlined in subsequent tiers.

- Tier 1 sampling activities include assessing the need to collect additional samples to assess whether the site is a risk and includes nonintrusive investigations, limited intrusive sampling (e.g., soil gas surveys), and the sampling of existing systems (e.g., wells).
- Tier 2 activities include more extensive and intrusive investigations such as subsurface borings and sampling of soils, or the installation and sampling of wells.
- Tier 3 activities, if they occur, typically are remedial-design oriented such as soil vapor extraction or aquifer tests.

Because implementation of the Presumptive Remedy is the objective of RI/FS, the following sections discuss specifics of several sampling methods and their relevance to this objective.

### 4.1.1 Surface Geophysical Survey

An electromagnetic (EM) surface geophysical survey will be conducted to better define the limits of landfilled waste. The area to be included in the survey is based on the Phase I RI (Jacobs Engineering 1993a), employee interviews (Jacobs Engineering 1994), and aerial surveys (SAIC 1993). The boundaries of landfilled waste will be used to design a landfill cap and will define the area requiring institutional controls (including deed restrictions).

### 4.1.2 Soil Gas Survey

A soil gas survey will be performed to evaluate the potential presence of hot spots per the U.S. EPA Presumptive Remedy requirements (U.S. EPA 1993). The soil gas data will be used to identify potential hot spots. Hot spots may require further characterization, and treatment or removal if assessment of data shows that a hot spot threatens the integrity of the landfill containment system. Soil gas samples will be collected and analyzed in a manner consistent with California Regional Water Quality Control Board (RWQCB 1994).

### 4.1.3 Air Monitoring and Sampling

Air monitoring and sampling will be performed to reassess the migration of landfill gas into the atmosphere by verifying and supplementing existing emission data. The resulting data will be used to assess the effectiveness of the existing cap and evaluate whether additional control of landfill gas emission is necessary. Sample types and locations were selected using South Coast Air Quality Management District (SCAQMD) Rule 1150.1 guidelines (SCAQMD 1989).

### 4.1.4 Groundwater Monitoring and Sampling

Groundwater monitoring wells will be installed and sampled, and the resulting data will be used to assess potential impacts to groundwater as well as potential impacts to compliance monitoring required for landfill closure (CCR 1991).

### 4.1.5 Vadose Zone Monitoring and Sampling

Soil sampling using angled borings will be performed to assess landfill impacts to vadose zone soils. Vadose zone monitoring equipment (i.e., soil vapor probe) will be installed in selected borings to assess the migration of landfill contaminants for vadose zone compliance monitoring. The soil samples collected during drilling will be analyzed for the chemicals of potential concern (COPCs) identified in the DQO. For compliance monitoring, two vadose zone borings will be advanced under the landfill and equipped with vapor probes.

### 4.1.6 Soil Sampling

Soil sampling will be performed to assess if there is subsurface soil contamination and to support an evaluation of risk. Shallow soil samples will be collected at depths 0, 5, and 10 feet and will be analyzed for COPCs identified in the DQO.

## 4.2 TIER 1

Tier 1 sampling activities at Site 3 may include:

- land surveying,
- surface geophysical surveying,
- soil gas sampling,
- air monitoring and sampling,
- soil sampling,
- vadose zone sampling, and
- surface water sampling.

The application of these sampling activities are discussed for each unit of Site 3.

### 4.2.1 Unit 1: Landfill Area

The location of Unit 1 is shown on Map C3-2. Unit 1 field investigations and data collection will focus on ascertaining information to supplement Phase I RI data and to facilitate cost-effective closure criteria set forth by California RWQCB.

The proposed scope for Tier 1 for Unit 1 includes the following tasks:

- land surveying,
- surface geophysical surveying,
- soil gas sampling, and
- air sampling.

#### 4.2.1.1 LAND SURVEYING

At the beginning and at the completion of the field investigation, Site 3 will be surveyed to establish horizontal and vertical controls. The initial field survey will establish proposed locations for the soil gas and geophysical survey, soil borings, and groundwater monitoring wells. In addition, the data will be used to generate a topographic map of the site. Topographic data will be used in the landfill cap design.

At the completion of the Phase II activities, a final survey will be conducted to identify sampling stations that were changed. The final survey will also establish well casing elevations and will locate landfilled waste boundaries as delineated by the surface geophysical survey and trenching data.

#### 4.2.1.2 SURFACE GEOPHYSICAL SURVEYING

Previous surface geophysical surveys were conducted using ground-penetrating radar (GPR) during the Air SWAT investigation (Strata 1991) and both GPR and EM surveys during the Phase I investigation (Jacobs Engineering 1991). These geophysical surveys

were limited, leaving uncertainty regarding the boundaries of the landfill. The Phase I team reported having more success with EM investigations. Therefore, at the completion of the initial land survey, an EM survey will be conducted to better define landfilled waste boundaries.

The EM surface geophysical survey will be performed on a layout consisting of lines spaced at 50 feet. The area to be included in the surface geophysical survey are shown on Map C3-2.

#### 4.2.1.3 SOIL GAS SAMPLING

Soil gas samples will be collected from a 200-foot, on-center grid (Map C3-2). Samples will be collected from a depth of approximately 15 feet. Samples will be analyzed using an on-site mobile laboratory. Laboratory test results will be used to identify potential soil gas hot spots. Localized areas of containing potential hot spots will then be further characterized from a 25-foot, on-center grid.

To assess off-site migration of landfill gas, soil gas samples will be collected at a spacing of not less than 1,000 feet outside the fill areas and along the perimeter of the site from approximate depths of 10, 25, and 40 feet.

The soil gas and gas migration samples are shown on Map C3-2.

#### 4.2.1.4 AIR SAMPLING

The air sampling program consists of an instantaneous gas sampling survey, integrated surface gas sampling, flux chamber monitoring, ambient air sampling, and collection of local meteorological data. Meteorological data will be used to identify the optimum number and locations of the ambient air samples. Lateral migration of landfill gas will be evaluated by sampling at the perimeter of the landfill and outside the refuse boundaries as described in Section 4.2.1.3.

***Instantaneous Gas Sampling***

An instantaneous gas emissions survey will be performed over the landfill area. The instantaneous sampling survey consists of sampling grid lines where the concentration of the gas immediately above the surface of the landfill is monitored with a portable flame ionization detector (FID). Sample locations are shown on Map C3-3.

***Integrated Surface Samples***

Seven integrated surface samples will be collected to check that the average concentration of TOCs over a certain area (50,000 feet$^2$) does not exceed 50 parts per million by volume ($ppm_V$). Sample locations are shown on Map C3-3.

***Meteorological Data***

Before and during ambient air sampling, mechanical weather stations will be installed at the perimeter of the landfill to measure wind speed and direction. The initial data will be reviewed to identify the optimum number and locations of the ambient air samples.

***Ambient Air Sampling***

Upwind and downwind ambient air samples will be collected at the perimeter of Site 3. The samples will be collected over a 24-hour period beginning between 10 and 11 a.m.

***Flux Chamber Monitoring***

The location and number of flux chamber samples will be determined in a manner consistent with the U.S. EPA Isolation Flux Chamber User's Guide (U.S. EPA 1986) after a review of the surface emission and soil gas sampling results.

## 4.2.2 Unit 2: Agua Chinon Wash

The location of Unit 2 is shown on Map C3-2, Site Layout. The Unit 2 study area includes the portion of Agua Chinon Wash that bisects the Original Landfill. Sampling in this unit will focus on ascertaining information to supplement Phase I RI data and facilitate the selection of cost-effective remedial options. The Unit 2 sampling program consists of one tier.

The proposed scope for Tier 1 for Unit 2 includes the following tasks:

- land surveying,
- soil gas sampling,
- surface water sampling, and
- sediment sampling.

### 4.2.2.1 LAND SURVEYING

An initial survey will be performed to identify proposed sample locations. The survey will be used to document horizontal and vertical location of the samples, referenced to a United States Geological Survey (USGS) benchmark. If sample locations change, a final survey will be conducted to document the actual sample positions. Both surveys will include horizontal and vertical controls.

### 4.2.2.2 SOIL GAS SAMPLING

The soil gas sampling program described for Unit 1, Tier 1, will include Agua Chinon Wash. Soil gas samples will be collected from a 200-foot, on-center grid. Samples will be collected from a depth of approximately 15 feet. Laboratory test results will be used to identify potential soil gas hot spots. Localized areas of containing potential hot spots will then be further characterized from a 25-foot, on-center grid. Sample locations are shown on Map C3-2.

### 4.2.2.3 SURFACE WATER SAMPLING

Four surface water samples will be collected at the locations where Phase I RI samples were collected. Surface water samples will be collected when the stream flow is present.

If possible, sampling will be conducted after the first rainfall. Sample locations are shown on Map C3-2.

#### 4.2.2.4 SEDIMENT SAMPLING

Three sediment samples will be collected at the locations where Phase I RI samples were collected. Sample locations are shown on Map C3-2.

### 4.2.3 Unit 3: Solvent Spill Area (SWMU/AOC 300)

The location of Unit 3 is shown on Map C3-4, Site Layout. Unit 3 will focus on ascertaining information to supplement Phase I RI data and facilitate cost-effective remedial options. Unit 3 study area includes the solvent spill area (SWMU/AOC 300). The Unit 3, sampling program consists of two tiers. Sample locations for Unit 3 are shown on Map C3-2.

The proposed scope for Tier 1 for Unit 3 includes the following tasks:

- land surveying,
- soil gas sampling, and
- shallow soil sampling.

#### 4.2.3.1 LAND SURVEYING

Initial and final surveying will include proposed and actual sample location, respectively. Both surveys will include horizontal and vertical controls. Surveys will be referenced to USGS benchmark.

#### 4.2.3.2 SOIL GAS SAMPLING

Soil gas sampling will be conducted on a 20-foot, on-center grid across the site, to a depth of approximately 10 feet. Samples will be analyzed using an on-site mobile laboratory. Laboratory test results will be used to identify potential soil gas hot spots.

#### 4.2.3.3 SHALLOW SOIL SAMPLING

Two shallow soil samples will be collected and analyzed for COPCs to support the human health and ecological risk assessments. The shallow soil samples will be collected at a depths of 0, 5, and 10 feet.

### 4.2.4 Unit 4: Former Incinerator Site (SWMU/AOC 194)

The location of Unit 4 is shown on Map C3-4, Site Layout. Unit 4 field investigations and data collection will focus on ascertaining information to supplement Phase I RI data and to facilitate cost-effective remedial options. The Unit 4 (SWMU/AOC 194) sampling program consists of two tiers. Sample locations for Unit 4 are shown on Map C3-4.

The proposed scope for Tier 1 includes the following tasks:

- land surveying,

- soil gas sampling, and
- surface and shallow soil sampling.

#### 4.2.4.1 LAND SURVEYING

Initial and final surveying will include proposed and actual sample location, respectively. Both surveys will include horizontal and vertical controls. Surveys will be referenced to USGS benchmark.

#### 4.2.4.2 SOIL GAS SAMPLING

Soil gas sampling will be conducted on a 10-foot, on-center grid across the site to a depth of approximately 15 feet. Samples will be analyzed using an on-site mobile laboratory. Laboratory test results will be used to identify potential soil gas hot spots.

#### 4.2.4.3 SHALLOW SOIL SAMPLING

Three shallow soil samples will be collected and analyzed for COPCs to support the human health and ecological risk assessments. The surface and shallow soil samples will be collected at a depths of 0, 5, and 10 feet.

## 4.3 TIER 2

The Tier 2 sampling activities will be implemented on the results of the Tier 1 activities. The primary objective of Tier 2 activities will be to estimate the extent of contamination. These activities may include:

- trenching,
- soil sampling, and
- vadose zone sampling.

### 4.3.1 Unit 1: Landfill Area

The scope of Tier 2 investigations at Unit 1 depends on the findings of the Tier 1 investigation. At the completion of Tier 1, the data will be evaluated to focus the following Tier 2 tasks:

- trenching,
- subsurface soil sampling, and
- vadose zone sampling.

#### 4.3.1.1 TRENCHING

The lateral extent of disposal activities will be confirmed by trenching across locations along the landfills perimeter where geophysical anomalies exist. To avoid contaminating the native soil, the backhoe will excavate the waste material from the perimeter of disposal areas toward the center of the disposal area.

#### 4.3.1.2 SUBSURFACE SAMPLING

If potential hot spots are identified during Tier 1 sampling, hollow-stem auger borings may be collected. The number, location, and depth of these borings will depend on Tier 1 findings and field conditions. Information from these borings will help answer the following questions (U.S. EPA 1993):

1. Does evidence exists that indicates the presence and approximate location of localized waste?
2. Is the localized waste a "principal threat waste" such as a chlorinated solvent?
3. Is the localized waste in a discrete, accessible part of the landfill?
4. Is the localized waste significant enough of a threat, yet small enough in volume to be removed from the landfill in a cost-effective manner?

#### 4.3.1.3 VADOSE ZONE SAMPLING

A minimum of two slanted borings will be drilled and sampled adjacent to the main disposal area of Site 3. The borings will be cased and a permanent sampling probe will be installed in the borings to collect leachate and/or gas that has percolated beneath the refuse into the vadose zone.

The final number and locations of these borings will depend on the results of the Tier 1 investigations.

### 4.3.2 Unit 3: Solvent Spill (SWMU/AOC 300)

The scope of Tier 2 investigations depends on the findings of Tier 1 investigations. At the completion of Tier 1, the data will be evaluated to focus the Tier 2 task of soil sampling.

#### 4.3.2.1 SOIL SAMPLING

If surficial and shallow soil hot spots are identified during Tier 1 sampling, soil borings will be taken to identify the nature and extent of contamination. The number, location, and depth of these borings will depend on Tier 1 findings and field conditions. Soil samples will be obtained at 5-foot intervals, and borings will be extended to depths where at least two consecutive clean samples are encountered.

### 4.3.3 Unit 4: Former Incinerator Site (SWMU/AOC 194)

The scope of Tier 2 investigations depends on the findings of Tier 1 investigations. At the completion of Tier 1, the data will be evaluated to focus the Tier 2 task of subsurface soil sampling.

#### 4.3.3.1 SUBSURFACE SAMPLING

If surficial and shallow soil hot spots are identified during Tier 1 sampling, subsurface borings may be collected to identify the nature and extent of contamination. The number, location, and depth of these borings will depend on Tier 1 findings and field conditions.

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# Section 5
# REQUEST FOR ANALYSES

Request for analyses is based on the analytical test rationale discussed in Section 4 of the FSP, which reflect the COPCs listed in the DQOs (BNI 1995a, Appendix C). These were based on the results of Phase I RI activities.

The analytical methods discussed in this section comprise those presented in the Phase II Quality Assurance Project Plan (QAPP) for quality assurance procedures (BNI 1995b). The primary objective when requesting an analytical method is to provide data that are precise, accurate, representative, complete, and comparable. The data must meet the DQOs discussed in detail in the QAPP and must follow all the guidelines established under Naval Facilities Engineering Service Center (NFESC, formerly known as Naval Energy and Environmental Support Activity [NEESA]) Level D.

## 5.1 ANALYTICAL TESTING RATIONALE

The various analyses chosen are based on the COPCs and are thus site specific. During the Phase II RI, the NFESC Level D guidelines must be followed and the analyses will be performed by an approved laboratory for Comprehensive Long-Term Environmental Action Navy (CLEAN) II. The parameters have been determined based on regulatory limits, health/risk calculations, and NFESC Level D analytical method limitations.

## 5.2 FIELD SCREENING

Field-screening analytical methods provide cost-effective, rapid turnaround chemical analysis, and provide accurate data. Field-screening provides useful information during field investigations and remediation planning at contaminated sites. The data collected from the field-screening methods can minimize the number of nondetects submitted to a stationary laboratory for analysis, and can also be effectively used to estimate the nature and extent of contamination.

### 5.2.1 Metals - X-Ray Fluorescence

Landfills are typically sources of several types of metals. During the Phase I RI, several metals were identified in both soil and groundwater. For this reason metals will be screened on soil samples collected.

All of the soil samples collected will be field-screened with X-ray fluorescence. The X-ray fluorescence field-screening tests will be performed in the on-site mobile laboratory.

### 5.2.2 Pesticides and PCBs - Immunoassay

Electrical transformers and waste oil may have been disposed at the landfill, and they are a possible source of PCBs. Agricultural activities are common both on MCAS El Toro and in the vicinity of the landfill at Site 3; thus, it is reasonable to expect several pesticides in the landfill. Typically, pesticides and PCBs would be superficial because of their low solubility and limited tendency to migrate. However, because of the nature of a

landfill, both pesticides and PCBs may have been landfilled and could be deeper in the subsurface.

All soil samples collected will be field-screened using immunoassay methods. The immunoassay field screening tests will be performed in the on-site mobile laboratory.

### 5.2.3 Volatile Organics Compounds - PID And Portable Gas Chromatography or Gas Chromatography/Mass Spectroscopy

VOCs at Site 3 include common solvents, dry cleaning fluids, and degreasing agents. They were commonly used at MCAS El Toro and, thus, were likely disposed at the landfill. Additionally, VOCs were identified as COPCs in Site 3 soils and groundwater.

All soil samples collected will be field-screened with a PID. Select samples will be sent to the mobile laboratory when data gaps exist or if necessary to assess the extent of contamination. The on-site mobile laboratory will analyze the samples for VOCs using a portable gas chromatograph (GC) or gas chromatography/mass spectroscopy (GC/MS).

### 5.2.4 Semivolatile Organics - PID and Portable GC or GC/MS

Several fuel and oil products, as well as burned by-products, are included in the semivolatile organics analysis. Several semivolatile organics have been identified as COPCs in soil samples during Phase I investigations.

All soil samples collected will be field screened with a PID in the field. Selected samples will be sent to the mobile laboratory if data gaps exist or if it is necessary to assess the extent of contamination. The on-site mobile laboratory will test for SVOCs with a portable GC or GC/MS.

### 5.2.5 Nonhalogenated Volatiles - PID and Portable GC or GC/MS

Fuel hydrocarbons (including gasoline and diesel fuel) were used extensively at MCAS El Toro and were probably disposed at the landfill. The Phase I investigation identified fuel hydrocarbons and TRPH at several locations at Site 3.

All soil samples collected will be field-screened with a PID in the field. Selected samples will be sent to the mobile laboratory when data gaps exist or if it is necessary to assess the extent of contamination. The on-site mobile laboratory will test for nonhalogenated volatiles and fuel hydrocarbons with a portable GC or GC/MS.

### 5.2.6 Gross Alpha and Beta - Scintillometer

Dials painted with radioactive residue could have been disposed at the landfills. Gross alpha and gross beta particle activity was identified during Phase I field investigations as a COPC in groundwater.

All soil samples collected will be field-screened with the scintillometer.

### 5.2.7 TO-14 Volatile Organic Compounds - Soil Gas

Several VOCs have been identified at Site 3 in the soil gas, surface, and ambient air. This analysis will be performed on soil gas, surface, and ambient air samples.

All soil gas, surface, and ambient air samples collected will be analyzed in the on-site mobile laboratory using Method TO-14 for VOCs in Suma canisters.

## 5.3 FIXED-BASE ANALYTICAL LABORATORY TESTS

As described in the QAPP (BNI 1995b), a percentage of samples are required to be analyzed by a NFESC Level D laboratory for confirmation. The analytical tests methods for NFESC Level D confirmation analysis are described below.

### 5.3.1 Metals (Title 26 Metals) - U.S. EPA Methods 6010 and 200.7

Of the soil samples collected and field-screened for metals, 10 percent of the samples with detectable concentrations will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for metals analysis.

### 5.3.2 Pesticides and PCBs - U.S. EPA Methods 8080 and 608

Although the pesticides identified during Phase I investigations are included in U.S. EPA Method 8270 (which is also being performed), the detection limits in the U.S. EPA Method 8080 are lower. To better define RBC limits, U.S. EPA Method 8080 will be performed.

Of the soil samples collected and field-screened for pesticides and PCBs, 10 percent of the samples with detectable concentrations will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for pesticides and PCBs analysis.

### 5.3.3 Volatile Organic Compounds - U.S. EPA Methods 8240 and 624

Of the soil samples collected and analyzed in the mobile laboratory for VOCs, 10 percent of the samples with detectable concentrations will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for confirmatory analyses of VOCs.

### 5.3.4 General Minerals/Chemistry

Although the general minerals/chemistry analysis provides information necessary for remedial design, samples analyzed for the constituents and parameters included in this method may yield higher then acceptable results due to natural geologic processes. Several constituents and parameters included in this analysis were identified as COPCs during the Phase I investigations.

All collected groundwater samples will be sent to the NFESC Level D laboratory for general minerals/chemistry analysis.

### 5.3.5 Gross Alpha and Beta - U.S. EPA Method 703

Of the soil samples collected and field-screened for gross alpha/beta radioactivity, 10 percent of the samples with elevated radioactivity will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for gross alpha/beta radioactivity analyses.

### 5.3.6 Total Organic Carbon - U.S. EPA Method 9060

Analysis for total organic carbon is being performed to characterize potential soil retardation factors. Retardation factors are helpful in understating the contaminants fate and transport. For analysis, soil samples are retrieved from borings in the saturated zone. Only one sample (saturated soil) will be analyzed for total organic carbon in each well.

### 5.3.7 Semivolatile Organic Compounds - U.S. EPA Methods 8270 and 625

Of the soil samples collected and analyzed in the mobile laboratory for SVOCs, 10 percent of the samples with detectable concentrations will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for SVOC analyses.

### 5.3.8 Nonhalogenated Volatiles - U.S. EPA Method 8015M

Of the soil samples collected and analyzed in the mobile laboratory for nonhalogenated volatiles, 10 percent of the samples with hits will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for a nonhalogenated volatiles analyses.

### 5.3.9 Chlorinated Herbicides - U.S. EPA Methods 8150 and 615

Agricultural activities are common both on the Station and in the vicinity of the landfill; thus, it is reasonable to expect several herbicides in the landfill. Typically, herbicides would be superficial because of their low tendency to migrate. However, because of the nature of a landfill, herbicides may have been landfilled and may occur deeper in the subsurface.

As described previously, of the soil samples collected and field-screened for pesticides and PCBs, 10 percent of the samples with detectable concentrations will be sent to the NFESC Level D laboratory for confirmation. These same samples will also be analyzed for chlorinated herbicides. All groundwater samples collected will be sent to the NFESC Level D laboratory for chlorinated herbicide analyses.

### 5.3.10 Chlorinated Herbicides-Immunoassay

The Phase I RI identified various chlorinated herbicides in soil samples at Site 3.

## 5.4 SUMMARY OF TESTS

Tables C5-1 through C5-7 summarize the analytical tests planned for the Phase II RI.

## Table C5-1
## Soil Sampling and Analysis – On-Site Mobile Laboratory

| Tier | Unit/Name | No. of Locations | Samples/ Location[a] | Total Samples | ON-SITE MOBILE LABORATORY | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VOCs[b] | SVOCs[c] | TPH[d] | Pesticides/ PCBs[e] | Metals | Gross Alpha & Beta[f] |
| Tier 1 | Landfill Area | NFRAP[g] | | | | | | | | |
| | Agua Chinon Wash | NA[h] | | | | | | | | |
| | Solvent Spill | 2 | 3 | 6 | 6 | 6 | 6 | 6 | 6 | |
| | Former Incinerator | 3 | 3 | 9 | 9 | 9 | 9 | 9 | 9 | |
| Tier 2 | Landfill Area | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | Agua Chinon Wash | NA | | | | | | | | |
| | Solvent Spill | TBD[i] | | | | | | | | |
| | Former Incinerator | TBD | | | | | | | | |
| *Total* | | | | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

Notes:
[a] a minimum of one soil sample from each slant boring drilled in the vadose zone will be sent to the on-site mobile laboratory; additional samples will be collected if it is determined additional wells are necessary
[b] VOC – volatile organic compound
[c] SVOC – semivolatile organic compound
[d] TPH – total petroleum hydrocarbons
[e] PCB – polychlorinated biphenyl
[f] field instrument
[g] NFRAP – No Further Response Action Planned
[h] NA – not applicable
[i] TBD – to be determined

**Table C5-2**
**Soil Sampling and Analysis – Off-Site Laboratory**

| Tier | Unit/Name | No. of Locations | Samples/ Location[b] | Total Samples | OFF-SITE LABORATORY[a] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VOCs[c] | SVOCs[d] | TPH[e] | Pesticides/ PCBs[f] | Herbicides | Metals | Gross Alpha & Beta |
| Tier 1 | Landfill Area | NFRAP[g] | | | | | | | | | |
| | Agua Chinon Wash | NA[h] | | | | | | | | | |
| | Solvent Spill | 2 | 3 | 6 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Former Incinerator | 3 | 3 | 9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Tier 2 | Landfill Area | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Agua Chinon Wash | NA | | | | | | | | | |
| | Solvent Spill | TBD[i] | | | | | | | | | |
| | Former Incinerator | TBD | | | | | | | | | |
| *Totals* | | | | 17 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |

Notes:
[a] a minimum of 10 percent of the total samples sent to the on-site mobile laboratory (per unit) will be sent to an off-site laboratory for QA/QC
[b] a minimum of one soil sample from each slant boring drilled in the vadose zone will be collected for analytical testing
[c] VOC – volatile organic compound
[d] SVOC – semivolatile organic compound
[e] TPH – total petroleum hydrocarbons
[f] PCB – polychlorinated biphenyl
[g] NFRAP – No Further Response Action Planned
[h] NA – not applicable
[i] TBD – to be determined

## Table C5-3
## Soil Gas Sampling and Analysis

| Tier | Unit/Name | No. of Locations | Samples/ Location[a] | Total Samples | ON-SITE MOBILE LABORATORY[b] VOCs | OFF-SITE LABORATORY[c] TO-14 (Methane) |
|---|---|---|---|---|---|---|
| Tier 1 | Landfill Area | 29[d]+TBD[e] | 1 or 3 | 43 | 39 | 4 |
| | Agua Chinon Wash | 4 | 1 | 4 | 4 | 0 |
| | Solvent Spill | 30 | 1 | 3 | 30 | 3 |
| | Former Incinerator | 6 | 1 | 7 | 6 | 1 |
| Tier 2 | Landfill Area | 2 | 1 | 3 | 2 | 1 |
| | Agua Chinon Wash | | | | | |
| | Solvent Spill | | | | | |
| | Former Incinerator | | | | | |
| | Total | 71 | | 90 | 81 | 9 |

Notes:

[a] samples will be collected from 24 locations on the landfill at depths of 15 feet; samples will be collected from 5 locations outside the landfill boundary at depths of 10, 25, and 40 feet bgs; a minimum of one sample will be collected from each slant boring drilled in the vadose zone

[b] all soil gas samples collected will be sent to the on-site mobile laboratory for analysis

[c] a minimum of 10 percent of the samples sent to the on-site mobile laboratory will be sent to an off-site laboratory for QA/QC

[d] additional soil gas samples may be collected to better define hot spots within the landfill

[e] TBD – to be determined

## Table C5-4
## Groundwater Sampling and Analysis

| Tier | Unit/Name | No. of Locations | Samples/ Location | Total Samples | Off-site Laboratory | | | | | | | | On-site Mobile Laboratory |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VOCs[a] | SVOCs[b] | TPH[c] | Pesticides/ PCBs[d] | Herbicides | General Chemistry | Metals | Gross Alpha & Beta | VOCs |
| Tier 1 | Landfill Area | 4[e] | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| | Agua Chinon Wash | NA[f] | | | | | | | | | | | |
| | Solvent Spill | NA | | | | | | | | | | | |
| | Former Incinerator | NA | | | | | | | | | | | |
| Tier 2 | Landfill Area | TBD[g] | | | | | | | | | | | |
| | Agua Chinon Wash | NA | | | | | | | | | | | |
| | Solvent Spill | NA | | | | | | | | | | | |
| | Former Incinerator | NA | | | | | | | | | | | |
| | *Total* | 4 | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

Notes:
- [a] VOC – volatile organic compound
- [b] SVOC – semivolatile organic compound
- [c] TPH – total petroleum hydrocarbons
- [d] PCB – polychlorinated biphenyl
- [e] samples from existing wells
- [f] N/A – not applicable
- [g] TBD – to be determined

## Table C5-5
## Sediment Sampling and Analysis – On-Site Mobile Laboratory

| Tier | Unit/Name | No. of Locations | Samples/ Location | Total Samples | ON-SITE MOBILE LABORATORY | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VOCs[a] | SVOCs[b] | TPH[c] | Pesticides/ PCBs[d] | Metals | Gross Alpha & Beta |
| Tier 1 | Landfill Area | NA[e] | | | | | | | | |
| | Agua Chinon Wash | 4 | 1 | 4 | X | X | X | X | X | X |
| | Solvent Spill | NA | | | | | | | | |
| | Former Incinerator | NA | | | | | | | | |
| Tier 2 | Landfill Area | NA | | | | | | | | |
| | Agua Chinon Wash | TBD[f] | | | | | | | | |
| | Solvent Spill | NA | | | | | | | | |
| | Former Incinerator | NA | | | | | | | | |
| | *Total* | 3 | | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

Notes:
- [a] VOC – volatile organic compound
- [b] SVOC – semivolatile organic compound
- [c] TPH – total petroleum hydrocarbons
- [d] PCB – polychlorinated biphenyl
- [e] N/A – not applicable
- [f] TBD – to be determined

## Table C5-6
## Sediment Sampling and Analysis – Off-Site Mobile Laboratory

| Tier | Unit/Name | No. of Locations | Samples/ Location | Total Samples | ON-SITE MOBILE LABORATORY[a] VOCs[b] | SVOCs[c] | TPH[d] | Pesticides/ PCBs[e] | Herbicides | Metals | Gross Alpha & Beta |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tier 1 | Landfill Area | NA[f] | | | | | | | | | |
| | Agua Chinon Wash | 3 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Solvent Spill | NA | | | | | | | | | |
| | Former Incinerator | NA | | | | | | | | | |
| | *Subtotals* | | | 4 | 4 | 4 | 4 | 4 | | 4 | 4 |
| Tier 2 | Landfill Area | NA | | | | | | | | | |
| | Agua Chinon Wash | TBD[g] | | | | | | | | | |
| | Solvent Spill | NA | | | | | | | | | |
| | Former Incinerator | NA | | | | | | | | | |
| | *Total* | 3 | | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Notes:
[a] a minimum of 10 percent of the total samples sent to the on-site mobile laboratory will be sent to an off-site laboratory for QA/QC
[b] VOC – volatile organic compound
[c] SVOC – semivolatile organic compound
[d] TPH – total petroleum hydrocarbons
[e] PCB – polychlorinated biphenyl
[f] NA – not applicable
[g] TBD – to be determined

## Table C5-7
## Surface Water Sampling and Analysis

| Tier | Unit/Name | No. of Locations | Samples/ Location | Total Samples | Off-site Laboratory | | | | | | | | Onsite Mobile Laboratory |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VOCs[a] | SVOCs[b] | TPH[c] | Pesticides/ PCBs[d] | Herbicides | General Chemistry | Metals | Gross Alpha & Beta | VOCs |
| Tier 1 | Landfill Area | NA[e] | | | | | | | | | | | |
| | Agua Chinon Wash | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | Solvent Spill | NA | | | | | | | | | | | |
| | Former Incinerator | NA | | | | | | | | | | | |
| Tier 2 | Landfill Area | NA | | | | | | | | | | | |
| | Agua Chinon Wash | TBD[f] | | | | | | | | | | | |
| | Solvent Spill | NA | | | | | | | | | | | |
| | Former Incinerator | NA | | | | | | | | | | | |
| | *Total* | 3 | | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

Notes:
[a] VOC – volatile organic compound
[b] SVOC – semivolatile organic compound
[c] TPH – total petroleum hydrocarbons
[d] PCB – polychlorinated biphenyl
[e] NA – not applicable
[f] TBD – to be determined

# Section 6
# FIELD METHODS AND PROCEDURES

This section presents site-specific field methods that will be used to collect samples and other field data. The field methods discussed in this are based on CLEAN II Program Standard Operating Procedures.

## 6.1 LAND SURVEY

An initial land survey will establish proposed locations for the soil gas and geophysical survey, soil borings, and groundwater monitoring wells. Each control point to be surveyed will be marked on the ground and on the draft field maps. Each point will be identified by the station identification on the map and on a flag attached to the rebar marking the sampling location.

Each sampling point will be surveyed and located to the nearest 0.1 foot, using the California Plane Coordinate System with northings and eastings. The precision of the vertical measurements will be within 0.01 feet. A surface contour map will be generated with 2-foot contour intervals.

At the completion of the Phase II activities, a final survey will be conducted to identify sampling stations that were changed. The final vertical controls will be resurveyed to the accuracy of 0.01 feet. The final survey will also establish well casing elevations, and identify landfilled waste boundaries as delineated during by the surface geophysical survey and trenching data. Further land surveying details are discussed in Section 6 of the FSP.

## 6.2 SURFACE GEOPHYSICAL SURVEY

At the completion of the initial land survey, a surface geophysical survey will be conducted to define landfilled waste boundaries. Both EM induction profiling and time-domain EM surveys will be performed. Survey lines will be spaced at approximately 50-foot intervals that cross the suspected boundaries of fill areas. The area to be surveyed includes the suspected limits of waste disposal at the landfill. Operational procedures for surface geophysical surveys are described in Section 6 of the FSP.

## 6.3 TRENCHES

The rationale for limited trenching is to confirm the presence of past disposal activities at locations where surface geophysics indicate the presence of anomalies. The lateral extent of disposal activities will be confirmed by trenching across the perimeter of anomalous areas using a backhoe. To avoid contaminating the native soil, the backhoe will excavate the waste material from the perimeter of disposal areas toward the center of the disposal area.

Excavation will continue until the lateral extent of wastes are visibly determined, or the depth of approximately 10 feet bgs is reached, whichever comes first.

## 6.4 SOIL GAS

Soil gas samples will be collected using a cone penetrometer test rig. Soil gas samples will be collected according to "Requirements for Active Soil Gas Investigation," produced by the California RWQCB Los Angeles Region (RWQCB 1994). Guidelines that will not be followed are related to the recommended distance between sample points. A 200-foot initial grid pattern is planned for Site 3 with a secondary 25-foot grid to characterize hot spots. Soil gas sampling procedures are described in detail in FSP Section 6.

## 6.5 SOIL SAMPLES

Surface and near-surface soil samples will be collected with a hand trowel or hand auger. Part of the soil sample will be directly transferred to the sample jar and placed into the cooler. Samples being analyzed for VOCs will have a portion of the sample placed in a plastic bag for field determination of organic vapor in the headspace.

Soil samples will also be collected from angled soil borings and monitoring well borings. Each boring will be hand augered to a depth of 5 feet (or refusal) to reduce the potential for drilling through subsurface utilities. A CLEAN II Team geologist will be present for drilling, soil logging and sampling, field screening, and final abandonment or completion of a monitoring or vadose well. All borings will be logged according to the Unified Soils Classification System. Soil samples will be collected at minimum 10-foot intervals by driving a modified California soil sampler. Sample intervals may be reduced at the discretion of the field geologist. Soil sampling procedures are outlined in the following FSP sections:

- Section 6.9, geophysics;
- Section 6.2, utility clearance;
- Section 6.12, decontamination;
- Section 6.3, surface samples;
- Section 6.3, hollow-stem auger borings;
- Section 6.3, hand auger borings;
- Section 5.2, field screening; and
- Section 6.14, sample handling, packaging, and shipping.

## 6.6 AIR SAMPLING

Air sampling will be performed to satisfy SCAQMD Rule 1150.2 requirements for the control of gaseous emissions from inactive landfills. The surface emission sampling program will be implemented to evaluate the landfill gas surface emissions and the potential for off-site migration. The sampling program consists of an instantaneous gas sampling survey, integrated surface gas sampling, flux chamber monitoring, ambient air sampling, and collection of local meteorological data. Lateral migration of landfill gas

will be evaluated by sampling at the perimeter of the landfill and outside the refuse boundaries, as described in Section 4.2.1.4.

### 6.6.1 Instantaneous Gas Sampling

During the instantaneous sampling survey, the concentration of the gas immediately above the surface of the landfill is monitored with a portable FID. The FID is held no more than 3 inches above the landfill surface. Areas above which the instantaneous organic vapor analyzer reading exceeding 50 $ppm_v$ will be identified per SCAQMD Rule 1150.2.

### 6.6.2 Integrated Surface Samples

To collect integrated surface samples, Site 3 will be divided into several grids, each 50,000 $feet^2$ in size. One integrated surface sample will be collected at 2 to 3 inches above the surface from each 50,000 $feet^2$ grid area. Surface samples will be collected using a portable self-contained sampling unit equipped with a collection probe and a pump. Continuous samples are collected in 10-liter Tedlar™ bags at a pump flow rate of 333 cubic centimeters per minute taken while walking through 2,600 linear feet in 25 minutes. The integrated surface sample contained in the Tedlar bag will be monitored with a portable FID. If the FID reading exceeds 500 $ppm_v$, the sample will be submitted to the laboratory for analysis. Surface monitoring and sampling will be performed when landfill is dry (a minimum of 72 hours after rainfall). Surface sampling will be terminated when the average wind speed exceeds 5 miles per hour (determined on a 10-minute average) or the instantaneous wind speed exceeds 10 miles per hour.

### 6.6.3 Flux Chamber Monitoring

Although not required by SCAQMD Rule 1150.2, landfill gas emissions will be collected from an isolated soil surface area using an emission isolation flux chamber, for risk assessment purposes. Gaseous emissions are sampled by placing the flux chamber over the area to be sampled and working it into the surface to a depth of approximately 1 inch. Sweep air is injected at a flow rate of 5 liters per minute. After 24 minutes, samples are collected. To prevent cross-contamination prior to and between sampling activities, the chamber will be purged with ultra-high-purity air (less than 0.1 $ppm_v$ total hydrocarbons) and followed with running a method blank until exit concentrations are less than 10 $ppm_v$ or less than 10 percent of expected concentrations, whichever is smaller. Gas emission samples will not be collected using the flux chamber during or after a rain. Gas emission samples will be collected after a minimum of 72 hours after rainfall. Details of monitoring and sampling procedures are provided in the FSP Section 6. The location and number of flux chamber samples will be determined after the review of the surface emission and soil gas sampling results.

### 6.6.4 Ambient Air Sampling

Ambient air sampling will be performed at the perimeter of Site 3 to assess potential concentrations of landfill gas migrating off-site. Several continuous recorders will be installed and operated at the perimeter of the landfill to measure wind speed and direction throughout the sampling period. These data will be reviewed to identify the optimum number and locations of the ambient air samples. The mechanical weather stations will be installed approximately 12 feet above the ground and more than 60 feet away from obstacles such as trees and buildings. Three ambient air samplers will be installed at the perimeter of Site 3 at downwind and upwind locations. Samples will be collected in a 10-liter Tedlar™ bag over a 24-hour period, beginning between 10 and 11 a.m.

## 6.7 GROUNDWATER SAMPLES

Before collecting groundwater samples, depth to water level will be measured in the existing wells. Before sampling, each monitoring well will be purged. After the level of groundwater has recovered to at least 90 percent of the prepurged level, groundwater samples will be collected. The water samples will be analyzed for VOCs in the on-site mobile laboratory.

If any new wells are drilled and installed at Site 3, sampling will follow well-development procedures. No new wells are currently planned. All new wells will be developed before groundwater sampling. Groundwater sampling procedures are outlined in the following FSP sections:

- Section 6.9, geophysics;
- Section 6.2, utility clearance;
- Section 6.12, decontamination;
- Section 6.4, field measurement of water quality parameters;
- Section 6.4, groundwater sampling to determine water quality;
- Section 6.4, field filtration of groundwater samples; and
- Section 6.14, sample handling, packaging, and shipping.

### 6.7.1 Monitoring Well Construction

To maintain a consistent groundwater quality data collection effort, Phase II monitoring wells will be constructed similar to those installed during the Phase I RI. The wells will be constructed with flush-threaded, 4-inch-diameter, Schedule 40, polyvinyl chloride (PVC) blank casing, screened over the lower 40 feet. Flush-threaded, 4-inch-diameter, stainless steel, wire-wrapped screen will be used. The screen slot size (0.010 inch or 0.020 inch) will be determined at the time of drilling. Sand filter pack will be selected such that at least 90 percent of the filter pack is retained by the well screen. Centralizers will be used at the top, bottom, and center of the well screen.

Wells more than 200 feet deep will be constructed using 5-inch-diameter, flush-threaded, Schedule 80 PVC blank casing and screened over the lower 40 feet. Flush-threaded, 5-inch-diameter, stainless steel, wire-wrapped well screen will be used. Sand filter pack will be selected such that at least 90 percent of the filter pack is retained by the well screen. Centralizers will be used at the top, bottom, and center of the well screen. The wells will be constructed by suspending the casing in the boring. Well construction procedures are described in the following sections of the FSP:

- Section 6.4, monitoring well construction; and
- Section 6.4, surface completion of monitoring wells.

### 6.7.2 Well Development and Groundwater Sampling

The well materials will be allowed to set at least 48 hours before development. Each monitoring well will be developed using a surge-and-pump method until the discharged water is relatively free of fine suspended sediment. After each well volume is removed, samples of the discharged water will be collected and analyzed in the field for conductivity, temperature, pH, and turbidity. Well development will be complete when conductivity, temperature, and pH measurements vary less than 10 percent, and the discharged water is relatively free of fine suspended sediment. The field measurements will be recorded on the well-development log.

Groundwater samples will be collected after waiting a minimum of 7 days after development. Groundwater sampling and development procedures are described in FSP Section 6.

## 6.8 SURFACE WATER SAMPLING

Surface water sample will be collected before measurement of the flow velocity is taken. To measure the surface water flow velocity, a float will be dropped in the stream at a location above the sampling point. The distance that the float will travel will be measured to determine velocity and volume of water. The measured distance will be relatively straight and have approximately the same cross-sectional area along its entire length. The float will be dropped at the upstream end of the distance. The time in seconds required for the float to arrive to the end of the measured distance will be recorded. This procedure will be repeated three times, and velocity will be calculated. The width of the cross section will be estimated, and the depth of water at three or more points along the cross section will be measured. Using the measured data, the volume of flow will be determined.

Procedures for surface water sampling are described in FSP Section 6.

## 6.9 LEACHATE SAMPLING

A minimum of two slanted borings will be drilled and sampled adjacent to the main disposal area of the Site 3. Borings will be drilled at an angle of 35 degrees from vertical

to obtain lateral penetration of approximately 50 feet bgs. Soil samples will be collected at 5-foot intervals and will be monitored for VOCs.

After the boring is cased, a probe assembly will be installed 1 foot into the vadose zone at the bottom of the casing. After applying a vacuum to the sample container with a hand pump, the needle assembly will be lowered into the drive rod, connected to the filter tip, and a leachate sample will be collected.

Different size sample container vials are available to collect 35-, 70-, and 500-milliliter samples. The pressure inside the sample vials can be monitored by an electronic pressure transducer.

An unsaturated soil moisture sampling system (lysimeter) will be used to collect a soil moisture sample from angled soil borings to assess the potential infiltration of landfill leachate in the vadose zone. The angled soil borings will be drilled such that at termination, the borings will be located beneath the refuse. A lysimeter probe assembly will be lowered through the hollow-stem augers and inserted approximately 1 to 2 feet into the soil. A vacuum will be applied to the lysimeter using a hand pump or equivalent vacuum device. A soil moisture sample will be collected.

## Section 7
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Contract No. N68711-92-D-4670

**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**

**CLEAN II**

# FIELD SAMPLING PLAN
# ATTACHMENT D
# SITE 4 – FERROCENE SPILL AREA
# MCAS EL TORO, CALIFORNIA

**CTO-0059**

Prepared by:

BECHTEL NATIONAL, INC.
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August 1995

## Attachment D
# SITE 4 – FERROCENE SPILL AREA

Site 4 is presently a Removal Action site. Site 4 was designated for the Removal Action in June of 1994; therefore, no sampling will be conducted at this site as part of the Phase II Remedial Investigation/Feasibility Study, and no sampling plan for this site is provided in this attachment. Background information on this site is presented in Appendix D of the Work Plan for the Phase II Remedial Investigation/Feasibility Study.

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San Diego, California 92132-5187

Contract No. N68711-92-D-4670

**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**

**CLEAN II**

# FIELD SAMPLING PLAN
# ATTACHMENT E
# OPERABLE UNIT 2 –
# SITE 5 – PERIMETER ROAD LANDFILL
# MCAS EL TORO, CALIFORNIA

**CTO-0059**

Prepared by:

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August 1995

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# ACRONYMS/ABBREVIATIONS

| | |
|---|---|
| Air SWAT | Air Solid Waste Assessment Test |
| bgs | below ground surface |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| COPC | chemical of potential concern |
| DQO | data quality objective |
| EM | electromagnetic |
| FID | flame ionization detector |
| FS | Feasibility Study |
| FSP | Field Sampling Plan |
| GC | gas chromatograph |
| GC/MS | gas chromatography/mass spectroscopy |
| GPR | ground-penetrating radar |
| MCAS | Marine Corps Air Station |
| µg/kg | micrograms per kilogram |
| µg/L | micrograms per liter |
| mg/kg | milligrams per kilogram |
| mph | miles per hour |
| NEESA | Naval Energy and Environmental Support Activity |
| NFESC | Naval Facilities Engineering Service Center |
| ND | not detected |
| $\%_v$ | percent volume |
| PCB | polychlorinated biphenyl |
| PCE | tetrachloroethene |
| PID | photoionization detector |
| $ppb_v$ | parts per billion by volume |
| $ppm_v$ | parts per million by volume |
| PRG | (U.S. EPA Region IX) Preliminary Remediation Goal |
| PVC | polyvinyl chloride |
| QAPP | Quality Assurance Project Plan |

## ACRONYMS/ABBREVIATIONS (continued)

| | |
|---|---|
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| RWQCB | (California) Regional Water Quality Control Board |
| SAIC | Science Applications International Corporation |
| SCAQMD | South Coast Air Quality Management District |
| SVOC | semivolatile organic compound |
| TFH | total fuel hydrocarbons |
| TOC | total organic compound |
| TRPH | total recoverable petroleum hydrocarbons |
| U.S. EPA | United States Environmental Protection Agency |
| VOC | volatile organic compound |

# ACRONYMS/ABBREVIATIONS (continued)

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# Section 1
# OBJECTIVES

This Field Sampling Plan (FSP) for the Site 5, Perimeter Road Landfill, outlines the field procedures and methodology applicable to this site. The FSP follows the United States Environmental Protection Agency (U.S. EPA) Region IX guidelines for preparing sample plans (U.S. EPA 1992). This FSP is written to aid field personnel unfamiliar with the site in gathering the required samples and field data. The purpose of this plan is to help assure that data collection activities will satisfy the field investigation design developed in the data quality objectives (DQOs).

The DQO for this site were developed using the U.S. EPA seven-step DQO process. The field investigation is designed to determine if the site poses a human health or environmental risk and to provide data for selecting any necessary remedial alternative(s).

## 1.1 SAMPLING OBJECTIVES

The overall objective of this FSP is to direct collection of data sufficient to allow the presumptive remedy of capping as established by the U.S. EPA for municipal landfills at Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites (U.S. EPA 1993). Site 5 can be classified as a municipal landfill because the wastes present are a large-volume, heterogeneous mixture of municipal waste (e.g., nontoxic household, construction, and landscaping debris) as well as industrial and hazardous wastes (including fuel hydrocarbons, solvents, pesticides, and metals). The Presumptive Remedy allows for unit closure after resolving hot spot issues and taking engineered or institutional steps to limit the release of contaminants to the environment.

Under the Presumptive Remedy approach, engineered designs are prepared to limit the release of contaminants to the atmosphere, surface water, and groundwater. The primary containment measures are:

- capping the landfill to limit direct contact with disposed waste, infiltration, and resulting contaminant leaching to groundwater, and to control surface water runoff and erosion;
- any necessary groundwater treatment to reduce the impact of released contaminants; and
- any necessary gas control and treatment to reduce uncontrolled atmospheric releases and the mass of subsurface volatile contaminants.

Also under the Presumptive Remedy, institutional controls are implemented to limit the exposure to landfilled waste. The most common institutional control is a deed restriction. Related Phase II data collection activities should thus include the delineation of landfill boundaries to allow the preparation of legal descriptions for the deed restrictions.

Additional input information supporting Presumptive Remedy decisions include the following:

- location, nature, and extent of potential hot spots;
- existence, areal extent, depth, nature, and condition of landfill cap; and
- delineation of landfilled wastes using historic, nonintrusive (e.g., electromagnetic [EM]), or intrusive (e.g., trenching) techniques.

## 1.2 DATA USAGE

To satisfy the objectives of this FSP, field data will be used for the purposes detailed below.

- Surface geophysical and topographic surveys will be conducted to define the limits of landfilled waste and to record site elevations. The boundaries of landfilled waste and the resulting topographic map will support the landfill cap design, will define the area requiring institutional controls, and will assist in placing sample locations during the Phase II Remedial Investigation (RI).
- A soil gas survey will be performed to evaluate the potential presence of hot spots per U.S. EPA Presumptive Remedy requirement. Hot spot data will be used to identify areas that may require further characterization. If the data indicate the presence of a hot spot that could threaten the integrity of the containment system, treatment or removal may be necessary.
- Air monitoring and sampling will be performed to reassess the migration of landfill gas into the atmosphere by verifying and supplementing existing emission data. The resulting data will be used to assess the effectiveness of the existing cap, evaluate whether additional control measures are necessary, and support the streamlined risk assessment.
- Groundwater monitoring wells will be installed and sampled. The resulting data will be used to assess potential impacts to groundwater and to conduct subsequent compliance monitoring.
- Disposal options will be evaluated for Phase I RI investigation-derived waste based on the previous results of laboratory analyses of the stockpiled soil.

# Section 2
# BACKGROUND

This section presents a discussion on the general description and results of previous investigations at the Site 5. The purpose of this section is to provide a brief compilation of the data that was used to develop the site-specific FSP for Phase II RI/ Feasibility Study (FS) activities. Previous investigations and reports do provide a more thorough discussion of site history and activities.

## 2.1 SITE DESCRIPTION

Site 5, the Perimeter Road Landfill, is located in the southeast quadrant of Marine Corps Air Station (MCAS) El Toro, adjacent to the eastern property boundary and approximately 800 feet north-northwest of Borrego Canyon Wash. Suspected wastes and contaminants included burnable trash, municipal solid waste, cleaning fluids, scrap metals, paint residues, and unspecified fuels, oils, and solvents. Almost any type of waste generated at MCAS El Toro may have been disposed in this landfill (Map E3-1).

### 2.1.1 Site History

Site 5 was used from about 1955 to the late 1960s as a cut-and-fill operation, with landfilled waste volumes estimated at 50,000 to 60,000 cubic yards. Typically, wastes were burned prior to landfilling to reduce volume. The site encompasses a disposal area of approximately 65,000 feet$^2$ (1.5 acres). The Waste Storage Facility for the Phase I RI is located within and adjacent to the site boundaries.

### 2.1.2 Geology

The geology of Site 4 consists of Quaternary alluvial and marine deposits (Jacobs Engineering 1993). Holocene deposits consist of fine-grained overbank deposits and coarse grained stream channel deposits. The soils are derived from the Santa Ana Mountains to the east and conformably overlie Pleistocene interbedded fine-grained lagoonal and near-shore marine deposits. Pleistocene deposits could not be differentiated from Holocene deposits in Phase I RI soil borings. Pleistocene deposits unconformably overlie semiconsolidated marine sandstones, siltstones, and conglomerates of late Miocene to late Pliocene. The Miocene to Pliocene formations are considered to be bedrock in the area. Based on a review of the Phase I RI boring logs, the subsurface lithology consists of well graded to silty sand, interbedded with silt and clay. Within the sand units are occasional gravel lenses which may be associated with stream channels.

### 2.1.3 Hydrogeology

Site 5 lies along Perimeter Road on the edge of a grassy field at an elevation of about 430 feet mean sea level. The landfill is covered with a layer of imported fill of unknown thickness, and it is relatively flat. The surface of the site is overgrown with weeds. Based on a review of Phase I RI boring logs, subsurface soil consists of discontinuous lenses of clay, silt, sandy silt, and sand (Jacobs Engineering 1993). Materials encountered in the northern part of the landfill were mostly sand with some thin clay

layers. At the southern end of the site, semiconsolidated to consolidated material was encountered at a depth of about 200 feet below ground surface (bgs). Subsurface soil becomes increasingly clayey toward the southern end of the site.

Groundwater lies at a depth of about 190 feet bgs and follows a regional gradient to the west northwest (Jacobs Engineering 1993). The potential for surface water runoff appears to be slight.

## 2.2 PHASE I REMEDIAL INVESTIGATION RESULTS

The activities conducted as part of the Phase I RI included:

- performing a geophysical survey to locate the landfill boundary;
- collecting shallow soil samples at five locations (upgradient, and from an adjacent boring);
- drilling and sampling one deep boring completed as a monitoring well (05_DBMW41);
- drilling, installing, and sampling one upgradient monitoring well; and
- drilling, installing, and sampling two downgradient monitoring wells.

A summary of the Phase I RI analytical results (by chemical class and media) is presented below (Jacobs Engineering 1993, Tables A5-1a through A5-1c). The summary includes minimum and maximum detected concentrations for each chemical listed. The minimum concentration is recorded as less than the detection limit if the chemical constituent was not detected (ND). Metal concentrations are listed only if they exceeded U.S. EPA Region IX Preliminary Remediation Goals (PRGs) or ecological screening criteria (Jacobs Engineering 1993, Tables A-3a, A-3b, and A5-3a, and A5-3b). Target analyte list metals that were analyzed during the Phase I RI are beryllium, barium, arsenic, antimony, aluminum, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc. The locations of Phase I RI investigations are shown on Map E3-2.

### 2.2.1 Shallow Soil

- metals: arsenic (1.5b to 4.4 milligrams per kilogram [mg/kg] [17_LF2 at 0 feet]), chromium (6 to 297 mg/kg [17_LF3 at 0 feet]), lead (1.4 to 361 mg/kg [17_SA1 at 0 feet]), zinc (16.3 to 260 mg/kg [17_SA1 at 0 feet]), and 20 other TAL metals;
- volatile organic compounds (VOCs): toluene (3J to 180 micrograms per kilogram [µg/kg] [17_SA2 at 4 feet]), acetone (< 10 to 86D µg/kg [ 17_SA2 at 4 feet]), methylene chloride (< 10 to 47D µg/kg [17_SA2 at 4 feet]);
- semivolatile organic compounds (SVOCs): benzo(a)anthracene (< 660 to 200J µg/kg [17_LF3 at 0 feet]); benzo(a)pyrene (< 660 to 390J µg/kg [17_LF3 at 0 feet]); benzo(g,h,i)perylene (< 660 to 160J µg/kg [17_LF3 at 0 feet]); chrysene (< 660 to 220J µg/kg [17_LF3; 0]); 2,4-dimethylphenol (< 660 to

6,000J µg/kg [17_SA1 at 0 feet]); fluoranthene (< 660 to 360J µg/kg [17_LF3 at 0 feet]); indeno(1,2,3-cd)pyrene (< 660 to 240J µg/kg [17_LF3 at 0 feet]); pyrene (< 660 to 320J µg/kg [17_LF3 at 0 feet]), 4-methylphenol (390J to 34,000 µg/kg [17_SA1 at 0 feet]);

- petroleum hydrocarbons: total recoverable petroleum hydrocarbons (TRPH) (< 9 to 2,733 mg/kg [17_SA2 at 4 feet]), total fuel hydrocarbons (TFH)-gasoline (0.05 to 0.526 mg/kg [17_SA2 at 4 feet]), TFH-diesel (<12.5 to 1,010 mg/kg [17_SA1 at 0 feet]); and
- pesticides, polychlorinated biphenyls (PCBs), herbicides: alpha-chlordane (< 1.7 to 8.81J µg/kg [17_SA1 at 0 feet]), 4,4'-dichlorodiphenyldichloroethane (< 3.29 to 38.1J µg/kg [17_SA1 at 0 feet]), 4,4'-dichlorodiphenyldichloroethene (0.64J to 11.6J µg/kg [17_SA1 at 0 feet]), 4,4'-dichlorodiphenyltrichloroethane (< 3.29 to 135J µg/kg [17_LF3 at 0 feet]), delta-BHC (< 1.7 to 8.81J µg/kg [17_SA1 at 0 feet]), dieldrin (0.86J to 3.77J µg/kg [17_SA1 at 0 feet]), endosulfan sulfate (2.86J to 27.6 µg/kg [17_SA1 at 0 feet]), endrin ketone (< 3.29 to 8.66J µg/kg (17_SA1 at 0 feet)), heptachlor epoxide (< 1.7 to 2.91J µg/kg [17_SA1 at 2 feet]), gamma-chlordane (< 1.7 to 7.98J µg/kg [17_SA1 at 0 feet]), methoxychlor (< 1.7 to 7.56J µg/kg [17_SA2 at 4 feet]), and 2,4-DB (< 49.5 to 402J µg/kg [17_SA2 at 4 feet]).

## 2.2.2 Subsurface Soil

- metals: 21 of 23 TAL metals;
- VOCs: acetone (< 10 to 38 µg/kg [17_DGMW82 at 25 feet]), toluene (< 10 to 4J µg/kg [17_DBO53 at 10 feet]), 2-butanone (< 10 to 16 µg/kg [17_DGMW82 at 25 feet]);
- petroleum hydrocarbons: TRPH (< 20 to 1,886 mg/kg [17_DBO53 at 10 feet]), TFH-gasoline (< 0.05 to 0.584 mg/kg [17_DBO53 at 10 feet]), TFH-diesel (< 13.6 to 106 mg/kg [17_DBO53 at 10 feet]); and
- pesticides, PCBs, herbicides: endrin ketone (< 3.4 to 2.9 µg/kg [17_DBO53 at 10 feet]), endosulfan sulfate (< 3.4 to 7.29 µg/kg [17_DBO53 at 10 feet]), dalapon (< 54.7 to 172 µg/kg [17_DBO53 at 10 feet]), dinoseb (< 25.6 to 38.8 µg/kg [17_DBO53 at 60 feet]), 2-methyl-4-chlorophenoxyproprionic acetic (< 25,600 to 70,300 µg/kg [17_DBO53 at 5 feet]), 2-methyl-4-chlorophenoxyproprionic acid (< 25,600 to 58,300 µg/kg [17_DBO53 at 40 feet]), 2,4-DB (< 51.2 to 200 µg/kg [17_DBO53 at 60 feet]), dichloroprop (< 102 to 171 µg/kg [17_DBO53 at 40 feet]).

## 2.2.3 Groundwater

- metals: arsenic (< 0.7 to 5.6B micrograms per liter [µg/L] [17_DGMW82]) and 12 other TAL metals; and
- VOCs: bromodichloromethane (< 1 to 7 µg/L [17_DGMW82]), chlorodibromomethane (< 1 to 6 µg/L [17_DGMW82]), and chloroform (< 1 to 7 µg/L [17_DGMW82]).

## 2.3 AIR SOLID WASTE ASSESSMENT TEST

The following activities were conducted as part of the Air Solid Waste Assessment Test (Air SWAT) (Strata 1991):

- landfill gas sampling,
- ambient air sampling,
- integrated surface sampling, and
- landfill gas migration testing.

A summary of the Air SWAT analytical results is presented below. The Air SWAT report did not quantify compound detection limits. If the compound was not detected, it was reported as ND.

### 2.3.1 Landfill Gas

- VOCs: dichloromethane (110 to 290 parts per billion by volume [$ppb_v$]) trichloroethylene (ND to 2,700 $ppb_v$), and tetrachloroethene (PCE) (ND to 71 $ppb_v$) and,
- other gases: hydrogen (ND to 0.35 percent by volume [$\%_v$]), oxygen (13 to 20$\%_v$), nitrogen (79 to 80 $\%_v$), and carbon dioxide (0.72 to 6.9 $\%_v$).

### 2.3.2 Ambient Air

- VOCs: dichloromethane (3.3 to 13 $ppb_v$), 1,1,1-trichloroethane (0.55 to 2. ppbv), and PCE (ND to 0.38 $ppb_v$)

### 2.3.3 Integrated Surface Sampling

- total organic compounds (TOCs) as methane (< 2 parts per million by volume [$ppm_v$])

### 2.3.4 Landfill Gas Migration Sample Points

- TOCs (< 1 $ppm_v$)

## Section 3
# MAPS

The maps on the following pages present the location of the site on MCAS El Toro, site boundaries, site units, physical features of the site, previous sampling locations, and proposed Phase II sampling locations (where known). These maps are referenced in other sections of this FSP.

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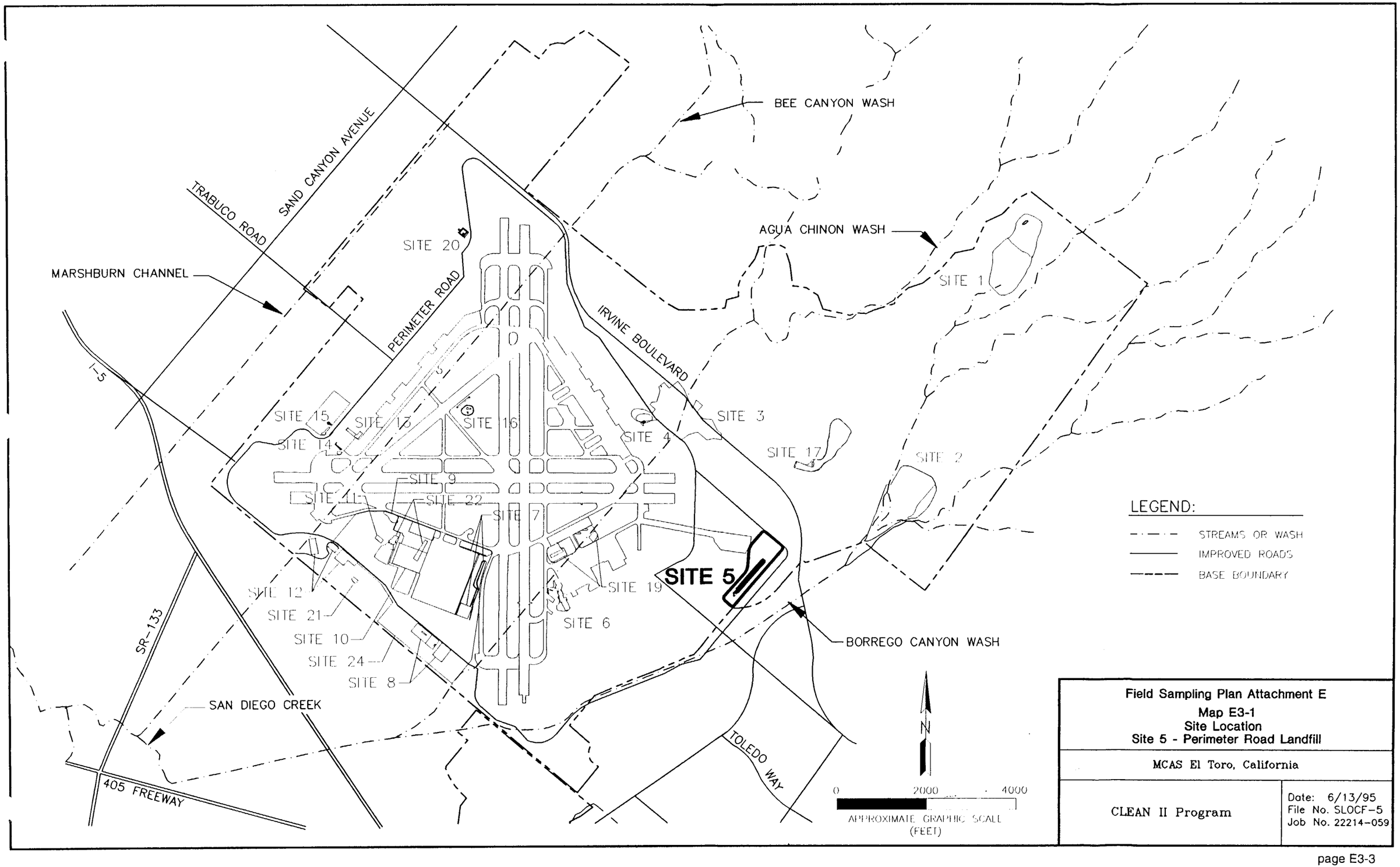


**Field Sampling Plan Attachment E**
**Map E3-1**
**Site Location**
**Site 5 - Perimeter Road Landfill**

MCAS El Toro, California

CLEAN II Program

Date: 6/13/95
File No. SLOCF-5
Job No. 22214-059

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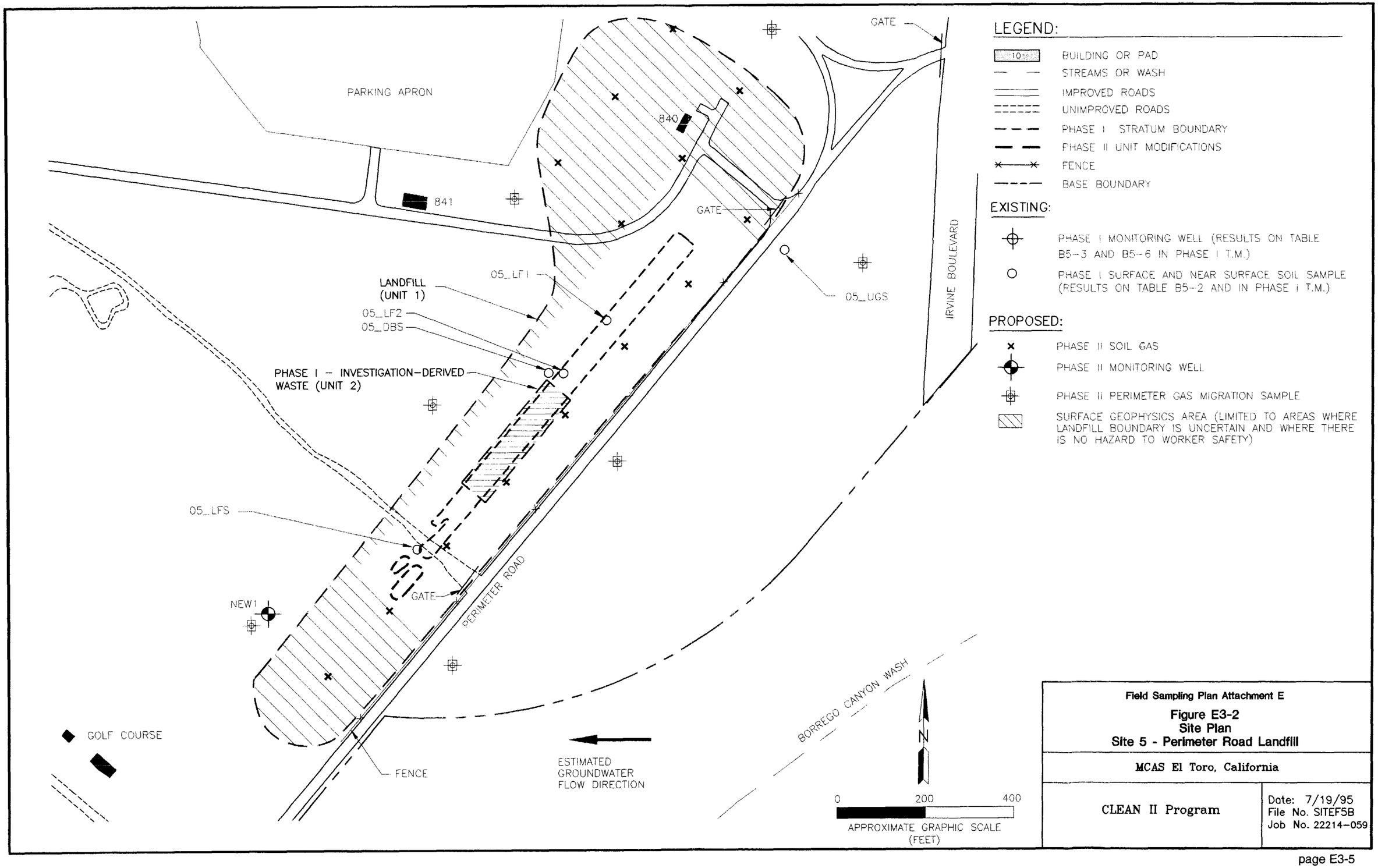


Field Sampling Plan Attachment E

**Figure E3-2**
**Site Plan**
**Site 5 - Perimeter Road Landfill**

MCAS El Toro, California

CLEAN II Program

Date: 7/19/95
File No. SITEF5B
Job No. 22214-059

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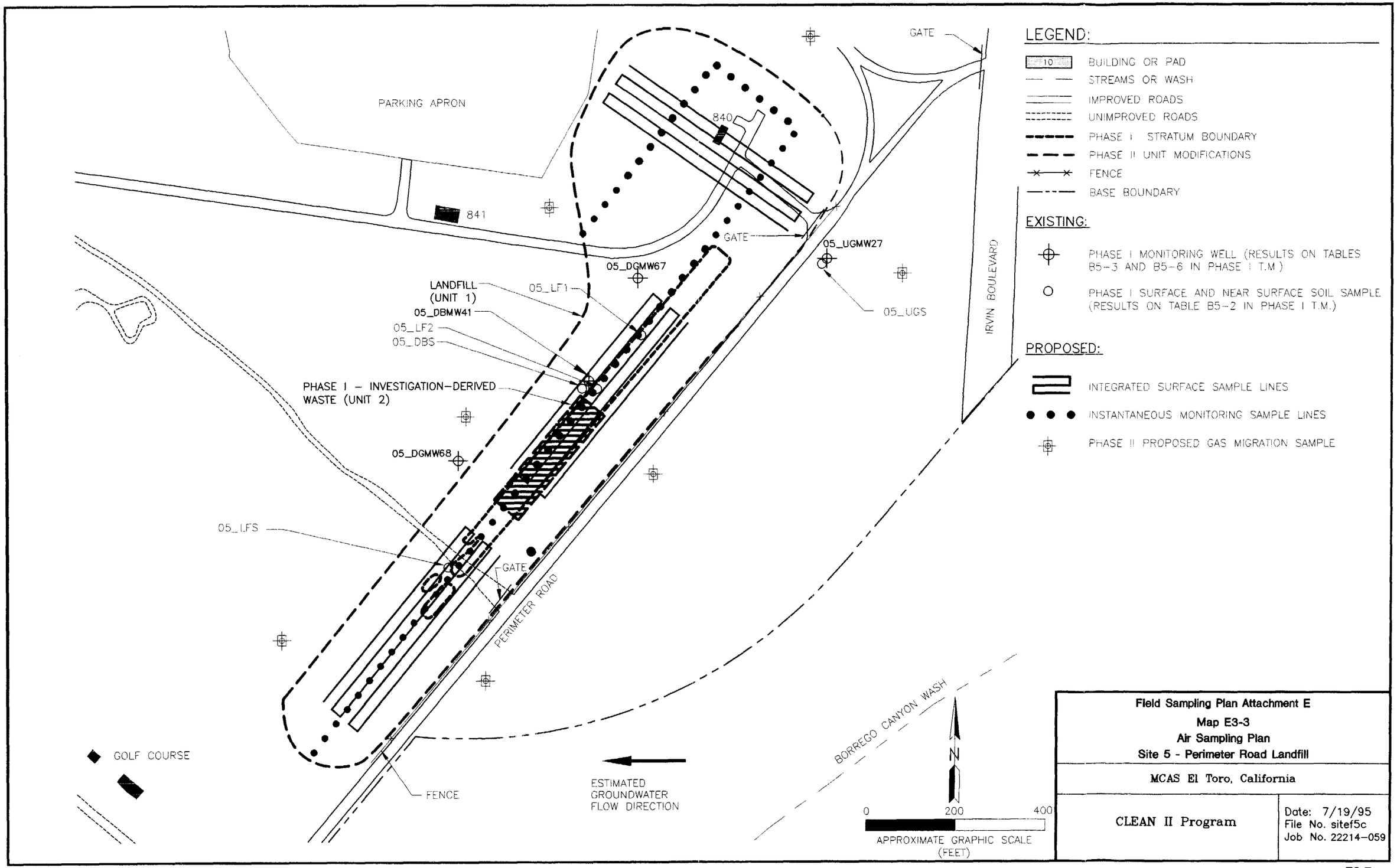


**Field Sampling Plan Attachment E**

**Map E3-3**

**Air Sampling Plan**

**Site 5 - Perimeter Road Landfill**

**MCAS El Toro, California**

**CLEAN II Program**

Date: 7/19/95
File No. sitef5c
Job No. 22214–059

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# Section 4
# RATIONALE FOR SAMPLING LOCATIONS

The rationale for sampling at Site 5 is based on site conditions, previous investigations, and the DQOs as presented in Appendix E of the Phase II Work Plan (BNI 1995a). The data collection activities at Site 5 are designed to be sufficient to allow application of the U.S. EPA Presumptive Remedy for municipal landfill sites (U.S. EPA 1993).

## 4.1 SAMPLING PROGRAMS, SAMPLE TYPES, AND LOCATIONS

Sampling programs, sample types, and locations are presented on the basis of a site unit. Selection of specific sampling programs, sample types, and locations are based on:

- site history,
- types of media suspected or known to be impacted from previous investigations, and
- objectives of site-specific RI/FS efforts.

The site has been subdivided into study units that represent areas of generally similar geologic media or surface features. For Site 5 the study units are:

- Unit 1: area occupied by the landfill; and
- Unit 2: Phase I RI stockpiled IDW soil.

Phase II RI activities will be organized using the unit subdivisions listed above.

The sampling program will be implemented by following a tiered approach. At the conclusion of each tier, collected data will be evaluated. Based on the results of the evaluation, decisions will be made on whether or how to proceed with additional field activities outlined in subsequent tiers.

- Tier 1 sampling activities include assessing the need to collect additional samples to assess whether the site is a risk and includes nonintrusive investigations, limited intrusive sampling (e.g., soil gas surveys), and the sampling of existing systems (e.g., wells).
- Tier 2 activities include more extensive and intrusive investigations such as subsurface borings and sampling of soils, or the installation and sampling of wells.
- Tier 3 activities, if they occur, typically are remedial-design oriented such as soil vapor extraction or aquifer tests.

Because the implementation of the Presumption Remedy is the objective of the RI/FS, the following sections discuss specifics of several sampling methods and their relevance to this objective.

### 4.1.1 Surface Geophysical Survey

An EM surface geophysical survey will be conducted to better define the limits of landfilled waste. The area to be included in the survey is based on the Phase I RI (Jacobs

Engineering 1993), employee interviews (Jacobs Engineering 1994), and aerial surveys (SAIC 1993). The boundaries of landfilled waste will be used to design a landfill cap and will define the area requiring institutional controls (including deed restrictions).

### 4.1.2 Soil Gas Survey

A soil gas survey will be performed to evaluate the potential presence of hot spots in accordance with the U.S. EPA Presumptive Remedy requirements (U.S. EPA 1993). The soil gas data will be used to identify potential hot spots. Hot spots may require further characterization, and treatment or removal if assessment of the data show the hot spot threatens the integrity of the landfill containment system. Soil gas samples will be collected and analyzed in a manner consistent with California Regional Water Quality Control Board (RWQCB) Los Angeles Region requirements for active soil gas investigations (RWQCB 1994).

### 4.1.3 Air Monitoring and Sampling

Air monitoring and sampling will be performed to reassess the migration of landfill gas into the atmosphere by verifying and supplementing existing emission data. The resulting data will be used to assess the effectiveness of the existing cap and evaluate whether additional control of landfill gas emission is necessary. Sample types and locations were selected using South Coast Air Quality Management District (SCAQMD) Rule 1150.1 guidelines (SCAQMD 1989).

### 4.1.4 Groundwater Monitoring and Sampling

Groundwater monitoring wells will be installed and sampled, and the resulting data will be used to assess if there are impacts to groundwater as well as compliance monitoring required for landfill closure (CCR 1991).

### 4.1.5 Vadose Zone Monitoring and Sampling

Soil sampling using angled borings will be performed to assess landfill impacts to vadose zone soils. Vadose zone monitoring equipment (i.e., soil vapor probe) will be installed in selected borings to assess the migration of landfill contaminants for vadose zone compliance monitoring. The soil samples collected during drilling will be analyzed for the chemicals of potential concern (COPCs) identified in the DQOs. For compliance monitoring, two vadose zone borings will be advanced under the landfill and equipped with vapor probes.

## 4.2 TIER 1

Tier 1 sampling activities at Site 3 may include:

- land surveying,
- surface geophysical surveying,

- soil gas sampling,
- air monitoring and sampling,
- soil sampling,
- groundwater monitoring,
- vadose zone sampling, and
- surface water sampling.

The application of these sampling activities are discussed for each unit of Site 3.

## 4.2.1 Unit 1: Landfill Area

The location of Unit 1 is shown on Map E3-2. Unit 1 field investigations and data collection will focus on ascertaining information to supplement Phase I RI data and to facilitate cost-effective closure criteria set forth by California RWQCB. The Unit 1, Landfill Area, sampling program consists of two tiers.

The proposed scope for Tier 1 includes the following tasks:

- land surveying,
- surface geophysical surveying,
- soil gas sampling, and
- air sampling.

### 4.2.1.1 LAND SURVEYING

At the beginning and at the completion of the field investigation, Site 5 will be surveyed to establish horizontal and vertical controls. The initial field survey will establish proposed locations for the soil gas and geophysical survey, soil borings, and groundwater monitoring wells. In addition, the data will be used to generate a topographic map of the site. Topographic data will be used in the landfill cap design.

At the completion of the Phase II activities, a final survey will be conducted to identify sampling stations that were changed. The final survey will also establish well casing elevations and will locate landfilled waste boundaries as delineated by the surface geophysical survey and trenching data.

### 4.2.1.2 SURFACE GEOPHYSICAL SURVEYING

Previous surface geophysical surveys were conducted using ground-penetrating radar (GPR) during the Air SWAT investigation (Strata 1991) and both GPR and EM surveys during the Phase I investigation (Jacobs Engineering 1991). These geophysical surveys were both limited, leaving uncertainty regarding the boundaries of the landfill. The Phase I team reported having more success with EM investigations. Therefore, at the completion of the initial land survey, an EM survey will be conducted to better define landfilled waste boundaries.

The EM surface geophysical survey will be performed on a layout consisting of lines spaced at 50 feet. The area to be included in the surface geophysical survey are shown on Map E3-2.

#### 4.2.1.3 SOIL GAS SAMPLING

Soil gas samples will be collected from a 200-foot, on-center grid (Map E3-2). Samples will be collected from a depth of approximately 15 feet. Samples will be analyzed using an on-site mobile laboratory. Laboratory test results will be used to identify potential soil gas hot spots. Localized areas of containing potential hot spots will then be further characterized from a 25-foot, on-center grid.

To assess off-site migration of landfill gas, soil gas samples will be collected at a spacing of not less than 1,000 feet outside the fill areas and along the perimeter of the site from approximate depths of 10, 25, and 40 feet.

Soil gas and gas migration sample locations are shown on Map E3-2.

#### 4.2.1.4 AIR SAMPLING

The air sampling program consists of an instantaneous gas sampling survey, integrated surface gas sampling, flux chamber monitoring, ambient air sampling, and collecting local meteorological data. Meteorological data will be used to identify the optimum number and locations of the ambient air samples. Lateral migration of landfill gas will be evaluated by sampling at the perimeter of the landfill and outside the refuse boundaries as described in Section 4.2.1.3.

##### *Instantaneous Gas Sampling*

An instantaneous gas emissions survey will be performed over the landfill area. The instantaneous sampling survey consists of sampling grid lines where the concentration of the gas immediately above the surface of the landfill is monitored with a portable flame ionization detector (FID). Sample locations are shown on Map E3-3.

##### *Integrated Surface Samples*

Three integrated surface samples will be collected to check that the average concentration of TOCs over a certain area (50,000 feet$^2$) does not exceed 50 $ppm_V$. Sample locations are shown on Map E3-3.

##### *Meteorological Data*

Before and during ambient air sampling, mechanical weather stations will be installed at the perimeter of the landfill to measure wind speed and direction. The initial data will be reviewed to identify the optimum number and locations of the ambient air samples.

##### *Ambient Air Sampling*

Upwind and downwind ambient air samples will be collected at the perimeter of Site 5. The samples will be collected over a 24-hour period beginning between 10 and 11 a.m.

***Flux Chamber Monitoring***

The location and number of flux chamber samples will be determined in a manner consistent with the U.S. EPA Isolation Flux Chamber User's Guide (U.S. EPA 1986) and after a review of the surface emission and soil gas sampling results.

***Landfill Gas Migration Samples***

As described in Section 4.2.1.3, landfill gas migration samples will be collected during the soil gas investigation.

### 4.2.2 Unit 2: Stockpiled Phase I Investigation-Derived Waste

Unit 2 comprises stockpiled soil consisting of Phase I RI investigation-derived waste. Based on existing data available as to the source of the stockpiles, it has been decided not to conduct sampling activities for this unit. The following potential disposal options will be evaluated:

- reuse as clean fill,
- landfilling in one of the MCAS El Toro landfills,
- landfilling at an off-site landfill, and
- recycling by thermal desorption.

## 4.3 TIER 2

The Tier 2 sampling activities will be implemented on the results of the Tier 1 activities. The primary objective of Tier 2 activities will be to estimate the extent of contamination. These activities may include:

- trenching,
- soil sampling,
- groundwater sampling, and
- vadose zone monitoring.

### 4.3.1 Unit 1: Landfill Area

The scope of Tier 2 investigations depends on the findings of the Tier 1 investigation. At the completion of Tier 1, the data will be evaluated to focus the following Tier 2 tasks:

- trenching,
- subsurface soil sampling,
- groundwater monitoring well installation and sampling, and
- vadose zone monitoring.

#### 4.3.1.1 TRENCHING

If necessary, the lateral extent of disposal activities will be confirmed by trenching across locations along the landfills perimeter where geophysical anomalies exist. To avoid contaminating the native soil, the backhoe will excavate the waste material from the perimeter of disposal areas toward the center of the disposal area.

#### 4.3.1.2 SUBSURFACE SAMPLING

If potential hot spots are identified during Tier 1 sampling, hollow-stem auger borings may be collected. The number, location and depth of these borings will depend on Tier 1 findings and field conditions. Information from these borings will help answer the following questions (U.S. EPA 1993):

1. Does evidence exists that indicates the presence and approximate location of localized waste?
2. Is the localized waste a "principal threat waste" such as a chlorinated solvent?
3. Is the localized waste in a discrete, accessible part of the landfill?
4. Is the localized waste significant enough of a threat, yet small enough in volume to be removed from the landfill in a cost-effective manner?

#### 4.3.1.3 GROUNDWATER MONITORING WELL INSTALLATION AND SAMPLING

In addition to the existing monitoring wells, one new downgradient monitoring well may be installed to assess water quality. The existing wells and the proposed location of the downgradient well are shown on Map E3-2.

#### 4.3.1.4 VADOSE ZONE SAMPLING

Two slanted borings will be drilled and sampled adjacent to the main disposal area of Site 5. The borings will be cased and a permanent sampling probe will be installed in the borings to collect leachate and/or gas that has percolated beneath the refuse into the vadose zone.

The final number and location of these borings will depend on the results of the Tier 1 investigations.

# Section 5
# REQUEST FOR ANALYSES

Request for analyses is based on the analytical test rationale discussed in Section 4 of the FSP, which reflect the COPCs listed in the DQOs (BNI 1995a). These were based on the results of Phase I RI activities.

The analytical methods discussed in this section comprise those presented in the Phase II Quality Assurance Project Plan (QAPP) for quality assurance procedures (BNI 1995b). The primary objective when requesting an analytical method is to provide data that are precise, accurate, representative, complete, and comparable. The data must meet the DQOs discussed in detail in the QAPP and must follow all the guidelines established under Naval Facilities Engineering Service Center (NFESC, formerly known as Naval Energy and Environmental Support Activity [NEESA]) Level D.

## 5.1 ANALYTICAL TESTING RATIONALE

The various analyses chosen are based on the COPCs and are thus site specific. During the Phase II RI, the NFESC Level D guidelines must be followed and the analyses will be performed by an approved laboratory for Comprehensive Long-Term Environmental Action Navy (CLEAN) II. The parameters have been determined based on regulatory limits, health/risk calculations, and NFESC Level D analytical method limitations.

## 5.2 FIELD SCREENING

Field-screening analytical methods provide cost-effective, rapid turnaround chemical analysis during the field investigation, and provide accurate data. Field-screening provides useful information during field investigations and remediation planning at contaminated sites. The data collected from the field-screening methods can minimize the number of nondetects submitted to a stationary laboratory for analysis, and can also be effectively used to estimate the nature and extent of contamination.

### 5.2.1 Metals (Title 26)

Landfills are typically sources of several types of metals. During the Phase I RI, several metals were identified in both soil and groundwater. For this reason, an on-site mobile laboratory will analyze select soil samples for Title 26 metals using inductively coupled argon plasma techniques.

### 5.2.2 Volatile Organics Compounds - Photoionization Detector and FID

VOCs at Site 5 include common solvents, dry cleaning fluids, and degreasing agents. They were commonly used at MCAS El Toro and, thus, were likely disposed at the landfill. Additionally, VOCs were identified as COPCs in Site 5 soils and groundwater.

All soil samples collected will be field-screened with a photoionization detector (PID) and FID. All soil samples with elevated PID and FID readings above background and 5

percent with nondetectable readings will be sent to the mobile laboratory. The on-site mobile laboratory will analyze the samples for VOCs using a gas chromatograph (GC) or gas chromatography/mass spectroscopy (GC/MS).

### 5.2.3 Semivolatile Organic Compounds - FID

Several fuel and oil products, as well as burned by-products, are included in the SVOCs analysis. Several SVOCs have been identified as COPCs in soil samples during Phase I investigations.

All soil samples collected will be field screened with a FID in the field. All soil samples with elevated PID and FID readings above background and 5 percent with nondetectable readings will be sent to the mobile laboratory. The on-site mobile laboratory will analyze for SVOCs using a GC or GC/MS.

### 5.2.4 Nonhalogenated Volatiles - PID and FID

Fuel hydrocarbons (including gasoline and diesel fuel) were used extensively at MCAS El Toro and were probably disposed at the landfill. The Phase I investigation identified fuel hydrocarbons and TRPH at several locations at Site 5.

All soil samples collected will be field-screened with a PID and FID in the field. All soil samples with elevated PID and FID readings above background and 5 percent with nondetectable readings will be sent to the mobile laboratory. The on-site mobile laboratory will analyze for nonhalogenated volatiles and fuel hydrocarbons using a portable GC or GC/MS.

### 5.2.5 Gross Alpha and Beta - Scintillometer

Dials painted with radioactive residue could have been disposed at the landfills. Gross alpha particle activity and gross beta particle activity were identified during Phase I field investigations as a COPC in groundwater.

All soil samples collected will be field-screened with the scintillometer.

### 5.2.6 TO-14 Volatile Organic Compounds - Soil Gas

Several VOCs have been identified at Site 5 in the soil gas and surface and ambient air. This analysis will be performed on soil gas and surface and ambient air samples.

All soil gas, surface, and ambient air samples collected will be analyzed in the on-site mobile laboratory using Method TO-14 for VOCs.

## 5.3 FIXED-BASE ANALYTICAL LABORATORY TESTS

As described in the QAPP (BNI 1995b), 20 percent of the soil samples are required to be analyzed by a NFESC Level D laboratory for confirmation. Two-thirds of the 20 percent will include soil samples that contain detectable concentrations of VOCs, SVOCs, nonhalogenated volatiles, or concentrations of metals that exceed background. One-third

of the 20 percent will include soil samples that contain nondetectable concentrations of the above constituents and soil samples that do not exceed background concentrations of metals. The analytical tests methods for NFESC Level D confirmation analysis are described below.

### 5.3.1 Metals (Title 26 Metals) - U.S. EPA Methods 6010 and 200.7

Select soil samples analyzed by the mobile laboratory for Title 26 metals will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for metals analysis.

### 5.3.2 Pesticides and PCBs - U.S. EPA Methods 8080 and 608

Although the pesticides identified during Phase I investigations are included in U.S. EPA Method 8270 (which is also being performed), the detection limits in the U.S. EPA Method 8080 are lower. To better define PRG limits, U.S. EPA Method 8080 will be performed.

Soil samples will be sent to the NFESC Level D laboratory for analysis of pesticides and PCBs using U.S. EPA Method 8080. All collected groundwater samples will be sent to the NFESC Level D laboratory for pesticides and PCBs using U.S. EPA Method 608.

### 5.3.3 Volatile Organic Compounds - U.S. EPA Methods 8240 and 624

Select soil samples analyzed in the mobile laboratory for VOCs will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for confirmatory analyses of VOCs.

### 5.3.4 General Minerals/Chemistry

All groundwater samples will be sent to the NFESC Level D laboratory for analysis of general minerals and water chemistry. The analyses will include alkalinity (as $CaCO_3$), alkalinity with breakdown, total phosphates, ammonia-nitrogen, TKN, nitrate, calcium, sodium, potassium, magnesium, iron, sulfate, chloride, bicarbonate, nitrite, fluoride, turbidity, pH, total dissolved solids, and conductivity.

### 5.3.5 Gross Alpha and Beta - U.S. EPA Method 703

Of the soil samples collected and field-screened for gross alpha/beta radioactivity, all of the samples with elevated radioactivity will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for gross alpha/beta radioactivity analyses.

### 5.3.6 Total Organic Carbon - U.S. EPA Method 9060

Analysis for total organic carbon is being performed to characterize potential soil retardation factors. Retardation factors are helpful in understating the contaminants fate and transport. For analysis, soil samples are retrieved from borings in the saturated zone. Only one sample (saturated soil) will be analyzed for TOC in each well.

### 5.3.7 Semivolatile Organic Compounds - U.S. EPA Methods 8270 and 625

Select soil samples analyzed in the mobile laboratory for SVOCs will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for SVOC analyses.

### 5.3.8 Nonhalogenated Volatiles - U.S. EPA Method 8015M

Select soil samples analyzed in the mobile laboratory for nonhalogenated volatiles will be sent to the NFESC Level D laboratory for confirmation. All collected groundwater samples will be sent to the NFESC Level D laboratory for a nonhalogenated volatiles analyses.

### 5.3.9 Chlorinated Herbicides - U.S. EPA Methods 8150 and 615

Agricultural activities are common both on the Station and in the vicinity of the landfill; thus, it is reasonable to expect several herbicides in the landfill. Typically, herbicides would be superficial because of their low tendency to migrate. However, because of the nature of a landfill, herbicides may have been landfilled and may occur deeper in the subsurface.

Select samples with detectable concentrations will be sent to the NFESC Level D laboratory for analysis of chlorinated herbicides. All groundwater samples collected will be sent to the NFESC Level D laboratory for chlorinated herbicide analyses.

## 5.4 SUMMARY OF TESTS

Tables E5-1 through E5-4 summarize the analytical tests planned for the Phase II RI.

**Table E5-1**
**Soil Sampling and Analysis – On-Site Mobile Laboratory**

| Tier | Unit/Name | No. of Locations | Samples/ Location[a] | Total Samples | ON-SITE MOBILE LABORATORY | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VOCs[b] | SVOCs[c] | TPH[d] | Pesticides and PCBs[e] | Metals | Gross Alpha and Beta[f] |
| Tier 1 | Landfill Area | NA[g] | | | | | | | | |
| | Stockpiled IDW[h] Soil | NFI[i] | | | | | | | | |
| Tier 2 | Landfill Area | 3 | 1 or 5[j] | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| | Stockpiled IDW Soil | NFI | | | | | | | | |
| *Total* | | | | 7 | 7 | 7 | 7 | 7 | 7 | 7 |

Notes:
[a] a minimum of one soil sample from each slant boring drilled in the vadose zone and five soil samples from each groundwater monitoring well; groundwater monitoring well will be sent to the on-site mobile laboratory
[b] VOC – volatile organic compound
[c] SVOC – semivolatile organic compound
[d] TPH – total petroleum hydrocarbons
[e] PCB – polychlorinated biphenyl
[f] saturated soil sample
[g] NA – not applicable
[h] IDW – investigation-derived waste
[i] NFI – No Further Investigation
[j] one soil sample will be collected from each slant boring drilled in the vadose zone and five samples will be collected from each groundwater monitoring well

**Table E5-2**
**Soil Sampling and Analysis – Off-Site Laboratory**

| Tier | Unit/Name | No. of Locations | Samples/ Location[b] | Total Samples | OFF-SITE LABORATORY[a] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VOCs[c] | SVOCs[d] | TPH[e] | Pesticides and PCBs[f] | Herbicides | Total Organic Carbon[g] | Metals | Gross Alpha & Beta |
| Tier 1 | Landfill Area | NA[h] | | | | | | | | | | |
| | Stockpiled IDW[i] Soil | NFRAP[j] | | | | | | | | | | |
| Tier 2 | Landfill Area | 3 | 1 or 5[k] | 7 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | Stockpiled IDW Soil | NFRAP | | | | | | | | | | |
| *Total* | | | | 7 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

Notes:
[a] a minimum of 10 percent of the total samples sent to the on-site mobile laboratory will be sent to an off-site laboratory for QA/QC
[b] a minimum of one soil sample from each slant boring drilled in the vadose zone and five soil samples from each groundwater monitoring well; groundwater monitoring well will be sent to the on-site mobile laboratory
[c] VOC – volatile organic compound
[d] SVOC – semivolatile organic compound
[e] TPH – total petroleum hydrocarbons
[f] PCB – polychlorinated biphenyl
[g] saturated soil sample
[h] NA – not applicable
[i] IDW – investigation-derived waste
[j] NFRAP – No Further Response Action Planned
[k] one soil sample will be collected from each slant boring drilled in the vadose zone and five samples will be collected from each groundwater monitoring well

## Table E5-3
## Soil Gas Sampling and Analysis

| Tier | Unit/Name | No. of Locations | Samples/ Location[a] | Total Samples | ON-SITE MOBILE LABORATORY[b] TO-14 (Methane) | OFF-SITE LABORATORY[c] TO-14 (Methane) |
|---|---|---|---|---|---|---|
| Tier 1 | Landfill Area | 22[d] +TBD[e] | 1 or 3 | 36 | X | X |
| | Stockpiled IDW[f] Soil | NA[g] | | | | |
| Tier 2 | Landfill Area | 2 | 1 | 2 and TBD | X | X |
| | Stockpiled IDW Soil | NA | | | | |
| *Total* | | | | 2 and TBD | 2 | 1 |

Notes:

[a] samples will be collected from 15 locations on the landfill at depths of 15 feet; samples will be collected from seven locations outside the landfill boundary at depths of 10, 25, and 40 feet below ground surface; a minimum of one sample will be collected from each slant boring drilled in the vadose zone

[b] all soil gas samples collected will be sent to the on-site mobile laboratory for analysis

[c] a minimum of 10 percent of the samples sent to the on-site mobile laboratory will be sent to an off-site laboratory for quality assurance/quality control

[d] additional soil gas samples may be collected to better define hot spots within the landfill

[e] TBD – to be determined

[f] IDW – investigation-derived waste

[g] NA – not applicable, included in landfill area samples

**Table E5-4**
**Groundwater Sampling and Analysis**

| Tier | Unit/Name | No. of Locations | Samples/ Location | Total Samples | OFF-SITE LABORATORY | | | | | | | | ON-SITE MOBILE LABORATORY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | VOCs[a] | SVOCs[b] | TPH[c] | Pesticides and PCBs[d] | Herbicides | General Chemistry | Metals | Gross Alpha and Beta | VOCs |
| Tier 1 | Landfill Area | NA[e] | | | | | | | | | | | |
| | Stockpiled IDW Soil | NA | | | | | | | | | | | |
| Tier 2 | Landfill Area | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Stockpiled IDW Soil | NA | | | | | | | | | | | |
| *Total* | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Notes:
[a] VOC – volatile organic compound
[b] SVOC – semivolatile organic compound
[c] TPH – total petroleum hydrocarbons
[d] PCB – polychlorinated biphenyl
[e] NA – not applicable

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# Section 6
# FIELD METHODS AND PROCEDURES

This section presents site-specific field methods that will be used to collect samples and other field data. The field methods discussed in this are based on CLEAN II Standard Operating Procedures.

## 6.1 LAND SURVEY

An initial land survey will establish proposed locations for the soil gas and geophysical survey, soil borings, and groundwater monitoring wells. Each control point to be surveyed will be marked on the ground and on the draft field maps. Each point will be identified by the station identification on the map and on a flag attached to the rebar marking the sampling location.

Each sampling point will be surveyed and located to the nearest 0.1 foot, using the California Plane Coordinate System with northings and eastings. The precision of the vertical measurements will be within 0.01 feet. A surface contour map will be generated with 2-foot contour intervals.

At the completion of the Phase II activities, a final survey will be conducted to identify sampling stations that were changed. The final vertical controls will be resurveyed to the accuracy of 0.01 feet. The final survey will also establish well casing elevations and identify landfilled waste boundaries as delineated by the surface geophysical survey and trenching data. Further land surveying details are discussed in Section 6 of the FSP.

## 6.2 SURFACE GEOPHYSICAL SURVEY

At the completion of the initial land survey, a surface geophysical survey will be conducted to define landfilled waste boundaries. Both electromagnetic induction profiling and time-domain electromagnetic surveys will be performed. Survey lines will be spaced at approximately 50-foot intervals that cross the suspected boundaries of fill areas. The area to be surveyed includes the suspected limits of waste disposal at the landfill. Operational procedures for surface geophysical surveys are described in Section 6 of the FSP.

## 6.3 TRENCHES

The rationale for limited trenching is to confirm the presence of past disposal activities at locations where surface geophysics indicate the presence of anomalies. The lateral extent of disposal activities will be confirmed by trenching across the perimeter of anomalous areas using a backhoe. To avoid contaminating the native soil, the backhoe will excavate the waste material from the perimeter of disposal areas toward the center of the disposal area.

Excavation will continue until the lateral extent of wastes are visibly determined, or the depth of approximately 10 feet bgs is reached, whichever comes first.

## 6.4 SOIL GAS

Soil gas samples will be collected using a CPT rig. Soil gas samples will be collected according to "Requirements for Active Soil Gas Investigation," produced by the California RWQCB, Los Angeles Region (RWQCB 1994). Guidelines that will not be followed are related to the recommended distance between sample points. A 200-foot initial grid pattern is planned for Site 5 with a secondary 25-foot grid to characterize hot spots. Soil gas sampling procedures are described in detail in FSP Section 6.

## 6.5 SOIL SAMPLES

Surface and near surface soil samples will be collected with a hand trowel or hand auger. Part of the soil sample will be directly transferred to the sample jar and placed into the cooler. Samples being analyzed for VOCs will have a portion of the sample placed in a plastic bag for field determination of organic vapor in the headspace.

Soil samples will also be collected from angled soil borings and monitoring well borings. Each boring will be hand augered to a depth of 5 feet (or refusal) to reduce the potential of drilling through subsurface utilities. A CLEAN II Team geologist will be present for drilling, soil logging and sampling, field screening, and final abandonment or completion of a monitoring or vadose well. All borings will be logged according to the Unified Soils Classification System. Soil samples will be collected at minimum 5-foot intervals by driving a modified California soil sampler. Sample intervals may be reduced at the discretion of the field geologist. Soil sampling procedures are outlined in the following FSP sections:

- Section 6.9, geophysics;
- Section 6.2, utility clearance;
- Section 6.12, decontamination;
- Section 6.3, surface samples;
- Section 6.3, hollow-stem auger borings;
- Section 6.3, hand auger borings;
- Section 5.2, field screening; and
- Section 6.14, sample handling, packaging, and shipping.

## 6.6 AIR SAMPLING

Air sampling will be performed to satisfy SCAQMD Rule 1150.2 requirements for the control of gaseous emissions from inactive landfills. The surface emission sampling program will be implemented to evaluate the landfill gas surface emissions, and the potential for off-site migration. The sampling program consists of an instantaneous gas sampling survey, integrated surface gas sampling, flux chamber monitoring, ambient air sampling, and collection of local meteorological data. Lateral migration of landfill gas

will be evaluated by sampling at the perimeter of the landfill and outside the refuse boundaries, as described in Section 4.2.1.4.

### 6.6.1 Instantaneous Gas Sampling

During the instantaneous sampling survey, the concentration of the gas immediately above the surface of the landfill is monitored with a portable FID. The FID is held no more than 3 inches above the landfill surface. Areas above which the instantaneous organic vapor analyzer reading exceeding 50 $ppm_v$ will be identified per SCAQMD Rule 1150.2.

### 6.6.2 Integrated Surface Samples

To collect integrated surface samples, Site 5 will be divided into several grids, each 50,000 $feet^2$ in size. One integrated surface sample will be collected at 2 to 3 inches above the surface from each 50,000-$feet^2$ grid area. Surface samples will be collected using a portable self-contained sampling unit equipped with a collection probe and a pump. Continuous samples are collected in 10-liter Tedlar bags at a pump flow rate of 333 cubic centimeters per minute taken while walking through 2,600 linear feet in 25 minutes. The integrated surface sample contained in the Tedlar bag will be monitored with a portable FID. If the FID reading exceeds 500 $ppm_v$, the sample will be submitted to the laboratory for analysis. Surface monitoring and sampling will be performed when landfill is dry (a minimum of 72 hours after rainfall). Surface sampling will be terminated when the average wind speed exceeds 5 miles per hour (mph) (determined on a 10-minute average) or the instantaneous wind speed exceeds 10 mph.

### 6.6.3 Flux Chamber Monitoring

Although not required by SCAQMD Rule 1150.2, landfill gas emissions will be collected from an isolated soil surface area using an emission isolation flux chamber, for risk assessment purposes. Gaseous emissions are sampled by placing the flux chamber over the area to be sampled and working it into the surface to a depth of approximately 1 inch. Sweep air is injected at a flow rate of 5 liter per minute. After 24 minutes, samples are collected. To prevent cross-contamination before and between sampling activities, the chamber will be purged with ultra-high-purity air (less than 0.1 $ppm_v$ total hydrocarbons) and followed with running a method blank until exit concentrations are less than 10 $ppm_v$ or less than 10 percent of expected concentrations, whichever is smaller. Gas emission samples will not be collected using the flux chamber during or after a rain. Gas emission samples will be collected after a minimum of 72 hours after rainfall. Details of monitoring and sampling procedures are provided in the FSP Section 6. The location and number of flux chamber samples will be determined after the review of the surface emission and soil gas sampling results.

### 6.6.4 Ambient Air Sampling

Ambient air sampling will be performed at the perimeter of Site 5 to assess potential concentrations of landfill gas migrating off-site. Several continuous recorders will be installed and operated at the perimeter of the landfill to measure wind speed and direction throughout the sampling period. These data will be reviewed to identify the optimum number and locations of the ambient air samples. The mechanical weather stations will be installed approximately 12 feet above the ground, and more than 60 feet away from obstacles such as trees and buildings. Three ambient air samplers will be installed at the perimeter of Site 5 at downwind and upwind locations. Samples will be collected in a 10-liter Tedlar™ bag over a 24-hour period, beginning between 10 and 11 a.m.

## 6.7 GROUNDWATER SAMPLES

Prior to collecting groundwater samples, depth to water level will be measured in the existing wells. Prior to sampling, each monitoring well will be purged. After the level of groundwater has recovered to at least 90 percent of the prepurged level, groundwater samples will be collected. The water samples will be analyzed for VOCs in the on-site mobile laboratory

Groundwater wells drilled and installed at Site 5 will follow well-development procedures. All new wells will be developed prior to groundwater sampling. Groundwater sampling procedures are outlined in the following FSP sections:

- Section 6.9, geophysics;
- Section 6.2, utility clearance;
- Section 6.12, decontamination;
- Section 6.4, field measurement of water quality parameters;
- Section 6.4 groundwater sampling to evaluate water quality;
- Section 6.4, field filtration of groundwater samples; and
- Section 6.14, sample handling, packaging, and shipping.

### 6.7.1 Monitoring Well Construction

To maintain a consistent groundwater quality data collection effort, Phase II monitoring wells will be constructed similar to those installed during the Phase I RI. The wells will be constructed with flush-threaded, 4-inch-diameter, Schedule 40, polyvinyl chloride (PVC) blank casing, screened over the lower 40 feet. Flush-threaded, 4-inch diameter, stainless steel, wire-wrapped screen will be used. The screen slot size (0.010 inch or 0.020 inch) will be determined at the time of drilling. Sand filter pack will be selected such that at least 90 percent of the filter pack is retained by the well screen. Centralizers will be used at the top, bottom, and center of the well screen.

Wells over 200 feet in depth will be constructed using 5-inch-diameter, flush-threaded, Schedule 80 PVC blank casing and screened over the lower 40 feet. Flush-threaded,

5-inch-diameter, stainless steel, wire-wrapped well screen will be used. Sand filter pack will be selected such that at least 90 percent of the filter pack is retained by the well screen. Centralizers will be used at the top, bottom, and center of the well screen. The wells will be constructed by suspending the casing in the boring. Well construction procedures are described in the following sections of the FSP:

- Section 6.4, monitoring well construction; and
- Section 6.4, surface completion of monitoring wells.

### 6.7.2 Well Development and Groundwater Sampling

The well materials will be allowed to set at least 48 hours before development. Each monitoring well will be developed using a surge-and-pump method until the discharged water is relatively free of fine suspended sediment. After each well volume is removed, samples of the discharged water will be collected and analyzed in the field for conductivity, temperature, pH, and turbidity. Well development will be complete when conductivity, temperature, and pH measurements vary less than 10 percent, and the discharged water is relatively free of fine suspended sediment. The field measurements will be recorded on the well-development log.

Groundwater samples will be collected after waiting a minimum of 7 days after development. Groundwater sampling and development procedures are described in FSP Section 6.

## 6.8 LEACHATE SAMPLING

A minimum of two slanted borings will be drilled and sampled adjacent to the main disposal area of the Site 3. Borings will be drilled at an angle of 30 degrees from vertical to obtain lateral penetration of approximately 50 feet bgs. Soil samples will be collected at 5-foot intervals and will be monitored for VOCs.

After the boring is cased, a probe assembly will be installed 1 foot into the vadose zone at the bottom of the casing. After applying a vacuum to the sample container with a hand pump, the needle assembly will be lowered into the drive rod and connected to the filter tip, and a leachate sample will be collected.

Different size sample container vials are available to collect 35-, 70-, and 500-milliliter samples. The pressure inside the sample vials can be monitored by an electronic pressure transducer.

An unsaturated soil moisture sampling system (lysimeter) will be used to collect a soil moisture sample from angled soil borings to assess the potential infiltration of landfill leachate in the vadose zone. The angled soil borings will be drilled such that at termination, the borings will be located beneath the refuse. A lysimeter probe assembly will be lowered through the hollow-stem augers and inserted approximately 1 to 2 feet into the soil. A vacuum will be applied to the lysimeter using a hand pump or equivalent vacuum device. A soil moisture sample will be collected.

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## Section 7
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San Diego, California 92132-5187

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**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**

**CLEAN II**

# FIELD SAMPLING PLAN ATTACHMENT F OPERABLE UNIT 3 – SITE 6 – DROP TANK DRAINAGE AREA NO. 1 MCAS EL TORO, CALIFORNIA

**CTO-0059**

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# ACRONYMS/ABBREVIATIONS

| | |
|---|---|
| bgs | below ground surface |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| COPC | chemical of potential concern |
| FS | Feasibility Study |
| FSP | Field Sampling Plan |
| Irvine Subbasin | Irvine Groundwater Subbasin |
| MCAS | Marine Corps Air Station |
| MCL | maximum contaminant level |
| NEESA | Naval Energy and Environmental Support Activity |
| NFESC | Naval Facilities Engineering Service Center |
| PAH | polynuclear aromatic hydrocarbons |
| PRG | (U.S. EPA Region IX) Preliminary Remediation Goal |
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| SVOC | semivolatile organic compound |
| SWMU/AOC | solid waste management unit/area of concern |
| TAL | target analyte list |
| TDS | total dissolved solids |
| TFH | total fuel hydrocarbons |
| TPH | total petroleum hydrocarbons |
| TRPH | total recoverable petroleum hydrocarbons |
| U.S. EPA | United States Environmental Protection Agency |
| VOC | volatile organic compound |

# ACRONYMS/ABBREVIATIONS (continued)

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# Section 1
# OBJECTIVES

This Field Sampling Plan (FSP) for Site 6, the Drop Tank Drainage Area No. 1, outlines the field procedures and methodology to be used during the Remedial Investigation (RI)/Feasibility Study (FS) for this site. The purpose of this FSP is to enable field personnel unfamiliar with the site to gather the required samples and field data. It is also intended to assure that data collection will be comparable to and compatible with previous data collected at the site and with other sampling activities at other sites at the Marine Corps Air Station (MCAS) El Toro.

## 1.1 SAMPLING OBJECTIVES

The specific objectives for this FSP at Site 6 are as follows:

- verify boundaries of waste disposal activities;
- characterize the nature and extent of contamination;
- estimate the vertical and horizontal extent of contamination; and
- characterize site-specific groundwater contamination, if soil contamination extends to groundwater.

## 1.2 DATA USAGE

To satisfy RI/FS objectives for Site 6, the data to be collected, compiled, and analyzed will be used to perform the following:

- characterize subsurface soils;
- establish stratigraphic controls;
- establish geotechnical parameters;
- characterize groundwater conditions and quality (where soil contamination suggests);
- determine the types of contaminants in soil and/or groundwater;
- estimate the extent of contaminants in soil and/or groundwater;
- evaluate human health and ecological risks;
- evaluate the mass of contaminants;
- evaluate cleanup levels;
- characterize the feasible removal or remedial actions, if necessary; and
- evaluate remedial alternatives.

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# Section 2
# BACKGROUND

This section generally describes and discusses the results of previous investigations at Site 6. This section also provides a brief compilation of the data used to develop the site-specific FSP for Phase II RI/FS activities. Previous investigations and reports provide a more thorough discussion of site history, activities, and summaries of previous investigations.

## 2.1 SITE DESCRIPTION

Site 6 consists of a concrete apron bordered by a grassy area located southwest of Building 727 in the southern quadrant of MCAS El Toro (Map F3-1). The terrain in the immediate vicinity of the site slopes slightly to the west. Surface drainage from the site appears to flow through a small swale located to the west and into a ditch, then into a catch basin that discharges into Aqua Chinon Wash (Jacobs Engineering 1993a).

### 2.1.1 History

Site 6 was previously used for aircraft drop tank storage and drainage. From approximately 1969 to 1983, aircraft drop tanks were transported to the area and their remaining fuel was drained. Residual JP-5 fuel in the tanks was washed onto the concrete apron; and the fuel and wash/rinse water drained onto the adjacent grassy area. In addition, waste lubricant oils from maintenance operations were reported to be stored in drums and staged in the area. An estimated 300 gallons of waste oils were spilled at Site 6 (Jacobs Engineering 1993a).

### 2.1.2 Geology

The geology of Site 6 consists of Quaternary alluvial and marine deposits (Jacobs Engineering 1993b). Holocene deposits consist of a matrix of fine-grained overbank deposits and some coarse-grained stream channel deposits. These soils are derived from the Santa Ana Mountains to the east and conformably overlie Pleistocene interbedded fine-grained lagoonal and near-shore marine deposits. Pleistocene deposits could not be differentiated from Holocene deposits in Phase I RI soil borings. Pleistocene deposits unconformably overlie semiconsolidated marine sandstones, siltstones, and conglomerates of late Miocene to late Pliocene, which are considered to be bedrock in the area.

Based on a review of the Phase I RI boring logs, it appears that the subsurface lithology at Site 6 consists predominantly of well-graded to silty sands mixed and interbedded with silts and clays. Within the sand units are occasional gravels, which are probably associated with stream channels.

### 2.1.3 Hydrogeology

MCAS El Toro lies within the Irvine Groundwater Subbasin (Irvine Subbasin). Regional aquifers in the Irvine Subbasin tend to be composed of discontinuous lenses of clayey and silty sands and fine-grained gravels contained within a complex assemblage of sandy

clays and sandy silts. Three general aquifer systems have been identified near the Station: a shallow and perched system, a principal aquifer zone, and a lower hydrogeologic system existing in bedrock (Jacobs Engineering 1993b).

The Phase I RI results indicate the shallow, perched zone is not present at Site 6. The principal aquifer is the main water-producing zone for the Irvine area and is of primary interest in this investigation. The principal aquifer is encountered about 145 feet beneath Site 6. The regional groundwater flow direction is to the northwest. The local hydraulic gradient has been influenced strongly by the pumping of irrigation wells located west of MCAS El Toro.

## 2.2 PHASE I REMEDIAL INVESTIGATION RESULTS

During the Phase I RI, Site 6 (Map F-2) was represented by three strata:

- Stratum 1 - Concrete Pad Apron Edge (the soil around the edge of the pad);
- Stratum 2 - Drainage Ditch (the drainage area from the pad to the catch basin); and
- Stratum 3 - Storage Area (the former drop tank storage area).

The following site-specific activities were conducted for the Phase I RI:

- collection of shallow soil samples (0 to 10 feet below ground surface [bgs]) from three locations from each stratum;
- collection of soil samples from one deep boring on-site;
- drilling, installation, and sampling of one downgradient monitoring well (06_DGMW69) and one upgradient monitoring well (06_UGMW28);
- collection of 26 soil samples from nine shallow boring locations and one deep boring;
- collection of five soil samples from the vadose zone from the borings of the groundwater monitoring wells;
- soil samples were analyzed for target analyte list (TAL) metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), total fuel hydrocarbons (TFH)-diesel and -gasoline, and total recoverable petroleum hydrocarbons (TRPH); and
- groundwater samples were analyzed for TAL metals, VOCs, SVOCs, TFH-diesel and -gasoline, and TRPH.

United States Environmental Protection Agency (U.S. EPA) Region IX Preliminary Remediation Goals (PRGs) and ecological screening criteria were compared with corresponding shallow soil analytical results. The results of these comparisons are detailed below:

- lead exceeds PRGs in Stratum 3 and ecological criteria in Stratum 1;
- antimony, barium, lead, and zinc exceed ecological criteria in Stratum 2; and
- lead exceeds PRGs and chromium, lead, antimony, and zinc exceed ecological criteria for Stratum 3.

Groundwater samples were collected from two groundwater monitoring wells (06_UGMW28 and 06_DGMW69) constructed near Site 6. Chemicals of potential concern (COPCs) detected in groundwater samples were compared to PRGs and maximum contaminant levels (MCLs). The results are as follows:

- antimony, manganese, and nitrate exceed PRGs in the upgradient well (06_UGMW28);
- nickel and nitrate exceed PRGs in the downgradient well (06_DGMW69);
- antimony, manganese, nickel, selenium, nitrate, chloride, sulfate and total dissolved solids (TDS) exceed MCLs in the upgradient well; and
- antimony, cadmium, nickel, nitrate, chloride, and TDS exceed MCLs in the downgradient well.

Analytical data indicated that no site-related contaminants were identified in groundwater from these wells (Jacobs Engineering 1993a).

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## Section 3
# MAPS

The maps on the following pages illustrate the site location at MCAS El Toro, site boundaries, site units, physical features of the site, previous sampling locations, and proposed Phase II sampling locations (where known). These maps are referenced in other sections of this FSP.

The proposed Phase II sampling locations presented on these maps are intended to illustrate the type of sampling strategy proposed for each unit. Other considerations (e.g., randomly selected starting points, underground utilities/pipelines, or overhead obstacles) could result in adjustments to sampling locations. The actual field sample locations will be accurately recorded by field personnel relative to surveyed coordinates, and if any sampling points require relocation, the reasons for such changes will be described in the field notebook.

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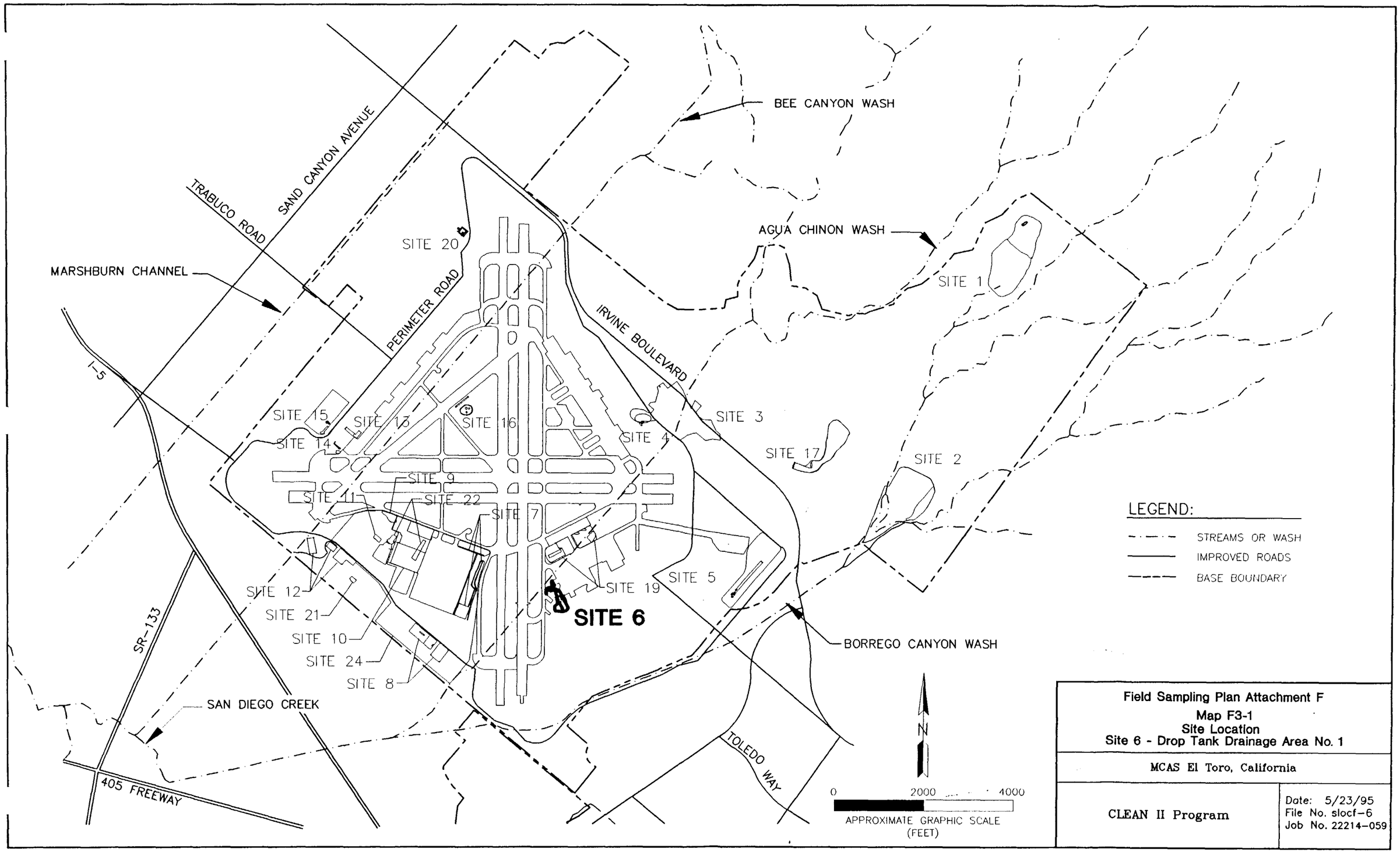


**Field Sampling Plan Attachment F**
**Map F3-1**
**Site Location**
**Site 6 - Drop Tank Drainage Area No. 1**

MCAS El Toro, California

CLEAN II Program

Date: 5/23/95
File No. slocf-6
Job No. 22214-059

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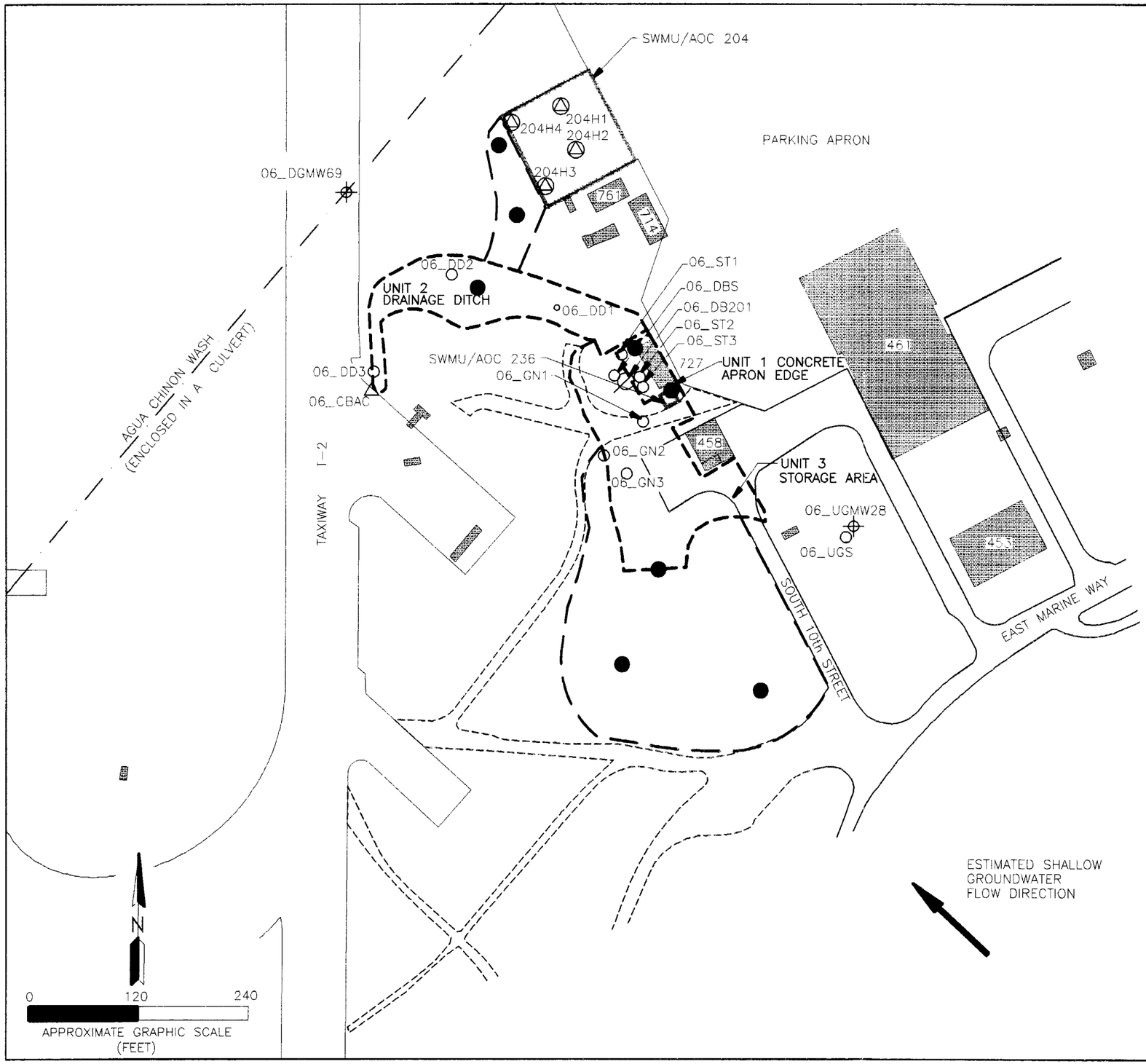


## LEGEND:

- BUILDING OR PAD
- STREAMS OR WASH
- IMPROVED ROADS
- UNIMPROVED ROADS
- PHASE I STRATUM BOUNDARY
- PHASE II UNIT MODIFICATIONS
- SOLID WASTE MANAGEMENT UNIT/AREA OF CONCERN (SWMU/AOC) BOUNDARY
- APPROXIMATE SOLID WASTE MANAGEMENT UNIT/AREA OF CONCERN (SWMU/AOC) BOUNDARY

### EXISTING:

- PHASE I MONITORING WELL (RESULTS ON TABLES B6-3 AND B6-6 IN PHASE I T.M.)
- PHASE I DEEP OR ANGLE BORING (RESULTS ON TABLE (RESULTS ON TABLE B6-3 IN PHASE I T.M.)
- PHASE I SURFACE AND NEAR SURFACE SOIL SAMPLE (RESULTS ON TABLE B6-2 IN PHASE I T.M.)
- PHASE I SEDIMENT SAMPLE (RESULTS ON TABLE B6-2 IN PHASE I T.M.)
- RFA BORING (RESULTS IN APPENDIX A IN RFA)

### PROPOSED:

- PHASE II SURFACE AND NEAR SURFACE SOIL SAMPLE

**Field Sampling Plan Attachment F**

**Map F3-2**
**Site 6 - Drop Tank Drainage Area No. 1**

MCAS El Toro, California

CLEAN II Program

Date: 7/14/95
File No. SITEF6B
Job No. 22214-059

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# Section 4
# RATIONALE FOR SAMPLING LOCATIONS

This section explains the rationale for the number of sampling programs, types of samples, locations of samples, and analytical parameters. The rationale for sampling is based on site conditions, previous investigations, and data quality objectives as presented in the appendices of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.1 SAMPLING PROGRAMS, SAMPLE TYPES, AND LOCATIONS

Sampling programs, types of samples, and locations are presented based on the smallest area of study. For some sites, the smallest area of study is a site unit; for others, the area of study may be the entire site. Selection of sampling programs, sample types, and locations is based on:

- site activities and history;
- types of media suspected or known to be impacted from previous investigations;
- objectives of site-specific RI/FS efforts; and
- site-specific initial surveys.

The site will be represented by three areas (units) for the Phase II RI/FS investigation. The three units include the areas identified as the three strata used in the Phase I RI for Site 6. However, the boundaries of Units 2 and 3 have been expanded (Map F3-2). Unit 2 has been expanded northward to include the area where possible surface drainage from the solid waste management unit/area of concern (SWMU/AOC) 204 may have occurred. Unit 3 has been expanded to include SWMU/AOC 236 located north of Building 458 and southward to include the area of drop tank storage racks and a triangular impoundment located to the southwest.

The units will be sampled using a tiered sampling approach as discussed in the following sections. Previous site activities, Phase I RI sampling results, and regulatory comments were used to formulate the Phase II sampling approach. During the Phase I RI, soil samples were collected from each stratum, and COPCs were identified and evaluated against PRGs. Sampling locations in all units have been positioned in locations to refine risk assessments for the units.

## 4.2 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk to human health or the environment. The Tier 1 sampling approach will consist of collecting shallow soil samples (less than 10 feet bgs) from a specific number of sampling locations within the unit. The number of sampling locations has been proposed in a manner that will allow accurate comparison of the Phase I and II data to estimate risk for the unit. An explanation of the proposed sampling designs for Tier 1 soil sampling can be found in Section 4 of the Phase II RI/FS Work Plan (BNI 1995a).

### 4.2.1 Unit 1: Concrete Apron Edge

The Unit 1 boundaries of Site 6 consist of the concrete apron edge of Building 727 on the site.

#### 4.2.1.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 5, and 10 feet bgs in the two stratified random sampling locations in Unit 1 (Map F3-2).

### 4.2.2 Unit 2: Drainage Ditch

The Unit 2 boundaries of Site 6 consist of the drainage ditch and adjacent drainage area from SWMU/AOC 204 at the site.

#### 4.2.2.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 5, and 10 feet bgs in the three systematic random sampling locations on an axis in Unit 2 (Map F3-2).

### 4.2.3 Unit 3: Storage Area

The Unit 3 boundaries of Site 6 consist of the area of drop tank storage racks and a triangular impoundment.

#### 4.2.3.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 5, and 10 feet bgs in the three stratified random sampling locations in Unit 3 (Map F3-2).

## 4.3 TIER 2

The Tier 2 sampling program will also focus exclusively on shallow soil (0 to 10 feet) conditions. The primary objective of this program will be to refine the data on the extent of shallow soil contamination identified during the Tier 1 sampling. Tier 2 sample locations will be based on these sample results. The process by which the Tier 2 sample locations will be selected is detailed in Appendix F of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.4 TIER 3

The objective of a Tier 3 soil sampling program is to estimate the extent of a contaminant plume in deeper subsurface soils. To accomplish this goal, a series of boreholes will be drilled and sampled. The location of boreholes for Tier 3 is intended to minimize the number of boreholes required to define the lateral and vertical extent of the contaminant plume in deeper subsurface soils. Groundwater samples will be collected only when a contaminant plume in deeper subsurface soils has been traced (through a drilling and soil sampling program) downward to the water table. At such units/sites, the objectives of the

sampling program must then be expanded to include a determination of whether groundwater has been adversely impacted as a result of the historic activities at this unit/site.

The process by which the locations for Tier 3 soil borings and monitoring wells will be selected is detailed in Appendix F of the Phase II RI/FS Work Plan (BNI 1995a).

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# Section 5
# REQUEST FOR ANALYSES

Requests for analyses are based on:

- site activities and history,
- results of previous investigations, and
- objectives of site-specific RI/FS efforts.

The analytical methods referenced in this section are from the Phase II RI/FS Quality Assurance Project Plan (QAPP) (BNI 1995b). Section 6 in the QAPP specifies the number and/or frequency for collection of field duplicate and blank samples during the Phase II RI/FS field activities.

## 5.1 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk. The Tier 1 sampling approach will consist of the collection of shallow soil samples (less than 10 feet bgs) from a specific number of sampling locations within the unit. Table F5-1 lists all soil samples and associated analyses for the units in Site 6.

### 5.1.1 Unit 1: Concrete Apron Edge

The six Tier 1 soil samples that will be collected at Site 6, Unit 1, will be analyzed according to the methods listed below.

#### 5.1.1.1 FIELD SCREENING

No field screening chemicals analyses will be performed on samples from Unit 1.

#### 5.1.1.2 FIXED-BASE ANALYTICAL LABORATORIES

All soil samples will be submitted to the fixed-base laboratory for chemical analyses. The fixed-based analyses are polynuclear aromatic hydrocarbons (PAH) (U.S. EPA Method 8310), VOCs (U.S. EPA Method 8010), total petroleum hydrocarbons (TPH)-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) under Naval Facilities Engineering Service Center (NFESC, formerly known as Naval Energy and Environmental Support Activity [NEESA]) Level D protocols.

### 5.1.2 Unit 2: Drainage Ditch

The nine Tier 1 soil samples that will be collected at Site 6, Unit 2, will be analyzed according to the methods listed below.

#### 5.1.2.1 FIELD SCREENING

All soil samples will be field screened for PAH with immunoassay test kits (U.S. EPA Method 4035), and for VOCs (U.S. EPA Method 8010), TPH-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) using an appropriately equipped mobile laboratory.

**Table F5-1**
**Soil Sampling and Analysis**

| Tier | Unit/Name | PHASE II RI/FS SAMPLE NUMBERS | | | FIELD[a] - IMMUNOASSAY OR MOBILE LABORATORY | | | | | OFF-SITE LABORATORY[b] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Locations | Samples/ Location | Total Samples | PAH[c,d] | PCBs[c,e] | VOCs[f,g] | TPH[h]- Gasoline and -Diesel[f] | Target Analyte List - Metals[f] | PAH | VOCs | TPH Gasoline and Diesel | Target Analyte List Metals |
| Tier 1 | Unit 1 Concrete Apron Edge | 2 | 3 | 6 | | | | | | X | X | X | X |
| | Unit 2 Drainage Ditch | 3 | 3 | 9 | X | | X | X | X | | | | |
| | Unit 3 Storage Area | 3 | 3 | 9 | X | | X | X | X | | | | |
| *Tier 1 Subtotals* | | | | 24 | 18 | | 18 | 18 | 18 | 6 | 6 | 6 | 6 |
| Tier 2 | Optional: Scope of Tier 2 would be to further define extent of shallow soil contamination; based on Tier 1 data, Phase I RI findings, and RCRA Facility Assessment data, with approval of Base Closure and Realignment (BRAC) Cleanup Team (BCT). | | | | | | | | | | | | |
| Tier 3 | Optional: Scope of Tier 3 would be to characterize horizontal and vertical extent of contamination below 10 feet depth; based on Tier 1 and 2 data, combined with the Phase I RI findings, with approval of BCT. | | | | | | | | | | | | |

Notes:
[a] at a minimum, 10 percent of detects and 5 percent of nondetects will be sent to the off-site laboratory for confirmation analyses
[b] these constituents cannot be determined in the field; all samples to be analyzed for these constituents will be sent to the off-site laboratory
[c] immunoassay analyses
[d] PAH – polynuclear aromatic hydrocarbons
[e] PCB – polychlorinated biphenyl
[f] mobile laboratory analyses
[g] VOC – volatile organic compound
[h] TPH – total petroleum hydrocarbons

#### 5.1.2.2 FIXED-BASE ANALYTICAL LABORATORIES

For QA/QC support and verification, six samples (four detects and two nondetects) will be submitted to the fixed-base laboratory to confirm field screening results. The fixed-based analyses are PAH (U.S. EPA Method 8310), VOCs (U.S. EPA Method 8010), TPH-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) under NFESC Level D protocols.

### 5.1.3 Unit 3: Storage Area

The nine Tier 1 soil samples that will be collected at Site 6, Unit 3, will be analyzed according to the methods discussed below.

#### 5.1.3.1 FIELD SCREENING

All soil samples will be field screened for PAH with immunoassay test kits (U.S. EPA Method 4035), and for VOCs (U.S. EPA Method 8010), TPH-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) using an appropriately equipped mobile laboratory.

#### 5.1.3.2 FIXED-BASE ANALYTICAL LABORATORIES

For QA/QC support and verification, three samples (two detects and one nondetect) will be submitted to the fixed-base laboratory to confirm field screening results. These fixed-based analyses are PAH (U.S. EPA Method 8310), VOCs (U.S. EPA Method 8010), TPH-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) under NFESC Level D protocols.

## 5.2 TIER 2

A Tier 2 request for analysis, if necessary, will be contingent upon the Tier 1 sample results.

## 5.3 TIER 3

A Tier 3 request for analysis, if necessary, will be contingent upon the Tier 1 and Tier 2 sample results.

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# Section 6
# FIELD METHODS AND PROCEDURES

This section presents site-specific field methods that will be used to collect samples and other field data. The field methods referenced in this section are from Section 6 of the FSP and the Comprehensive Long-Term Environmental Action Navy (CLEAN) Standard Operating Procedures, which discuss specific field methods and procedures.

## 6.1 INITIAL SURVEYS

Before the collection of Phase II RI/FS soil samples, the site will be scaled, and sampling locations will be staked or paint-marked. Once a sampling point is marked, utility clearances will be made before collecting any sample that uses power equipment to reach the sample depth. Utility clearances may also be made at locations where samples are being collected using a hand auger. Nonintrusive utility clearances will be completed by a subcontractor, using geophysical methodology in conjunction with site activities.

Each sampling point will be located by survey, using the California Plane Coordinate System, with northings and eastings determined to the nearest 0.1 foot. The surface elevation will be determined to the nearest 0.01 foot.

## 6.2 TIER 1

All samples in Tier 1 will be collected at the locations and depths described in Section 4.2. More information on soil sampling procedures is provided in Section 6 of the FSP.

### 6.2.1 Unit 1: Concrete Apron Edge

The six Tier 1 soil samples will be collected at Site 6, Unit 1, at depths of 0, 5, and 10 feet bgs in two borings as indicated below.

#### 6.2.1.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig with a 140-pound hammer. All soil sampling will be conducted as detailed in Section 6 of the FSP.

### 6.2.2 Unit 2: Drainage Ditch

The nine Tier 1 soil samples will be collected at Site 6, Unit 2, at depths of 0, 5, and 10 feet bgs in three borings as indicated below.

#### 6.2.2.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig with a 140-pound hammer. All soil sampling will be conducted as detailed in Section 6 of the FSP.

### 6.2.3 Unit 3: Storage Area

The nine Tier 1 soil samples will be collected at Site 6, Unit 3, at depths of 0, 5, and 10 feet bgs in three borings as indicated below.

#### 6.2.3.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig with a 140-pound hammer. All soil sampling will be conducted as detailed in Section 6 of the FSP.

## 6.3 TIER 2

If Tier 2 soil sampling is conducted at Site 6, shallow soil samples will be collected as described above.

## 6.4 TIER 3

If Tier 3 sampling is conducted, deep soil samples (from 10 feet bgs until groundwater level) will be collected at 5-foot intervals, with a modified California split-spoon sampler equipped with stainless steel sleeves. The split-spoon sampler will be driven into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer. When drilling is required to depths of greater than 130 feet bgs, the hollow-stem auger drilling rig will be replaced by an air-rotary drilling rig. If groundwater sampling is necessary, sampling will follow procedures presented in Section 6 of the FSP.

## Section 7
# REFERENCES

Bechtel National, Inc. 1995a. *Final Work Plan, Phase II Remedial Investigation/Feasibility Study*. Marine Corps Air Station El Toro, California.

———. 1995b. *Final Quality Assurance Project Plan, Phase II Remedial Investigation/ Feasibility Study*. Marine Corps Air Station El Toro, California.

BNI. *See* Bechtel National, Inc.

Jacobs Engineering. *See* Jacobs Engineering Group, Inc.

Jacobs Engineering Group, Inc. 1993a. *Installation Restoration Program, Phase II Remedial Investigation/Feasibility Study, Draft Work Plan*. Marine Corps Air Station El Toro, California.

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**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**

**CLEAN II**

# FIELD SAMPLING PLAN ATTACHMENT G OPERABLE UNIT 3 – SITE 7 – DROP TANK DRAINAGE AREA NO. 2 MCAS EL TORO, CALIFORNIA

**CTO-0059**

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August 1995

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**ACRONYMS/ABBREVIATIONS** ..... G-iii

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# ACRONYMS/ABBREVIATIONS

| | |
|---|---|
| bgs | below ground surface |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| COPC | chemical of potential concern |
| EE/CA | Engineering Evaluation/Cost Analysis |
| FS | Feasibility Study |
| FSP | Field Sampling Plan |
| Irvine Subbasin | Irvine Groundwater Subbasin |
| LUFT | (California) Leaking Underground Fuel Tank (Field Manual) |
| MCAS | Marine Corps Air Station |
| MCL | maximum contaminant level |
| NEESA | Naval Energy and Environmental Support Activity |
| NFESC | Naval Facilities Engineering Service Center |
| PAH | polynuclear aromatic hydrocarbons |
| PCB | polychlorinated biphenyl |
| PRG | (U.S. EPA Region IX) Preliminary Remediation Goal |
| QAPP | Quality Assurance Project Plan |
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| SVOC | semivolatile organic compound |
| TDS | total dissolved solids |
| TFH | total fuel hydrocarbons |
| TPH | total petroleum hydrocarbons |
| TRPH | total recoverable petroleum hydrocarbons |
| U.S. EPA | United States Environmental Protection Agency |
| VOC | volatile organic compound |

# ACRONYMS/ABBREVIATIONS (continued)

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# Section 1
# OBJECTIVES

This Field Sampling Plan (FSP) for Site 7, the Drop Tank Drainage Area No. 2, outlines the field procedures and methodology to be used during the Remedial Investigation (RI)/Feasibility Study (FS) for this site. This FSP is written so field personnel unfamiliar with the site will be able to gather the required samples and field data. The purpose of this FSP is to assure that data collection will be comparable to and compatible with previous data collected at the site and with other sampling activities at other sites at Marine Corps Air Station (MCAS) El Toro.

## 1.1 SAMPLING OBJECTIVES

The specific objectives for sampling at Site 7 are as follows:

- verify boundaries of waste disposal activities;
- characterize the nature and extent of contamination;
- estimate the vertical and horizontal extent of contamination; and
- characterize site-specific groundwater contamination, if soil contamination extends to groundwater.

## 1.2 DATA USAGE

To satisfy the RI/FS objectives for Drop Tank Drainage Area No. 2, the data to be collected, compiled, and analyzed will be used to perform the following:

- characterize subsurface soils;
- establish stratigraphic controls;
- establish geotechnical parameters;
- characterize groundwater conditions and quality (where soil contamination suggests);
- determine the types of contaminants in soil and/or groundwater;
- estimate the extent of contaminants in soil and/or groundwater;
- evaluate human health and ecological risks;
- evaluate the mass of contaminants;
- evaluate cleanup levels;
- characterize the feasible removal or remedial actions, if necessary; and
- evaluate remedial alternatives.

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# Section 2
# BACKGROUND

This section generally describes and discusses the results of previous investigations at Site 7. This section also provides a brief compilation of the data used to develop the site-specific FSP for Phase II RI/FS activities. Previous investigations and reports provide a more thorough discussion of site history, activities, and summaries of previous investigations.

## 2.1 SITE DESCRIPTION

Drop Tank Drainage Area No. 2 is located in the southwest quadrant of MCAS El Toro, north and east of Hangar Buildings 295 and 296, at an elevation of approximately 275 feet above mean sea level (Map G3-1). In the north area, drainage flows to a catch basin that discharges into Aqua Chinon Wash. To the east of Buildings 295 and 296, drainage flows to a ditch and eventually joins the Aqua Chinon Wash. In the southern portion of the site, surface drainage generally runs to the south (Jacobs Engineering 1993a).

### 2.1.1 History

Site 7 was previously used for aircraft drop tank storage and drainage. In the north area, aircraft drop tanks were drained and washed from approximately 1969 to 1983. An estimated 7,000 gallons of JP-5 and lubrication oil were disposed in this area. In the east area, the hangars may have been sprayed with more than 11,000 gallons of lubrication oil and nearly 4,000 gallons of JP-5 for dust control between 1972 and 1983. From 1972 to 1978, portions of this area served as an unpaved parking lot. Lubricant oils were sprayed for dust control in the parking area. The concrete pad on the site, located west of Buildings 295 and 296, was constructed in 1978 (Jacobs Engineering 1993a). In 1982, 2,000 gallons of JP-5 were accidentally spilled in this area from a tank truck and were washed onto the soil at the edge of the pad. Surface drainage in this area is generally to the south towards Aqua Chinon Wash (Jacobs Engineering 1993a).

### 2.1.2 Geology

The geology of Site 7 consists of Quaternary alluvial and marine deposits (Jacobs Engineering 1993b). Holocene deposits consist of a matrix of fine-grained overbank deposits and some coarse-grained stream channel deposits. These soils are derived from the Santa Ana Mountains to the east and conformably overlie Pleistocene interbedded fine-grained lagoonal and near-shore marine deposits. Pleistocene deposits could not be differentiated from Holocene deposits in Phase I RI soil borings. Pleistocene deposits unconformably overlie semiconsolidated marine sandstones, siltstones, and conglomerates of late Miocene to late Pliocene, considered to be bedrock in the area.

Based on a review of the Phase I RI boring logs, the subsurface lithology at Site 7 consists of well-graded to silty sand, interbedded with silt and clay. Within the sand units are occasional gravel lenses that are probably associated with stream channels.

### 2.1.3 Hydrogeology

MCAS El Toro lies within the Irvine Groundwater Subbasin (Irvine Subbasin). Regional aquifers in the Irvine Subbasin tend to be composed of discontinuous lenses of clayey and silty sands and fine-grained gravels contained within a complex assemblage of sandy clays and sandy silts. Three general aquifer systems have been identified near the Station: a shallow and perched system, a principal aquifer zone, and a lower hydrogeologic system existing in bedrock (Jacobs Engineering 1993b).

The Phase I RI results indicate that the shallow perched zone is not present at Site 7. The principal aquifer is the main water-producing zone for the Irvine area and is of primary interest in this investigation. The principal aquifer is encountered about 120 feet beneath Site 7. The regional groundwater flow direction in the area of the site is to the northwest. The hydraulic gradient has been influenced strongly by the pumping of irrigation wells located west of MCAS El Toro.

## 2.2 PHASE I REMEDIAL INVESTIGATION RESULTS

During the Phase I RI, Site 7 (Map G3-2) consisted of five strata:

- Stratum 1 - North Pavement Edge;
- Stratum 2 - Old East Pavement Edge;
- Stratum 3 - New East Pavement Edge;
- Stratum 4 - Drainage Ditch; and
- Stratum 5 - Open Dirt Area (partially paved area south of Building 296).

Strata 1, 2, and 3 consist of the current or former perimeters of the concrete apron surrounding Buildings 295 and 296. Drop tanks were drained, and residual fuel was flushed or allowed to seep into the ground along the edge of the pavement. In Stratum 4, large discharges from the apron may have migrated along the ditch. Stratum 5 has served as a storage area as early as 1952.

During the Phase I RI, the following site-specific activities were conducted:

- shallow soil samples (0 to 10 feet below ground surface [bgs]) were collected from 16 locations in Strata 1 through 5;
- three deep borings were drilled and sampled;
- three groundwater monitoring wells (07_DBMW43, 70, and 100) were drilled, installed, and sampled (subsurface soil and groundwater);
- three downgradient monitoring wells (07_DGMW71, 72, and 91) were drilled, installed, and sampled (subsurface soil and groundwater);
- soil samples were analyzed for metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), total fuel hydrocarbons (TFH), total recoverable petroleum hydrocarbons (TRPH), pesticides/polychlorinated biphenyls (PCBs); and

- groundwater samples were analyzed for metals, general chemistry VOCs, SVOCs, TFH, TRPH, pesticides/PCBs, herbicides, and gross alpha/beta.

United States Environmental Protection Agency (U.S. EPA) Region IX Preliminary Remediation Goals (PRGs) and ecological screening criteria for the site were compared with corresponding soil sample analytical results. The results of this comparison for shallow soil are listed below (Jacobs Engineering 1993a, Table A7-3a):

- dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, and benzo(b)fluoranthene exceed PRGs; and benzo(a)pyrene, dichlorodiphenyldichloroethene, barium, and lead exceed ecological screening criteria in Stratum 1;
- no chemicals of potential concern (COPCs) exceed PRGs, and only cobalt exceeds ecological screening criteria in Stratum 2;
- dibenzo(a,h) anthracene, indeno(1,2,3-cd)pyrene, benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, and benzo(b)fluoranthene exceed PRGs; and benzo(a)pyrene, barium, and lead exceed ecological screening criteria in Stratum 3;
- no COPCs exceed PRGs, and only lead exceeds ecological screening criteria in Stratum 4; and
- benzo(a)pyrene, lead, and dieldren exceed PRGs, and benzo(a)pyrene, mercury, and lead exceed ecological screening criteria in Stratum 5.

Based on Leaking Underground Fuel Tank (LUFT) Field Manual guidelines (LUFT 1989), petroleum hydrocarbons detected in shallow soil at Site 7 do not appear to pose a threat to groundwater (Jacobs Engineering 1993a).

PRGs and maximum contaminant levels (MCLs) were compared with groundwater sample analytical results from the monitoring wells constructed as part of the investigation of Site 7 (07_DBMW43, 70 and 100 and 07_DGMW71, 72, and 91) (Jacobs Engineering 1993a, Table A7-3b). The results of this comparison are listed below:

- carbon tetrachloride and nitrate/nitrite-N exceed PRGs and manganese, nitrate/nitrite-N, selenium, total dissolved solids (TDS) exceed MCLs in the on-site well 07_DBMW43;
- carbon tetrachloride, nitrate/nitrite-N, antimony, and selenium exceed PRGs and carbon tetrachloride, chloride, nitrate/nitrite-N, selenium, sulfate, and TDS exceed MCLs in the on-site well 07_DBMW70;
- carbon tetrachloride, arsenic, selenium, and beryllium exceed PRGs and carbon tetrachloride, antimony, nickel, nitrate/nitrite-N, selenium, TDS exceed MCLs in the on-site well 07_DBMW100;
- 1,1-dichloroethene, trichloroethylene, arsenic, and nitrate/nitrite-N exceed PRGs and trichloroethylene, selenium, nitrate/nitrite-N, and TDS exceed MCLs in the downgradient well 07_DGMW71;

- carbon tetrachloride, tetrachloroethene, trichloroethylene, antimony, and nitrate/nitrite-N exceed PRGs and carbon tetrachloride, trichloroethylene, antimony, nitrate/nitrite-N, sulfate, and TDS exceed MCLs in the downgradient well 07_DGMW72; and
- carbon tetrachloride, tetrachloroethene, trichloroethylene, antimony, and nitrate/nitrite-N exceed PRGs and carbon tetrachloride, trichloroethylene, antimony, cadmium, nickel, nitrate/nitrite-N, and TDS exceed MCLs in the downgradient well 07_DGMW91.

## Section 3
# MAPS

The maps on the following pages illustrate the site location at MCAS El Toro, site boundaries, site units, physical features of the site, previous sampling locations, and proposed Phase II sampling locations (where known). These maps are referenced in other sections of this FSP.

The proposed Phase II sampling locations presented on these maps are intended to illustrate the type of sampling strategy proposed for each unit. Other considerations (e.g., randomly selected starting points, underground utilities/pipelines, or overhead obstacles) could result in adjustments to sampling locations. The actual field sample locations will be accurately recorded by field personnel relative to surveyed coordinates, and if any sampling points require relocation, the reasons for such changes will be described in the field notebook.

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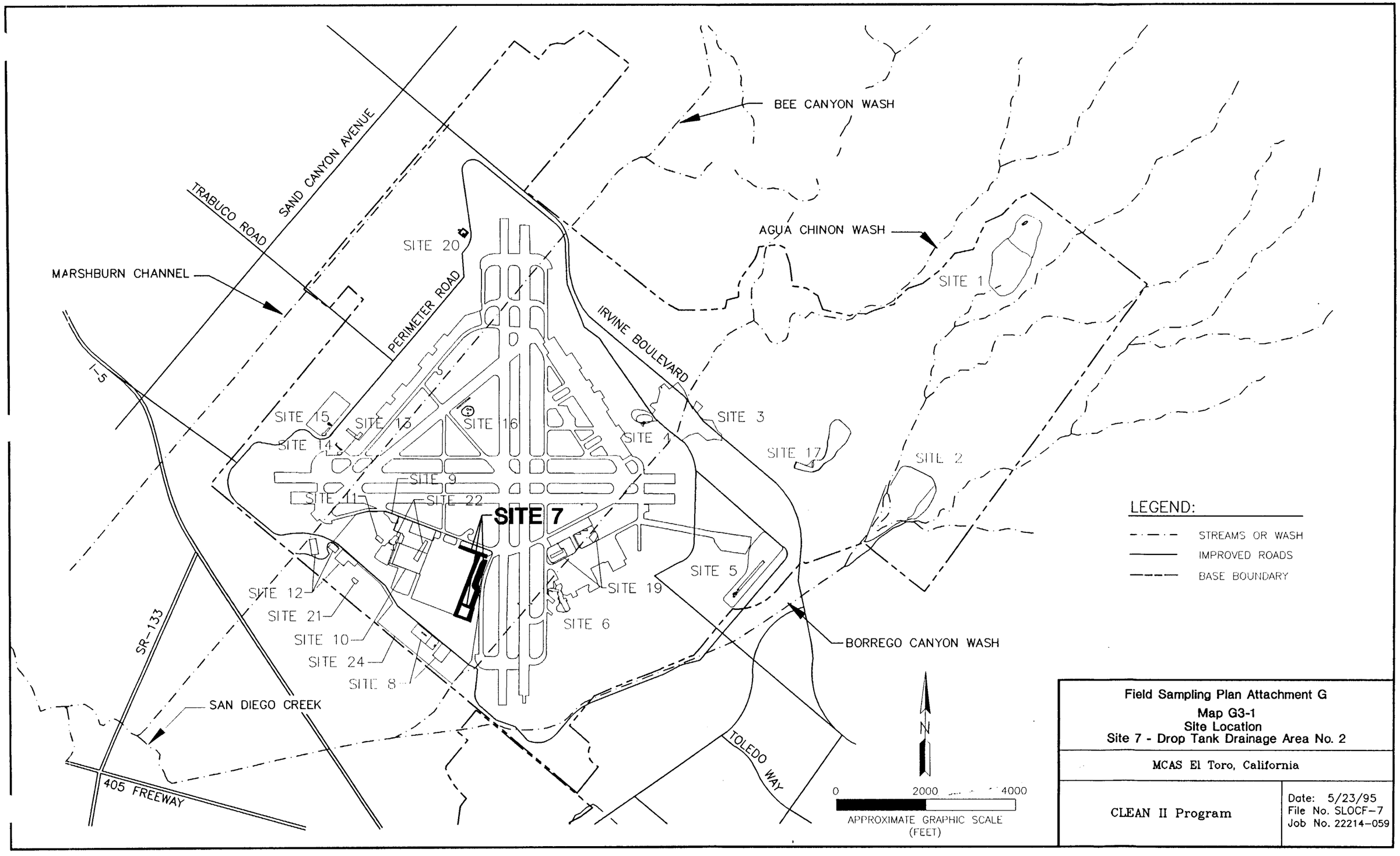


**Field Sampling Plan Attachment G**
**Map G3-1**
**Site Location**
**Site 7 - Drop Tank Drainage Area No. 2**

MCAS El Toro, California

CLEAN II Program

Date: 5/23/95
File No. SLOCF-7
Job No. 22214-059

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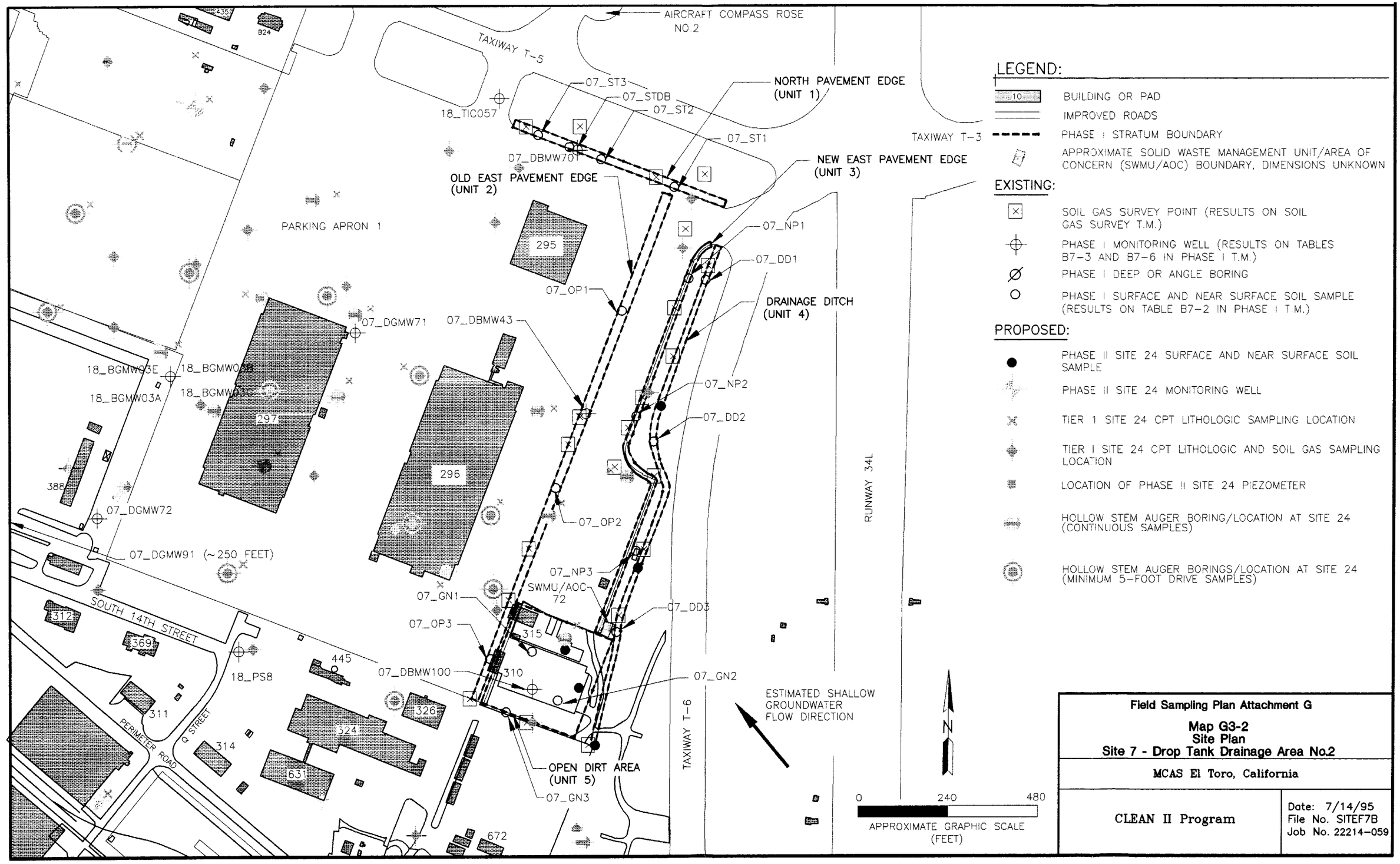
AIRCRAFT COMPASS ROSE NO.2
TAXIWAY T-5
TAXIWAY T-3
NORTH PAVEMENT EDGE (UNIT 1)
NEW EAST PAVEMENT EDGE (UNIT 3)
OLD EAST PAVEMENT EDGE (UNIT 2)
DRAINAGE DITCH (UNIT 4)
OPEN DIRT AREA (UNIT 5)
SWMU/AOC 72
07_ST3
07_STDB
07_ST2
07_ST1
07_DBMW701
18_TIC057
07_NP1
07_DD1
07_OP1
07_DBMW43
07_DGMW71
07_NP2
07_DD2
07_OP2
07_NP3
07_DD3
07_GN1
07_OP3
07_DBMW100
07_GN2
07_GN3
18_BGMW03E
18_BGMW03A
07_DGMW72
07_DGMW91 (~250 FEET)
18_PS8
PARKING APRON 1
SOUTH 14TH STREET
PERIMETER ROAD
Q STREET
TAXIWAY T-6
RUNWAY 34L
ESTIMATED SHALLOW GROUNDWATER FLOW DIRECTION
N
0 240 480
APPROXIMATE GRAPHIC SCALE (FEET)
LEGEND:
BUILDING OR PAD
IMPROVED ROADS
PHASE I STRATUM BOUNDARY
APPROXIMATE SOLID WASTE MANAGEMENT UNIT/AREA OF CONCERN (SWMU/AOC) BOUNDARY, DIMENSIONS UNKNOWN
EXISTING:
SOIL GAS SURVEY POINT (RESULTS ON SOIL GAS SURVEY T.M.)
PHASE I MONITORING WELL (RESULTS ON TABLES B7-3 AND B7-6 IN PHASE I T.M.)
PHASE I DEEP OR ANGLE BORING
PHASE I SURFACE AND NEAR SURFACE SOIL SAMPLE (RESULTS ON TABLE B7-2 IN PHASE I T.M.)
PROPOSED:
PHASE II SITE 24 SURFACE AND NEAR SURFACE SOIL SAMPLE
PHASE II SITE 24 MONITORING WELL
TIER 1 SITE 24 CPT LITHOLOGIC SAMPLING LOCATION
TIER I SITE 24 CPT LITHOLOGIC AND SOIL GAS SAMPLING LOCATION
LOCATION OF PHASE II SITE 24 PIEZOMETER
HOLLOW STEM AUGER BORING/LOCATION AT SITE 24 (CONTINUOUS SAMPLES)
HOLLOW STEM AUGER BORINGS/LOCATION AT SITE 24 (MINIMUM 5-FOOT DRIVE SAMPLES)
Field Sampling Plan Attachment G
Map G3-2
Site Plan
Site 7 - Drop Tank Drainage Area No.2
MCAS El Toro, California
CLEAN II Program
Date: 7/14/95
File No. SITEF7B
Job No. 22214-059

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# Section 4
# RATIONALE FOR SAMPLING LOCATIONS

This section explains the rationale for the number of sampling programs, types of samples, locations of samples, and analytical parameters. The rationale for sampling is based on site conditions, previous investigations, and data quality objectives as presented in the appendices of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.1 SAMPLING PROGRAMS, SAMPLE TYPES, AND LOCATIONS

Sampling programs, types of samples, and locations are presented based on the smallest area of study. For some sites, the smallest area of study is a site unit; for other sites, the area of study may be the entire site. Selection of sampling programs, sample types, and locations is based on:

- site activities and history;
- types of media suspected or known to be impacted from previous investigations;
- objectives of site-specific RI/FS efforts; and
- site-specific initial surveys.

The site will be represented by five areas (units) for the Phase II RI/FS Investigation. The five units will correspond to the same areas defined as the five strata in the Phase I RI for Site 7 (Map G3-2). The units will be sampled using a tiered sampling approach, as discussed in following sections. Previous site activities, Phase I RI sampling results, and regulatory comments were used to formulate the Phase II sampling approach.

During the Phase I RI, soil samples were collected from each stratum, and COPCs were identified and evaluated against PRGs. The Phase II RI will attempt to collect more soil sampling data from each unit to provide enough information to perform risk assessments for the units and Site 7.

## 4.2 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk. The Tier 1 sampling approach will consist of the collection of shallow soil samples (less than 10 feet bgs) from a specific number of sampling locations within the unit. The number of sampling locations has been proposed in a manner that will allow accurate comparison of the Phase I and II data to estimate risk for the unit. An explanation of the proposed sampling designs for Tier 1 soil sampling can be found in Section 4 of the Phase II RI/FS Work Plan (BNI 1995a).

### 4.2.1 Unit 1: North Pavement Edge

The North Pavement Edge consists of the concrete apron edge north of Buildings 295 and 296. Unit 1 is presently being addressed as an Early Action through the Non-Time-Critical Removal Action process. An Engineering Evaluation/Cost Analysis (EE/CA) has been prepared for this unit.

### 4.2.2 Unit 2: Old East Pavement Edge

The Unit 2 boundaries of Site 7 consist of the old east pavement edge of the site. No Further Investigation has been approved for this unit (Map G3-2).

### 4.2.3 Unit 3: New East Pavement Edge

The Site 7, Unit 3, consists of the new east pavement edge of the site. Unit 3 has been approved for Early Action and is being addressed through the Non-Time-Critical Removal Action process. An EE/CA will be prepared for this unit.

### 4.2.4 Unit 4: Drainage Ditch

The Unit 4 boundaries of Site 7 consist of the drainage ditch located east of the pavement.

#### 4.2.4.1 SOIL SAMPLES

Based on previous Phase I RI results, soil samples will be collected at 0, 5, and 10 feet bgs in the three systematic random sampling locations on an axis at Unit 4 (Map G3-2).

### 4.2.5 Unit 5: Open Dirt Area

The Unit 5 boundaries of Site 7 consist of the open partially paved area south of Building 296.

#### 4.2.5.1 SOIL SAMPLES

Based on previous Phase I RI results, soil samples will be collected at 0, 5, and 10 feet bgs in the two stratified random sampling locations at Unit 5 (Map G3-2).

## 4.3 TIER 2

The Tier 2 sampling program will also focus exclusively on shallow soil (0 to 10 feet) conditions. The primary objective of this program will be to refine the data on the extent of shallow soil contamination identified during the Tier 1 sampling. Tier 2 sample locations will be based on these sample results. The process by which the Tier 2 sample locations will be selected is detailed in Appendix G of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.4 TIER 3

The objective of a Tier 3 soil sampling program is to estimate the extent of a contaminant plume in deeper subsurface soils. To accomplish this goal, a series of boreholes will be drilled and sampled. The location of Tier 3 boreholes is intended to minimize the number of boreholes required to define the lateral and vertical extent of the contaminant plume in deeper subsurface soils. Groundwater samples will be collected only when a contaminant plume in deeper subsurface soils has been traced (through a drilling and soil sampling program) downward to the water table. At such units/sites, the objectives of the sampling

program must then be expanded to include a determination of whether groundwater has been adversely impacted as a result of the historic activities at this unit/site.

The process by which the locations for Tier 3 soil borings and monitoring wells will be selected is detailed in Appendix G of the Phase II RI/FS Work Plan (BNI 1995a).

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# Section 5
# REQUEST FOR ANALYSES

Requests for analyses are based on:

- site activities and history,
- results of previous investigations, and
- objectives of site-specific RI/FS efforts.

The analytical methods referenced in this section are from the Phase II RI/FS Quality Assurance Project Plan (QAPP) (BNI 1995b). Section 6 in the QAPP specifies the number and/or frequency for collection of field duplicate and blank samples during the Phase II field activities.

## 5.1 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk. The Tier 1 sampling approach will consist of the collection of shallow soil samples (less than 10 feet bgs) from a specific number of sampling locations within the unit. Table G5-1 lists all soil samples and associated analyses for the Units in Site 7.

### 5.1.1 Unit 4: Drainage Ditch

The nine Tier 1 soil samples that will be collected at Site 7, Unit 4, will be analyzed according to the methods listed below.

#### 5.1.1.1 FIELD SCREENING

All soil samples will be field screened for polynuclear aromatic hydrocarbons (PAH) with immunoassay test kits (U.S. EPA Method 4035), and for VOCs (U.S. EPA Method 8010), total petroleum hydrocarbons (TPH)-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) using an appropriately equipped mobile laboratory.

#### 5.1.1.2 FIXED-BASE ANALYTICAL LABORATORIES

All soil samples will be analyzed using a fixed-base laboratory for pesticides/PCBs (U.S. EPA Method 8080) under Naval Facilities Engineering Service Center (NFESC, formerly known as Naval Energy and Environmental Support Activity [NEESA]) Level D protocols. Six samples (four detects and two nondetects) will be submitted to the fixed-base laboratory to confirm field screening results. These fixed-based analyses are PAH (U.S. EPA Method 8310), VOCs (U.S. EPA Method 8010), TPH-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) under NFESC Level D protocols.

### 5.1.2 Unit 5: Open Dirt Area

The six Tier 1 soil samples that will be collected at Site 7, Unit 5, will be analyzed according to the methods listed below.

**Table G5-1**
**Soil Sampling and Analysis**

| Tier | Unit/Name | PHASE II RI/FS SAMPLE NUMBERS | | | FIELD[a] - IMMUNOASSAY OR MOBILE LABORATORY | | | | | OFF-SITE LABORATORY[b] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Locations | Samples/ Location | Total Samples | PAH[c,d] | PCBs[c,e] | VOCs[f,g] | TPH[h]- Gasoline and -Diesel[f] | Target Analyte List - Metals[f] | Pesticides and PCBs | Herbicides |
| Tier 1 | Unit 4 Drainage Ditch | 3 | 3 | 9 | X | | X | X | X | X | |
| | Unit 5 Open Dirt Area | 2 | 3 | 6 | X | | X | X | X | X | |
| *Tier 1 Subtotals* | | | | 15 | 15 | | 15 | 15 | 15 | 15 | |
| Tier 2 | Optional: Scope of Tier 2 would be to further define extent of shallow soil contamination; based on Tier 1 data, Phase I RI findings, RCRA Facility Assessment (RFA) data, and soil gas survey results, with approval of Base Closure and Realignment (BRAC) Cleanup Team (BCT). | | | | | | | | | | |
| Tier 3 | Optional: Scope of Tier 3 would be to characterize horizontal and vertical extent of contamination below 10 feet depth; based on Tier 1 and 2 data, Phase I RI findings, soil gas survey results and/or RFA data, with approval of BCT. | | | | | | | | | | |

Notes:
- [a] at a minimum, 10 percent of detects and 5 percent of nondetects will be sent to the off-site laboratory for confirmation analyses
- [b] these constituents cannot be determined in the field; all samples to be analyzed for these constituents will be sent to the off-site laboratory
- [c] immunoassay analyses
- [d] PAH – polynuclear aromatic hydrocarbons
- [e] PCB – polychlorinated biphenyl
- [f] mobile laboratory analyses
- [g] VOC – volatile organic compound
- [h] TPH – total petroleum hydrocarbons
- [i] No Further Response Action Planned

#### 5.1.2.1 FIELD SCREENING

All soil samples will be field-screened for PAH with immunoassay test kits (U.S. EPA Method 4035), and for VOCs (U.S. EPA Method 8010), TPH-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) using an appropriately equipped mobile laboratory.

#### 5.1.2.2 FIXED-BASE ANALYTICAL LABORATORIES

All soil samples will be analyzed using a fixed-base laboratory for pesticides/PCBs (U.S. EPA Method 8080) under NFESC Level D protocols. Three samples (two detects and one nondetect) will be submitted to the fixed-base laboratory to confirm field screening results. The fixed-based analyses are PAH (U.S. EPA Method 8310), VOCs (U.S. EPA Method 8010), TPH-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) under NFESC Level D protocols.

## 5.2 TIER 2

A Tier 2 request for analysis, if necessary, will be contingent upon the Tier 1 sample results.

## 5.3 TIER 3

A Tier 3 request for analysis, if necessary, will be contingent upon the Tier 1 and Tier 2 sample results.

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# Section 6
# FIELD METHODS AND PROCEDURES

This section presents site-specific field methods that will be used to collect samples and other field data. The field methods referenced in this section are from Section 6 of the FSP and the Comprehensive Long-Term Environmental Action Navy (CLEAN) Standard Operating Procedures, which discuss specific field methods and procedures.

## 6.1 INITIAL SURVEYS

Before the collection of Phase II RI/FS soil samples, the site will be scaled and sampling locations will be staked or paint-marked. Once a sampling point is marked, utility clearances will be made before collecting any sample that uses power equipment to reach the sample depth. Utility clearances may also be made at locations where samples are being collected using a hand auger. Nonintrusive utility clearances will be completed by a subcontractor, using geophysical methodology in conjunction with site activities.

Each sampling point will be located by survey, using the California Plane Coordinate System, with northings and eastings determined to the nearest 0.1 foot. The surface elevation will be determined to the nearest 0.01 foot.

## 6.2 TIER 1

All samples in Tier 1 will be collected at the locations and depths described in Section 4.2. More information on soil sampling procedures is provided in Section 6 of the FSP.

### 6.2.1 Unit 4: Drainage Ditch

The nine Tier 1 soil samples will be collected at Site 7, Unit 4, at depths of 0, 5, and 10 feet bgs in three borings as indicated below.

#### 6.2.1.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig with a 140-pound hammer. All soil sampling will be conducted as detailed in Section 6 of the FSP.

### 6.2.2 Unit 5: Open Dirt Area

The six Tier 1 soil samples will be collected at Site 7, Unit 5, at depths of 0, 5, and 10 feet bgs in two borings as indicated below.

#### 6.2.2.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig with a 140-pound hammer. All soil sampling will be conducted as detailed in Section 6 of the FSP.

## 6.3 TIER 2

If Tier 2 soil sampling is conducted at Site 7, shallow soil samples will be collected as described above.

## 6.4 TIER 3

If Tier 3 sampling is conducted, deep soil samples (from 10 feet bgs to groundwater level) will be collected at 5-foot intervals, with a modified California split-spoon sampler equipped with stainless steel sleeves. The split-spoon sampler will be driven into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer. When drilling is required to depths of greater than 130 feet bgs, the hollow-stem auger drilling rig will be replaced by an air-rotary drilling rig. If groundwater sampling is necessary, sampling will follow procedures presented in Section 6 of the FSP.

## Section 7
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Contracts Department
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Contract No. N68711-92-D-4670

**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**

**CLEAN II**

# FIELD SAMPLING PLAN
# ATTACHMENT H
# OPERABLE UNIT 3 –
# SITE 8 – DRMO STORAGE YARD
# MCAS EL TORO, CALIFORNIA

**CTO-0059**

Prepared by:

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August 1995

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# ACRONYMS/ABBREVIATIONS

| | |
|---|---|
| bgs | below ground surface |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| COPC | chemical of potential concern |
| CSY | Current Storage Yard |
| DDE | dichlorodiphenyldichloroethene |
| DRMO | Defense Reutilization and Marketing Office |
| FSP | Field Sampling Plan |
| Irvine Subbasin | Irvine Groundwater Subbasin |
| LUFT | (California) Leaking Underground Fuel Tank (Field Manual) |
| MCAS | Marine Corps Air Station |
| MCL | maximum contaminant level |
| MSL | mean sea level |
| NEESA | Naval Energy and Environmental Support Activity |
| NFESC | Naval Facilities Engineering Service Center |
| OSY | Old Storage Yard |
| PAH | polynuclear aromatic hydrocarbons |
| PCB | polychlorinated biphenyl |
| PRG | (U.S. EPA Region IX) Preliminary Remediation Goal |
| QAPP | Quality Assurance Project Plan |
| RI/FS | Remedial Investigation/Feasibility Study |
| SVOC | semivolatile organic compound |
| TAL | target analyte list |
| TCE | trichloroethene |
| TDS | total dissolved solids |
| TFH | total fuel hydrocarbons |
| TPH | total petroleum hydrocarbons |
| U.S. EPA | U.S. Environmental Protection Agency |
| VOC | volatile organic compound |

# Section 1
# OBJECTIVES

This Field Sampling Plan (FSP) for Site 8, the Defense Reutilization and Marketing Office (DRMO) Storage Yard, outlines the field procedures and methodology to be used during the Remedial Investigation(RI)/Feasibility Study (FS) for this site. The purpose of this FSP is to enable field personnel unfamiliar with the site to gather the required samples and field data. It is also intended to assure that data collection will be comparable to and compatible with previous data collected at the site and with other sampling activities at other sites at the Marine Corps Air Station (MCAS) El Toro.

## 1.1 SAMPLING OBJECTIVES

The specific objectives for sampling at Site 8 are as follows:

- verify boundaries of waste disposal activities;
- characterize the nature and extent of contamination;
- estimate the vertical and horizontal extent of contamination; and
- characterize site-specific groundwater contamination, if soil contamination extends to groundwater.

## 1.2 DATA USAGE

To satisfy the RI/FS objectives for the DRMO Storage Yard, the data to be collected, compiled, and analyzed will be used to perform the following:

- characterize subsurface soils;
- establish stratigraphic controls;
- establish geotechnical parameters;
- characterize groundwater conditions and quality (where soil contamination suggests);
- determine the types of contaminants in soil and/or groundwater;
- estimate the extent of contaminants in soil and/or groundwater;
- evaluate human health and ecological risks;
- evaluate the mass of contaminants;
- evaluate cleanup levels;
- characterize the feasible removal or remedial actions, if necessary; and
- evaluate remedial alternatives.

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# Section 2
# BACKGROUND

This section presents a discussion on the general description and the results of previous investigations at Site 8. This section also provides a brief compilation of the data used to develop the site-specific FSP for Phase II RI/FS activities. Previous investigations and reports provide a more thorough discussion of site history, activities, and summaries of previous investigations.

## 2.1 SITE DESCRIPTION

The DRMO Storage Yard (Site 8) is located near the western edge of MCAS El Toro at an elevation of about 290 feet above mean sea level (MSL) on the southwest corner of South Marine Way and R Street (Map H3-1). Site 8 is a storage area for containerized liquid chemicals and various scrap materials, including mechanical and electrical components. The site has two primary areas of concern, the Old Salvage Yard (OSY), and the Current Storage Yard (CSY). The CSY (consisting of both the west and east sections) comprises the western portion of Site 8 and occupies approximately 4.5 acres. The OSY is approximately 2.5 acres. Currently, the OSY is a gravel-topped pad elevated several feet above the surrounding street culverts, used as a parking lot for Building 800 (Map H3-2) (Jacobs Engineering 1993a).

### 2.1.1 History

In 1984, several gallons of oil containing polychlorinated biphenyls (PCBs) were spilled in the CSY. The contaminated soil, covering an area of about 1,500 feet$^2$ at the eastern section of the CSY, was excavated to a depth of 1 foot and removed from the site (Jacobs Engineering 1993a).

### 2.1.2 Geology

The geology of Site 8 consists of Quaternary alluvial and marine deposits (Jacobs Engineering 1993b). Holocene deposits consist of a matrix of fine-grained overbank deposits and some coarse-grained stream channel deposits. These soils are derived from the Santa Ana Mountains to the east and conformably overlie Pleistocene interbedded fine-grained lagoonal and near-shore marine deposits. Pleistocene deposits could not be differentiated from Holocene deposits in Phase I RI soil borings. Pleistocene deposits unconformably overlie semiconsolidated marine sandstones, siltstones, and conglomerates of late Miocene to late Pliocene, which are considered to be bedrock in the area.

Based on a review of boring logs from the Phase I RI, the subsurface lithology at Site 8 consists of sandy lean clay, sandy silt, and poorly graded fine sand.

### 2.1.3 Hydrogeology

MCAS El Toro lies within the Irvine Groundwater Subbasin (Irvine Subbasin). Regional aquifers in the Irvine Subbasin tend to be composed of discontinuous lenses of clayey

and silty sands and fine-grained gravels contained within a complex assemblage of sandy clays and sandy silts. Three general aquifer systems have been identified near the Station: a shallow and perched system, a principal aquifer zone, and a lower hydrogeologic system existing in bedrock (Jacobs Engineering 1993b).

The Phase I RI results indicate the shallow, perched zone is not present at Site 8. The principal aquifer is the main water-producing zone for the Irvine area and is of primary interest in this investigation. The principal aquifer is encountered about 120 feet beneath Site 8. The regional groundwater flow direction is to the northwest. The local hydraulic gradient has been influenced strongly by the pumping of irrigation wells located west of MCAS El Toro.

## 2.2 PHASE I REMEDIAL INVESTIGATION RESULTS

During the Phase I RI, Site 8 was divided into five strata (Map H3-2):

- Stratum 1 - the eastern section of the CSY;
- Stratum 2 - the western section of the CSY;
- Stratum 3 - the Refuse Pile Area (soil beneath a former refuse pile);
- Stratum 4 - the PCB Spill Area; and
- Stratum 5 - the old salvage yard.

The following field activities were conducted during this phase (Jacobs Engineering 1993b):

- surface and shallow soil samples were collected from 14 locations (three each in the east and west sections of the CSY, the OSY, the Refuse Pile Area; one upgradient; and one at the deep boring);
- one 75-foot-deep boring was drilled and sampled at the eastern portion of the CSY;
- four 25-foot borings were drilled and sampled (three in the OSY and one in the Refuse Pile Area);
- one upgradient monitoring well (08_UGMW29) and two downgradient monitoring wells (08_DGMW73 and 74), were drilled, installed, and sampled (subsurface soil and groundwater);
- soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) pesticides/PCBs, herbicides (only samples from Stratum 3 and one sample from Stratum 1), total recoverable petroleum hydrocarbon, total fuel hydrocarbons (TFH), target analyte list (TAL) metals; and
- groundwater samples were analyzed for general chemistry, VOCs, SVOCs, pesticides/PCBs, herbicides (only samples from the two downgradient monitoring wells 08_DGMW73 and 74), TFH, total cyanide, and TAL metals.

United States Environmental Protection Agency (U.S. EPA) Region IX Preliminary Remediation Goals (PRGs) and ecological screening criteria were compared with corresponding analytical data obtained from this site (Jacobs Engineering 1993a, page A8-9 to A8-10). The results of this comparison are listed below:

- benzo(a)pyrene, dieldren, Aroclor 1248, Aroclor 1254, and Aroclor 1260 exceed PRGs; and benzo(a)pyrene, 4,4'- dichlorodiphenyldichloroethene (DDE), PCB-1254, lead, and zinc exceed ecological screening criteria in Stratum 1;
- no detected chemicals of potential concern (COPCs) exceed PRGs or ecological screening criteria in Stratum 2;
- alpha chlordane, dieldren, and Aroclor 1248, 1254, and 1260 exceed PRGs; and alpha chlordane, dieldren, Aroclor 1254, aluminum, barium, cadmium, copper, lead, mercury, and zinc exceed ecological screening criteria in Stratum 3;
- dieldren, Aroclor 1254 and 1260 exceed PRGs; and dieldren, DDE, and Aroclor 1254 exceed ecological screening criteria in Stratum 4; and
- no detected COPCs exceed PRGs in Stratum 5; ecological screening criteria were not evaluated for that stratum.

COPCs detected in groundwater samples were compared to PRGs and maximum contaminant levels (MCLs):

- 1,1-dichloroethene, 1,1,2-trichloroethane, carbon tetrachloride, tetrachloroethane, trichloroethylene, arsenic, and nitrate/nitrite-N in groundwater exceed PRGs; and 1,1-dichloroethene, carbon tetrachloride, tetrachloroethane, trichloroethene (TCE), arsenic, nickel, nitrate/nitrite-N, and total dissolved solids (TDS) in groundwater exceed MCLs in upgradient well (08_DGMW73);
- 1,1-dichloroethene, carbon tetrachloride, tetrachloroethane, TCE, arsenic, and nitrate/nitrite-N in groundwater exceed PRGs; and carbon tetrachloride, tetrachloroethane, TCE, nickel, nitrate/nitrite-N, and TDS in groundwater exceed MCLs in downgradient well (08_DGMW74); and
- TCE, and nitrate/nitrite-N in groundwater exceed PRGs; and TCE, nickel, nitrate/nitrite-N, and TDS exceed MCLs in upgradient well (08_UGMW29).

Petroleum hydrocarbons detected in shallow soil samples were compared to California Leaking Underground Fuel Tank (LUFT) Field Manual guidelines (LUFT 1989) to evaluate their potential to migrate to the groundwater. Based on LUFT guidelines, TFH-diesel in Stratum 4 shallow soil may pose a threat to groundwater. No other classes of compounds detected in subsurface soil were found to have the potential to reach the groundwater (Jacobs Engineering 1993a).

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## Section 3
# MAPS

The maps on the following pages present the site location at MCAS El Toro, site boundaries, site units, physical features of the site, previous sampling locations, and proposed Phase II sampling locations (where known). These maps are referenced in other sections of this FSP.

The proposed Phase II sampling locations presented on these maps are intended to illustrate the type of sampling strategy proposed for each unit. Other considerations (e.g., randomly selected starting points, underground utilities/pipelines, or overhead obstacles) could result in adjustments to sampling locations. The actual field sample locations will be accurately recorded by field personnel relative to surveyed coordinates, and if any sampling points require relocation, the reasons for such changes will be described in the field notebook.

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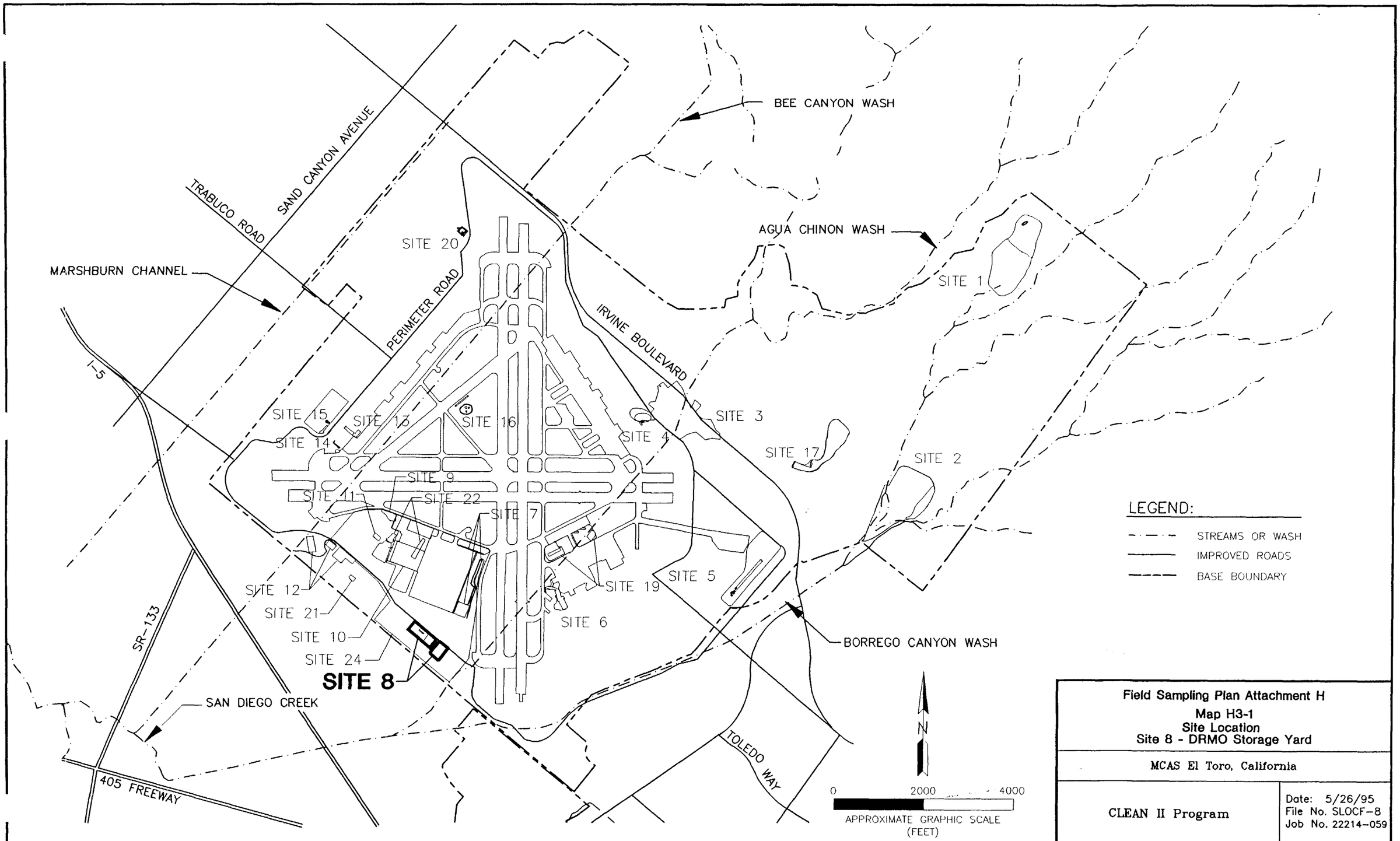


**Field Sampling Plan Attachment H**
**Map H3-1**
**Site Location**
**Site 8 - DRMO Storage Yard**

MCAS El Toro, California

CLEAN II Program

Date: 5/26/95
File No. SLOCF-8
Job No. 22214-059

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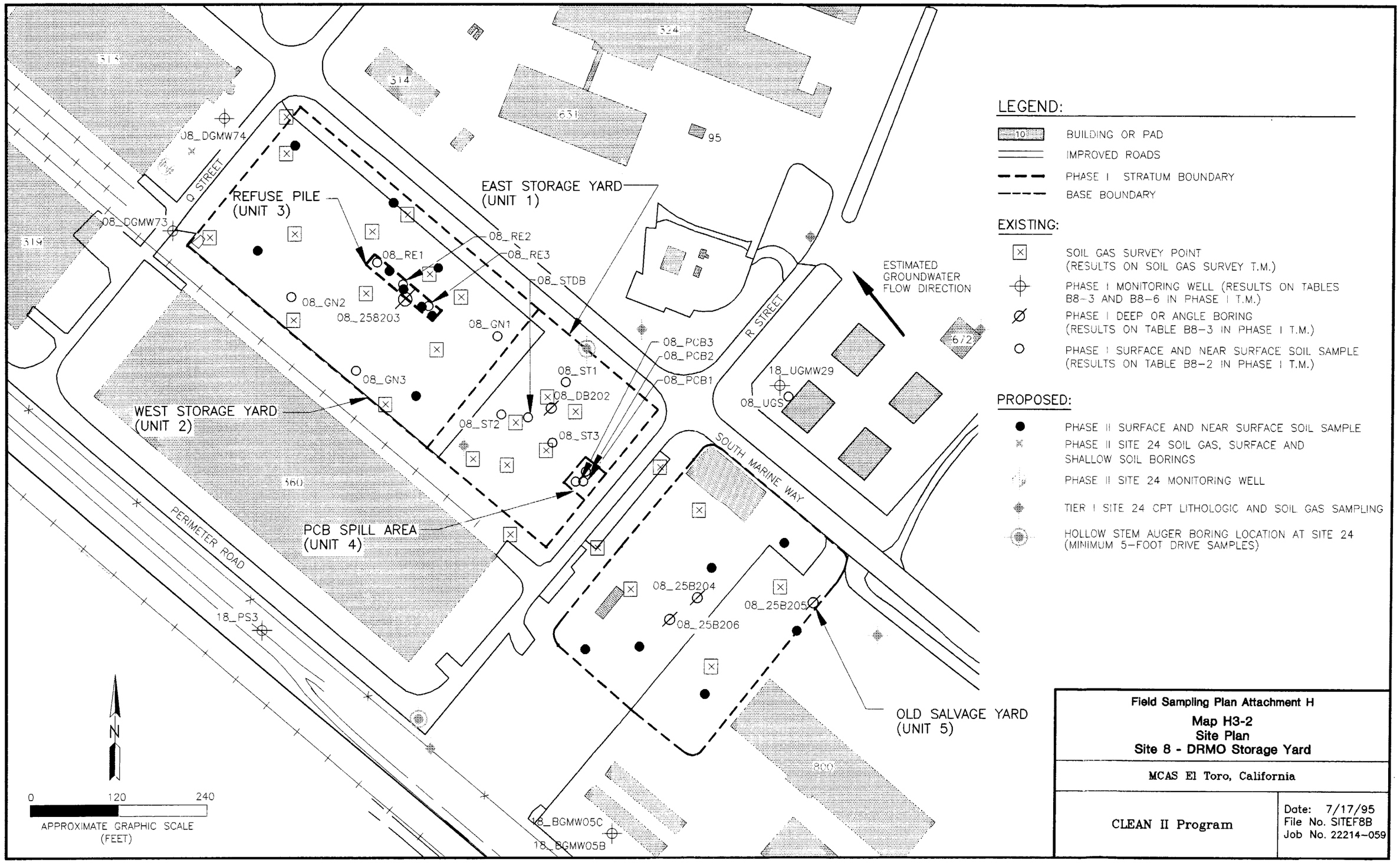


**Field Sampling Plan Attachment H**

**Map H3-2**
**Site Plan**
**Site 8 - DRMO Storage Yard**

MCAS El Toro, California

CLEAN II Program

Date: 7/17/95
File No. SITEF8B
Job No. 22214-059

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# Section 4
# RATIONALE FOR SAMPLING LOCATIONS

This section explains the rationale for the number of sampling programs, types of samples, locations of samples, and analytical parameters. The rationale for sampling is based on site conditions, previous investigations, and data quality objectives as presented in the appendices of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.1 SAMPLING PROGRAMS, SAMPLE TYPES, AND LOCATIONS

Sampling programs, types of samples, and locations are presented based on the smallest area of study. For some sites, the smallest area of study is a site unit; for other sites, the area of study may be the entire site. Selection of sampling programs, sample types, and locations is based on:

- site activities and history;
- types of media suspected or known to be impacted from previous investigations;
- objectives of site-specific RI/FS efforts; and
- site-specific initial surveys.

The DRMO Storage Yard will be represented by five different units for the Phase II RI/FS:

- Unit 1: the Eastern Section (approximately 1.5 acres) of the CSY;
- Unit 2: the Western Section (approximately 3 acres) of the CSY;
- Unit 3: the Refuse Pile Area;
- Unit 4: the PCB Spill (approximately 1,500 feet$^2$), located at the eastern portion of Unit 1; and
- Unit 5: the OSY (approximately 2.5 acres) located across R Street, near Building 800.

The units will be sampled using a tiered sampling approach as discussed in the following sections. Previous site activities, Phase I RI sampling results, and regulatory comments were used to formulate the Phase II RI/FS sampling approach. During the Phase I RI, soil samples were collected from each stratum, and COPCs were identified and evaluated against PRGs. Proposed Phase II RI sampling locations have been positioned to refine risk estimates for the units in Site 8.

## 4.2 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk to human health or the environment. The Tier 1 sampling approach will consist of the collection of shallow soil samples (less than 10 feet below ground surface [bgs]) from a specific number of sampling locations within the unit. The number of sampling locations has been proposed such that when the Phase I and II RI/FS data are evaluated together, a risk can be estimated for the unit. An explanation of the proposed sampling designs for

Tier 1 soil sampling can be found in Section 4 of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.2.1 Unit 1: East Storage Yard

Unit 1 is the eastern portion of the CSY (approximately 1.5 acres) located north of Building 360. Unit 1 is presently being addressed as an Early Action through the Non-Time-Critical Removal Action process. An Engineering Evaluation/Cost Analysis has been prepared for this unit.

## 4.2.2 Unit 2: West Storage Yard

Unit 2 comprises the western portion of the CSY north of Building 360. It covers approximately 3 acres at an elevation of about 290 feet above MSL (Map H3-2).

### 4.2.2.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 2, 4, and 10 feet bgs in five stratified random-sampling locations (Map H3-2).

## 4.2.3 Unit 3: Refuse Pile Area

Unit 3 comprises the soil beneath a former rubbish pile, located in the north-central portion of the Western Storage Yard. The top 2 feet of the soil under the refuse pile were excavated and removed from Site 8 by a paving contractor.

### 4.2.3.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 2, 4, and 10 feet bgs in the four areal systematic random-sampling locations based on a grid spacing of 33 by 20 feet in Unit 3 (Map H3-2).

## 4.2.4 Unit 4: PCB Spill Area

The PCB spill area comprises approximately 1,500 feet$^2$ on the eastern edge of Unit 1. Impacted soil at the spill site was excavated to a depth of 1 foot and removed from the site (Map H3-2). Unit 4 has been approved for Early Action and is being addressed through the Non-Time-Critical Removal Action process. An Engineering Evaluation/Cost Analysis will be prepared for this unit.

## 4.2.5 Unit 5: Old Salvage Yard

The old salvage yard comprises approximately 2.5 acres and is located in eastern portion of Site 8, across R Street near Building 800. The upper 5 feet in this site is imported fill material.

#### 4.2.5.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 2.5, and 10 feet bgs in the six areal systematic random sampling locations based on a grid spacing of 142 by 127 feet in Unit 4 (Map H3-2).

## 4.3 TIER 2

The Tier 2 sampling program will also focus exclusively on shallow soil (0 to 10 feet) conditions. The primary objective of this program will be to refine the data on the extent of shallow soil contamination identified during the Tier 1 sampling. Tier 2 sample locations will be based on these sample results. The process by which the Tier 2 sample locations will be selected is detailed in Appendix H of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.4 TIER 3

The objective of a Tier 3 soil sampling program is to estimate the extent of a contaminant plume in deeper subsurface soils. To accomplish this goal, the drilling and sampling of a series of boreholes will be required. The location of Tier 3 boreholes is intended to minimize the number of boreholes required to define the lateral and vertical extent of the contaminant plume in deeper subsurface soils. Groundwater samples will be collected only when a contaminant plume in deeper subsurface soils has been traced (through a drilling and soil sampling program) downward to the water table. At such units/sites, the objectives of the sampling program must then be expanded to include a determination of whether groundwater has been adversely impacted as a result of the historic activities at this unit/site.

The process by which the locations for Tier 3 soil borings and monitoring wells will be selected is detailed in Appendix H of the Phase II RI/FS Work Plan (BNI 1995a).

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# Section 5
# REQUEST FOR ANALYSES

Requests for analyses are based on:

- site activities and history;
- results of previous investigations; and
- objectives of site-specific RI/FS efforts.

The analytical methods referenced in this section are from the Phase II RI/FS Quality Assurance Project Plan (QAPP) (BNI 1995b). Section 6 in the QAPP specifies the number and/or frequency for collection of field duplicate and blank samples during the Phase II RI/FS field activities.

## 5.1 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk. The Tier 1 sampling approach will consist of the collection of shallow soil samples (less than 10 feet bgs) from a specific number of sampling locations within the unit. Table H5-1 lists all soil samples and associated analyses for the units in Site 8.

### 5.1.1 Unit 2: West Storage Yard

The 20 Tier 1 soil samples that will be collected at Site 8, Unit 2, will be analyzed according to the methods listed below.

#### 5.1.1.1 FIELD SCREENING

All soil samples will be field-screened for polynuclear aromatic hydrocarbons (PAH) with immunoassay test kits (U.S. EPA Method 4035), and for VOCs (U.S. EPA Method 8010), total petroleum hydrocarbons (TPH)-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) using an appropriately equipped mobile laboratory.

#### 5.1.1.2 FIXED-BASE ANALYTICAL LABORATORIES

All soil samples will be analyzed using a fixed-base laboratory for pesticides/PCBs (U.S. EPA Method 8080) under Naval Facilities Engineering Service Center (NFESC, formerly known as Naval Energy and Environmental Support Activity [NEESA]) Level D protocols. Six samples (four detects and two nondetects) will be submitted to the fixed-base laboratory to confirm field screening results. The fixed-based analyses are PAH (U.S. EPA Method 8310), VOCs (U.S. EPA Method 8010), TPH-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) under NFESC Level D protocols.

### 5.1.2 Unit 3: Refuse Pile Area

The 16 Tier 1 soil samples that will be collected at Site 8, Unit 3, will be analyzed according to the methods listed below.

**Table H5-1**
**Soil Sampling and Analysis**

| Tier | Unit/Name | PHASE II RI/FS SAMPLE NUMBERS | | | FIELD[a] - IMMUNOASSAY OR MOBILE LABORATORY | | | | OFF-SITE LABORATORY[b] | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Locations | Samples/ Location | Total Samples | PAH[c,d] | VOCs[e,f] | TPH[g]- Gasoline and -Diesel[e] | Target Analyte List Metals[e] | Pesticides and PCBs[h] | Herbicides |
| Tier 1 | Unit 2 West Storage Yard | 5 | 4 | 20 | X | X | X | X | X | |
| | Unit 3 Refuse Pile | 4 | 4 | 16 | X | | X | X | X | |
| | Unit 5 Old Salvage Yard | 6 | 3 | 18 | X | at 10 feet only | X | X | X | |
| *Tier 1 Subtotals* | | | | 54 | 54 | 23 | 54 | 54 | 54 | |
| Tier 2 | Optional: Scope of Tier 2 would be to further define extent of shallow soil contamination; based on Tier 1 data, Phase I RI findings, RCRA Facility Assessment data, and soil gas survey results, with approval of Base Closure and Realignment (BRAC) Cleanup Team (BCT). | | | | | | | | | |
| Tier 3 | Optional: Scope of Tier 3 would be to characterize horizontal and vertical extent of contamination below 10 feet depth; based on Tier 1 and 2 data, Phase I RI findings, and soil gas survey results, with approval of BCT. | | | | | | | | | |

Notes:
[a] at a minimum, 10 percent of detects and 5 percent of nondetects will be sent to the off-site laboratory for confirmation analyses
[b] these constituents cannot be determined in the field; all samples to be analyzed for these constituents will be sent to the off-site laboratory
[c] immunoassay analyses
[d] PAH – polynuclear aromatic hydrocarbons
[e] mobile laboratory analyses
[f] VOC – volatile organic compound
[g] TPH – total petroleum hydrocarbons
[h] PCB – polychlorinated biphenyl

#### 5.1.2.1 FIELD SCREENING

All soil samples will be field-screened for PAH with immunoassay test kits (U.S. EPA Method 4035), for TPH-diesel and -gasoline (U.S. EPA Method 8015M), and for TAL metals (U.S. EPA Method 6000/7000) using an appropriately equipped mobile laboratory.

#### 5.1.2.2 FIXED-BASE ANALYTICAL LABORATORIES

All soil samples will be analyzed using a fixed-base laboratory for pesticides/PCBs (U.S. EPA Method 8080) under NFESC Level D protocols. Four samples (three detects and one nondetect) will be submitted to the fixed-base laboratory to confirm field screening results. The fixed-based analyses will include PAH (U.S. EPA Method 8310), TPH-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) under NFESC Level D protocols.

### 5.1.3 Unit 5: Old Salvage Yard

The 18 Tier 1 soil samples that will be collected at Site 8, Unit 5, will be analyzed according to the methods listed below.

#### 5.1.3.1 FIELD SCREENING

All soil samples will be field-screened for PAH with immunoassay test kits (U.S. EPA Method 4035), for VOCs (U.S. EPA Method 8010), and for TPH-diesel and -gasoline at only the 10-foot samples (U.S. EPA Method 8015M). TAL metals (U.S. EPA Method 6000/7000) will be field-screened using an appropriately equipped mobile laboratory.

#### 5.1.3.2 FIXED-BASE ANALYTICAL LABORATORIES

All soil samples will be analyzed by a fixed-base laboratory for pesticides/PCBs (U.S. EPA Method 8080) under NFESC Level D protocols. Six samples (four detects and two nondetects) will be submitted to the fixed-base laboratory to confirm field-screening results. These fixed-based analyses will include PAH (U.S. EPA Method 8310), VOCs (U.S. EPA Method 8010), TPH-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) under NFESC Level D protocols.

## 5.2 TIER 2

A Tier 2 request for analysis, if necessary, will be contingent upon the Tier 1 sample results.

## 5.3 TIER 3

A Tier 3 request for analysis, if necessary, will be contingent upon the Tier 1 and Tier 2 sample results.

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# Section 6
# FIELD METHODS AND PROCEDURES

This section presents site-specific field methods that will be used to collect samples and other field data. The field methods referenced in this section are from Section 6 of the FSP and the Comprehensive Long-Term Environmental Action Navy (CLEAN) Standard Operating Procedures, which discuss specific field methods and procedures.

## 6.1 INITIAL SURVEYS

Before the collection of Phase II RI/FS soil samples, the site will be scaled, and sampling locations will be staked or paint-marked. Once a sampling point is marked, utility clearances will be made before collecting any sample that uses power equipment to reach the sample depth. Utility clearances may also be made at locations where samples are being collected using a hand auger. Nonintrusive utility clearances will be completed by a subcontractor, using geophysical methodology in conjunction with site activities.

Each sampling point will be located by survey, using the California Plane Coordinate System, with northings and eastings determined to the nearest 0.1 foot. The surface elevation will be determined to the nearest 0.01 foot.

## 6.2 TIER 1

All samples in Tier 1 will be collected at the locations and depths described in Section 4.2 and will be field-screened with a scintillometer to measure radioactivity. More information on soil sampling procedures is provided in Section 6 of the FSP.

### 6.2.1 Unit 2: West Storage Yard

The 20 Tier 1 soil samples will be collected at Site 8, Unit 2, at depths of 0, 2, 4, and 10 feet bgs in five borings as indicated below.

#### 6.2.1.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig with a 140-pound hammer. All soil sampling will be conducted as detailed in Section 6 of the FSP.

### 6.2.2 Unit 3: The Refuse Pile Area

The 16 Tier 1 soil samples will be collected at Site 8, Unit 3, at depths of 0, 2, 4, and 10 feet bgs in four borings as indicated below.

#### 6.2.2.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-

stem auger drilling rig with a 140-pound hammer. All soil sampling will be conducted as detailed in Section 6 of the FSP.

### 6.2.3 Unit 5: Old Salvage Yard

The 18 Tier 1 soil samples will be collected at Site 8, Unit 5, at depths of 0, 2.5, and 10 feet bgs in six borings as indicated below.

#### 6.2.3.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig with a 140-pound hammer. All soil sampling will be conducted as detailed in Section 6 of the FSP.

## 6.3 TIER 2

If Tier 2 soil sampling is conducted at Site 8, shallow soil samples will be collected as described above.

## 6.4 TIER 3

If Tier 3 sampling is conducted, deep soil samples (from 10 feet bgs to groundwater level) will be collected at 5-foot intervals, with a modified California split-spoon sampler equipped with stainless steel sleeves. The split-spoon sampler will be driven into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer. When drilling is required to depths of greater than 130 feet bgs, the hollow-stem auger drilling rig will be replaced by an air-rotary drilling rig. If groundwater sampling is necessary, sampling will follow procedures presented in Section 6 of the FSP.

## Section 7
# REFERENCES

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———. 1993b. *Installation Restoration Program, Phase I Remedial Investigation Draft Technical Memorandum.* Marine Corps Air Station El Toro, California.

———. 1994. *Soil Gas Survey Report.* Marine Corps Air Station El Toro, California.

LUFT. *See* State of California Leaking Underground Fuel Tank Task Force.

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Southwest Division
Naval Facilities Engineering Command
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1220 Pacific Highway, Room 135
San Diego, California 92132-5187

Contract No. N68711-92-D-4670

**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**

**CLEAN II**

# FIELD SAMPLING PLAN
# ATTACHMENT I
# OPERABLE UNIT 3 –
# SITE 9 – CRASH CREW PIT NO. 1
# MCAS EL TORO, CALIFORNIA

**CTO-0059**

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August 1995

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# ACRONYMS/ABBREVIATIONS

| | |
|---|---|
| bgs | below ground surface |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| COPC | chemical of potential concern |
| FS | Feasibility Study |
| FSP | Field Sampling Plan |
| Irvine Subbasin | Irvine Groundwater Subbasin |
| LUFT | (California) Leaking Underground Fuel Tank (Field Manual) |
| MCAS | Marine Corps Air Station |
| MCL | maximum contaminant level |
| NEESA | Naval Energy and Engineering Support Activity |
| NFESC | Naval Facilities Engineering Service Center |
| PAH | polynuclear aromatic hydrocarbons |
| PCB | polychlorinated biphenyl |
| PRG | (U.S. EPA Region IX) Preliminary Remediation Goal |
| QAPP | Quality Assurance Project Plan |
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| SVOC | semivolatile organic compound |
| TAL | target analyte list |
| TDS | total dissolved solids |
| TFH | total fuel hydrocarbons |
| TPH | total petroleum hydrocarbons |
| TRPH | total recoverable petroleum hydrocarbons |
| U.S. EPA | U.S. Environmental Protection Agency |
| VOC | volatile organic compound |

# ACRONYMS/ABBREVIATIONS (continued)

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# Section 1
# OBJECTIVES

This Field Sampling Plan (FSP) for Site 9, the Crash Crew Pit No. 1, outlines the field procedures and methodology to be used during the Remedial Investigation (RI)/Feasibility Study (FS) for this site. The purpose of this FSP is to enable field personnel unfamiliar with the site to gather the required samples and field data. It is also intended to assure that data collection will be comparable to and compatible with previous data collected at the site and with other sampling activities at other sites at the Marine Corps Air Station (MCAS) El Toro.

## 1.1 SAMPLING OBJECTIVES

The specific objectives for sampling at Site 9 are as follows:

- verify boundaries of waste disposal activities;
- characterize the nature and extent of contamination;
- estimate the vertical and horizontal extent of contamination; and
- characterize site-specific groundwater contamination, if soil contamination extends to groundwater.

## 1.2 DATA USAGE

To satisfy RI/FS objectives for the Crash Crew Pit No. 1, the data to be collected, compiled, and analyzed will be used to perform the following:

- characterize subsurface soils;
- establish stratigraphic controls;
- establish geotechnical parameters;
- characterize groundwater conditions and quality (where soil contamination suggests);
- determine the types of contaminants in soil and/or groundwater;
- estimate the extent of contaminants in soil and/or groundwater;
- evaluate human health and ecological risks;
- evaluate the mass of contaminants;
- evaluate cleanup levels;
- characterize the feasible removal or remedial actions, if necessary; and
- evaluate remedial alternatives.

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# Section 2
# BACKGROUND

This section presents a discussion on the general description and the results of previous investigations at Site 9. This section also provides a brief compilation of the data used to develop the site-specific FSP for Phase II RI/FS activities. Previous investigations and reports provide a more thorough discussion of site history, activities, and summaries of previous investigations.

## 2.1 SITE DESCRIPTION

Crash Pit Crew No. 1 (Site 9) is located in the west portion of MCAS El Toro northeast of Building 306 just south of a taxiway for the east/west runway (Map I3-1). The terrain in the immediate vicinity of the site is relatively flat. The area around both pits (east and west) is covered with dirt and vegetation. The east pit is also partially covered by aircraft matting. Surface drainage from the site appears to flow northwest to a storm drain, which eventually discharges into the Bee Canyon Wash (Jacobs Engineering 1993a).

### 2.1.1 History

Site 9 was previously used to train firefighters. During training, the two pits were filled with water and covered with various mixtures of residual fuels and fluids (JP-5 fuel, aviation gasoline, possibly crankcase oil, and other wastes). The mixtures were then ignited. Based upon the types of wastes burned at Site 16, small quantities of napalm, white phosphorus, and magnesium phosphate may also have been used at Site 9. From 1965 through 1971, an estimated 123,700 gallons of waste liquids were used in the west pit training exercises, 10 percent of which may have infiltrated the subsurface. The west pit is estimated to have been 150 feet long, east to west, and 25 to 50 feet wide, north to south. Although only the west pit operational history is known, the east pit operations are believed to have been similar to the west pit operations. In aerial photos reviewed, the east pit appears elliptical, approximately 90 feet long, east to west, and about 60 feet wide, north to south, with a depth probably similar to that of the west pit. The two fire fighting pits (east and west) have since been filled to surrounding grade (Jacobs Engineering 1993a).

### 2.1.2 Geology

The geology of Site 9 consists of Quaternary alluvial and marine deposits (Jacobs Engineering 1993b). Holocene deposits consist of a matrix of fine-grained overbank deposits and some coarse-grained stream channel deposits. These soils are derived from the Santa Ana Mountains to the east and conformably overlie Pleistocene interbedded fine-grained lagoonal and near-shore marine deposits. Pleistocene deposits could not be differentiated from Holocene deposits in Phase I RI soil borings. Pleistocene deposits unconformably overlie semiconsolidated marine sandstones, siltstones, and conglomerates of late Miocene to late Pliocene, which are considered to be bedrock in the area.

Based on a review of the Phase I RI boring logs, the subsurface lithology at Site 9 consists of well-graded to silty sand, interbedded with silt and clay. Within the sand units are occasional gravel lenses, probably associated with stream channels.

### 2.1.3 Hydrogeology

MCAS El Toro lies within the Irvine Groundwater Subbasin (Irvine Subbasin). Regional aquifers in the Irvine Subbasin tend to be composed of discontinuous lenses of clayey and silty sands and fine-grained gravels contained within a complex assemblage of sandy clays and sandy silts. Three general aquifer systems have been identified near the Station: a shallow and perched system, a principal aquifer zone, and a lower hydrogeologic system existing in bedrock (Jacobs Engineering 1993b).

The Phase I RI results indicate the shallow, perched zone is not present at Site 9. The principal aquifer is the main water-producing zone for the Irvine area and is of primary interest in this investigation. The principal aquifer is encountered about 120 feet beneath Site 9. The regional groundwater flow direction is to the northwest. The local hydraulic gradient has been influenced strongly by the pumping of irrigation wells located west of MCAS El Toro.

## 2.2 PHASE I REMEDIAL INVESTIGATION RESULTS

During the Phase I RI, Site 9 was represented by one stratum which included both pit areas (Map I3-2). The following site-specific activities were conducted:

- four surface soil samples (0 to 6 inches below ground surface [bgs]) were collected from three locations;
- one 25-foot boring was drilled and sampled; and one deep boring was drilled, completed as a monitoring well (09_DBMW45), and sampled;
- one downgradient monitoring well (09_DGMW75) was drilled, installed, and sampled;
- 19 soil samples were collected from the vadose zone during the drilling of these three borings;
- soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), total fuel hydrocarbons (TFH)-gasoline, TFH-diesel, total recoverable petroleum hydrocarbons (TRPH), and target analyte list (TAL) metals; one sample from 20 feet bgs in the deep boring on-site was analyzed for dioxins and dibenzofurans; and
- groundwater samples were analyzed for general chemistry, VOCs, SVOCs, TFH-gasoline, TFH-diesel, TRPH, metals, pesticides/polychlorinated biphenyls, and gross alpha and beta.

In addition, United States Environmental Protection Agency (U.S. EPA) Region IX Preliminary Remediation Goals (PRGs) of the chemicals of potential concern (COPCs) and ecological screening criteria for the site were compared with corresponding analytical

sampling results. The results of this investigation indicated that no COPCs detected in the shallow soil exceeded PRGs; however, barium and lead concentrations in soil exceeded ecological screening criteria.

Petroleum hydrocarbons were detected in both pits. However, according to the California Leaking Underground Fuel Tank (LUFT) Field Manual guidelines (LUFT 1989), they would not appear to pose a threat to groundwater. Small concentrations of VOCs were detected in both the east and west pits. SVOCs were detected only in the east pit. Concentrations of VOCs appeared to increase with depth in the east pit, but this correlation was not evident in the soil samples collected from 09_DBMW45, located in the west pit.

Groundwater samples were collected from the two groundwater monitoring wells, 09_DBMW45 and 09_DGMW75, constructed on-site and downgradient of Site 9, respectively. COPCs detected in groundwater samples were compared to PRGs and maximum contaminant levels (MCLs) (Jacobs Engineering 1993a, page A9-7, Table A9-3b):

- 1,1-dichloroethene, 1,2-dichloroethane, carbon tetrachloride, tetrachloroethylene, trichloroethylene and nitrate exceed human health PRGs; and 1,1-dichloroethylene, 1,2-dichloroethane, carbon tetrachloride, tetrachloroethylene, trichloroethylene, nitrate, and total dissolved solids (TDS) exceed MCLs in the on-site well 09_DBMW45; and
- 1,1-dichloroethene, carbon tetrachloride, nitrate, tetrachloroethylene, and trichloroethylene, exceed PRGs; and antimony, carbon tetrachloride, chloride, nitrate, selenium, and sulfate, tetrachloroethylene, trichloroethylene, and TDS exceed MCLs in downgradient well 09_DGMW75.

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## Section 3
# MAPS

The maps on the following pages present the site location at MCAS El Toro, site boundaries, site units, physical features of the site, previous sampling locations, and proposed Phase II sampling locations (where known). These maps are referenced in other sections of this FSP.

The proposed Phase II sampling locations presented on these maps are intended to illustrate the type of sampling strategy proposed for each unit. Other considerations (e.g., randomly selected starting points, underground utilities/pipelines, or overhead obstacles) could result in adjustments to sampling locations. The actual field sample locations will be accurately recorded by field personnel relative to surveyed coordinates, and if any sampling points require relocation, the reasons for such changes will be described in the field notebook.

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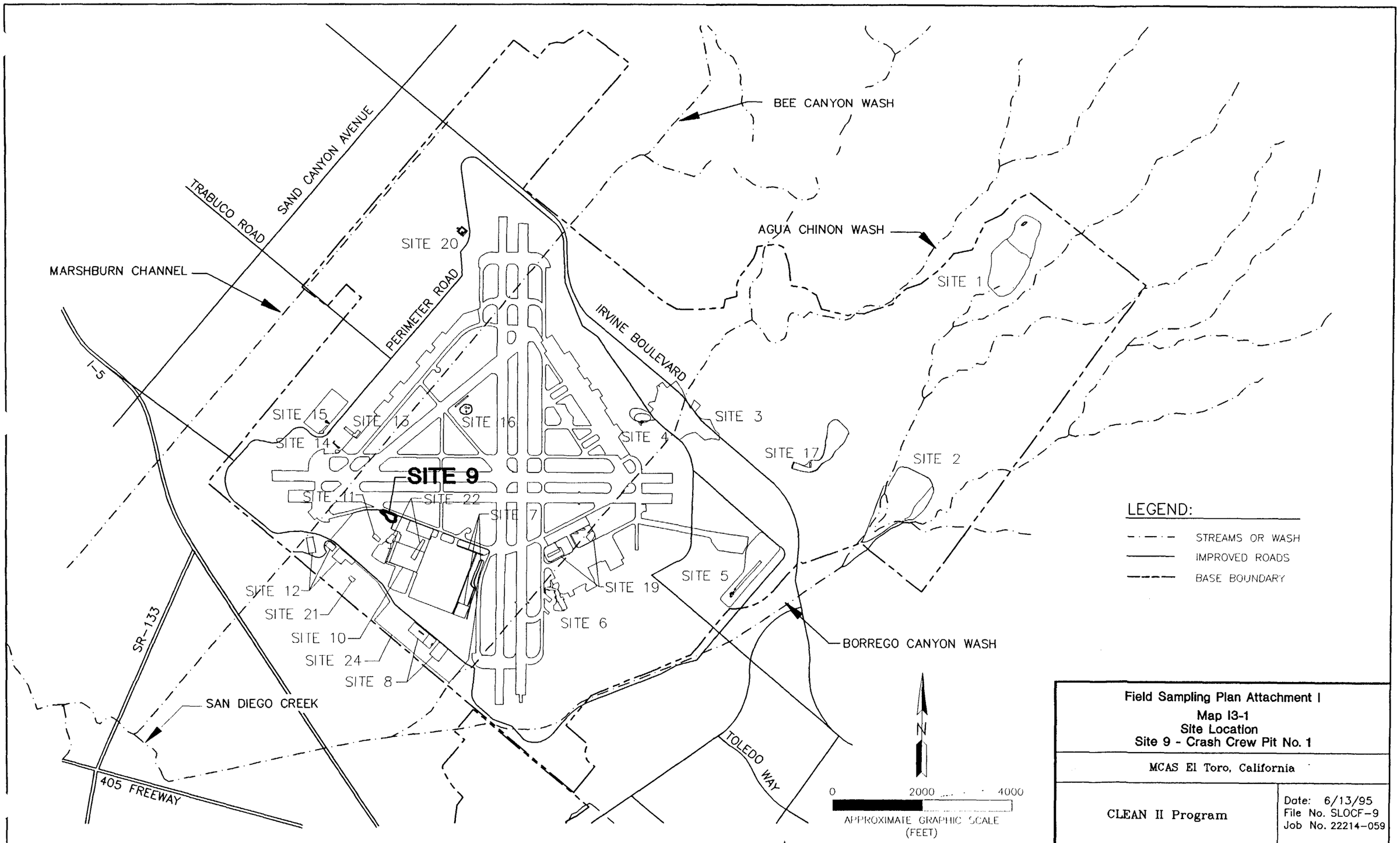


**Field Sampling Plan Attachment I**
**Map I3-1**
**Site Location**
**Site 9 - Crash Crew Pit No. 1**

MCAS El Toro, California

CLEAN II Program

Date: 6/13/95
File No. SLOCF-9
Job No. 22214-059

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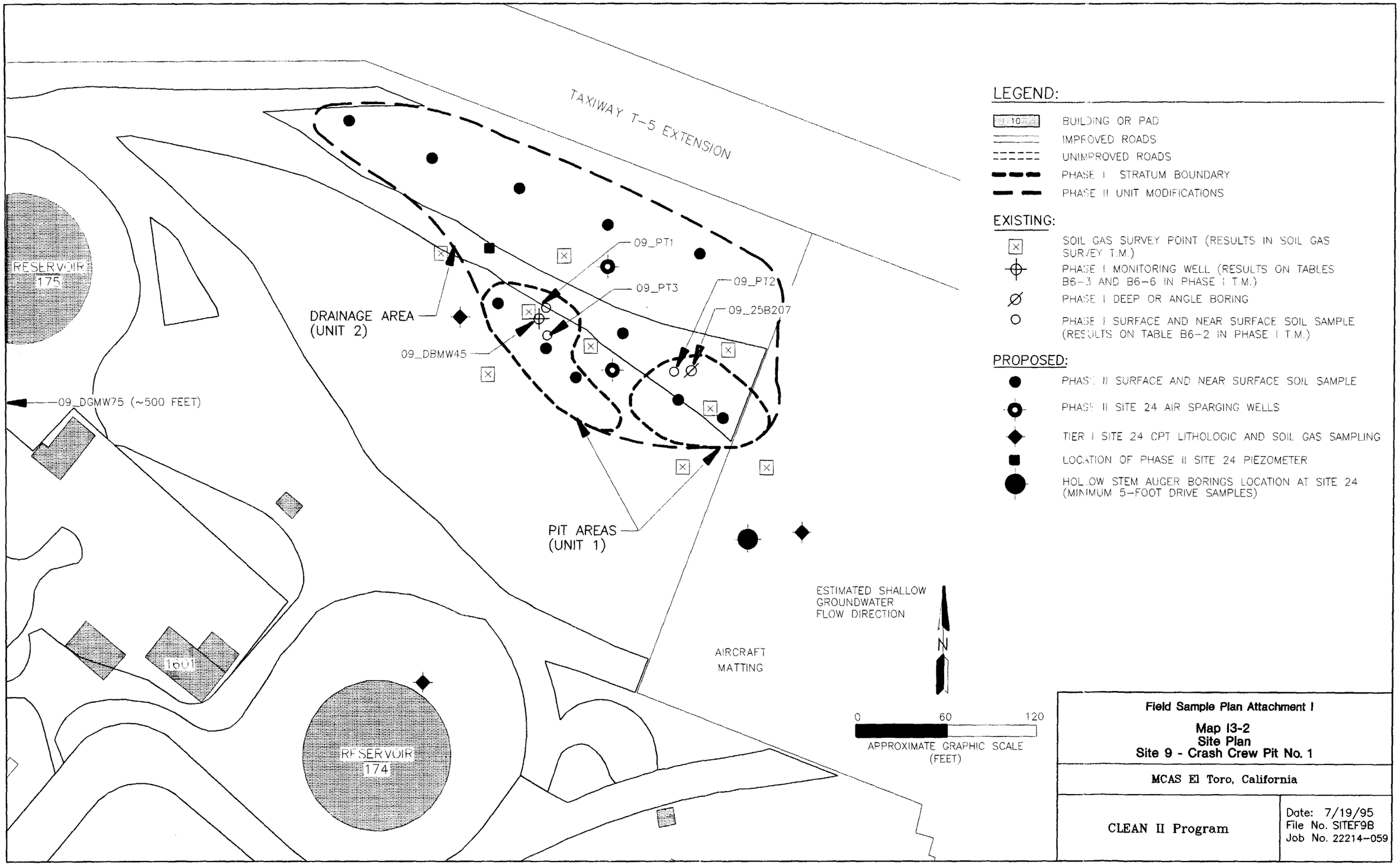


**Field Sample Plan Attachment I**

**Map I3-2**
**Site Plan**
**Site 9 - Crash Crew Pit No. 1**

**MCAS El Toro, California**

**CLEAN II Program**

Date: 7/19/95
File No. SITEF9B
Job No. 22214-059

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# Section 4
# RATIONALE FOR SAMPLING LOCATIONS

This section explains the rationale for the number of sampling programs, types of samples, locations of samples, and analytical parameters. The rationale for sampling is based on site conditions, previous investigations, and data quality objectives as presented in the appendices of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.1 SAMPLING PROGRAMS, SAMPLE TYPES, AND LOCATIONS

Sampling programs, types of samples, and locations are presented based on the smallest area of study. For some sites, the smallest area of study is a site unit; for other sites, the area of study may be the entire site. Selection of sampling programs, sample types, and locations is based on:

- site activities and history;
- types of media suspected or known to be impacted from previous investigations;
- objectives of site-specific RI/FS efforts; and
- site-specific initial surveys.

The site will be represented by two areas (units) for the Phase II RI/FS. Unit 1 is the same area as Site 9, Stratum 1 (the pit areas) in the Phase I RI. Unit 2 has been created for the Phase II RI/FS to include a drainage area where possible surface drainage from Unit 1 may have collected (Map I3-2).

The units will be sampled using a tiered sampling approach, as detailed in the following sections. Previous site activities, Phase I RI sampling results, and regulatory comments were used to formulate the Phase II RI/FS sampling approach. During the Phase I RI, soil samples were collected from the stratum, and COPCs were identified and evaluated against PRGs. Sample locations in all units have been positioned to characterize additional areas not sampled during the Phase I RI.

## 4.2 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk to human health and the environment. The Tier 1 sampling approach will consist of collecting shallow soil samples (less than 10 feet bgs) from a specific number of sampling locations within the unit. The number of sampling locations has been proposed, such that when the Phase I and II RI/FS data are evaluated together, a risk can be estimated for the unit. An explanation of the proposed sampling designs for Tier 1 soil sampling can be found in Section 4 of the Phase II RI/FS Work Plan (BNI 1995a).

### 4.2.1 Unit 1: Pit Areas

The Unit 1 boundaries of Site 9 consist of the locations of the two fire-fighting training pits at the site.

#### 4.2.1.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 5, and 10 feet bgs at five stratified random-sampling locations (Map I3-2).

### 4.2.2 Unit 2: Drainage Area

The Unit 2 boundaries of Site 9 consist of the drainage area from the crash crew pits to the catch basin.

#### 4.2.2.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 5, and 10 feet bgs at six systematic random-sampling locations on an axis (Map I3-2).

## 4.3 TIER 2

The Tier 2 sampling program will also focus exclusively on shallow soil (0 to 10 feet) conditions. The primary objective of this program will be to refine the data on the extent of shallow soil contamination identified during the Tier 1 sampling. Tier 2 sample locations will be based on these sample results. The process by which the Tier 2 sample locations will be selected is detailed in Appendix I of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.4 TIER 3

The objective of a Tier 3 soil sampling program is to estimate the extent of a contaminant plume in deeper subsurface soils. To accomplish this goal, the drilling and sampling of a series of boreholes will be required. The location of Tier 3 boreholes is intended to minimize the number of boreholes required to define the lateral and vertical extent of the contaminant plume in deeper subsurface soils. Groundwater samples will be collected only when a contaminant plume in deeper subsurface soils has been traced (through a drilling and soil sampling program) downward to the water table. At such units/sites, the objectives of the sampling program must then be expanded to include a determination of whether groundwater has been adversely impacted as a result of the historic activities at this unit/site.

The process by which the locations for Tier 3 soil borings and monitoring wells will be selected is detailed in Appendix I of the Phase II RI/FS Work Plan (BNI 1995a).

# Section 5
# REQUEST FOR ANALYSES

Requests for analyses are based on:

- site activities and history;
- results of previous investigations; and
- objectives of site-specific RI/FS efforts.

The analytical methods referenced in this section are from the Phase II RI/FS Quality Assurance Project Plan (QAPP) (BNI 1995b). Section 6 in the QAPP specifies the number and/or frequency for collection of field duplicate and blank samples during the Phase II RI/FS field activities.

## 5.1 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk. The Tier 1 sampling approach will consist of the collection of shallow soil samples (less than 10 feet bgs) from a specific number of sampling locations within the unit. Table I5-1, Soil Sampling and Analysis, lists all soil samples and associated analyses for the units in Site 9.

### 5.1.1 Unit 1: The Pit Areas

The 15 Tier 1 soil samples that will be collected at Site 9, Unit 1, will be analyzed according to the methods listed below.

#### 5.1.1.1 FIELD SCREENING

All soil samples will be field-screened for polynuclear aromatic hydrocarbons (PAH) with immunoassay test kits (U.S. EPA Method 4035), and for VOCs (U.S. EPA Method 8010), TPH-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) using an appropriately equipped mobile laboratory.

#### 5.1.1.2 FIXED-BASE ANALYTICAL LABORATORIES

All soil samples will be analyzed using a fixed-base laboratory for dioxins/dibenzofurans (U.S. EPA Method 8280) and phosphorus (U.S. EPA Method 365.2) under Naval Facilities Engineering Service Center (NFESC, formerly known as Naval Energy and Environmental Support Activity [NEESA]) Level D protocols. Three samples (two detects and one nondetect) will be submitted to the fixed-base laboratory to confirm field-screening results. The fixed-based analyses are PAH (U.S. EPA Method 8310), VOCs (U.S. EPA Method 8010), TPH-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) under NFESC Level D protocols.

**Table I5-1**
**Soil Sampling and Analysis**

| Tier | Unit/Name | PHASE II RI/FS SAMPLE NUMBERS | | | FIELD[a] - IMMUNOASSAY OR MOBILE LABORATORY | | | | | OFF-SITE LABORATORY[b] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Locations | Samples/ Location | Total Samples | PAH[c,d] | PCBs[c,e] | VOCs[f,g] | TPH[h]- Gasoline and -Diesel[f] | Target Analyte List - Metals[f] | Pesticides and PCBs | Herbicides | Others: Dioxins, Dibenzofurans, Total Phosphate |
| Tier 1 | Unit 1 Pit Areas | 5 | 3 | 15 | X | | X | X | X | | | X |
| | Unit 2 Drainage Areas | 6 | 3 | 18 | X | | X | X | X | | | X |
| *Tier 1 Subtotals* | | | | 33 | 33 | | 33 | 33 | 33 | | | 33 |
| Tier 2 | Optional: Scope of Tier 2 would be to further define extent of shallow soil contamination; based on Tier 1data, Phase I RI findings, and soil gas survey results, with approval of Base Closure and Realignment (BRAC) Cleanup Team (BCT). | | | | | | | | | | | |
| Tier 3 | Optional: Scope of Tier 3 would be to characterize horizontal and vertical extent of contamination below 10 feet depth; based on Tier 1 and 2 data, Phase I RI findings, and soil gas survey results, with approval of BCT. | | | | | | | | | | | |

Notes:
[a] at a minimum, 10 percent of detects and 5 percent of nondetects will be sent to the off-site laboratory for confirmation analyses
[b] these constituents cannot be determined in the field; all samples to be analyzed for these constituents will be sent to the off-site laboratory
[c] immunoassay analyses
[d] PAH – polynuclear aromatic hydrocarbons
[e] PCB – polychlorinated biphenyl
[f] mobile laboratory analyses
[g] VOC – volatile organic compound
[h] TPH – total petroleum hydrocarbons

### 5.1.2 Unit 2: Drainage Area

The 18 Tier 1 soil samples that will be collected at Site 9, Unit 2, will be analyzed according to the methods listed below.

#### 5.1.2.1 FIELD SCREENING

All soil samples will be field screened for PAH with immunoassay test kits (U.S. EPA Method 4035), for VOCs (U.S. EPA Method 8010), for TPH-diesel and -gasoline (U.S. EPA Method 8015M), and for TAL metals (U.S. EPA Method 6000/7000) using an appropriately equipped mobile laboratory.

#### 5.1.2.2 FIXED-BASE ANALYTICAL LABORATORIES

All soil samples will be analyzed using a fixed-base laboratory for dioxins/dibenzofurans (U.S. EPA Method 8280) and phosphorus (U.S. EPA Method 365.2) under NFESC Level D protocols. Nine samples (six detects and three nondetects) will be submitted to the fixed-base laboratory to confirm field screening results. The fixed-based analyses are PAH (U.S. EPA Method 8310), VOCs (U.S. EPA Method 8010), TPH-diesel and -gasoline (U.S. EPA Method 8015M), and TAL metals (U.S. EPA Method 6000/7000) under NFESC Level D protocols.

## 5.2 TIER 2

A Tier 2 request for analysis, if necessary, will be contingent upon the Tier 1 sample results.

## 5.3 TIER 3

A Tier 3 request for analysis, if necessary, will be contingent upon the Tier 1 and Tier 2 sample results.

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# Section 6
# FIELD METHODS AND PROCEDURES

This section presents site-specific field methods that will be used to collect samples and other field data. The field methods referenced in this section are from Section 6 of the FSP and the Comprehensive Long-Term Environmental Action Navy (CLEAN) II Standard Operating Procedures, which discuss specific field methods and procedures.

## 6.1 INITIAL SURVEYS

Before the collection of Phase II RI/FS soil samples, the site will be scaled, and sampling locations will be staked or paint-marked. Once a sampling point is marked, utility clearances will be made before collecting any sample that uses power equipment to reach the sample depth. Utility clearances may also be made at locations where samples are being collected using a hand auger. Nonintrusive utility clearances will be completed by a subcontractor, using geophysical methodology in conjunction with site activities.

Each sampling point will be located by survey, using the California Plane Coordinate System, with northings and eastings determined to the nearest 0.1 foot. The surface elevation will be determined to the nearest 0.01 foot.

Excavation of test pits may be conducted at Site 9 if delineation of each pit's area cannot be reliably defined on the basis of a surficial survey at the site. Both of the pits, formerly used for training of firefighters, have been backfilled, and their locations are no longer clearly defined/visible at the site. Two trenches, oriented at right angles to one another, would be excavated to an estimated depth of about 4 feet at each pit. The trenches would be excavated parallel to the longest dimension of each pit. These trenches would be used only to determine the lateral and vertical limits of the two pits, and to describe the soil profile associated with each pit. The trenches will remain open only on the day of excavation, and they will be backfilled with the excavated material once examination of the soil profile is completed.

## 6.2 TIER 1

All samples in Tier 1 will be collected at the locations and depths described in Section 4.2. More information on soil sampling procedures is provided in Section 6 of the FSP.

### 6.2.1 Unit 1: Pit Areas

The 15 Tier 1 soil samples will be collected at Site 9, Unit 1, at depths of 0, 5, and 10 feet bgs in five borings as indicated below.

#### 6.2.1.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer.

## 6.2.2 Unit 2: Drainage Area

The 18 Tier 1 soil samples will be collected at Site 9, Unit 2, at depths of 0, 5, and 10 feet bgs in six borings as indicated below.

### 6.2.2.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer.

## 6.3 TIER 2

If Tier 2 soil sampling is conducted at Site 9, shallow soil samples will be collected as described above.

## 6.4 TIER 3

If Tier 3 sampling is conducted, deep soil samples (from 10 feet bgs to groundwater level) will be collected at 5-foot intervals, with a modified California split-spoon sampler equipped with stainless steel sleeves. The split-spoon sampler will be driven into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer. When drilling is required to depths of greater than 130 feet bgs, the hollow-stem auger drilling rig will be replaced by an air-rotary drilling rig. If groundwater sampling is necessary, sampling will follow procedures presented in Section 6 of the FSP.

## Section 7
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Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Room 135
San Diego, California 92132-5187

Contract No. N68711-92-D-4670

**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**

**CLEAN II**

# FIELD SAMPLING PLAN
# ATTACHMENT J
# OPERABLE UNIT 3 –
# SITE 10 – PETROLEUM DISPOSAL AREA
# MCAS EL TORO, CALIFORNIA

**CTO-0059**

Prepared by:

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August 1995

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# ACRONYMS/ABBREVIATIONS

| | |
|---|---|
| bgs | below ground surface |
| Cal/EPA | California Environmental Protection Agency |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| COPC | chemical of potential concern |
| FS | Feasibility Study |
| FSP | Field Sampling Plan |
| Irvine Subbasin | Irvine Groundwater Subbasin |
| HDM | Heavy Duty Maintenance Shop |
| LUFT | (California) Leaking Underground Fuel Tank (Field Manual) |
| MCAS | Marine Corps Air Station |
| MCL | maximum contaminant level |
| MSL | mean sea level |
| NEESA | Naval Energy and Environmental Support Activity |
| NFESC | Naval Facilities Engineering Service Center |
| PAH | polynuclear aromatic hydrocarbons |
| PCB | polychlorinated biphenyl |
| PDA | Petroleum Disposal Area |
| PRG | (U.S. EPA Region IX) Preliminary Remediation Goal |
| QAPP | Quality Assurance Project Plan |
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| SAIC | Science Applications International Corporation |
| TAL | target analyte list |
| TPH | total petroleum hydrocarbons |
| U.S. EPA | U.S. Environmental Protection Agency |
| VOC | volatile organic compound |

# Section 1
# OBJECTIVES

This Field Sampling Plan (FSP) for Site 10, the Petroleum Disposal Area (PDA), outlines the field procedures and methodology to be used during the Remedial Investigation (RI)/Feasibility Study (FS) for this site. The purpose of this FSP is to enable field personnel unfamiliar with the site to gather the required samples and field data. It is also intended to assure that data collection will be comparable to and compatible with previous data collected at the site and with other sampling activities at other sites at the Marine Corps Air Station (MCAS) El Toro.

## 1.1 SAMPLING OBJECTIVES

The specific objectives for sampling at Site 10 are as follows:

- verify boundaries of waste disposal activities;
- characterize the nature and extent of contamination;
- estimate the vertical and horizontal extent of contamination; and
- characterize site-specific groundwater contamination, if soil contamination extends to groundwater.

## 1.2 DATA USAGE

To satisfy the RI/FS objectives for the PDA, the data to be collected, compiled, and analyzed will be used to perform the following:

- characterize subsurface soils;
- establish stratigraphic controls;
- establish geotechnical parameters;
- characterize groundwater conditions and quality (where soil contamination suggests);
- determine the types of contaminants in soil and/or groundwater;
- estimate the extent of contaminants in soil and/or groundwater;
- evaluate human health and ecological risks;
- evaluate the mass of contaminants;
- evaluate cleanup levels;
- characterize the feasible removal or remedial actions, if necessary; and
- evaluate remedial alternatives.

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# Section 2
# BACKGROUND

This section presents a discussion on the general description and the results of previous investigations at Site 10. This section also provides a brief compilation of the data used to develop the site-specific FSP for Phase II RI/FS activities. Previous investigations and reports provide a more thorough discussion of site history, activities, and summaries of previous investigations.

## 2.1 SITE DESCRIPTION

The PDA is located south of Building 435 and east of Building 369 (Map J3-1). It comprises an area of approximately 23 acres. At the present time, the southern portion of the PDA area is covered with a concrete apron (installed in 1971), and the northern portion is covered with aircraft matting (installed in 1973). As part of the construction of the concrete apron at the southern portion, the topsoil was excavated to a depth of 2 feet. During the installation of aircraft matting at the northern portion, soil was mixed with dry cement, then wetted to solidify the mixture. Site 10 lies at an elevation of about 280 feet above mean sea level (MSL) (Jacobs Engineering 1993a).

### 2.1.1 History

From 1952 through 1970, an estimated 52,000 gallons of wastes (crankcase oil, antifreeze, hydraulic and transmission fluids, motor oil, and solvents) were applied to this area for dust control. Since 1970, the areas previously sprayed have been excavated and concreted or built over (Jacobs Engineering 1993a).

### 2.1.2 Geology

The geology of Site 10 consists of Quaternary alluvial and marine deposits (Jacobs Engineering 1993b). Holocene deposits consist of a matrix of fine-grained overbank deposits and some coarse-grained stream channel deposits. These soils are derived from the Santa Ana Mountains to the east and conformably overlie Pleistocene interbedded fine-grained lagoonal and near-shore marine deposits. Pleistocene deposits could not be differentiated from Holocene deposits in Phase I RI soil borings. Pleistocene deposits unconformably overlie semiconsolidated marine sandstones, siltstones, and conglomerates of late Miocene to late Pliocene, which are considered to be bedrock in the area.

Based on a review of the Phase I RI boring logs, the subsurface lithology at Site 10 consists of layered sequences of sands, silts, and sandy and silty clays. Well-defined permeable units, such as well-sorted sands, are infrequent.

### 2.1.3 Hydrogeology

MCAS El Toro lies within the Irvine Groundwater Subbasin (Irvine Subbasin). Regional aquifers in the Irvine Subbasin tend to be composed of discontinuous lenses of clayey and silty sands and fine-grained gravels contained within a complex assemblage of sandy

clays and sandy silts. Three general aquifer systems have been identified near the Station: a shallow and perched system, a principal aquifer zone, and a lower hydrogeologic system existing in bedrock (Jacobs Engineering 1993b).

The Phase I RI results indicate the shallow, perched zone is not present at Site 9. The principal aquifer is the main water-producing zone for the Irvine area and is of primary interest in this investigation. The principal aquifer is encountered about 120 feet beneath Site 10. The regional groundwater flow direction is to the northwest. The local hydraulic gradient has been influenced strongly by the pumping of irrigation wells located west of MCAS El Toro.

## 2.2 PHASE I REMEDIAL INVESTIGATION RESULTS

During the Phase I RI, the site was divided into two strata:

- Stratum 1 – the Aircraft Matting Area; and
- Stratum 2 – the Concrete Apron Area.

The following field activities (Map J3-2) were conducted as part of the Phase I RI (Jacobs Engineering 1993b):

- surface and shallow soil samples (0 to 4 feet below ground surface [bgs]) were collected at six locations in Strata 1 and 2;
- two 25-foot borings (one in each stratum) and one 123-foot-deep boring were drilled and sampled in Stratum 1;
- one downgradient well (10_DGMW77) was drilled, installed, and sampled; and
- soil and groundwater samples were analyzed for target analyte list (TAL) metals, volatile organic compounds (VOCs), semivolatile organic compounds, total fuel hydrocarbons-diesel and -gasoline, total recoverable petroleum hydrocarbons, and pesticides/polychlorinated biphenyls (PCBs).

Concentrations of chemicals of potential concern (COPCs) detected in shallow soil at Site 10 during the Phase I RI were compared to United States Environmental Protection Agency (U.S. EPA) Region IX Preliminary Remediation Goals (PRGs) and ecological screening criteria. The results of this comparison are shown below (Jacobs Engineering 1993a, page A10-7 and Table A10-3a):

- benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, exceed PRGs and ecological criteria in Stratum 1; and
- no COPCs exceed PRGs or ecological criteria in Stratum 2.

The concentrations of COPCs detected in groundwater samples were compared to PRGs, and maximum contaminant levels (MCLs). The results of that comparison are shown below (Jacobs Engineering 1993a, page A10-7 and Table A10-3b):

- 1,1-dichloroethylene, carbon tetrachloride, tetrachloroethelene, trichloroethylene, arsenic, and nitrate/nitrite-N exceed PRGs; and
- carbon tetrachloride, tetrachloroethelene, trichloroethylene, nitrate-N, selenium, and total dissolved solids exceed MCLs.

Petroleum hydrocarbons detected in shallow soil samples were also compared to California Leaking Underground Fuel Tank (LUFT) Field Manual (LUFT 1989) guidelines to evaluate their potential to migrate to the groundwater. Based on LUFT guidelines, petroleum hydrocarbons in shallow soils at Strata 1 and 2 do not appear to pose a threat to groundwater at this site (Jacobs Engineering 1993a).

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## Section 3
# MAPS

The maps on the following pages present the site location at MCAS El Toro, site boundaries, site units, physical features of the site, previous sampling locations, and proposed Phase II sampling location (where known). These maps are referenced in other sections of this FSP.

The proposed Phase II sampling locations presented on these maps are intended to illustrate the type of sampling strategy proposed for each unit. Other considerations, (e.g., randomly selected starting points, underground utilities/pipelines, or overhead obstacles) could result in adjustments to sampling locations. The actual field sample locations will be accurately recorded by field personnel relative to surveyed coordinates, and if any sampling points require relocation, the reasons for such changes will be described in the field notebook.

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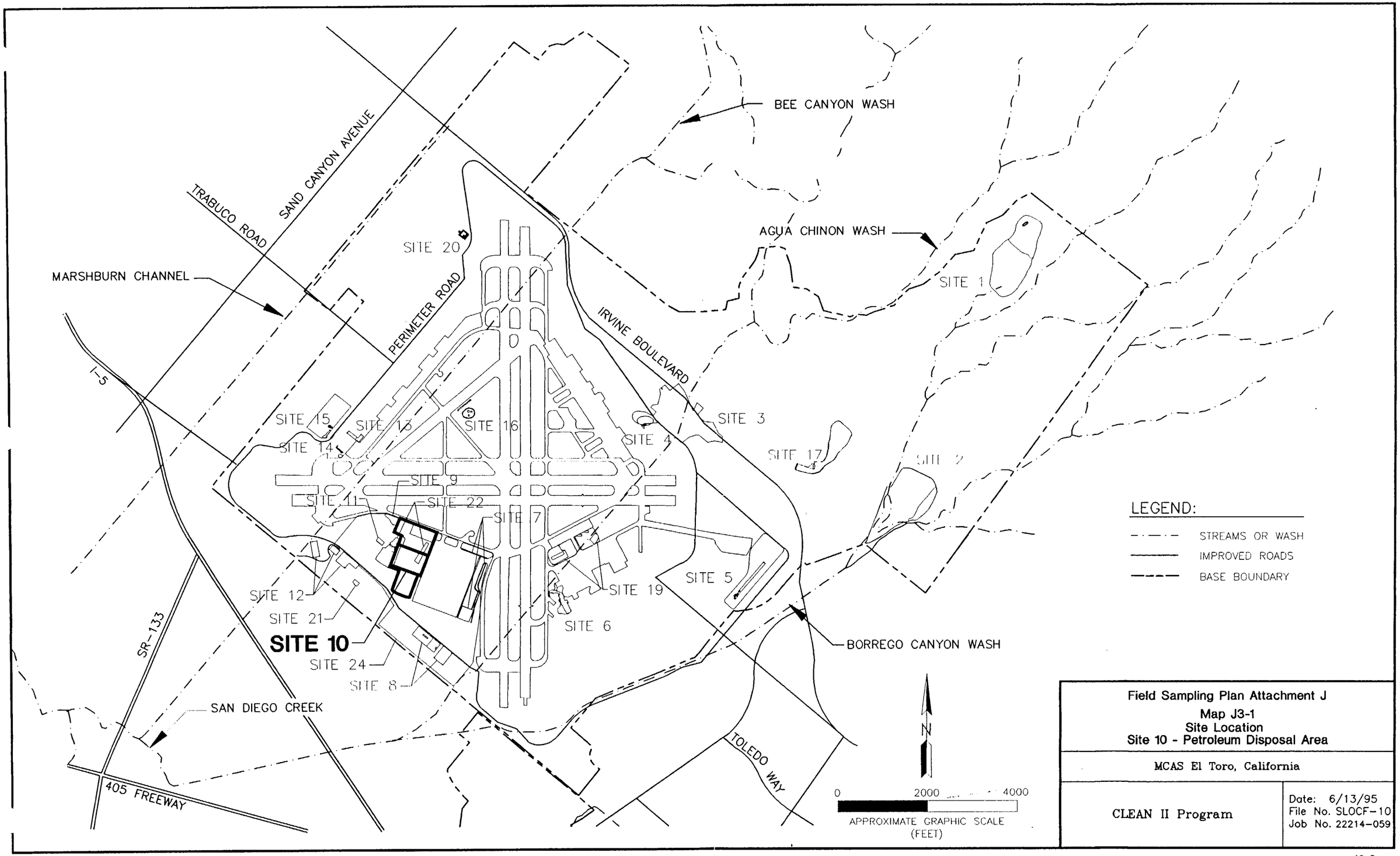


Field Sampling Plan Attachment J
Map J3-1
Site Location
Site 10 - Petroleum Disposal Area

MCAS El Toro, California

CLEAN II Program

Date: 6/13/95
File No. SLOCF-10
Job No. 22214-059

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## LEGEND:

- BUILDING OR PAD
- IMPROVED ROADS
- RAILROAD
- PHASE I STRATUM BOUNDARY
- PHASE II UNIT MODIFICATIONS
- BASE BOUNDARY

### EXISTING:

- SOIL GAS SURVEY POINT
- PHASE I MONITORING WELL (RESULTS ON TABLES B6-3 AND B6-6 IN PHASE I T.M.)
- PHASE I DEEP ANGLE BORING
- PHASE I SURFACE AND NEAR SURFACE SOIL SAMPLE (RESULTS ON TABLE B6-2 IN PHASE I T.M.)

### PROPOSED:

- PHASE II SURFACE AND NEAR SURFACE SOIL SAMPLE
- TIER 1 SITE 24 CPT LITHOLOGIC SAMPLING LOCATION
- PHASE II SITE 24 AIR SPARGING WELLS
- PHASE II SITE 24 MONITORING WELL
- TIER 1 SITE 24 CPT LITHOLOGIC SAMPLING LOCATION
- LOCATION OF PHASE II SITE 24 PIEZOMETER
- HOLLOW STEM AUGER BORING/LOCATION AT SITE 24 (MINIMUM 5-OOOT DRIVE SAMPLES)
- HOLLOW STEM AUGER BORING/LOCATION AT SITE 24 (CONTINUOUS SAMPLE)

N

0 150 300

APPROXIMATE GRAPHIC SCALE (FEET)

Field Sampling Plan Attachment 1

**Map J3-2**

**Site 10 - Petroleum Disposal Area**

MCAS El Toro, California

CLEAN II Program

Date: 7/8/95
File No. SITE710B
Job No. 22214-059

J3-5

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# Section 4
# RATIONALE FOR SAMPLING LOCATIONS

This section explains the rationale for the number of sampling programs, types of samples, locations of samples, and analytical parameters. The rationale for sampling is based on site conditions, previous investigations, and data quality objectives as presented in the appendices of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.1 SAMPLING PROGRAMS, SAMPLE TYPES, AND LOCATIONS

Sampling programs, types of samples, and locations are presented based on the smallest area of study. For some sites, the smallest area of study is a site unit; and for other sites, the area of study may be the entire site. Selection of sampling programs, sample types, and locations is based on:

- site activities and history;
- types of media suspected or known to be impacted from previous investigations;
- objectives of site-specific RI/FS efforts; and
- site-specific initial surveys.

Site 10 is covered with aircraft matting (at the northern portion) and a concrete apron (at the southern portion). All known petroleum disposal activities occurred before 1973. The two portions of the main PDA are differentiated by the paving materials on their surfaces. The concrete parking apron and the metal aircraft matting are likely to have different degrees of permeability that may affect the amount of storm water infiltrating into soil beneath. The 2-foot topsoil layer at the southern portion was excavated during construction of the concrete apron. Therefore, the distribution of contaminants in the soil may vary in the two portions.

The Science Applications International Corporation aerial survey identified (in an aerial photo from 1964) a dark stain area visible in the southern portion of the main PDA (SAIC 1993). This dark stain extends south of the area covered by the concrete apron into an area that is presently a parking lot. Based on this information, the California Environmental Protection Agency (Cal/EPA) requested expansion of the boundaries of Site 10 to cover the open dirt/asphalt section located south of the PDA, which has been designated Unit 3, Parking Lot Area, for the Phase II RI/FS (Map J3-2).

The former Heavy Duty Maintenance (HDM) shop was located in Building 1589. Two portable 500-gallon tanks (bowsers) were stored next to this building and were used to collect waste oils and solvents. When tanks were filled, the tank contents were sprayed onto the ground for dust control. This disposal activity occurred over a period of approximately 13 years, with an estimated maximum volume of 50,000 gallons (Jacobs Engineering 1993a). The former HDM shop also contained a waterfall paint booth. Sludges from the paint booth were drained onto the ground. Cal/EPA requested that this area be investigated. Based on this request, the Parking Area North of Building 1589 was added as Unit 4 for the Phase II RI/FS.

For the Phase II RI/FS, Site 10 will be represented by four units as follows:

- Unit 1: Aircraft Matting Area;
- Unit 2: Concrete Apron Area;
- Unit 3: Parking Lot Area; and
- Unit 4: Parking Area North of Building 1589.

## 4.2 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk to human health or the environment. The Tier 1 sampling approach will consist of collecting shallow soil samples (less than 10 feet bgs) from a specific number of sampling locations within the unit. The number of sampling locations has been proposed, such that when the Phase I and II RI/FS data are evaluated together, a risk can be estimated for the unit. An explanation of the proposed sampling designs for Tier 1 soil sampling can be found in Section 4 of the Phase II RI/FS Work Plan (BNI 1995a).

### 4.2.1 Unit 1: Aircraft Matting Area

Unit 1 consists of the northern portion of the main PDA, which includes the aircraft matting area.

#### 4.2.1.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 5, and 10 feet bgs at eight areal systematic random-sampling locations based on a grid spacing of 246 by 307 feet (Map J3-2).

### 4.2.2 Unit 2: Concrete Apron Area

Unit 2 comprises the southern portion of the main PDA, which is the concrete apron.

#### 4.2.2.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 5, and 10 feet bgs at 10 areal systematic random-sampling locations based on a grid spacing of 198 by 180 feet (Map J3-2).

### 4.2.3 Unit 3: Parking Lot Area

Unit 3 is the parking area located south of the main PDA.

#### 4.2.3.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 5, and 10 feet bgs at 12 areal systematic random-sampling locations based on a grid spacing of 155 by 151 feet (Map J3-2).

### 4.2.4 Unit 4: Parking Area North of Building 1589

Unit 4 is the area added to investigate the locations where the bowsers were staged and filled prior to the spraying of Site 10.

#### 4.2.4.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 5, and 10 feet bgs at two judgmental-sampling locations (Map J3-2).

## 4.3 TIER 2

The Tier 2 sampling program will also focus exclusively on shallow soil (0 to 10 feet) conditions. The primary objective of this program will be to refine the data on the extent of shallow soil contamination identified during the Tier 1 sampling. Tier 2 sample locations will be based on these sample results. The process by which the Tier 2 sample locations will be selected is detailed in Appendix J of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.4 TIER 3

The objective of a Tier 3 soil sampling program is to estimate the extent of a contaminant plume in deeper subsurface soils. To accomplish this goal, the drilling and sampling of a series of boreholes will be required. The location of Tier 3 boreholes is intended to minimize the number of boreholes required to define the lateral and vertical extent of the contaminant plume in deeper subsurface soils. Groundwater samples will be collected only when a contaminant plume in deeper subsurface soils has been traced (through a drilling and soil sampling program) downward to the water table. At such units/sites, the objectives of the sampling program must then be expanded to include a determination of whether groundwater has been adversely impacted as a result of the historic activities at this unit/site.

The process by which the locations for Tier 3 soil borings and monitoring wells will be selected is detailed in Appendix J of the Phase II RI/FS Work Plan (BNI 1995a).

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# Section 5
# REQUEST FOR ANALYSES

Requests for analyses are based on:

- site activities and history;
- results of previous investigations; and
- objectives of site-specific RI/FS efforts.

The analytical methods referenced in this section are from the Phase II RI/FS Quality Assurance Project Plan (QAPP) (BNI 1995b). Section 6 in the QAPP specifies the number and/or frequency for collection of field duplicate and blank samples during the Phase II RI/FS field activities.

## 5.1 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk. The Tier 1 sampling approach will consist of the collection of shallow soil samples (less than 10 feet bgs) from a specific number of sampling locations within the unit. Table J5-1 lists all soil samples and associated analyses for the units in Site 10.

### 5.1.1 Unit 1: Aircraft Matting Area

The 24 Tier 1 soil samples that will be collected at Site 10, Unit 1, will be analyzed according to the methods listed below.

#### 5.1.1.1 FIELD SCREENING

All soil samples will be field-screened for polynuclear aromatic hydrocarbons (PAH) with immunoassay test kits (U.S. EPA Method 4035) and for total petroleum hydrocarbons (TPH)-diesel and -gasoline (U.S. EPA Method 8015M) using an appropriately equipped mobile laboratory.

#### 5.1.1.2 FIXED-BASE ANALYTICAL LABORATORIES

Five samples (four detects and one nondetect) will be submitted to the fixed-base laboratory to confirm field screening results. The fixed-based analyses are PAH (U.S. EPA Method 8310) and TPH-diesel and -gasoline (U.S. EPA Method 8015M) under Naval Facilities Engineering Service Center (NFESC, formerly known as Naval Energy and Environmental Support Activity [NEESA]) Level D protocols.

### 5.1.2 Unit 2: Concrete Apron Area

The 30 Tier 1 soil samples that will be collected at Site 10, Unit 2, will be analyzed according to the methods listed below.

## Table J5-1
## Soil Sampling and Analysis

| Tier | Unit/Name | PHASE II RI/FS SAMPLE NUMBERS | | | FIELD[a] - IMMUNOASSAY OR MOBILE LABORATORY | | | | | OFF-SITE LABORATORY[b] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Locations | Samples/ Location | Total Samples | PAH[c,d] | PCBs[c,e] | VOCs[f,g] | TPH[h]- Gasoline and -Diesel[f] | Target Analyte List - Metals[f] | PAH | Target Analyte List - Metals |
| Tier 1 | Unit 1 Aircraft Matting | 8 | 3 | 24 | X | | | X | | | |
| | Unit 2 Concrete Apron | 10 | 3 | 30 | X | | | X | | | |
| | Unit 3 Parking Lot Area | 12 | 3 | 36 | X | | | X | | | |
| | Unit 4 Parking Area North of Building 1589 | 2 | 3 | 6 | | | | | | X | X |
| *Tier 1 Subtotals* | | | | 96 | 90 | | | 90 | | 6 | 6 |
| Tier 2 | Optional: Scope of Tier 2 would be to further define extent of shallow soil contamination; based on Tier 1 data, Phase I RI findings, and soil gas survey results, with approval of Base Closure and Realignment (BRAC) Cleanup Team (BCT). | | | | | | | | | | |
| Tier 3 | Optional: Scope of Tier 3 would be to characterize horizontal and vertical extent of contamination below 10 feet depth; based on Tier 1 and 2 data, Phase I RI findings, soil gas survey results and/or RFA data, with approval of BCT. | | | | | | | | | | |

Notes:
- [a] five samples from Unit 1, six samples from Unit 2, and nine samples from Unit 3 will be sent to the off-site laboratory for confirmation analyses
- [b] these constituents cannot be determined in the field; all samples to be analyzed for these constituents will be sent to the off-site laboratory
- [c] immunoassay analyses
- [d] PAH – polynuclear aromatic hydrocarbons
- [e] PCB – polychlorinated biphenyl
- [f] mobile laboratory analyses
- [g] VOC – volatile organic compound
- [h] TPH – total petroleum hydrocarbons

#### 5.1.2.1 FIELD SCREENING

All soil samples will be field screened for PAH with immunoassay test kits (U.S. EPA Method 4035) and for TPH-diesel and -gasoline (U.S. EPA Method 8015M) using an appropriately equipped mobile laboratory.

#### 5.1.2.2 FIXED-BASE ANALYTICAL LABORATORIES

Six samples (four detects and two nondetects) will be submitted to the fixed-base laboratory to confirm field-screening results. The fixed-based analyses are PAH (U.S. EPA Method 8310) and TPH-diesel and -gasoline (U.S. EPA Method 8015M) under NFESC Level D protocols.

### 5.1.3 Unit 3: Parking Lot Area

The 36 Tier 1 soil samples that will be collected at Site 10, Unit 3, will be analyzed according to the methods listed below.

#### 5.1.3.1 FIELD SCREENING

All soil samples will be field-screened for PAH with immunoassay test kits (U.S. EPA Method 4035), and for TPH-diesel and -gasoline (U.S. EPA Method 8015M) using an appropriately equipped mobile laboratory.

#### 5.1.3.2 FIXED-BASE ANALYTICAL LABORATORIES

Nine samples (six detects and three nondetects) will be submitted to the fixed-base laboratory to confirm field-screening results. The fixed-based analyses are PAH (U.S. EPA Method 8310), and TPH-diesel and -gasoline (U.S. EPA Method 8015M) under NFESC Level D protocols.

### 5.1.4 Unit 4: Parking Area North of Building 1589

The six Tier 1 soil samples that will be collected at Site 10, Unit 4, will be analyzed according to the methods listed below.

#### 5.1.4.1 FIXED-BASE ANALYTICAL LABORATORIES

All samples will be submitted to the fixed-base laboratory for chemical analyses. The fixed-base analyses are PAH (U.S. EPA Method 8310) and TAL metals (U.S. EPA Method 6000/7000) under NFESC Level D protocols.

## 5.2 TIER 2

A Tier 2 request for analysis, if necessary, will be contingent upon the Tier 1 sample results.

## 5.3 TIER 3

A Tier 3 request for analysis, if necessary, will be contingent upon the Tier 1 and Tier 2 sample results.

# Section 6
# FIELD METHODS AND PROCEDURES

This section presents site-specific field methods that will be used to collect samples and other field data. The field methods referenced in this section are from Section 6 of the FSP and the Comprehensive Long-Term Environmental Action Navy (CLEAN) Standard Operating Procedures, which discuss specific field methods and procedures.

## 6.1 INITIAL SURVEYS

Before the collection of Phase II RI/FS soil samples, the site will be scaled, and sampling locations will be staked or paint-marked. Once a sampling point is marked, utility clearances will be made before collecting any sample that uses power equipment to reach the sample depth. Utility clearances may also be made at locations where samples are being collected using a hand auger. Nonintrusive utility clearances will be completed by a subcontractor, using geophysical methodology in conjunction with site activities.

Each sampling point will be located by survey, using the California Plane Coordinate System, with northings and eastings determined to the nearest 0.1 foot. The surface elevation will be determined to the nearest 0.01 foot.

## 6.2 TIER 1

All samples in Unit 1 will be collected at the locations and depths described in Section 4.2. More information on soil sampling procedures is provided in Section 6 of the FSP.

### 6.2.1 Unit 1: Aircraft Matting Area

The 24 Tier 1 soil samples will be collected at Site 10, Unit 1, at depths of 0, 5, and 10 feet bgs in eight borings as indicated below.

#### 6.2.1.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer.

### 6.2.2 Unit 2: Concrete Apron Area

The 30 Tier 1 soil samples will be collected at Site 10, Unit 2, at depths of 0, 5, and 10 feet bgs in 10 borings as indicated below.

#### 6.2.2.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer.

### 6.2.3 Unit 3: Parking Lot Area

The 36 Tier 1 soil samples will be collected at Site 10, Unit 3, at depths of 0, 5, and 10 feet bgs in 12 borings as indicated below.

#### 6.2.3.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer.

### 6.2.4 Unit 4: Parking Area North of Building 1589

The six Tier 1 soil samples will be collected at Site 10, Unit 4, at depths of 0, 5, and 10 feet bgs in two borings as indicated below.

#### 6.2.4.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer.

## 6.3 TIER 2

If Tier 2 soil sampling is conducted at Site 10, shallow soil samples will be collected as described above.

## 6.4 TIER 3

If Tier 3 sampling is conducted, deep soil samples (from 10 feet bgs to groundwater level) will be collected at 5-foot intervals, with a modified California split-spoon sampler equipped with stainless steel sleeves. The split-spoon sampler will be driven into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer. When drilling is required to depths of greater than 130 feet bgs, the hollow-stem auger drilling rig will be replaced by an air-rotary drilling rig. If groundwater sampling is necessary, sampling will follow procedures presented in Section 6 of the FSP.

## Section 7
# REFERENCES

Bechtel National, Inc. 1995a. *Final Work Plan, Phase II Remedial Investigation/Feasibility Study.* Marine Corps Air Station El Toro, California.

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Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Room 135
San Diego, California 92132-5187

Contract No. N68711-92-D-4670

**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**

**CLEAN II**

# FIELD SAMPLING PLAN
# ATTACHMENT K
# OPERABLE UNIT 3 –
# SITE 11 – TRANSFORMER STORAGE AREA
# MCAS EL TORO, CALIFORNIA

**CTO-0059**

Prepared by:

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August 1995

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# ACRONYMS/ABBREVIATIONS

| | |
|---|---|
| bgs | below ground surface |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| COPC | chemical of potential concern |
| EE/CA | Engineering Evaluation/Cost Analysis |
| FSP | Field Sampling Plan |
| Irvine Subbasin | Irvine Groundwater Subbasin |
| MCAS | Marine Corps Air Station |
| NEESA | Naval Energy and Environmental Support Activity |
| NFESC | Naval Facilities Engineering Service Center |
| PCB | polychlorinated biphenyl |
| PRG | (U.S. EPA Region IX) Preliminary Remediation Goal |
| QAPP | Quality Assurance Project Plan |
| RI/FS | Remedial Investigation/Feasibility Study |
| U.S. EPA | United States Environmental Protection Agency |
| UST | underground storage tank |

# ACRONYMS/ABBREVIATIONS (continued)

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# Section 1
# OBJECTIVES

This Field Sampling Plan (FSP) for Site 11, the Transformer Storage Area, outlines the field procedures and methodology to be used during the Remedial Investigation (RI)/Feasibility Study (FS) for this site. The purpose of this FSP is to enable field personnel unfamiliar with the site to gather the required samples and field data. It is also intended to assure that data collection will be comparable to and compatible with previous data collected at the site and with other sampling activities at other sites at the Marine Corps Air Station (MCAS) El Toro.

## 1.1 SAMPLING OBJECTIVES

The specific objectives for sampling at Site 11 are as follows:

- verify boundaries of waste disposal activities;
- characterize the nature and extent of contamination;
- estimate the vertical and horizontal extent of contamination; and
- characterize site-specific groundwater contamination, if soil contamination extends to groundwater.

## 1.2 DATA USAGE

To satisfy the RI/FS objectives for the Transformer Storage Area, the data to be collected, compiled, and analyzed will be used to perform the following:

- characterize subsurface soils;
- establish stratigraphic controls;
- establish geotechnical parameters;
- characterize groundwater conditions and quality (where soil contamination suggests);
- determine the types of contaminants in soil and/or groundwater;
- estimate the extent of contaminants in soil and/or groundwater;
- evaluate human health and ecological risks;
- evaluate the mass of contaminants;
- evaluate cleanup levels;
- characterize the feasible removal or remedial actions, if necessary; and
- evaluate remedial alternatives.

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# Section 2
# BACKGROUND

This section generally describes and discusses the results of previous investigations at Site 11. This section also provides a brief compilation of the data used to develop the site-specific FSP for Phase II RI/FS activities. Previous investigations and reports provide a more thorough discussion of site history, activities, and summaries of previous investigations.

## 2.1 SITE DESCRIPTION

The Transformer Storage Area is located in the area adjacent to the northeast side of Building 369 located in the western quadrant of MCAS El Toro (Map K3-1). The site was characterized by transformer storage that took place there. A 30-foot concrete pad is located on the site, adjacent to the northeast of Building 369. The concrete pad is situated within a fenced storage yard that is covered with gravel and is relatively flat. A wide, shallow depression is located in the center of the yard. This depression appears to receive drainage from the concrete pad, and staining is evident. On-site workers explained that after rain events, the depression fills with water. An asphalt-lined drainage ditch runs along the north side of Building 369, adjacent to the concrete pad nearest the building. It drains to the northwest and onto the street southwest of Building 369 (Jacobs Engineering 1993a).

### 2.1.1 History

Site 11 was used to store 50 to 75 transformers from approximately 1968 to 1983. Reportedly, five transformers leaked. One transformer spilled approximately 60 gallons of polychlorinated biphenyl (PCB) transformer oil onto the concrete pad. It was not known where on the pad the leakage occurred. The transformer oil was believed to have migrated to the edge of the pad and discharged onto the unlined surface of the storage yard and into the drainage ditch parallel to Building 369. A catch basin that discharges into Bee Canyon Wash is located west of Building 369 and receives runoff from a wide area. In 1983, the transformers were removed and disposed off-site (Jacobs Engineering 1993a).

### 2.1.2 Geology

The geology of Site 11 consists of Quaternary alluvial and marine deposits (Jacobs Engineering 1993b). Holocene deposits consist of a matrix of fine-grained overbank deposits and some coarse-grained stream channel deposits. These soils are derived from the Santa Ana Mountains to the east and conformably overlie Pleistocene interbedded fine-grained lagoonal and near-shore marine deposits. Pleistocene deposits could not be differentiated from Holocene deposits in Phase I RI soil borings. Pleistocene deposits unconformably overlie semiconsolidated marine sandstones, siltstones, and conglomerates of late Miocene to late Pliocene, which are considered to be bedrock in the area.

Based on a review of boring logs from the Phase I RI, the subsurface lithology at Site 11 consists of well-graded to silty sand that is interbedded with silt and clay. Occasional gravel lenses may exist within the sand units, which would probably be associated with stream channels.

### 2.1.3 Hydrogeology

MCAS El Toro lies within the Irvine Groundwater Subbasin (Irvine Subbasin). Regional aquifers in the Irvine Subbasin tend to be composed of discontinuous lenses of clayey and silty sands and fine-grained gravels contained within a complex assemblage of sandy clays and sandy silts. Three general aquifer systems have been identified near the Station: a shallow and perched system, a principal aquifer zone, and a lower hydrogeologic system existing in bedrock (Jacobs Engineering 1993a).

Groundwater was not investigated as part of the Phase I RI for Site 11. However, based on monitoring wells adjacent to the site, the shallow, perched zone is probably not present at Site 11, and groundwater is at a depth of approximately 100 feet below ground surface (bgs). The regional groundwater flow direction is to the northwest. The local hydraulic gradient in the area of the site has been influenced strongly by the pumping of irrigation wells located west of MCAS El Toro.

## 2.2 PHASE I REMEDIAL INVESTIGATION RESULTS

During the Phase I RI, Site 11 was represented by two strata (Map K3-2):

- Stratum 1 - Concrete Pad and Surrounding Area (the area around the pad where spilled fluids may have drained); and
- Stratum 2 - Drainage Ditch (the asphalt-lined drainage ditch running parallel to Building 369).

The following site-specific activities were conducted:

- sixteen shallow soil samples (0 to 10 feet bgs) were collected from six locations (three in each stratum); and
- soil samples were analyzed for pesticides/PCBs.

No subsurface soil (deeper than 10 feet bgs) or groundwater samples were collected from Site 11 because it is not expected that the chemicals of potential concern (COPCs), the PCBs, will readily migrate vertically into these media.

United States Environmental Protection Agency (U.S. EPA) Region IX Preliminary Remediation Goals (PRGs) and ecological screening criteria for the site were compared with corresponding soil sample analytical results. The results of this comparison are summarized below (Jacobs Engineering 1993a, pages A11-6 and A11-7):

- Aroclor 1260 exceed PRGs in Strata 1 and 2; and
- no COPCs exceed ecological screening criteria in Strata 1 or 2.

## Section 3
# MAPS

The maps on the following pages illustrate the site location at MCAS El Toro, site boundaries, site units, physical features of the site, previous sampling locations, and proposed Phase II sampling locations (where known). These maps are referenced in other sections of this FSP.

The proposed Phase II sampling locations presented on these maps are intended to illustrate the type of sampling strategy proposed for each unit. Other considerations (e.g., randomly selected starting points, underground utilities/pipelines, or overhead obstacles) could result in adjustments to sampling locations. The actual field sample locations will be accurately recorded by field personnel relative to surveyed coordinates, and if any sampling points require relocating, the reasons for such changes will be described in the field notebook.

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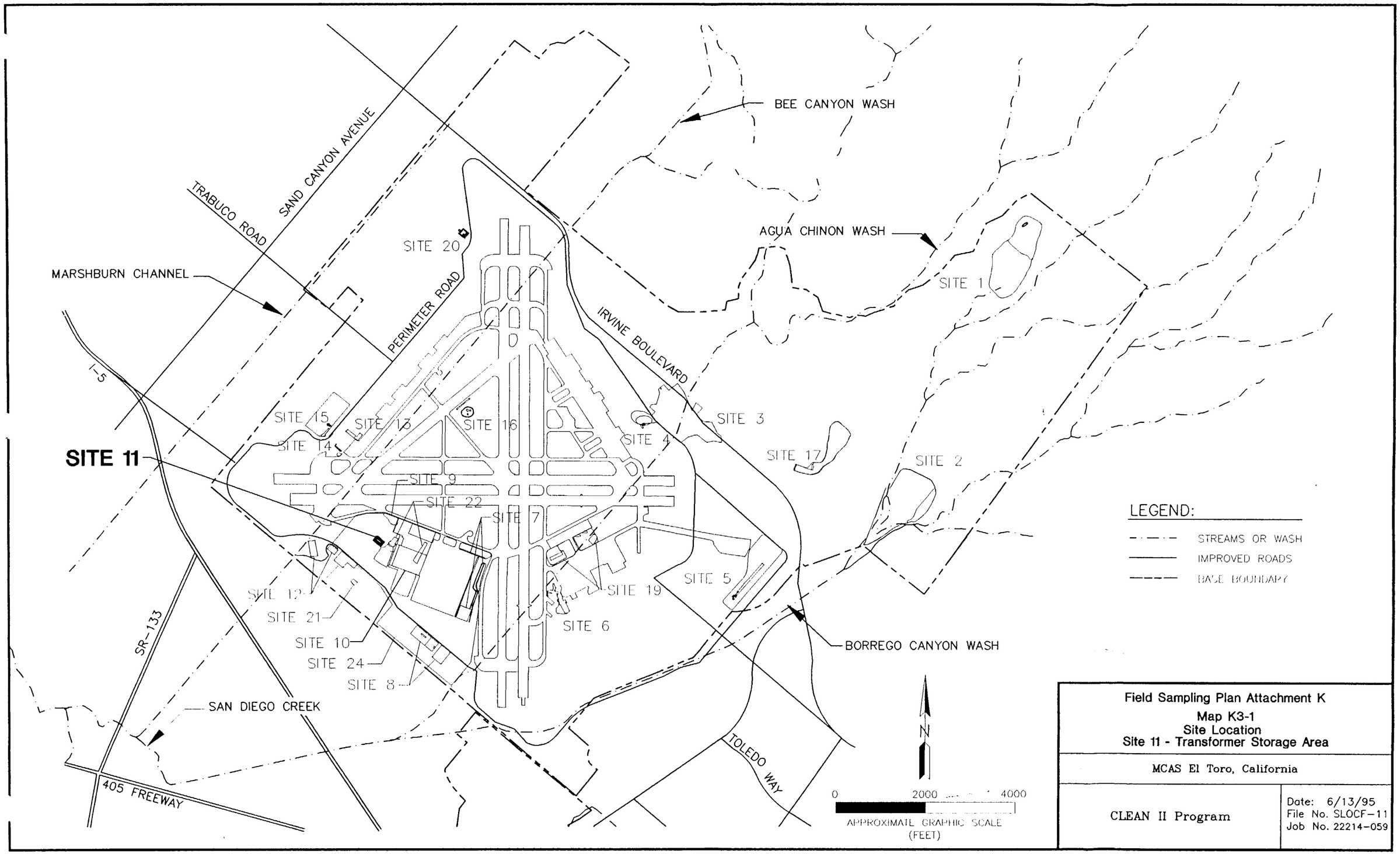


**Field Sampling Plan Attachment K**

**Map K3-1**
**Site Location**
**Site 11 - Transformer Storage Area**

MCAS El Toro, California

CLEAN II Program

Date: 6/13/95
File No. SLOCF-11
Job No. 22214-059

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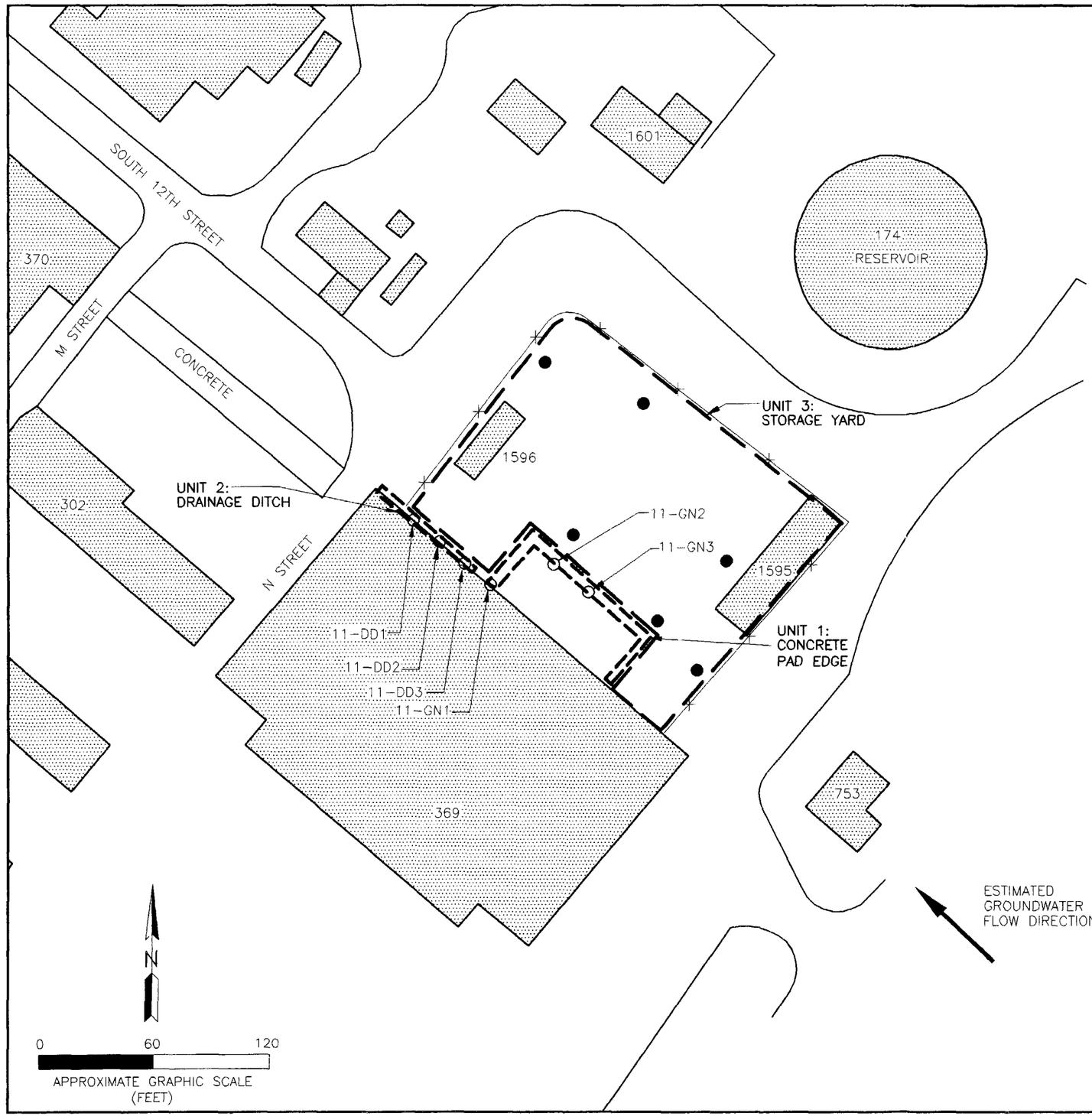


## LEGEND:

- BUILDING OR PAD
- IMPROVED ROADS
- RAILROAD
- PHASE I STRATUM BOUNDARY
- PHASE II UNIT MODIFICATIONS
- FENCE
- 270 ELEVATION CONTOURS (FEET MSL-2 FOOT INTERVAL)

### EXISTING:

- ○ PHASE I SURFACE AND NEAR SURFACE SOIL SAMPLE (RESULTS ON TABLE B11-2 IN PHASE I T.M.)

### PROPOSED:

- ● PHASE II SURFACE AND NEAR SURFACE SOIL SAMPLE

**Field Sampling Plan Attachment K**

**Map K3-2**

**Site Plan**
**Site 11 - Transformer Storage Area**

MCAS El Toro, California

CLEAN II Program

Date: 7/3/95
File No. SITEF11B
Job No. 22214-059

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# Section 4
# RATIONALE FOR SAMPLING LOCATIONS

This section explains the rationale for the number of sampling programs, types of samples, locations of samples, and analytical parameters. The rationale for sampling is based on site conditions, previous investigations, and data quality objectives as presented in the appendices of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.1 SAMPLING PROGRAMS, SAMPLE TYPES, AND LOCATIONS

Sampling programs, types of samples, and locations are presented based on the smallest area of study. For some sites, the smallest area of study is a site unit; for other sites, the area of study may be the entire site. Selection of sampling programs, sample types, and locations is based on:

- site activities and history,
- types of media suspected or known to be impacted from previous investigations,
- objectives of site-specific RI/FS efforts, and
- site-specific initial surveys.

The site will be represented by three areas (units) for the Phase II RI/FS:

- Unit 1 - Concrete Pad Edge (the same area as Stratum 1 from the Phase I RI);
- Unit 2 - Drainage Ditch (the same area as Stratum 2 in Phase I RI); and
- Unit 3 - Storage Yard (has been created to investigate the rest of the yard, due to the fact that transformers have probably been stored throughout the yard).

The units will be sampled using a tiered sampling approach as discussed in the following sections. Previous site activities, Phase I RI sampling results, and regulatory comments were used to formulate the Phase II sampling approach. During the Phase I RI, soil samples were collected from each stratum, and COPCs were identified and evaluated against PRGs. Sample locations in all units have been positioned in locations that were not sampled as part of the Phase I RI.

## 4.2 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk to human health or the environment. The Tier 1 sampling approach will consist of the collection of shallow soil samples (less than 10 feet bgs) from a specific number of sampling locations within the unit. The number of sampling locations has been proposed such that, when the Phase I and II RI/FS data are evaluated together, a risk can be estimated for the unit. An explanation of the proposed sampling designs for Tier 1 soil sampling can be found in Section 4 of the Phase II RI/FS Work Plan (BNI 1995a).

### 4.2.1 Unit 1: Concrete Pad Edge

Unit 1 is presently being addressed as an Early Action through the Non-Time-Critical Removal Action process. An Engineering Evaluation/Cost Analysis (EE/CA) has been prepared for this unit.

### 4.2.2 Unit 2: Drainage Ditch

Unit 2 has been approved for Early Action and is being addressed through the Non-Time-Critical Removal Action process. An EE/CA (has been prepared for this unit.

### 4.2.3 Unit 3: Storage Yard

Unit 3 was created for the Phase II RI to investigate the storage yard north of Building 369 where transformers were stored.

#### 4.2.3.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 2, and 4 feet bgs in six areal systematic random sampling locations in Unit 3 (Map K3-2).

#### 4.2.3.2 UNDERGROUND STORAGE TANK WIPE SAMPLE

In addition to the above sampling in Unit 3, one sample will also be collected from an underground storage tank (UST) present in the storage yard. If the UST contains fluid, then the fluid will be sampled and analyzed for PCBs. If the UST does not contain fluid, one wipe sample will be collected from the bottom of the UST and will be analyzed for PCBs. If PCBs are present in the fluid or wipe sample, then two borings adjacent to the UST will be drilled to a depth below the bottom of the UST to determine if soils below the UST have been impacted.

## 4.3 TIER 2

The Tier 2 sampling program will also focus exclusively on shallow soil (0 to 10 feet) conditions. The primary objective of this program will be to refine the data on the extent of shallow soil contamination identified during the Tier 1 sampling. Tier 2 sample locations will be based on these sample results. The process by which the Tier 2 sample locations will be selected is detailed in Appendix K of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.4 TIER 3

The objective of a Tier 3 soil sampling program is to estimate the extent of a contaminant plume in deeper subsurface soils. To accomplish this goal, a series of boreholes will be drilled and sampled. The location of Tier 3 boreholes is intended to minimize the number of boreholes required to define the lateral and vertical extent of the contaminant plume in deeper subsurface soils. Groundwater samples will be collected only when a contaminant plume in deeper subsurface soils has been traced (through a drilling and soil sampling

program) downward to the water table. At such units/sites, the objectives of the sampling program must then be expanded to include a determination of whether groundwater has been adversely impacted as a result of the historic activities at this unit/site.

The process by which the locations for Tier 3 soil borings and monitoring wells will be selected is detailed in Appendix K of the Phase II RI/FS Work Plan (BNI 1995a). However, due to the low mobility of PCBs in soil, implementation of a Tier 3 sampling program to assess deeper subsurface soil and groundwater is not expected to be necessary at Site 11.

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# Section 5
# REQUEST FOR ANALYSES

Requests for analyses are based on:

- site activities and history,
- results of previous investigations, and
- objectives of site-specific RI/FS efforts.

The analytical methods referenced in this section are from the Phase II RI/FS Quality Assurance Project Plan (QAPP) (BNI 1995b). Section 6 in the QAPP specifies the number and/or frequency for collection of field duplicate and blank samples during the Phase II RI/FS field activities.

## 5.1 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk. The Tier 1 sampling approach will consist of the collection of shallow soil samples (less than 10 feet bgs) from a specific number of sampling locations within the unit. Table K5-1 lists all soil samples and associated analyses for the Units in Site 11.

### 5.1.1 Unit 3: Storage Yard

The 18 Tier 1 soil samples and the one UST wipe or fluid sample that will be collected at Site 11, Unit 3, will be analyzed according to the methods listed below.

#### 5.1.1.1 FIXED-BASE ANALYTICAL LABORATORIES

The one wipe or fluid sample collected from the UST in the Storage Yard will be analyzed for pesticides/PCBs (U.S. EPA Method 8080) by a fixed-base laboratory under Naval Facilities Engineering Service Center (NFESC, formerly known as Naval Environmental and Energy Support Activity [NEESA]) Level D protocols. All soil samples will be submitted to the fixed-base laboratory for chemical analysis. The fixed-base laboratory analyses are pesticides/PCBs (U.S. EPA Method 8080) under NFESC Level D protocols.

## 5.2 TIER 2

A Tier 2 request for analysis, if necessary, will be contingent upon the Tier 1 sample results.

## 5.3 TIER 3

Owing to the low mobility of PCBs in soil, Tier 3 sampling, and subsequent sample analysis is not anticipated during the Phase II RI/FS.

**Table K5-1**
**Soil Sampling and Analysis**

| Tier | Unit/Name | PHASE II RI/FS SAMPLE NUMBERS | | | OFF-SITE LABORATORY[a] | |
|---|---|---|---|---|---|---|
| | | No. of Locations | Samples/ Location | Total Samples | Pesticides and PCBs[b] | Herbicides |
| Tier 1 | Unit 3 Storage Yard | 6 soil, 1 wipe | 3 soil, 1 wipe | 19 | X | |
| *Tier 1 Subtotals* | | | | 19 | 19 | |
| Tier 2 | Optional: Scope of Tier 2 would be to further define extent of shallow soil contamination; based on Tier 1 data and Phase I RI findings, with approval of Base Closure and Realignment (BRAC) Cleanup Team (BCT). | | | | | |
| Tier 3 | Optional: Scope of Tier 3 would be to characterize horizontal and vertical extent of contamination below 10 feet depth; based on Tier 1 and 2 data, combined with the Phase I RI findings, with approval of BCT. | | | | | |

Notes:
[a] these constituents cannot be determined in the field; all samples to be analyzed for these constituents will be sent to the off-site laboratory
[b] PCB – polychlorinated biphenyl

# Section 6
# FIELD METHODS AND PROCEDURES

This section presents site-specific field methods that will be used to collect samples and other field data. The field methods referenced in this section are from Section 6 of the FSP and the Comprehensive Long-Term Environmental Action Navy Standard (CLEAN) Operating Procedures, which discuss specific field methods and procedures.

## 6.1 INITIAL SURVEYS

Before the collection of Phase II RI/FS soil samples, the site will be scaled, and sampling locations will be staked or paint-marked. Once a sampling point is marked, utility clearances will be made before collecting any sample that uses power equipment to reach the sample depth. Utility clearances may also be made at locations where samples are being collected using a hand auger. Nonintrusive utility clearances will be completed by a subcontractor, using geophysical methodology in conjunction with site activities.

Each sampling point will be located by survey, using the California Plane Coordinate System, with northings and eastings determined to the nearest 0.1 foot. The surface elevation will be determined to the nearest 0.01 foot.

## 6.2 TIER 1

All samples in Tier 1 will be collected at the locations and depths, as described in Section 4.2. More information on soil sampling procedures is provided in Section 6 of the FSP.

### 6.2.1 Unit 3: Storage Yard

The 18 Tier 1 soil samples will be collected at Site 11, Unit 3, at depths of 0, 2, and 4 feet bgs in six borings as indicated below. In addition to these soil samples one UST wipe sample will also be collected.

#### 6.2.1.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig with a 140-pound hammer. All soil sampling will be conducted as detailed in Section 6 of the FSP.

#### 6.2.1.2 UST WIPE SAMPLE

One wipe sample may be collected from an UST present in the storage yard, according to FSP Section 6. If the UST contains fluid, the fluid will be sampled. If the UST does not contain fluid, one wipe sample will be collected from the bottom of the UST. Wipe sampling will be conducted by the procedures outlined in Section 6.

## 6.3 TIER 2

If Tier 2 soil sampling is conducted at Site 11, shallow soil samples will be collected as described above.

## 6.4 TIER 3

Tier 3 sampling is not anticipated during the Phase II RI/FS at Site 11 because the mobility of PCBs in soil is low and vertical migration to depths greater than 10 feet is not anticipated.

## Section 7
# REFERENCES

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Contract No. N68711-92-D-4670

**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**

**CLEAN II**

# FIELD SAMPLING PLAN
# ATTACHMENT L
# OPERABLE UNIT 3 –
# SITE 12 – SLUDGE DRYING BEDS
# MCAS EL TORO, CALIFORNIA

**CTO-0059**

Prepared by:

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August 1995

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# ACRONYMS/ABBREVIATIONS

| | |
|---|---|
| bgs | below ground surface |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| COPC | chemical of potential concern |
| DDD | dichlorodiphenyldichloroethane |
| DDE | dichlorodiphenyldichloroethene |
| DDT | dichlorodiphenyltrichloroethane |
| FS | Feasibility Study |
| FSP | Field Sampling Plan |
| Irvine Subbasin | Irvine Groundwater Subbasin |
| IWTP | Industrial Wastewater Treatment Plant |
| LUFT | (California) Leaking Underground Fuel Tank (Field Manual) |
| MCAS | Marine Corps Air Station |
| MCL | maximum containment level |
| MCPP | 2-methyl-4-chlorophenoxyproprionic acid |
| NEESA | Naval Energy and Environmental Support Activity |
| NFESC | Naval Facilities Engineering Service Center |
| PAH | polynuclear aromatic hydrocarbons |
| PCB | polychlorinated biphenyl |
| PRG | (U.S. EPA Region IX) Preliminary Remediation Goal |
| QAPP | Quality Assurance Project Plan |
| RCRA | Resource Conservation and Recovery Act |
| RFA | RCRA Facilities Assessment |
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| SVOC | semivolatile organic compound |
| TAL | target analyte list |
| TDS | total dissolved solids |
| TFH | total fuel hydrocarbons |
| TRPH | total recoverable petroleum hydrocarbons |

# ACRONYMS/ABBREVIATIONS (continued)

| | |
|---|---|
| U.S. EPA | United States Environmental Protection Agency |
| VOC | volatile organic compound |
| WWTP | Wastewater Treatment Plant |

# Section 1
# OBJECTIVES

This Field Sampling Plan (FSP) for Site 12, Sludge Drying Beds, outlines the field procedures and methodology to be used during the Remedial Investigation (RI)/Feasibility Study (FS) for this site. The purpose of this FSP is to enable field personnel unfamiliar with the site to gather the required samples and field data. It is also intended to assure that data collection will be comparable to and compatible with previous data collected at the site and with other sampling activities at other sites at the Marine Corps Air Station (MCAS) El Toro.

## 1.1 SAMPLING OBJECTIVES

The specific objectives for sampling at Site 12 are as follows:

- verify boundaries of waste disposal activities;
- characterize the nature and extent of contamination;
- estimate the vertical and horizontal extent of contamination; and
- characterize site-specific groundwater contamination, if soil contamination extends to groundwater.

## 1.2 DATA USAGE

To satisfy the RI/FS objectives for the Sludge Drying Beds, the data to be collected, compiled, and analyzed will be used to perform the following:

- characterize subsurface soils;
- establish stratigraphic controls;
- establish geotechnical parameters;
- characterize groundwater conditions and quality (where soil contamination suggests);
- determine the types of contaminants in soil and/or groundwater;
- estimate the extent of contaminants in soil and/or groundwater;
- evaluate human health and ecological risks;
- evaluate the mass of contaminants;
- evaluate cleanup levels;
- characterize the feasible removal or remedial actions, if necessary; and
- evaluate remedial alternatives.

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# Section 2
# BACKGROUND

This section generally describes and discusses the results of previous investigations at Site 12. This section also provides a brief compilation of the data used to develop the site-specific FSP for Phase II RI/FS activities. Previous investigations and reports provide a more thorough discussion of site history, activities, and summaries of previous investigations.

## 2.1 SITE DESCRIPTION

Site 12 is located in the southwest corner of MCAS El Toro, near Plant Road, South Marine Way, and Bee Canyon Wash (Map L3-1). During the Phase I RI (Jacobs Engineering 1993a), there were three areas of concern at this site.

- The West Sludge Drying Beds area is located between Bee Canyon Wash and Plant Road. These drying beds were abandoned by 1965, and the area is currently used as a construction yard for Station contractor.
- The East Sludge Drying Beds area lies east of Plant Road and west of South Marine Way. It is believed that the area was also the site of the Wastewater Treatment Plant (WWTP) impoundments or additional sludge drying beds. The beds were abandoned around 1972, and the area is now a grassy field.
- A drainage ditch runs east to west around much of the perimeter of the east beds, south of the west beds, and into the Bee Canyon Wash (Site 25). The ditch receives runoff from both the West and East Beds area.

### 2.1.1 History

From approximately 1943 to 1972, the WWTP at Site 12 was operating at MCAS El Toro. The plant was demolished several years after operations ceased. The sludge produced at this facility was dewatered in two drying bed areas. After closing the plant, the sludge may have been abandoned in the drying beds and eventually plowed under the soil surface. An Industrial Wastewater Treatment Plant (IWTP), located east of the WWTP, was identified on aerial photographs dating from 1952. The IWTP operated for less than 1 year between 1945 and 1946. The plant treated the waste stream produced by metals plating operations at MCAS El Toro. The plant structures were demolished in 1959 or 1960. Industrial sewer lines are believed to have terminated at the IWTP. Effluent lines then ran from the IWTP to the WWTP. Sludge lines also ran from the IWTP and WWTP to the East and West Sludge Drying Beds. No evidence of either the IWTP or the WWTP is now visible. The sludges produced in the WWTP and IWTP were thought to contain heavy metals such as silver, arsenic, cadmium, nickel, lead, mercury, copper, and zinc. These metals are present in wastewater associated with metal plating operations (Jacobs Engineering 1993b).

### 2.1.2 Geology

The geology of Site 12 consists of Quaternary alluvial and marine deposits (Jacobs Engineering 1993a). Holocene deposits consist of a matrix of fine-grained overbank

deposits and some coarse-grained stream channel deposits. These soils are derived from the Santa Ana Mountains to the east and conformably overlie Pleistocene interbedded fine-grained lagoonal and near-shore marine deposits. Pleistocene deposits could not be differentiated from Holocene deposits in Phase I RI soil borings. Pleistocene deposits unconformably overlie semiconsolidated marine sandstones, siltstones, and conglomerates of late Miocene to late Pliocene, which are considered to be bedrock in the area.

Site 12 is located in the alluvial basin area of MCAS EL Toro. A review of the Phase I RI boring logs indicates subsurface lithology at Site 12 consists of sandy soil with varying amounts of silt, clay, and gravel.

### 2.1.3 Hydrogeology

MCAS El Toro lies within the Irvine Groundwater Subbasin (Irvine Subbasin). Regional aquifers in the Irvine Subbasin tend to be composed of discontinuous lenses of clayey and silty sands and fine-grained gravels contained within a complex assemblage of sandy clays and sandy silts. Three general aquifer systems have been identified near the Station: a shallow and perched system, a principal aquifer zone, and a lower hydrogeologic system existing in bedrock (Jacobs Engineering 1993a).

The Phase I RI results indicate that the shallow, perched zone is not present at Site 19. The principal aquifer is present beneath Site 12 at a depth between 95 and 105 feet below ground surface (bgs). The regional groundwater flow direction site is to the northwest. The local hydraulic gradient has been influenced strongly by the pumping of irrigation wells located west of MCAS El Toro.

## 2.2 PHASE I REMEDIAL INVESTIGATION RESULTS

During the Phase 1 RI, Site 12 was divided into three strata (Map L3-2):

- Stratum 1 - West Sludge Drying Beds;
- Stratum 2 - East Sludge Drying Beds; and
- Stratum 3 - Drainage Ditch.

The following activities were conducted as part of the Phase I RI (Jacobs Engineering 1993a):

- surface and shallow soil samples were collected at 13 locations (three each in Strata 1, 2, and 3; two at the deep boring; one at the 25-foot boring);
- one 25-foot deep boring was drilled and sampled at the East Sludge Drying Beds (Stratum 2);
- one deep boring was drilled and sampled at the West Sludge Drying Beds (Stratum 1);

- two borings were drilled, sampled (subsurface soil and groundwater), and completed as an upgradient monitoring well (12_UGMW31) and a downgradient well (12_DBMW48);
- soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides and polychlorinated biphenyls (PCBs), total recoverable petroleum hydrocarbons (TRPH), total fuel hydrocarbons (TFH), target analyte list (TAL) metals, and general chemistry; and
- groundwater samples were analyzed for VOCs, SVOCs, TRPH, TFH, TAL metals, pesticides and PCBs, and general chemistry.

The concentration of chemicals of potential concern (COPCs) detected in shallow soil were compared to United States Environmental Protection Agency (U.S. EPA) Region IX Preliminary Remediation Goals (PRGs) and ecological screening criteria:

- in Stratum 1, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, dieldrin, and Aroclor 1254 exceed PRGs, and benzo(a)pyrene, dichlorodiphenyldichloroethene (DDE), lead, mercury, and zinc exceed ecological screening criteria;
- in Stratum 2, Aroclor 1254 exceeds PRGs, and DDE, dichlorodiphenyltrichloroethane (DDT), lead, and mercury exceeded ecological criteria; and
- in Stratum 3, benzo(a)pyrene, benzo(a)fluoranthene, benzo(k)fluoranthene, DDT, dieldrin, 2-methyl-4-chlorophenoxyproprionic acid (MCPP), Aroclor 1254 and lead exceed PRGs; dichlorodiphenyldichloroethane (DDD), DDE, DDT, aluminum, barium, lead, vanadium, and zinc exceeded ecological criteria.

Groundwater samples were collected from the two groundwater monitoring wells constructed in the area of Site 12. Concentrations of COPCs were compared to applicable PRGs and maximum contaminant levels (MCLs):

- trichloroethene, MCPP exceeds PRGs; and nitrate/nitrite-N, sulfate, total dissolved solids (TDS) exceed MCLs in the upgradient well (12_UGMW31); and
- carbon tetrachloride, tetrachloroethene, antimony, exceed PRGs; and chloride, nitrate/nitrite-N, sulfate, TDS exceed MCLs in the on-site well (12_DBMW48).

Petroleum hydrocarbons detected in shallow soil were also compared to the California Leaking Underground Fuel Tank (LUFT) Field Manual guidelines (LUFT 1989) to evaluate their potential to migrate to the groundwater. According to the LUFT guidelines, petroleum hydrocarbons in Stratum 3 may pose a threat to groundwater. No COPCs detected in deep soil (below 10 feet bgs) were found to have the potential to contaminate the groundwater (Jacobs Engineering 1993b).

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## Section 3
# MAPS

The maps on the following pages present the site location at MCAS El Toro, site boundaries, site units, physical features of the site, previous sampling locations, and proposed Phase II sampling locations (where known). These maps are referenced in other sections of this FSP.

The proposed Phase II sampling locations presented on these maps are intended to illustrate the type of sampling strategy proposed for each unit. Other considerations, (e.g., randomly selected starting points, underground utilities/pipelines, or overhead obstacles) could result in adjustments to sampling locations. The actual field sample locations will be accurately recorded by field personnel relative to surveyed coordinates, and if any sampling points require relocation, the reasons for such changes will be described in the field notebook.

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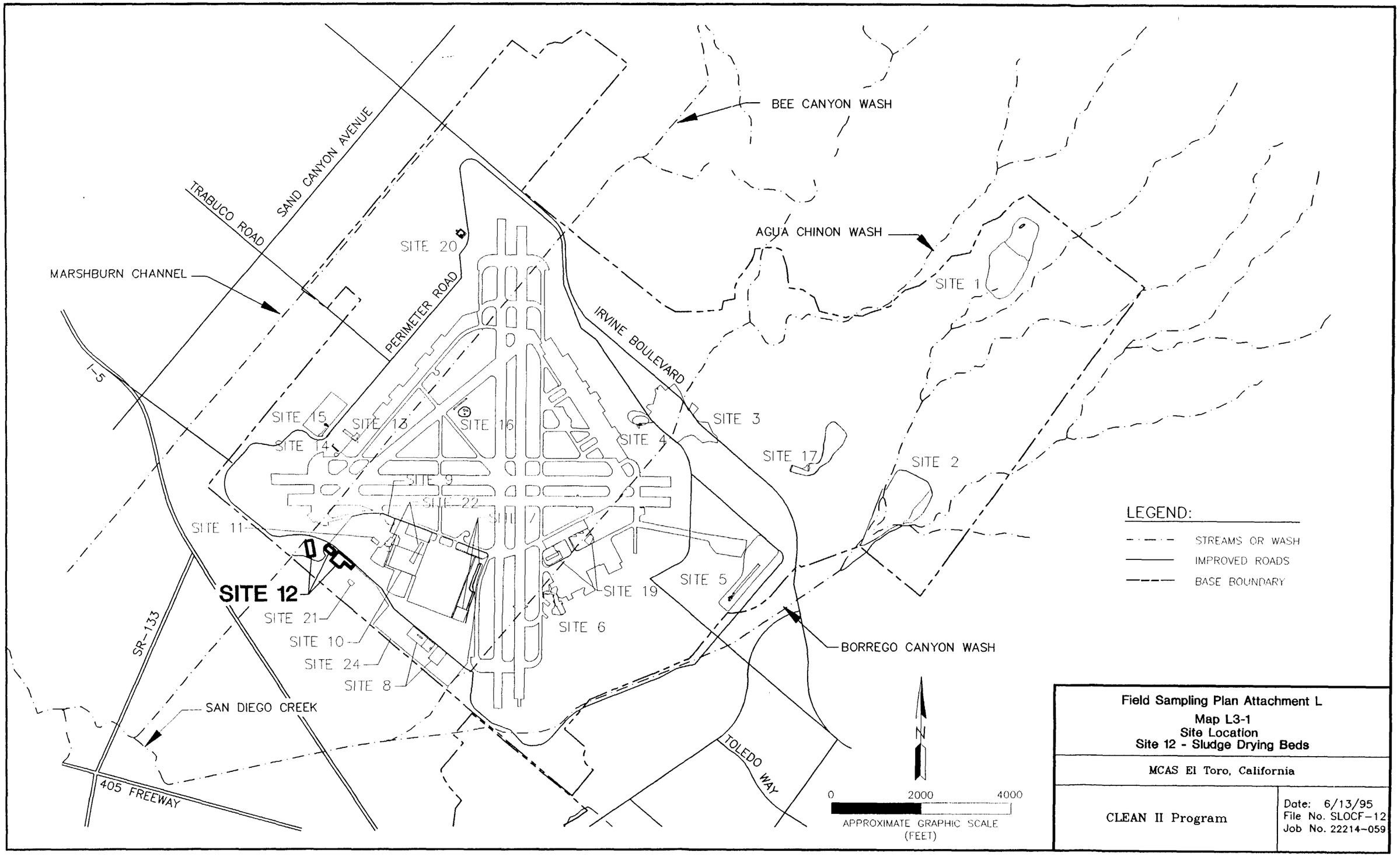


**Field Sampling Plan Attachment L**

**Map L3-1**
**Site Location**
**Site 12 - Sludge Drying Beds**

MCAS El Toro, California

CLEAN II Program

Date: 6/13/95
File No. SLOCF-12
Job No. 22214-059

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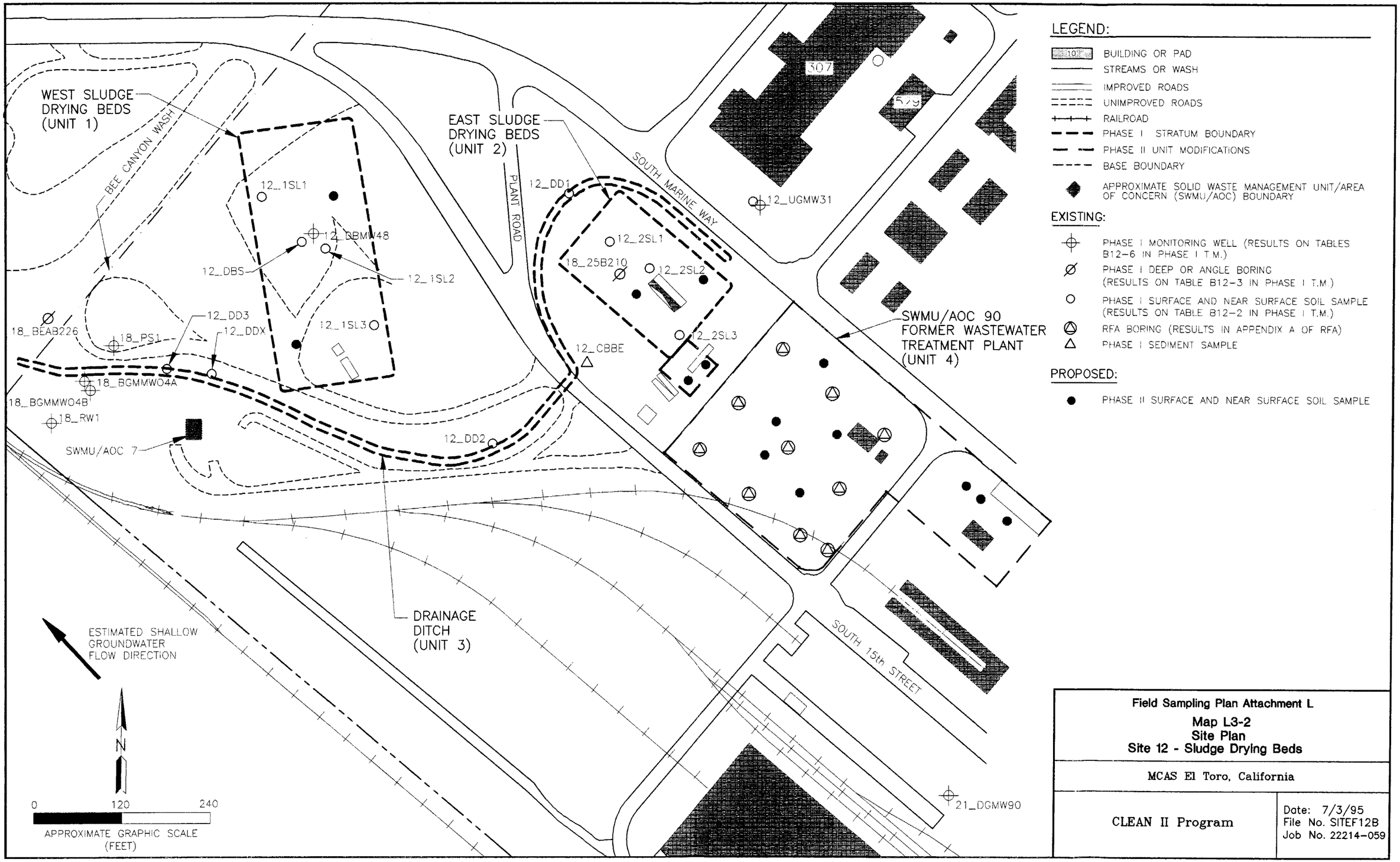


**Field Sampling Plan Attachment L**

**Map L3-2**
**Site Plan**
**Site 12 - Sludge Drying Beds**

MCAS El Toro, California

CLEAN II Program

Date: 7/3/95
File No. SITEF12B
Job No. 22214-059

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# Section 4
# RATIONALE FOR SAMPLING LOCATIONS

This section explains the rationale for the number of sampling programs, types of samples, locations of samples, and analytical parameters. The rationale for sampling is based on site conditions, previous investigations, and data quality objectives as presented in the appendices of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.1 SAMPLING PROGRAMS, SAMPLE TYPES, AND LOCATIONS

Sampling programs, types of samples, and locations are presented based on the smallest area of study. For some sites, the smallest area of study is a site unit; for other sites, the area of study may be the entire site. Selection of sampling programs, sample types, and locations is based on:

- site activities and history;
- types of media suspected or known to be impacted from previous investigations;
- objectives of site-specific RI/FS efforts; and
- site-specific initial surveys.

Based on the Phase I RI results, the surveys of aerial photographs, and a review of the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) results (solid waste management unit/area of concern 90), the former WWTP will be investigated in Phase II RI/FS. Results of RFA indicated various contaminants were detected in shallow soil samples collected from the WWTP area. According to the RFA, the WWTP was in operation from early 1940s through 1972. Furthermore, old construction maps revealed that an impoundment and the two vertical tanks (observed in aerial photographs in an area east of the WWTP) were an IWTP. The IWTP location will be combined with the WWTP area as one unit for the Phase II RI/FS. Also, the area of the East Sludge Drying Beds will be extended to the southeast and will include the location of small impoundments observed in the U.S. EPA aerial photographs (1952 to 1970).

For the Phase II RI/FS, Site 12 will be represented by four units (Map L3-2) as follows:

- Unit 1 - West Sludge Drying Beds;
- Unit 2 - East Sludge Drying Beds (extended to the southeast to include the small impoundments);
- Unit 3 - Drainage Ditch; and
- Unit 4 - Former WWTP Area (extended to southeast to include the former IWTP).

## 4.2 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk to human health or the environment. The Tier 1 sampling approach will consist of collecting shallow soil samples (less than 10 feet bgs) from a specific number of sampling

locations within the unit. The number of sampling locations has been proposed, such that when the Phase I and II RI/FS data are evaluated together, a risk can be estimated for the unit. An explanation of the proposed sampling designs for Tier 1 soil sampling can be found in Section 4 of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.2.1 Unit 1: West Sludge Drying Beds

Unit 1 is the area located between Bee Canyon Wash and Plant Road (south of South Marine Way).

### 4.2.1.1 SOIL SAMPLES

For the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 2, 5, and 10 feet bgs at two stratified random sampling locations (Map L3-2).

## 4.2.2 Unit 2: East Sludge Drying Beds

The East Sludge Drying Beds lie east of Plant Road and west of South Marine Way and extend to the southeast to include the location of a small impoundment believed to be associated with the former WWTP.

### 4.2.2.1 SOIL SAMPLES

In the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 2, 5, and 10 feet bgs at two stratified random sampling locations. In addition, Tier 1 soil samples will also be collected at 0, 2, 5, and 10 feet bgs at two judgmental sampling locations to investigate an impoundment area, as requested by the California Environmental Protection Agency (Map L3-2).

## 4.2.3 Unit 3: Drainage Ditch

Unit 3 has been approved for Early Action and is being addressed through the Non-Time-Critical Removal Action process. An Engineering Evaluation/Cost Analysis will be prepared for this unit.

## 4.2.4 Unit 4: Former Wastewater Treatment Plant

The area of the former WWTP lies southeast of the East Sludge Drying Beds (Unit 2) and south of South Marine Way. The area of the WWTP has been expanded to include the IWTP, which lies in the southeast portion, across M Street. The expanded area is approximately 6 acres and currently is covered with grass.

### 4.2.4.1 SOIL SAMPLES

In the Phase II RI/FS, Tier 1 soil samples will be collected at 0, 2, 5, and 10 feet bgs at the eight judgmental sampling locations (Map L3-2).

## 4.3 TIER 2

The Tier 2 sampling program, like the Tier 1 sampling program described above, will focus exclusively on shallow soil (0 to 10 feet) conditions. The primary objective of this program will be to refine the data on the extent of shallow soil contamination identified during the Tier 1 sampling. Tier 2 sample locations will be based on these sample results. The process by which the Tier 2 sample locations will be selected is detailed in Appendix L of the Phase II RI/FS Work Plan (BNI 1995a).

## 4.4 TIER 3

The objective of a Tier 3 soil sampling program is to estimate the extent of a contaminant plume in deeper subsurface soils. To accomplish this goal, the drilling and sampling of a series of boreholes will be drilled and sampled. The location of Tier 3 boreholes is intended to minimize the number of boreholes required to define the lateral and vertical extent of the contaminant plume in deeper subsurface soils. Groundwater samples will be collected only when a contaminant plume in deeper subsurface soils has been traced (through a drilling and soil sampling program) downward to the water table. At such units/sites, the objectives of the sampling program must then be expanded to include a determination of whether groundwater has been adversely impacted as a result of the historic activities are at this unit/site.

The process by which the locations for Tier 3 soil borings and monitoring wells will be selected is detailed in Appendix L of the Phase II RI/FS Work Plan (BNI 1995a).

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# Section 5
# REQUEST FOR ANALYSES

Requests for analyses are based on:

- site activities and history,
- results of previous investigations, and
- objectives of site-specific RI/FS efforts.

The analytical methods referenced in this section are from the Phase II RI/FS Quality Assurance Project Plan (QAPP) (BNI 1995b). Section 6 in the QAPP specifies the number and/or frequency for collection of field duplicate and blank samples during the Phase II RI/FS field activities.

## 5.1 TIER 1

The purpose of the Tier 1 sampling plan will be to estimate whether the unit poses a risk. The Tier 1 sampling approach will consist of the collection of shallow soil samples (less than 10 feet bgs) from a specific number of sampling locations within the unit. Table L5-1 lists all soil samples and associated analyses for the units in Site 12.

### 5.1.1 Unit 1: West Sludge Drying Beds

The eight Tier 1 soil samples that will be collected at Site 12, Unit 1, will be analyzed according to the methods listed below.

#### 5.1.1.1 FIELD SCREENING

All soil samples will be field-screened for polynuclear aromatic hydrocarbons (PAH) with immunoassay test kits (U.S. EPA Method 4035) and for TAL metals (U.S. EPA Method 6000/7000) using an appropriately equipped mobile laboratory.

#### 5.1.1.2 FIXED-BASE ANALYTICAL LABORATORIES

All soil samples will be analyzed using a fixed-base laboratory for analysis of pesticides/PCBs (U.S. EPA Method 8080), cyanide (U.S. EPA Method 335.2), and herbicides (U.S. EPA Method 8150) under Naval Facilities Engineering Service Center (NFESC, formerly known as Naval Energy and Environmental Support Activity [NEESA]) Level D protocols. Three samples (2 detects and 1 nondetect) will be submitted to the fixed-base laboratory to confirm field screening results. The fixed-based analyses are PAH (U.S. EPA Method 8310) and TAL metals (U.S. EPA Method 6000/7000) under NFESC Level D protocols.

### 5.1.2 Unit 2: East Sludge Drying Beds

The 16 Tier 1 soil samples that will be collected at Site 12 Unit 2, will be analyzed according to the methods listed below.

**Table L5-1**
**Soil Sampling and Analysis**

| Tier | Unit/Name | PHASE II RI/FS SAMPLE NUMBERS | | | FIELD[a] - IMMUNOASSAY OR MOBILE LABORATORY | | | | | OFF-SITE LABORATORY[b] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Locations | Samples/ Location | Total Samples | PAH[c,d] | PCBs[c,e] | VOCs[f,g] | TPH[h]- Gasoline and -Diesel[f] | Target Analyte List - Metals[g] | Pesticides and PCBs | Herbicides | Others: Cyanide |
| Tier 1 | Unit 1 West Sludge Drying Beds | 2 | 4 | 8 | X | | | | X | X | X | X |
| | Unit 2 East Sludge Drying Beds | 2 random, 2 judge | 4 | 16 | X | | | | X | X | X | X |
| | Unit 4 Former WWTP | 8 | 4 | 32 | X | | | | X | X | | X |
| *Tier 1 Subtotals* | | | | 56 | 56 | | | | 56 | 56 | 31 | 56 |
| Tier 2 | Optional: Scope of Tier 2 would be to further define extent of shallow soil contamination; based on Tier 1 data, Phase I RI findings, and RCRA Facility Assessment (RFA) data, with approval of Base Closure and Realignment (BRAC) Cleanup Team (BCT). | | | | | | | | | | | |
| Tier 3 | Optional: Scope of Tier 3 would be to characterize horizontal and vertical extent of contamination below 10 feet depth; based on Tier 1 and 2 data, Phase I RI findings, results, and RFA data, with approval of BCT. | | | | | | | | | | | |

Notes:
[a] three samples from Units 1, 2, and 4 will be sent to the off-site laboratory for confirmation analyses
[b] these constituents cannot be determined in the field; all samples to be analyzed for these constituents will be sent to the off-site laboratory
[c] immunoassay analyses
[d] PAH – polynuclear aromatic hydrocarbons
[e] PCB – polychlorinated biphenyl
[f] mobile laboratory analyses
[g] VOC – volatile organic compound
[h] TPH – total petroleum hydrocarbons

#### 5.1.2.1 FIELD SCREENING

All soil samples will be field screened for PAH with immunoassay test kits (U.S. EPA Method 4035) and for TAL metals (U.S. EPA Method 6000/7000) using an appropriately equipped mobile laboratory.

#### 5.1.2.2 FIXED-BASE ANALYTICAL LABORATORIES

All soil samples will be analyzed using a fixed-base laboratory for analysis of pesticides/ PCBs (U.S. EPA Method 8080), cyanide (U.S. EPA Method 335.2), and herbicides (U.S. EPA Method 8150) under NFESC Level D protocols. Three samples (two detects and one nondetect) will be submitted to the fixed-base laboratory to confirm field screening results. The fixed-based analyses are PAH (U.S. EPA Method 8310) and TAL metals (U.S. EPA Method 6000/7000) under NFESC Level D protocols.

### 5.1.3 Unit 4: Former Wastewater Treatment Plant

The 32 Tier 1 soil samples that will be collected at Site 12 Unit 4, will be analyzed according to the methods listed below.

#### 5.1.3.1 FIELD SCREENING

All soil samples will be field screened for PAH with immunoassay test kits (U.S. EPA Method 4035) and for TAL metals (U.S. EPA Method 6000/7000) using an appropriately equipped mobile laboratory.

#### 5.1.3.2 FIXED-BASE ANALYTICAL LABORATORIES

All soil samples will be analyzed using a fixed-base laboratory for analysis of pesticides/PCBs (U.S. EPA Method 8080) and cyanide (U.S. EPA Method 335.2) under NFESC Level D protocols. Three samples (two detects and one nondetect) will be submitted to the fixed-base laboratory to confirm field screening results. The fixed-based analyses are PAH (U.S. EPA Method 8310) and TAL metals (U.S. EPA Method 6000/7000) under NFESC Level D protocols.

## 5.2 TIER 2

A Tier 2 request for analysis, if necessary, will be contingent upon the Tier 1 sample results.

## 5.3 TIER 3

A Tier 3 request for analysis, if necessary, will be contingent upon the Tier 1 and Tier 2 sample results.

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# Section 6
# FIELD METHODS AND PROCEDURES

This section presents site-specific field methods that will be used to collect samples and other field data. The field methods referenced in this section are from Section 6 of the FSP and the Comprehensive Long-Term Environmental Action Navy (CLEAN) II Standard Operating Procedures, which discuss specific field methods and procedures.

## 6.1 INITIAL SURVEYS

Before the collection of Phase II RI/FS soil samples, the site will be scaled and sampling locations will be staked or paint-marked. Once a sampling point is marked, utility clearances will be made before collecting any sample that uses power equipment to reach the sample depth. Utility clearances may also be made at locations where samples are being collected using a hand auger. Nonintrusive utility clearances will be completed by a subcontractor, using geophysical methodology in conjunction with site activities.

Each sampling point will be located by survey, using the California Plane Coordinate System, with northings and eastings determined to the nearest 0.1 foot. The surface elevation will be determined to the nearest 0.01 foot.

## 6.2 TIER 1

All samples in Unit 1 will be collected at the locations and depths described in Section 4.2. More information on soil sampling procedures is provided in Section 6 of the FSP.

### 6.2.1 Unit 1: West Sludge Drying Beds

The eight Tier 1 soil samples will be collected at Site 12, Unit 1, at depths of 0, 2, 5, and 10 feet bgs in two borings as indicated below.

#### 6.2.1.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer.

### 6.2.2 Unit 2: East Sludge Drying Beds

The 16 Tier 1 soil samples will be collected at Site 12, Unit 2, at depths of 0, 2, 5, and 10 feet bgs in four borings as indicated below.

#### 6.2.2.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer.

### 6.2.3 Unit 4: Former Wastewater Treatment Plant

The 32 Tier 1 soil samples will be collected at Site 12, Unit 4, at depths of 0, 2, 5, and 10 feet bgs in eight borings as indicated below.

#### 6.2.3.1 SOIL SAMPLES

All soil samples will be collected with a modified California split-spoon sampler fitted with stainless steel sleeves. The sampler will be advanced into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer.

## 6.3 TIER 2

If Tier 2 soil sampling is conducted at Site 12, shallow soil samples will be collected as described above.

## 6.4 TIER 3

If Tier 3 sampling is conducted, deep soil samples (from 10 feet bgs to groundwater level) will be collected at 5-foot intervals, with a modified California split-spoon sampler equipped with stainless steel sleeves. The split-spoon sampler will be driven into the ground by a hollow-stem auger drilling rig equipped with a 140-pound hammer. When drilling is required to depths of greater than 130 feet bgs, the hollow-stem auger drilling rig will be replaced by an air-rotary drilling rig. If groundwater sampling is necessary, sampling will follow procedures presented in Section 6 of the FSP.

## Section 7
# REFERENCES

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Naval Facilities Engineering Command
Contracts Department
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San Diego, California 92132-5187

Contract No. N68711-92-D-4670

**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**

**CLEAN II**

# FIELD SAMPLING PLAN
# ATTACHMENT M
# SITE 13 – OIL CHANGE AREA
# MCAS EL TORO, CALIFORNIA

**CTO-0059**

Prepared by:

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August 1995

## Attachment M

# SITE 13 – OIL CHANGE AREA

Site 13 is presently a Removal Action site. Site 13 was designated for the Removal Action in June of 1994; therefore, no sampling will be conducted at this site as part of the Phase II Remedial Investigation/Feasibility, and no sampling plan for this site is provided in this attachment. Background information on this site is presented in Appendix M of the Work Plan for the Phase II Remedial Investigation/Feasibility Study.

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Contract No. N68711-92-D-4670

**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**

**CLEAN II**

# FIELD SAMPLING PLAN
# ATTACHMENT N
# SITE 14 – BATTERY ACID DISPOSAL AREA
# MCAS EL TORO, CALIFORNIA

**CTO-0059**

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## Attachment N

# SITE 14 – BATTERY ACID DISPOSAL AREA

Site 14 is presently a Removal Action site. Site 14 was designated for the Removal Action in June of 1994; therefore, no sampling will be conducted at this site as part of the Phase II Remedial Investigation/Feasibility Study, and no sampling plan for this site is provided in this attachment. Background information on this site is presented in Appendix N of the Work Plan for the Phase II Remedial Investigation/Feasibility Study.

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**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**

**CLEAN II**

# FIELD SAMPLING PLAN
# ATTACHMENT O
# OPERABLE UNIT 3 –
# SITE 15 – SUSPENDED FUEL TANKS
# MCAS EL TORO, CALIFORNIA

**CTO-0059**

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August 1995

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# ACRONYMS/ABBREVIATIONS

| | |
|---|---|
| bgs | below ground surface |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| COPC | chemical of potential concern |
| FS | Feasibility Study |
| FSP | Field Sampling Plan |
| Irvine Subbasin | Irvine Groundwater Subbasin |
| LUFT | (California) Leaking Underground Fuel Tank (Field Manual) |
| MCAS | Marine Corps Air Station |
| MCL | maximum contaminant level |
| NEESA | Naval Energy and Environmental Support Activity |
| NFESC | Naval Facilities Engineering Service Center |
| PAH | polynuclear aromatic hydrocarbons |
| PCB | polychlorinated biphenyl |
| PRG | (U.S. EPA Region IX) Preliminary Remediation Goal |
| QAPP | Quality Assurance Project Plan |
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| SVOC | semivolatile organic compound |
| SWMU/AOC | solid waste management unit/area of concern |
| TAL | target analyte list |
| TPH | total petroleum hydrocarbons |
| U.S. EPA | United States Environmental Protection Agency |
| VOC | volatile organic compound |

# ACRONYMS/ABBREVIATIONS (continued)

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# Section 1
# OBJECTIVES

This Field Sampling Plan (FSP) for Site 15, the Suspended Fuel Tanks, outlines the field procedures and methodology to be used during the Remedial Investigation (RI)/Feasibility Study (FS) for this site. The purpose of this FSP is to enable field personnel unfamiliar with the site to gather the required samples and field data. It is also intended to assure that data collection will be comparable to and compatible with previous data collected at the site and with other sampling activities at other sites at the Marine Corps Air Station (MCAS) El Toro.

## 1.1 SAMPLING OBJECTIVES

The specific objectives for sampling at Site 15 are as follows:

- verify boundaries of waste disposal activities;
- characterize the nature and extent of contamination;
- estimate the vertical and horizontal extent of contamination; and
- characterize site-specific groundwater contamination, if soil contamination extends to groundwater.

## 1.2 DATA USAGE

To satisfy the objectives of the RI/FS for the Suspended Fuel Tanks, the data to be collected, compiled, and analyzed will be used to perform the following:

- characterize subsurface soils;
- establish stratigraphic controls;
- establish geotechnical parameters;
- characterize groundwater conditions and quality (where soil contamination suggests);
- determine the types of contaminants in soil and/or groundwater;
- estimate the extent of contaminants in soil and/or groundwater;
- evaluate human health and ecological risks;
- evaluate the mass of contaminants;
- evaluate cleanup levels;
- characterize the feasible removal or remedial actions, if necessary; and
- evaluate remedial alternatives.

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# Section 2
# BACKGROUND

This section generally describes and discusses the results of previous investigations at Site 15. This section also provides a brief compilation of the data used to develop the site-specific FSP for Phase II RI/FS activities. Previous investigations and reports provide a more thorough discussion of site history, activities, and summaries of previous investigations.

## 2.1 SITE DESCRIPTION

The Suspended Fuel Tanks area (Site 15) is an unpaved, fenced enclosure located in the northwestern quadrant of MCAS El Toro, north of Building 31, along West Marine Way (Map O3-1). The site consists of two areas where stained soils were evident beneath two former elevated fuel tanks. The site is relatively flat and lies at an elevation of about 260 feet above mean sea level (Jacobs Engineering 1993a).

### 2.1.1 History

Two 500-gallon elevated diesel fuel tanks were located at Site 15 from 1979 through mid-1984. Reportedly, an estimated 500 gallons of diesel fuel leaked onto the soil from the tank fueling hoses and nozzles. The tanks were removed in 1984. Although staining was apparently visible in the past, no evidence of staining was visible at the time of the Phase I RI (Jacobs Engineering 1993a).

### 2.1.2 Geology

The geology of Site 15 consists of Quaternary alluvial and marine deposits (Jacobs Engineering 1993b). Holocene deposits consist of a matrix of fine-grained overbank deposits and some coarse-grained stream channel deposits. These soils are derived from the Santa Ana Mountains to the east and conformably overlie Pleistocene interbedded fine-grained lagoonal and near-shore marine deposits. Pleistocene deposits could not be differentiated from Holocene deposits in Phase I RI soil borings. Pleistocene deposits unconformably overlie semiconsolidated marine sandstones, siltstones, and conglomerates of late Miocene to late Pliocene, which are considered to be bedrock in the area. Based on a review of Phase I RI boring logs, subsurface lithology at Site 15 consists mainly of sand with varying amounts of silt and clay (Jacobs Engineering 1993b).

### 2.1.3 Hydrogeology

MCAS El Toro lies within the Irvine Groundwater Subbasin (Irvine Subbasin). Regional aquifers in the Irvine Subbasin tend to be composed of discontinuous lenses of clayey and silty sands and fine-grained gravels contained within a complex assemblage of sandy clays and sandy silts. Three general aquifer systems have been identified near the Station: a shallow and perched system, a principal aquifer zone, and a lower hydrogeologic system existing in bedrock (Jacobs Engineering 1993b).

The Phase I RI results indicate the shallow, perched zone is not present at Site 15. The principal aquifer is present beneath Site 15 at a depth of 125 feet below ground surface (bgs). The regional groundwater flow direction is to the northwest. The local hydraulic gradient has been influenced strongly by the pumping of irrigation wells located west of MCAS El Toro.

## 2.2 PHASE I REMEDIAL INVESTIGATION RESULTS

During the Phase I RI in 1992-93, Site 15 was represented by one stratum (Stratum 1 - Suspended Fuel Tanks), consisting of two adjacent areas where stained soils were evident beneath two former elevated fuel tanks (Map O3-2). The following site-specific activities were conducted during the Phase I RI:

- shallow soil samples were collected at five locations;
- soil samples were collected from one deep boring that was drilled and completed as a monitoring well and sampled;
- soil samples were analyzed for total recoverable petroleum hydrocarbons, total fuel hydrocarbons, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and target analyte list (TAL) metals; and
- groundwater samples were analyzed for general chemistry, VOCs, SVOCs, and metals.

Soil samples were collected at 0 and 2 feet bgs in the five shallow borings. Soil samples from nine depths were submitted for analysis, from the deep boring converted to a monitoring well. In addition, United States Environmental Protection Agency (U.S. EPA) Region IX Preliminary Remediation Goals (PRGs) of the chemicals of potential concern (COPCs) and ecological screening criteria for the site were compared with corresponding analytical sampling results. The results of this investigation indicate that no COPCs detected in the shallow soil exceed PRGs or ecological screening criteria.

Petroleum hydrocarbons detected in shallow soil were also compared to California Leaking Underground Fuel Tank (LUFT) Field Manual (LUFT 1989) guidelines to evaluate their potential to migrate to the groundwater. According to the LUFT guidelines, petroleum hydrocarbons in the shallow soil at Site 15 do not appear to pose a threat to groundwater (Jacobs Engineering 1993a).

Groundwater samples were collected from the groundwater monitoring well (15_DBMW51) constructed on Site 15. The results were compared to applicable PRGs and maximum contaminant levels (MCLs) (Jacobs Engineering 1993a):

- benzene, antimony, manganese, nitrate, and selenium, exceed primary MCLs; and chloride, manganese, sulfate; and
- total dissolved solids exceed secondary MCLs.