WORK PLAN

FOR
SITE VERIFICATION ACTIVITIES AT
FORMER MSC JP5 STATION 574 SITE AND JP5 PIPELINE
FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

Contract No. N68711-01-D-6008
Delivery Order No. 0006

Prepared for:

Department of the Navy
Naval Facilities Engineering Command
Southwest Division
1220 Pacific Highway
San Diego, California 92132

Prepared by:

GEOFON, INC.
22632 Golden Springs Drive, Suite 270
Diamond Bar, California 91765

GEOFON Project No. 4-12806

July 28, 2004

WORK PLAN

FOR
SITE VERIFICATION ACTIVITIES AT
FORMER MSC JP5 STATION 574 SITE AND JP5 PIPELINE
FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

Contract No. N68711-01-D-6008
Delivery Order No. 0006

Prepared by:

Nadine Doughman 7-28-04

Nadine Doughman
Project Engineer

Date

Reviewed by:

S. V. Akkenapally 7/28/2004

Sree Akkenapally
Project Manager

Date

Approved by:

7/28/04

Asrar Faheem, R.E.A
Senior Project Manager

Date

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS

BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene, xylene
°C	degrees Celsius
CIH	Certified Industrial Hygienist
CO	Contracting Officer
CSO	Caretaker Site Office
DHS	California Department of Health Services
DO	delivery order
DOT	Department of Transportation
DQOs	data quality objectives
DTSC	Department of Toxic Substance Control
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
GEOFON	GEOFON, Inc.
IDW	Investigation-Derived Waste
MCAS	Marine Corps Air Station
MSC	Miscellaneous Sites of Concern
mg/kg	milligrams per kilogram
msl	mean sea level
MTBE	methyl tertiary butyl ether
NAD83	North American Datum of 1983
NEDTS	Navy Environmental Data Transfer Standard
NFESC	Naval Facilities Engineering Service Center
OCHCA	Orange County Health Care Agency
PPE	personal protective equipment

LIST OF ACRONYMS (CONT.)

PID	photoionization detector
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
QCR	quality control report
RCRA	Resource Conservation and Recovery Act
ROICC	Resident Officer in Charge of Construction
RPM	remedial project manager
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SHSP	Site Health and Safety Plan
SOPs	standard operating procedures
SPLP	synthetic precipitation leaching procedure
SWDIV	Southwest Division
TPH	total petroleum hydrocarbons
VOA	volatile organic analysis
VOCs	volatile organic compounds
µg/kg	micrograms per kilogram
µg/L	micrograms per liter

1.0 INTRODUCTION

GEOFON, Inc. (GEOFON) has prepared this Work Plan for performing site verification activities at the former Miscellaneous Sites of Concern (MSC) JP5 Station 574 Site and along the former MSC JP5 Pipeline located at the former Marine Corps Air Station (MCAS), El Toro, California. The work will be conducted under the Department of the Navy, Southwest Division (SWDIV) Contract No. N68711-01-D-6008, Delivery Order No. 0006. The site verification activities will be performed at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline to evaluate the extent of a jet fuel release in the soil. The site verification activities will include drilling of shallow soil borings at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline.

The objective of this Work Plan is to provide a rationale for the location and depth of soil samples; methods and procedures to be used during the site verification sampling program with respect to sample collection, sample handling and documentation; management and disposal of investigation-derived waste (IDW); and laboratory test methods for the analysis of samples. The methods and procedures that will be used for the proposed sampling strategy will be in accordance with the Chapter 9 of U.S. Environmental Protection Agency (EPA) SW-846, Cal/EPA Department of Toxic Substance Control (DTSC) "Preliminary Endangerment Assessment Guidance Manual" (PEA).

1.1 Site Description

The former MCAS El Toro was a master jet air station supporting the operations and combat readiness of Pacific Fleet Marine Forces. MCAS El Toro provided materials and support for aviation activities of the United States Marine Corps (USMC).

MCAS El Toro is located in a semi-urban agricultural area in Southern California. The station is situated about 8 miles southeast of the City of Santa Ana and 12 miles northeast of the city of Laguna Beach (Figure 1-1). Most of the land northwest of MCAS El Toro was historically used to grow oranges and other agricultural crops. Land to the south and northwest of the station has been developed as commercial, light industrial, and residential.

MCAS El Toro consists of approximately 4,700 acres in central Orange County adjacent to the convergence of Interstate Freeways I-5 and I-405 and the Eastern Transportation Corridor. Most of the MCAS El Toro site is in unincorporated territory over which the County of Orange has direct land use planning and development authority. The southernmost portion of the MCAS El Toro site, approximately 342 acres south of the existing Burlington Northern and Santa Fe

railroad tracks, which border the base, is within the incorporated boundary of the City of Irvine. El Toro has two 10,000 ft. and two 8,000 ft. runways.

The majority of the land immediately surrounding MCAS is used to raise oranges, strawberries, asparagus, and other agricultural crops. Portions of the station are leased for nursery use and agriculture use. The University of California, Irvine, has an agricultural field station directly north of MCAS. Located just northeast of the MCAS is a large nursery where fruit trees are grown. Until 10 years ago, the entire area surrounding MCAS was agricultural land; since then, urbanization has brought development closer to MCAS. About one-half mile northwest of the MCAS boundary are the main residential areas of the city of Irvine. The land farther north and northeast of MCAS in the Santa Ana Mountains and the San Joaquin Hills remains essentially undeveloped.

1.2 Site History

In March 1943, MCAS El Toro was commissioned as a Marine Corps pilot fleet operation training facility. In 1950, MCAS El Toro was selected for development as a master jet station and permanent center for Marine Corps aviation on the west coast to support the operations and combat readiness of Pacific Fleet Marine Forces. Since commissioning, MCAS El Toro has been utilized for aviation activities. Other activities that have been performed on the base include aircraft maintenance and refurbishing operations, metal plating, sewage treatment, and incineration of trash. These activities have generated waste oils, paint residues, hydraulic fluid, used batteries, and other wastes.

In March 1993, MCAS El Toro was placed on the Base Closure and Realignment Act (BRAC) list of proposed military facilities considered for base closure and was formally selected for closure in September of that year. During 1998 and early 1999, all of the aircraft squadrons were transferred to other Marine Corps and Naval Air Stations. All remaining military operations ceased when MCAS El Toro formally closed on 02 July 1999.

1.3 Work Plan Organization

This Work Plan includes discussions of the site background; pre-construction activities, permitting requirements, soil sampling strategies, and soil sampling methods and procedures. The Work Plan also describes, in detail, the field sampling program, the quality assurance program, site health and safety protocols and project management.

SENSITIVE RECORD

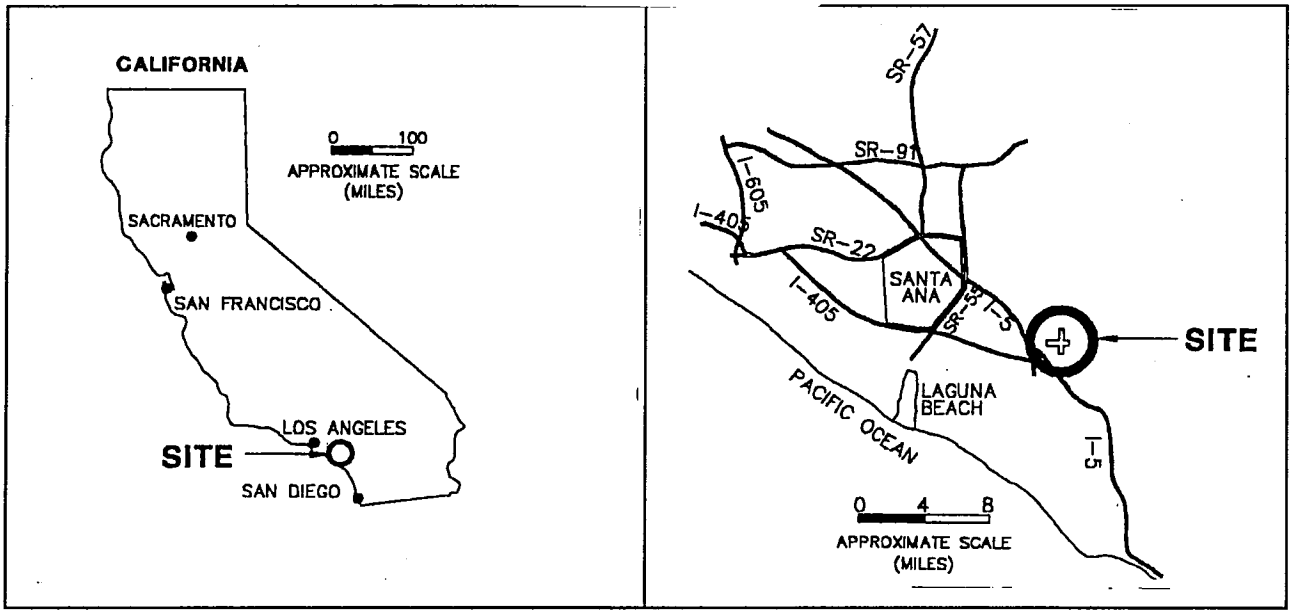
PORTIONS OF THIS RECORD ARE CONSIDERED SENSITIVE AND ARE NOT AVAILABLE FOR PUBLIC VIEWING

FIGURE 1-1 – PROJECT VICINITY MAP

FOR ADDITIONAL INFORMATION, CONTACT:

DIANE C. SILVA, RECORDS MANAGER
NAVAL FACILITIES ENGINEERING COMMAND, SOUTHWEST
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132

TELEPHONE: (619) 556-1280
E-MAIL: diane.silva@navy.mil



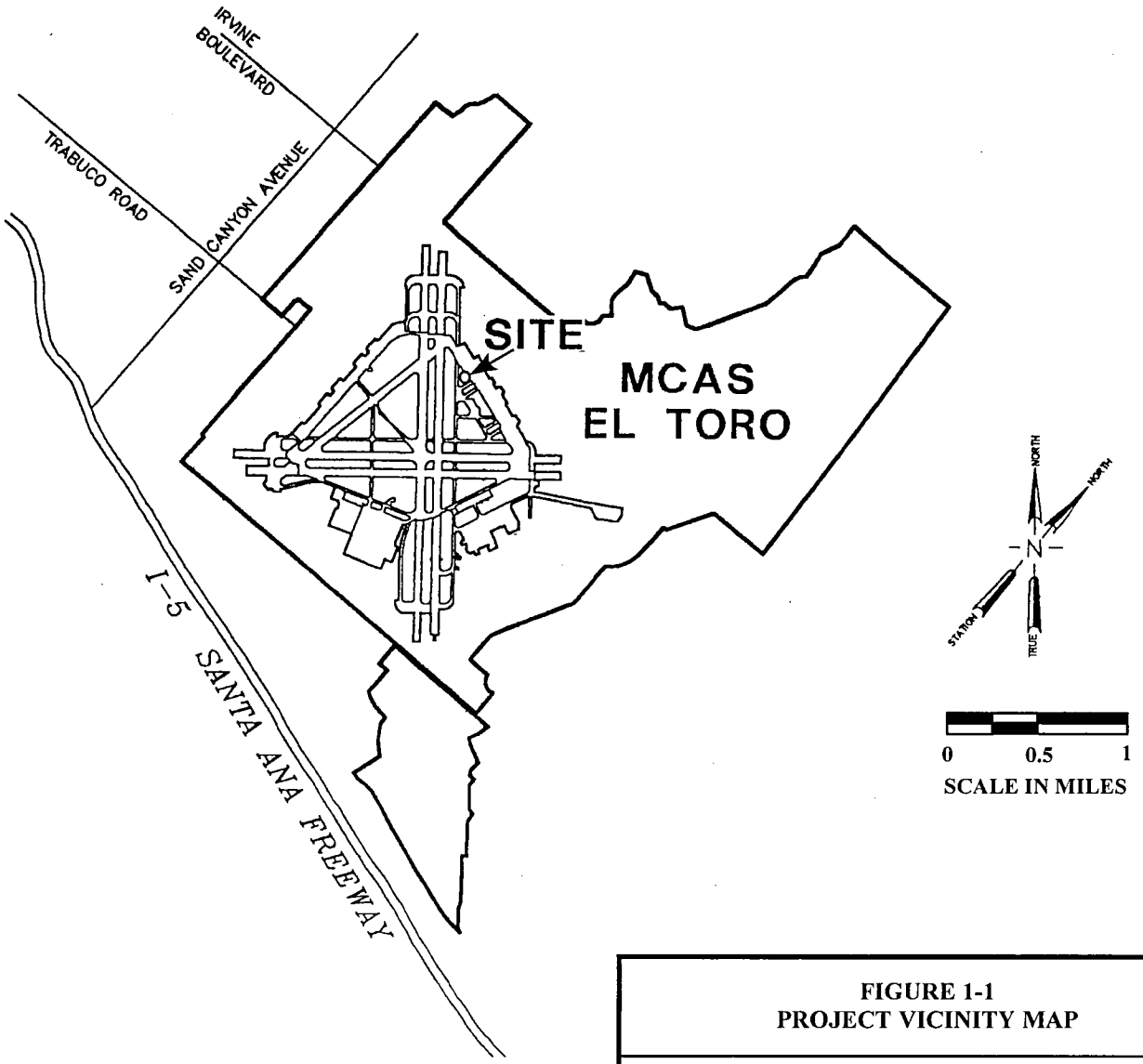


FIGURE 1-1
PROJECT VICINITY MAP

Former Marine Corps Air Station (MCAS)
El Toro, California

GEOFON INCORPORATED

Date: June, 2004
Contract No.: N68711-01-D-6008

The Work Plan is organized as follows:

Section 2.0	Site Background and Environmental Setting
Section 3.0	Project Objectives
Section 4.0	Pre-Construction Activities
Section 5.0	Soil Borings Drilling and Soil Sampling
Section 6.0	Sampling and Analysis Plan
Section 7.0	Data Validation and Data Evaluation
Section 8.0	Management and Disposal of Investigation-Derived Waste
Section 9.0	Site Verification Report
Section 10.0	Site Health and Safety Plan
Section 11.0	Project Management Plan
Section 12.0	Reference Sources

The following three appendices are attached:

Appendix A:	Sampling and Analysis Plan
Appendix B:	Site Health and Safety Plan

2.0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

Soil and groundwater contamination at MCAS El Toro is a result of several past operations that were accepted practices (for example, in the 1940s, aircraft refurbishing included the use solvents during degreasing activities). Between 1943 and 1955, municipal-type solid waste was generated by station housing (typical residential activities). Early disposal activities included incineration. Later, solid waste disposal was conducted at cut-and-fill landfill sites. Four landfills received solid waste, paint residues, oily wastes, industrial solvents, and incinerator ash. Fire-fighting training exercises were conducted at two burn pit areas and included the use of various flammable liquids such as jet fuel, aviation gasoline, and other waste liquids.

In addition to being part of the Installation Restoration Program, MCAS El Toro is included on the U.S. Environmental Protection Agency's National Priorities List of hazardous waste sites requiring cleanup. The Marine Corps/Navy and state and federal environmental regulatory agencies work in cooperation as the Base Realignment and Closure Cleanup Team to ensure compliance with environmental laws, rules, and regulations.

2.1 Previous Investigations

The former MSC JP5 Station 574 Site and former MSC JP5 Pipeline where the site verification activities are to be performed are located on the main MCAS facility as shown in Figure 2-1. A description and status of each of these two sites is presented in the following subsections.

2.1.1 Former MSC JP5 Station 574 Site

The former MSC JP5 Station 574 Site is located northwest to Building 372 in the northeast portion of MCAS El Toro on Figure 2-2. MSC JP5 Station 574 was a former jet fuel pump station constructed in 1956 and demolished in 1993.

In 1989 and 1990, NDE Environmental Corp. conducted hydrostatic testing of the 3-inch vacuum/return line at MSC JP5 Station 574. A leak was identified in the 3-inch vacuum/return line with an estimated leakage rate of 5 or more gallons per hour (Stollar 1991).

In 1990, a monitoring well and an 82-foot deep soil boring, MW398-08 and SB398-13, were installed near Station 574. The monitoring well and soil boring locations are on Figure 2-3. The groundwater samples collected from MW398-08 detected benzene, toluene, ethylbenzene and xylenes (BTEX) at concentrations of 1.2 micrograms per liter (µg/L), 26 µg/L, 0.82 µg/L, and 5.6 µg/L, respectively. The soil samples collected from SB398-13 at the depths of 30 and 80 feet below ground surface (bgs) were analyzed for BTEX and total petroleum hydrocarbons (TPH).

BTEX and TPH were not detected at or above laboratory reporting limits from the soil samples (Stollar 1991).

In 1992, MSC JP5 Station 574 was replaced with two new pump stations, Structures 904 and 905, which were constructed southwest of Station 574 in the former aircraft parking apron (Apron 1). The investigation area for MSC JP5 Station 574 includes the original pump station (574) and the most recently constructed pump stations (904 and 905).

2.1.2 Former MSC JP5 Pipeline

The former MSC JP5 Pipeline is comprised of primary and secondary jet fuel supply pipelines in the northeast quadrant of the MCAS El Toro on Figure 2-4. The primary jet fuel supply pipelines were used to distribute the fuel from the Tank Farm 555 storage tanks to secondary storage tanks within the MCAS El Toro. Secondary jet fuel pipelines then transported the fuel from the secondary storage tanks to the end user, either aircraft or fuel tank trucks. In 1998, service at the MSC JP5 Pipeline was discontinued.

Benzene has been detected in the groundwater from nearby monitoring wells 04_DBMW40, 04_UGMW63 and 18_BGMW01E. In November 1996, benzene was detected from 04_DBMW40 and 04_UGMW63 at the concentrations of 40 micrograms per liter (µg/L) and 7 µg/L, respectively (CDM 2004). In March 1997, benzene was detected at the concentration of 90 µg/L from 18_BGMW01E. The fueling stations and a dry well near Building 363 in the former truck fueling facility are possible sources of the benzene in the groundwater.

2.2 Environmental Setting

The local geology and soils, hydrogeology, surface hydrology and topography are discussed in the following subsections.

2.2.1 Site Geology and Soils

MCAS El Toro is underlain chiefly by Tertiary sediment rocks, which are overlain by Holocene and Pleistocene surficial units. The Holocene materials consist of isolated coarse grained, stream channel deposits contained within a matrix of fine-grained overbank deposits that range in thickness up to 300 feet. The Holocene alluvial materials conformably overlie Pleistocene Age sediments predominantly composed of interlayed fine-grained lagoonal and near-shore marine deposits. The deeper Quanternary sediments may be equivalent to the lower Pleistocene San Pedro Formation, which consists of semi consolidated silt, clays, and sands with interbedded limestone. These lagoonal and shallow marine deposits are considered to be a major water bearing unit in the region.

SENSITIVE RECORD

PORTIONS OF THIS RECORD ARE CONSIDERED SENSITIVE AND ARE NOT AVAILABLE FOR PUBLIC VIEWING

FIGURE 2-1 – SITE LOCATION MAP
FORMER MSC JP5 STATION 574 SITE
AND FORMER JP5 PIPELINE

FOR ADDITIONAL INFORMATION, CONTACT:

DIANE C. SILVA, RECORDS MANAGER
NAVAL FACILITIES ENGINEERING COMMAND, SOUTHWEST
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132

TELEPHONE: (619) 556-1280
E-MAIL: diane.silva@navy.mil

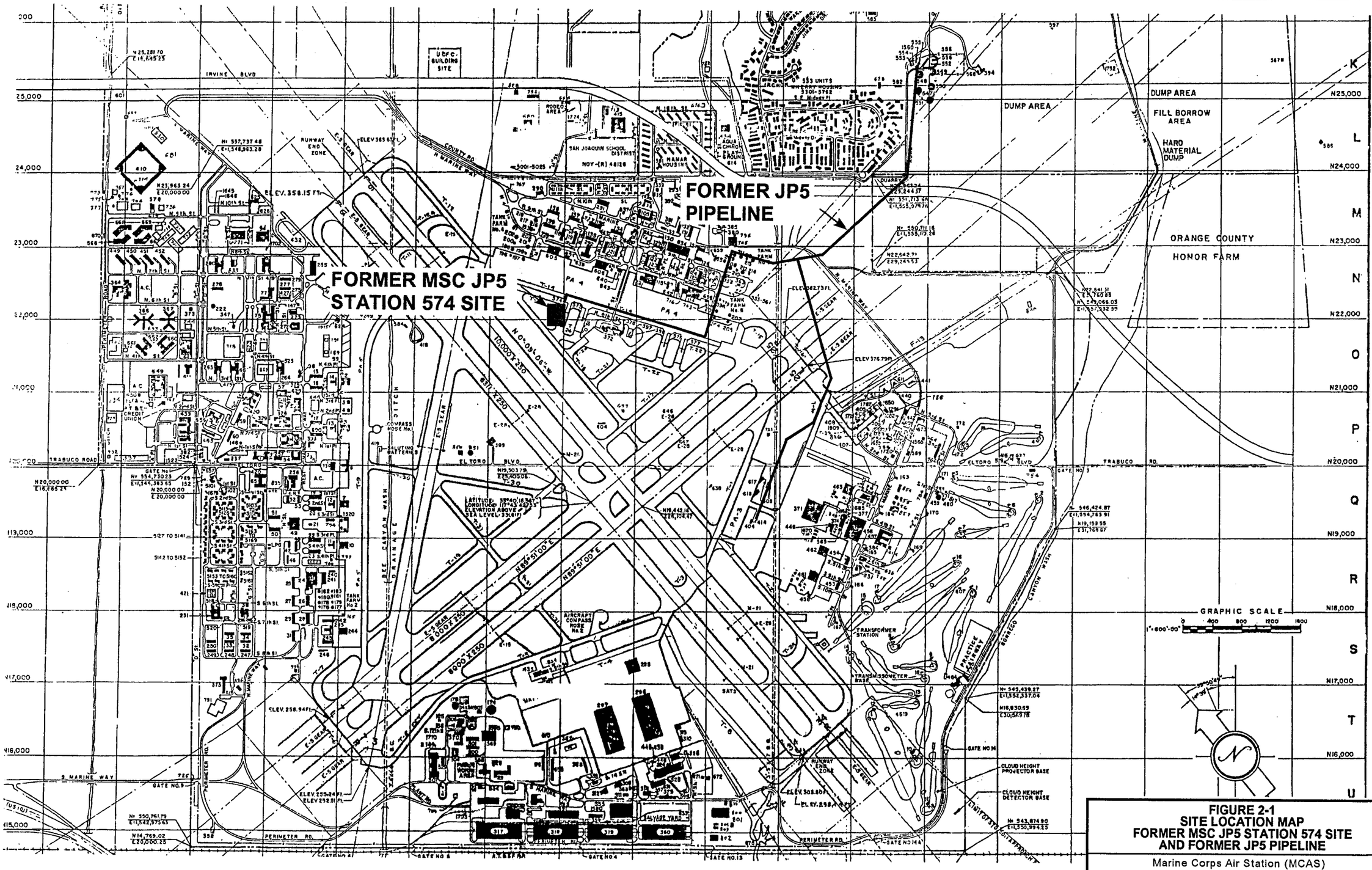


FIGURE 2-1
SITE LOCATION MAP
FORMER MSC JP5 STATION 574 SITE
AND FORMER JP5 PIPELINE

Marine Corps Air Station (MCAS)
El Toro, California

GEOFON INCORPORATED

Date: June, 2004
Contract No.: N68711-01-D-6008

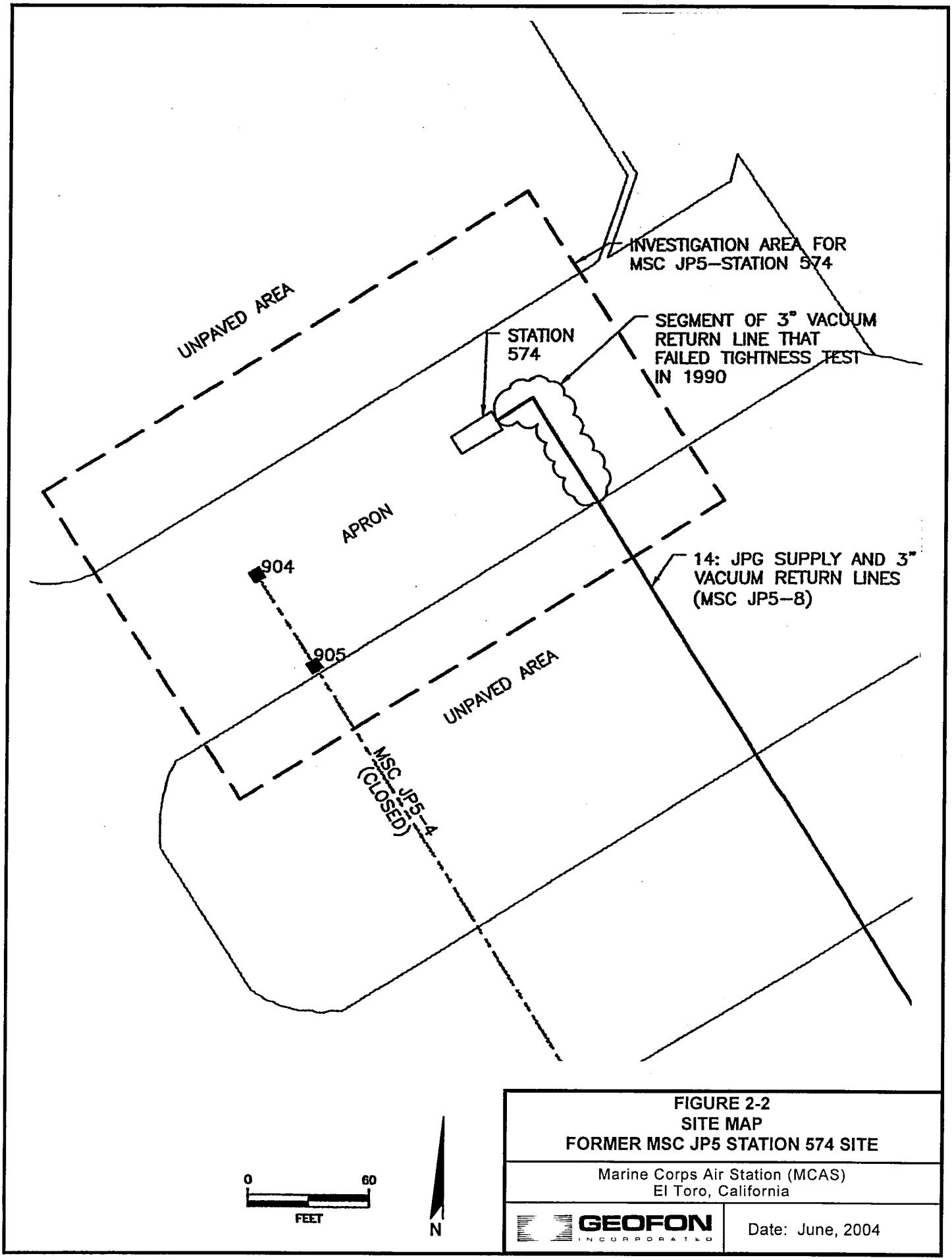
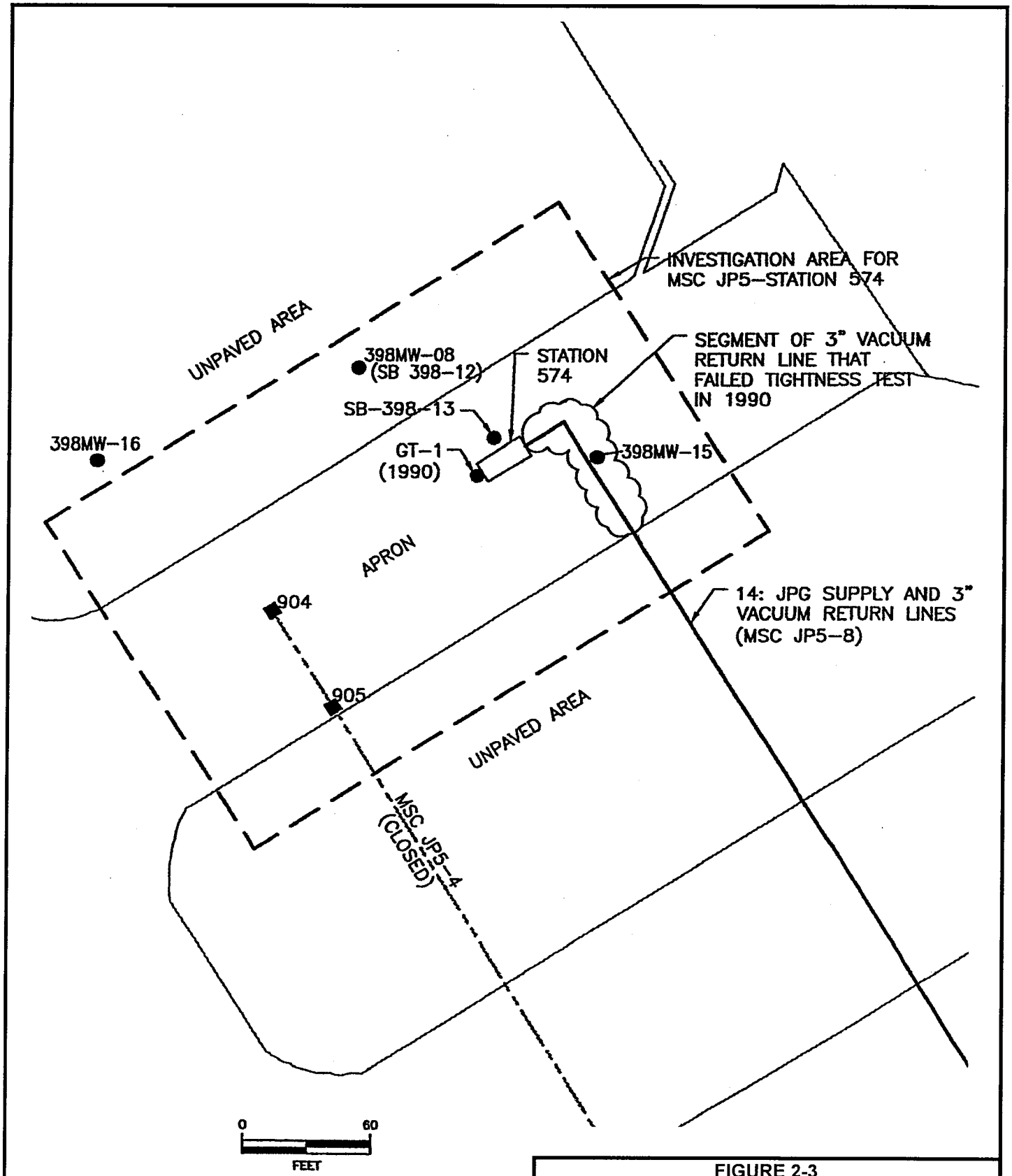


FIGURE 2-2
SITE MAP
FORMER MSC JP5 STATION 574 SITE

Marine Corps Air Station (MCAS)
El Toro, California

GEOFON INCORPORATED

Date: June, 2004



LEGEND

● PREVIOUS SAMPLE LOCATION (PRE 1990, ESTIMATED LOCATION)

FIGURE 2-3
PREVIOUS WELL AND SOIL BORING LOCATIONS
FORMER MSC JP5 STATION 574 SITE

Marine Corps Air Station (MCAS)
El Toro, California

GEOFON INCORPORATED

Date: June, 2004

SENSITIVE RECORD

PORTIONS OF THIS RECORD ARE CONSIDERED SENSITIVE AND ARE NOT AVAILABLE FOR PUBLIC VIEWING

FIGURE 2-4 – SITE MAP, FORMER PJ5 PIPELINE

FOR ADDITIONAL INFORMATION, CONTACT:

DIANE C. SILVA, RECORDS MANAGER
NAVAL FACILITIES ENGINEERING COMMAND, SOUTHWEST
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132

TELEPHONE: (619) 556-1280
E-MAIL: diane.silva@navy.mil

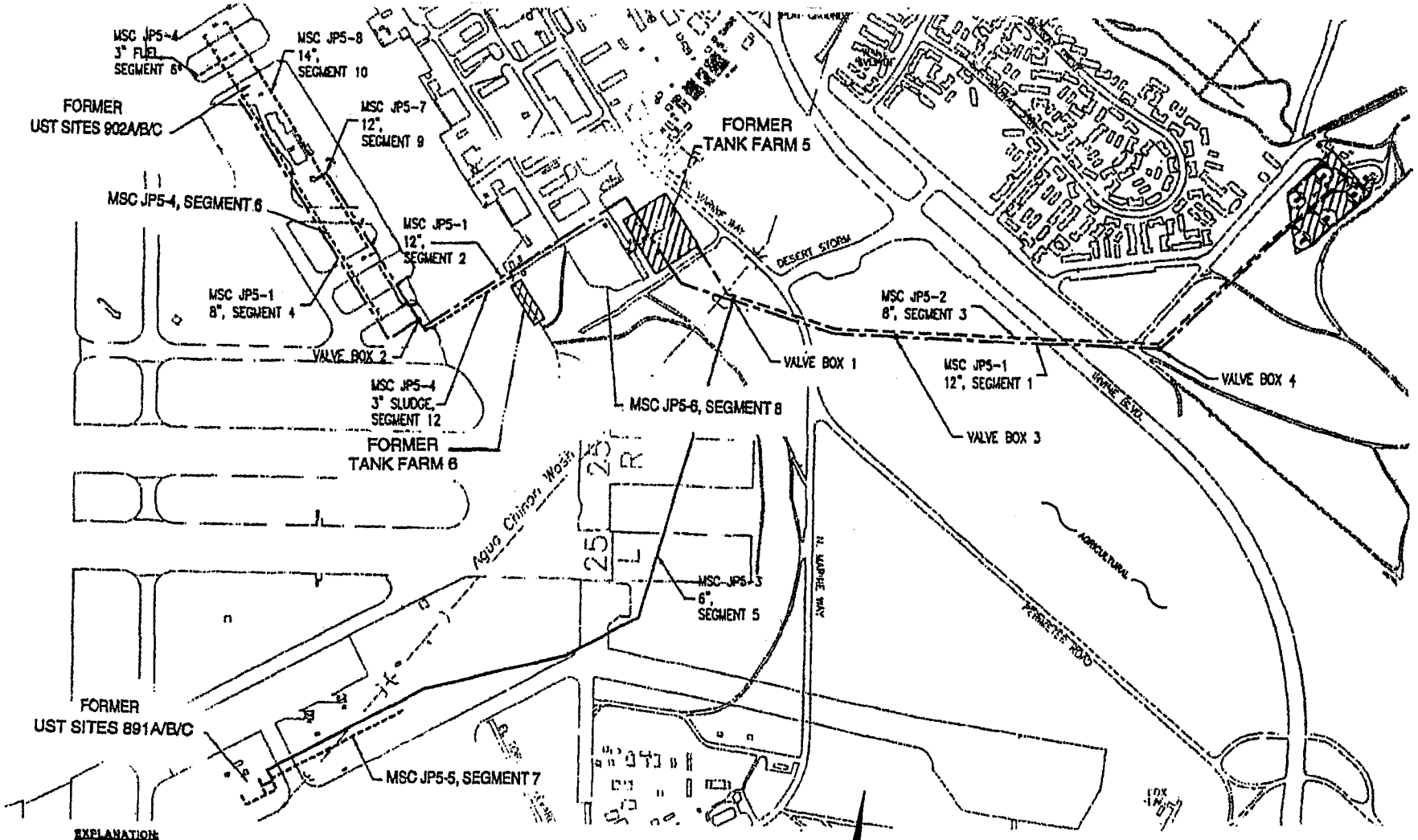


FIGURE 2-4
SITE MAP
FORMER JP5 PIPELINE

Marine Corps Air Station (MCAS)
El Toro, California

GEOFON INCORPORATED

June, 2004

The Pleistocene deposits unconformably overlie older semi consolidated marine sandstones, siltstones, and conglomerates of late Miocene to late Pliocene age; these units make up the Niguel, Fernando, and Capistrano Formations. These semi consolidated sediments are considered to be the bedrock near MCAS El Toro. The lower Pliocene Fernando Formation is the base of the water bearing units at MCAS El Toro.

2.2.2 Hydrogeology

MCAS El Toro lies within the Irvine Groundwater Sub Basin (Irvine Sub Basin). The Irvine Sub Basin and the main basin underline the Tustin Plain and Downey Plain, which are surficial physiographic features.

2.2.3 Surface Hydrology

Surface drainage near MCAS El Toro generally flows southwest, following the slope of the land perpendicular to the trend of the Santa Ana Mountains. Several washes originate in the hills northeast of MCAS El Toro and flow through or adjacent to the base en route to San Diego Creek. Off-base drainage from the hills and from upgradient irrigated farmlands combines with base runoff at MCAS El Toro and flows into four main drainage channels: Borrego Canyon, Agua Chinon, Bee Canyon, and Marshburn Channel. The southernmost wash is Borrego Canyon Wash, which flows along the southeast boundary of MCAS El Toro. Both Agua Chinon and Bee Canyon washes cross the central portion of MCAS El Toro. Marshburn Channel is a lined drainage channel that runs along the northwestern boundary of MCAS El Toro.

2.2.4 Topography

MCAS El Toro is situated on the southern edge of the Tustin Plain, a gently sloping surface of alluvial fan deposits derived mainly from the Santa Ana Mountains and on the south by the San Joaquin Hills, is at the southeast end of the Los Angeles Basin, a large sedimentary basin in the Peninsular Ranges Geologic Province. At the west corner of MCAS El Toro, the elevation is approximately 215 feet above mean sea level (MSL) and rises to approximately 800 feet above MSL at the east corner, in the foothills of the Santa Ana Mountains.

3.0 PROJECT OBJECTIVES

The objectives of this project are to evaluate jet fuel release in the soil at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline. In order to meet these objectives, the following is required:

Former MSC JP5 Station 574 Site

- Drill nine (9) shallow soil borings using direct push drilling methodology to a depth of 20 feet bgs to define the lateral extent of petroleum hydrocarbons in the soil. Collect soil samples at the depths of approximately 7 feet bgs and 20 feet bgs. Analyze the soil samples for TPH (as diesel and gasoline) and VOCs.
- Obtain the subsurface soil condition data (i.e. soil type, petroleum hydrocarbon concentration levels in the soil, etc.).

Former MSC JP5 Pipeline

- Drill fifteen (15) shallow soil borings along the pipeline using direct-push drilling methodology to a depth of 20 feet bgs to evaluate the extent of a jet fuel release in the soil. Collect soil samples at the depths of approximately 10 feet bgs (or below the pipeline) and 20 feet bgs. Analyze the soil samples for TPH (as diesel and gasoline) and VOCs.
- Obtain the subsurface soil condition data (i.e. soil type, petroleum hydrocarbon concentration levels in the soil, etc.).

4.0 PRE-CONSTRUCTION ACTIVITIES

Preconstruction activities include permitting, conducting a pre-construction meeting with SWDIV personnel, mobilization and site setup and utility clearances.

4.1 Permitting and Notification Requirements

The following permits and notifications will be required to perform site verification activities:

- Base access permits for GEOFON personnel and subcontractors
- Utility clearances and field work notification, as required by the Resident Officer in Charge of Construction (ROICC)

In addition, the RWQCB-Santa Ana Region will be notified 48 hours prior to fieldwork and all site verification activities will be performed with the RWQCB-Santa Ana Region concurrence.

4.2 Pre-Construction Meeting

Prior to mobilization, GEOFON will facilitate a meeting at the former MCAS with the ROICC and Navy Caretaker Site Office (CSO) personnel as required. The meeting objectives will be to discuss and develop an understanding of the health and safety program administration, periodic report submittal requirements, and the project execution approach. Appropriate notifications and permits required to commence work will be verified with the ROICC. Site-specific protocols and extent of work areas, vehicular traffic controls, and other areas of concern will also be discussed.

4.3 Mobilization

The following sections describe the mobilization of personnel, construction equipment, and materials required to complete the fieldwork at the former MCAS.

4.3.1 Personnel

The following personnel will be responsible for setting up temporary facilities and establishing work and support areas during each phase of the project:

- Site Superintendent (Project Geologist/Sampling Technician)
- Site Safety Officer

The following personnel may also be mobilized to the site during construction activities, but may not be present fulltime:

- Project Manager
- Health and Safety Officer
- Equipment Operators

Subcontractor personnel will be mobilized to the site as necessary, and may include the following:

- Underground utility locators
- Surveyors
- Drill rig operators

4.3.2 Equipment

GEOFON and/or its subcontractors will provide all equipment necessary to complete the project tasks. Equipment will be selected with adequate capability and capacity to perform the designated tasks. The equipment list includes, but is not limited to, the following:

- Direct-push drill rig
- Soil sampling equipment
- Portable decontamination equipment

4.4 Site Setup

Site setup will include site access, implementation of site security, verification of underground utility locations, and dust control.

4.4.1 Site Access

The ROICC will be contacted prior to site visits and will be apprised of any construction activities taking place at the site. Access to the site will be provided only for authorized GEOFON and subcontractor personnel.

4.4.2 Site Security

Prior to commencement of work at former MSC JP5 Station 574 Site and former MSC JP5 Pipeline segments, GEOFON will erect temporary security fencing and/or barriers and signs to prevent unauthorized access into construction areas. Temporary security barriers will remain in place until drilling and sampling activities at each site are completed. Only GEOFON personnel, subcontractor personnel, and authorized visitors with proper identification will be allowed access to the work site. The Site Superintendent is responsible for maintaining and updating a list of

authorized project personnel. A copy of the approved personnel list will be available to the ROICC and CSO upon request.

All visitors must comply with the project health and safety requirements and training. Visitors will be allowed to observe site verification activities from a designated observation area when accompanied by GEOFON personnel. All visitors will be logged in/out by company name and address recorded in the visitor's log.

Work is scheduled to be performed during normal approved work hours (7:00 a.m. to 5:00 p.m. Monday through Friday). GEOFON will submit a request to the ROICC for CSO approval for work to be performed outside of regular working hours.

4.4.3 Underground Utility Clearance

Underground utility clearances will be conducted at former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline, prior to conducting any subsurface digging, drilling or other disturbance of the surface. GEOFON will coordinate with the CSO by obtaining a Utility Clearance. Utility Clearance Request Forms, along with a site map of each site, will be submitted to the Engineering Technician, who will in turn provide utility drawings in the vicinity of each proposed drilling location. GEOFON will mark the location of utility lines on the site maps, as well as mark the proposed drilling locations at the site. The CSO will then conduct a physical site inspection to verify the location of the utility lines. Once the above has been completed, the Utility Clearance Request Forms will be submitted to the ROICC/CSO for concurrence and signature.

5.0 SOIL BORINGS DRILLING AND SOIL SAMPLING

This section describes the methods and procedures to be used during the site verification activities at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline with respect to sample collection, sample handling, packaging, shipment and documentation, sampling equipment decontamination procedures, and laboratory analytical methods. Drilling of the proposed soil borings, and soil sampling will be performed under the supervision of a California-registered Geologist. A GEOFON Geologist will visually log the borings in the accordance with the Unified Soil Classification System, collect soil samples, and monitor all field activities. Prior to the field assessment, GEOFON will visit each site to mark the boring locations, notify Underground Service Alert, and obtain any required permits. The following subsections will describe methods and procedures that will be used for drilling, and soil sampling.

5.1 Soil Borings Drilling Methodology

The shallow soil borings will be drilled using a direct-push rig at both of the sites. In the event that the direct-push rig is unable to drill through the soil (such as cobble), then a hollow stem auger drill rig will be used to drill the shallow soil borings.

The shallow soil borings will be drilled to the depth of 20 feet bgs at locations shown on Figures 5-1 and 5-2 using a direct-push rig. Each boring will be pushed using a 23-ton CPT direct push rig equipped with a soil sampler (probe) to hold the 500-mm-long by 355-mm-diameter stainless steel split barrel sample tube. After pushing the sampler to the desired depth, a soil sample will be collected in the sample tube. Immediately upon retrieval from the ground, the soil samples will be removed from the sampler and the required Encore samples will be collected of the soil in the sample tube. The sample tubes will be sealed at both ends with Teflon™-lined plastic caps to preserve sample integrity and reduce volatilization. The Encore samples and sample tubes will be labeled, sealed in Ziplock™ plastic bags, and will be immediately placed in an ice-chilled, thermally insulated cooler maintained at 4° C prior to and during transportation of the samples to the laboratory, and chain-of-custody forms will be prepared.

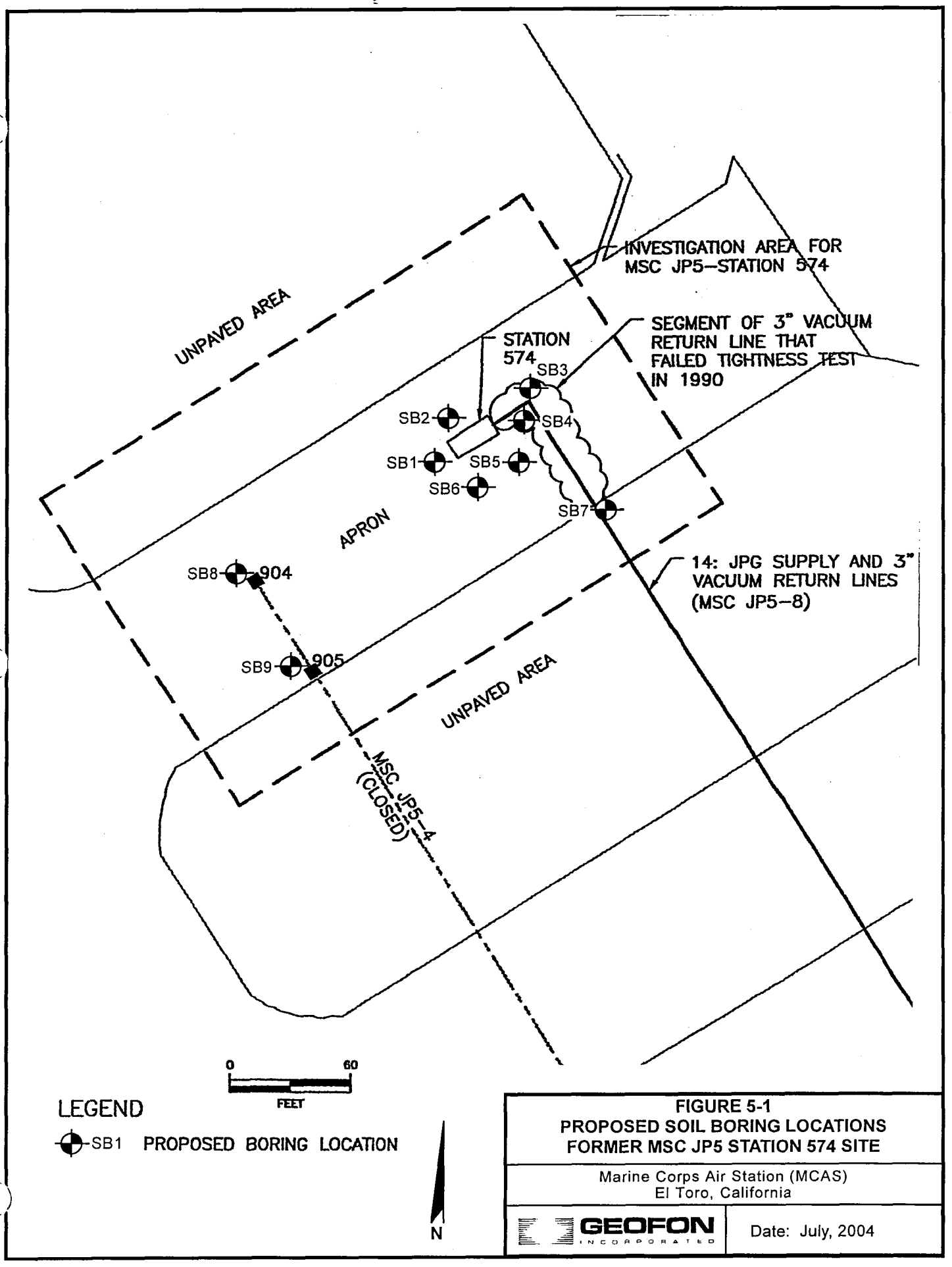
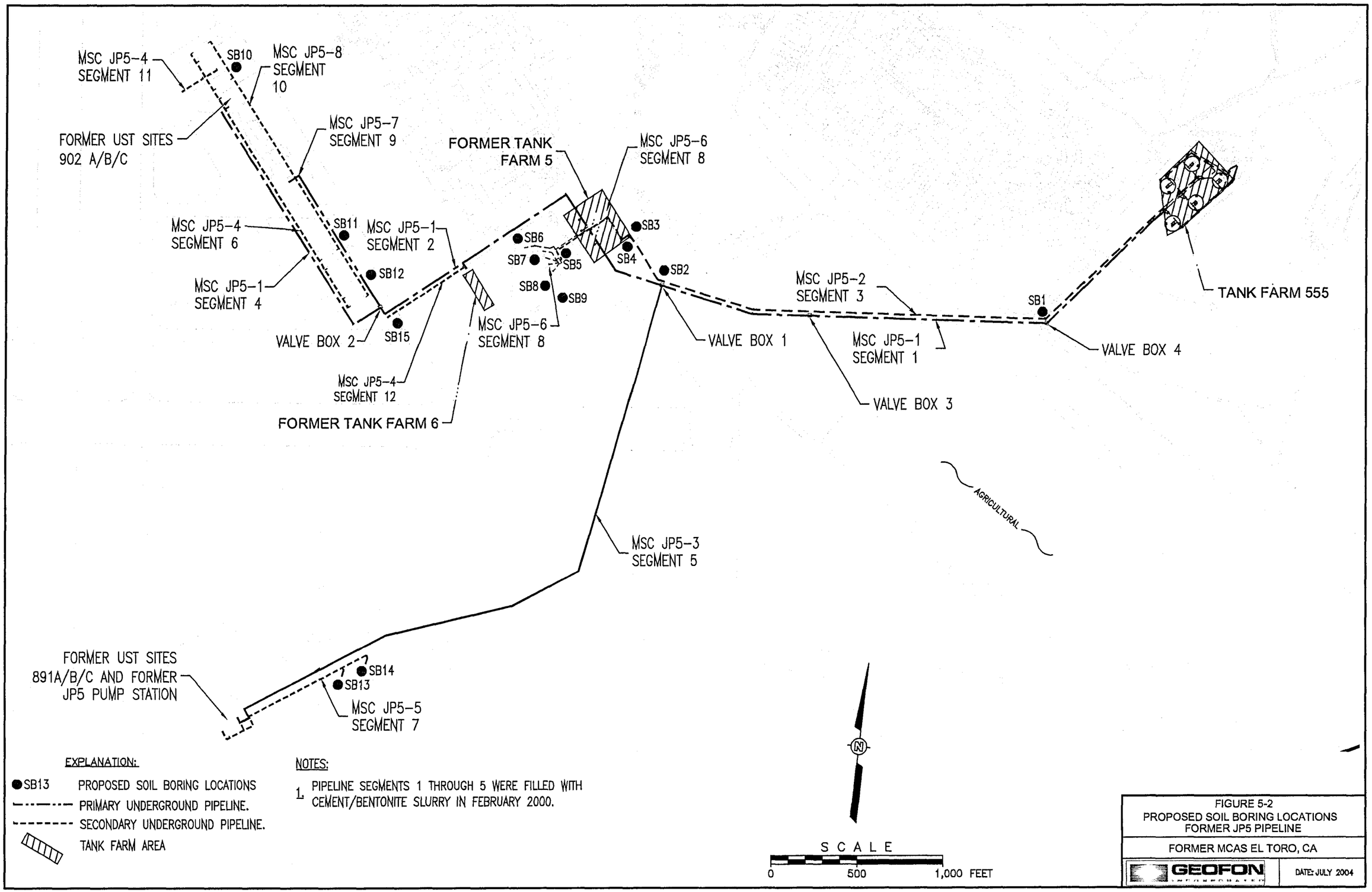


FIGURE 5-1
PROPOSED SOIL BORING LOCATIONS
FORMER MSC JP5 STATION 574 SITE

Marine Corps Air Station (MCAS)
El Toro, California

GEOFON INCORPORATED

Date: July, 2004


MSC JP5-4
SEGMENT 11
SB10
MSC JP5-8
SEGMENT
10
FORMER UST SITES
902 A/B/C
MSC JP5-7
SEGMENT 9
FORMER TANK
FARM 5
MSC JP5-6
SEGMENT 8
MSC JP5-4
SEGMENT 6
SB11
MSC JP5-1
SEGMENT 2
SB3
SB6
SB4
SB7
SB5
SB2
MSC JP5-1
SEGMENT 4
SB12
SB8
SB9
MSC JP5-2
SEGMENT 3
SB1
TANK FARM 555
VALVE BOX 2
SB15
MSC JP5-6
SEGMENT 8
VALVE BOX 1
MSC JP5-1
SEGMENT 1
VALVE BOX 4
MSC JP5-4
SEGMENT 12
VALVE BOX 3
FORMER TANK FARM 6
MSC JP5-3
SEGMENT 5
AGRICULTURAL
FORMER UST SITES
891A/B/C AND FORMER
JP5 PUMP STATION
SB14
SB13
MSC JP5-5
SEGMENT 7
EXPLANATION:
SB13 PROPOSED SOIL BORING LOCATIONS
PRIMARY UNDERGROUND PIPELINE.
SECONDARY UNDERGROUND PIPELINE.
TANK FARM AREA
NOTES:
1. PIPELINE SEGMENTS 1 THROUGH 5 WERE FILLED WITH CEMENT/BENTONITE SLURRY IN FEBRUARY 2000.
N
SCALE
0
500
1,000 FEET
FIGURE 5-2
PROPOSED SOIL BORING LOCATIONS
FORMER JP5 PIPELINE
FORMER MCAS EL TORO, CA
GEOFON
DATE: JULY 2004

5.2 Soil Sampling Strategy

In order to evaluate the extent of a jet fuel release in the soil at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline, the soil sampling strategy described in the following subsections will be implemented during the site verification activities. The soil sampling strategy provides a rationale for the location and depth of soil samples.

5.2.1 Soil Sampling Methods and Procedures

Soil samples will be collected at 5-foot intervals (starting at 5 feet bgs to the total depth drilled) for soil lithological description and field observations using a photo ionization detector (PID) calibrated to a hexane standard. Based on the field observations and PID readings, a maximum of 18 soil samples from the former MSC JP5 Station 574 Site and 30 soil samples from along the former MSC JP5 Pipeline will be selected for laboratory analysis. In each of the shallow soil borings, soil samples will be collected from the depths of 8 and 20 feet bgs at the former MSC JP5 Station 574 Site, and 10 and 20 feet bgs along the former MSC JP5 Station 574 Site.

5.2.2 Sampling Equipment Decontamination Procedures

If nondisposable sample equipment is used, the following procedure for decontamination of sampling equipment will be performed:

1. Wash with non-phosphate detergent.
2. Rinse with tap-water.
3. Deionized/distilled water rinse.
4. Deionized/distilled water rinse (twice).

Equipment rinsates will be collected daily, but analyzed every other day unless contamination is detected.

5.3 Sample Handling, Packaging and Shipment

Each sample will be identified by a unique number, coded to indicate the sampling location and depth. Sample labels will be completed and affixed to the appropriate sample containers. Preprinted labels may be used. The labels will be secured with waterproof tape and will include the sample identification number, the parameter(s) to be analyzed, the sampler's initials, and the preservative used. At the time of sample collection, a member of the field team will add the date and time of sample collection.

After all labeling and custody information have been verified, the samples will be placed in coolers for shipment to the analytical laboratory. Adequate ice will be used to maintain cooler temperatures at 4° C during shipment. A chain-of-custody form will accompany each cooler, listing the samples inside the cooler, the desired analyses, and any other necessary information. The chain-of-custody form will be placed in a self-sealing plastic bag and placed inside the cooler. The cooler will be adequately sealed, and a signed custody seal will be applied to the opposite sides of the cooler lid for security and accountability.

5.4 Laboratory Analytical Methods

An analytical laboratory accredited by the State of California Department of Health Services and approved by the Navy will analyze all soil samples collected during the field sampling program. All soil samples will be analyzed for TPH (as gasoline and diesel) using U.S. EPA Method 8015 Modified and for VOCs (including BTEX and MTBE) using U.S. EPA Method 5035/8260B. The laboratory analytical data will be submitted electronically in the Geotracker format.

5.5 Quality Control Procedures

The contract laboratory will perform comprehensive sample analysis quality control (QC). The laboratory will analyze internal QC samples (blind duplicates) at the frequency specified in the appropriate EPA method. The QC samples will include duplicates, method blanks, trip blank, matrix spikes and matrix spike duplicates (MS/MSD), and surrogate analysis for organics. One method blank sample will be analyzed for every 10 samples (minimum of one per day, one per matrix). GEOFON will review the data for Relative Percent Difference (RPD) between the primary and the QC samples to ensure <10% variation. The contract laboratory at the expense of the laboratory will reanalyze Method blanks in which contamination is detected above the detection limit for organic analysis.

5.6 Surveying

The location of each soil boring will be surveyed by a licensed land surveyor. The following requirements apply to surveying tasks to be conducted:

- The work will be performed or supervised by a land surveyor registered in the State of California.
- The survey will be conducted using a Third-Order, Class I accuracy.
- Horizontal control will be tied to the State Plane Coordinate System, based on the North American Datum of 1983 (NAD 83).

- Vertical control shall be based on North American Vertical Datum 1988, referenced to mean sea level (msl).

The survey data will be collected, and submitted in hard copy and electronic format.

6.0 SAMPLING AND ANALYSIS PLAN

The sampling and analysis plan (SAP) comprises Appendix A of this Work Plan and discusses in detail the field sampling objectives and tasks, data quality objectives (DQOs), field procedures, types and number of samples to be collected, location for sampling, the laboratory analyses to be performed, and quality assurance (QA) and quality control (QC) requirements. The SAP also discusses in detail the procedures that will be used for sampling, managing, and disposal of the investigation-derived waste. The SAP was developed in accordance with EPA's seven-step DQO process and Chapter 9 of U.S. EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846) guidance on test methods.

7.0 DATA VALIDATION AND DATA EVALUATION

Prior to evaluating the site verification activities sampling data, the analytical results will be validated by an independent evaluator in accordance with requirements of the SAP (Appendix A, Section 11.0). The usability of the data will also be assessed. Data qualifiers will be assigned to the reported results, as needed, during the data validation process. All analytical results will be validated at 90% QC Level III (screening) and 10% QC Level IV (definitive). Refer to Section 11.0 of the SAP for further discussion of the data validation planned for this project.

Soil sample data will be used to assess the distribution and concentration of contaminants in the soil. Data and the interpretations from these data will be presented in text, tables, and graphics.

8.0 MANAGEMENT AND DISPOSAL OF INVESTIGATION-DERIVED WASTE

Investigation-derive waste (IDW) generated from the site verification activities will consists of following three types:

- Soil cuttings as a result of drilling and sampling;
- Personal protective equipment (PPE); and
- Wastewater (decontamination water)

Soil Cuttings: Soil IDW will be placed in appropriately labeled containers (DOT-approved 55-gallon drums) and maintained on-site until all analytical work is completed. The analytical results of the soil samples will be used to characterize soil IDW generated at the site. If site samples associated with a particular drum are hazardous, the soil IDW will be disposed as hazardous waste. If the site samples associated with a particular drum are non hazardous, the soil IDW will be disposed as non-hazardous solid waste.

PPE: PPE generated during field activities (e.g., tyveks, gloves, paper towels, and sampling supplies) will be collected in plastic bags and stored in DOT-approved 55-gallon drums. The bags will be labeled to indicate the soil boring location, contents, and collection date. If the soil collected from the soil boring is characterized as hazardous, then the corresponding PPE will be disposed as hazardous waste. Otherwise, all PPE will be disposed as non-hazardous waste.

Wastewater: Separate, properly labeled DOT-approved 55-gallon drums will be used to collect decontamination water for all field decontamination activities. All liquid IDW will be transported off-site for appropriate treatment. Additional samples of liquid IDW will be analyzed for the contaminants of concern for disposal purposes.

Off-site disposal of waste will be coordinated by GEOFON. The Navy will be the generator and will sign any manifests. IDW will be profiled, transported, and disposed off in accordance with applicable Federal, State, and local regulations.

9.0 SITE VERIFICATION REPORT

A Draft Site Verification Report will be prepared for the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline submitted for Navy review. The site verification data reduction, analysis and evaluation will be incorporated into the Site Verification Report. A Final Site Verification Report will be prepared after incorporating Navy comments. This final report will be distributed for regulatory review. The following activities will be performed for the reporting effort:

- Review of field and laboratory data;
- Laboratory data validation;
- Preparation of a draft report including summary data tables, maps, and a description of field activities;
- VLEACH (or equivalent vadose zone modeling program), if applicable;
- Incorporation of Navy comments and preparation of final report; and
- Preparation of an analytical database in the Geotracker format.

The Site Verification Report will be presented using text, tables, and graphics. The report will be submitted in Microsoft Work; graphics will be in AutoCAD; and data tables will be in Microsoft Excel. The following are preliminary topics for the Site Verification Report:

Introduction: Summary information on the site description, site history, and the contaminant sources, as well as a description of the site verification purpose, scope, and objectives.

Previous Investigation Activities: Discussion of previous investigations at each site verification location.

Site Activities: Description of procedures used for the soil assessment, land surveying of soil borings, IDW management, sample handling and management, field quality control samples, decontamination procedures, laboratory analysis, and data management.

Conclusions and Recommendations: Conclusions from the site verification activities and recommendations for future actions. If VLEACH computer modeling (or equivalent vadose zone modeling program) is performed for any of the sites, results of the modeling will also be presented in the Site Verification Report.

Appendices will include copies of field forms, laboratory reports (including completed chain-of-custody forms), data validation reports, and waste manifests. Technical data collected during the

site verification activities, including the field and laboratory data, will be submitted to the Navy in the Geotracker format.

10.0 SITE HEALTH AND SAFETY PLAN

It is the intent of GEOFON to provide a safe and healthful work environment for employees, government personnel and subcontractors. All field activities will be conducted in accordance with the Site Health and Safety Plan (HASP) prepared specifically for this project. The HASP is included in Appendix B.

The HASP has been prepared in accordance with the U.S. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, Title 29, Code of Federal Regulations (CFR), 1910.120, 1910.165, 1910.1030, 1910.1200, 1910.134; California Code of Regulations (CCR), Title 8, Section 5192; the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM-385-1-1, (September 1996); the Navy/Marine Corps Installation Restoration Manual (August 2000) and other applicable local activity safety plans and standard operating procedures.

11.0 PROJECT MANAGEMENT PLAN

This section presents the management structure for the site verification activities work at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline as described in this Work Plan. The following subsections present project organization and key personnel, subcontract support services, and the project schedule/deliverable commitment.

11.1 Project Organization and Key Personnel

The project team consists of the Project Manager, Project Engineer, Project Geologist, Sampling Technician, Site Safety Officer, and Quality Assurance Officer. The project organization chart is presented in Figure 11-1. The Project Manager, Sree Akkenapally will have overall responsibility for all aspects of the project and for communications between GEOFON and the Navy. Day-to-day operations and subcontractor oversight is the responsibility of the Project Geologist (to be designated), who will report to the PM on a regular basis.

Technical review will be conducted by an in-house senior staff member to assure that all documents are reviewed and internally consistent prior to submittal to the Navy.

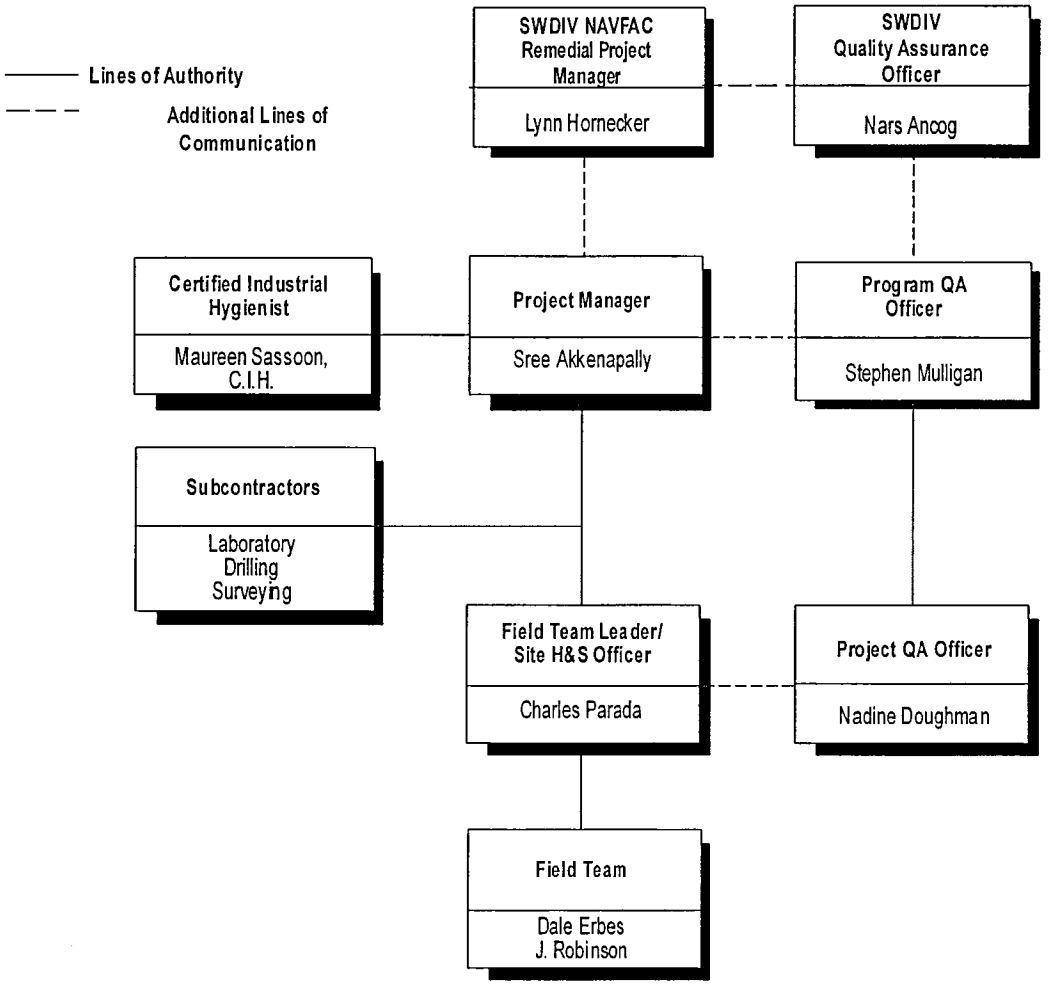
The Health and Safety Officer, Dr. Maureen Sassoon, C.I.H., is responsible for oversight and review of all site-specific Health and Safety Plans. The Site Safety Officer is responsible for plan implementation and policy conformance by all field personnel and subcontractors at the site.

The Quality Assurance Officer, Stephen Mulligan, is responsible for all contractual QA requirements as well as in-house QA requirements for project deliverables and subcontractor work products.

11.2 Subcontractors

A State-of-California licensed drilling subcontractor will perform soil boring drilling activities. Soil sampling will require subcontractor laboratory services for analytical testing of the samples. EMAX Laboratories, in Torrance, California has been retained to provide the analytical services for the soil samples. EMAX is California-accredited and Navy-approved laboratory.

FIGURE 11-1
PROJECT ORGANIZATION CHART



12.0 REFERENCE SOURCES

CDM Federal Programs Corporation, 2004. *Groundwater Monitoring Report, September 2003 Monitoring Round 18 for Marine Corps Air Station El Toro, California*, 16 April 2004.

IT Corporation, 2002. *Location of Concern MSC JP-5, JP-5 Pipeline Units 4,5,6,7, and 8 Technical Memorandum,* Marine Corps Air Station El Toro, California, 8 October 2002.

Shaw Environmental, Inc. 2004. *Proposed Soil Sampling Strategy for Miscellaneous Sites of Concern (MSC) JP5, Unit 7, Segment 9 & Unit 8, Segment 10,* Former Marine Corps Air Station El Toro, California, 31 March 2004.

Stollar, R.L. & Associates, Inc., 1990. *Test Report: Tracer Gas Leak Pinpointing for 3 In. Vacuum/Return Pipeline, Mag 11,* 12 to 16 January 1990, Test Report No. NDE-90-R013101, Marine Corps Air Station El Toro, California, 31 January 1990.

Stollar, R.L. & Associates, Inc., 1991. *Preliminary Assessment of the Tank 398 Site at the Marine Corps Air Station, El Toro, California.* March.

Southwest Division Naval Facilities Engineering Command, 2003. *Base Realignment and Closure (BRAC) Business Plan*, Former Marine Corps Air Station El Toro, California, May 2003.

U.S. Environmental Protection Agency, 1996, *Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846, Update III.* September 1996.

APPENDICES

APPENDIX A

SAMPLING AND ANALYSIS PLAN

FINAL
SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)

FOR SITE VERIFICATION ACTIVITIES AT
FORMER MSC JP5 STATION 574 SITE AND JP5 PIPELINE
FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

Contract No. N68711-01-D-6008
Delivery Order No. 0006

Prepared for:

Department of the Navy
Naval Facilities Engineering Command
Southwest Division
1220 Pacific Highway
San Diego, California 92132

Prepared by:

GEOFON, INC.
22632 Golden Springs Drive, Suite 270
Diamond Bar, California 91765

GEOFON Project No. 4-12806

July 28, 2004

FINAL
SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)

FOR SITE VERIFICATION ACTIVITIES AT
FORMER MSC JP5 STATION 574 SITE AND JP5 PIPELINE
FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

Contract No. N68711-01-D-6008
Delivery Order No. 0006

Prepared by:

Nadine Doughman — 7-28-2004

Nadine Doughman
Project Engineer

Date

Reviewed and Approved by:

Stephen Mulligan — 7/28/2004

Stephen W. Mulligan
Program Quality Assurance Manager

Date

Approved by:

Narciso Alban Ancog — 7/29/04

Narciso A. Ancog
Government Quality Assurance Officer

Date

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

TABLE 1: ELEMENTS OF EPA QA/R-5 IN RELATION TO THIS SAP

Sampling and Analysis Plan, Former Marine Corps Air Station, El Toro, California

EPA QA/R-5 QAPP ELEMENT*		GEOFON FORMER MSC JP5 STATION 574 SITE AND JP5 PIPELINE SAP	
A1	Title and Approval Sheet		Title and Approval Sheet
A2	Table of Contents		Table of Contents
A3	Distribution List	A.vii	Distribution List
A4	Project/Task Organization	A.1.3	Project Organization
A5	Problem Definition/Background	A.1.1	Site Description and Background
A6	Project/Task Description	A.1.2	Objective
A7	Quality Objectives and Criteria	A.2.0	Project Quality Assurance Objectives
A8	Special Training/Certification	A.6.1	Laboratory Requirements
A9	Documents and Records	A.3.0	Documents and Records
B1	Sampling Process Design	A.4.0	Field Methods and Sampling Procedures
B2	Sampling Methods	A.4.2	Sample Collection
B3	Sample Handling and Custody	A.5.0	Sample Handling and Custody
B4	Analytical Methods	A.6.0	Analytical Methods
B5	Quality Control	A.7.0	Quality Control
B6	Instrument/Equipment Calibration and Frequency	A.9.0	Instrument Calibration and Frequency
B7	Inspection/Equipment Calibration and Frequency	A.8.0	Equipment Testing, Inspection and Maintenance
B8	Inspection/Acceptance of Supplies and Consumables	A.8.0	Equipment Testing, Inspection and Maintenance
B9	Non-direct Measurements		Not Applicable
B10	Data Management	A.11.2	Data Reporting

EPA QA/R-5 QAPP ELEMENT*		GEOFON FORMER MSC JP5 STATION 574 SITE AND JP5 PIPELINE SAP	
C1	Assessment and Response Actions	A.10.1	Assessment and Response Actions
C2	Reports to Management	A.10.2	Reports to Management
D1	Data Review, Verification, and Validation	A.11.0	Data Review, Reporting and Validation
D2	Validation and Verification Methods	A.11.1	Data Review and Verification
		A.11.3	Data Validation
D3	Reconciliation with User Requirements	A.11.0	Data Review, Reporting and Validation

Notes:

* EPA. 2001. "EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5." Office of Environmental Information. Washington, DC. EPA/240/B-01/003. March.

EPA U.S. Environmental Protection Agency

MSC Miscellaneous Sites of Concern

QA Quality assurance

QAPP Quality assurance project plan

SAP Sampling and analysis plan

DISTRIBUTION LIST

Lynn Marie Hornecker
Remedial Project Manager
Code 06CC.LMH
Department of the Navy,
Southwest Division
Naval Facilities Engineering Command
1220 Pacific Highway
San Diego, California 92132-5187

Narciso A. Ancog
Government Quality Assurance Officer
Department of the Navy,
Southwest Division
Naval Facilities Engineering Command
1220 Pacific Highway
San Diego, California 92132-5187

John Broderick
Remedial Project Manager
California Regional Water Quality Control Board
Santa Ana Region
3737 Main Street, Suite 500
Riverside, California 92501-3348

LIST OF ACRONYMS

ASTM D	American Society for Testing and Materials Designation
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
BRAC	Base Realignment and Closure
°C	degrees Celsius
CCC	calibration check compound
CF	calibration factor
CIH	Certified Industrial Hygienist
COC	chain-of-custody
DHS	California Department of Health Services
DO	delivery order
DOT	Department of Transportation
DQIs	data quality indicators
DQOs	data quality objectives
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
GEOFON	GEOFON, Inc.
HAZMAT	hazardous materials
HCl	hydrochloric acid
IDW	Investigation-Derived Waste
LCS	laboratory control sample
LIMS	laboratory information management system
LQMP	Laboratory Quality Management Plan
LUFT	leaking underground fuel tank
MCAS	Marine Corps Air Station
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter

LIST OF ACRONYMS (CONT.)

MD	matrix duplicate
MDLs	method detection limits
MS	matrix spike
MSC	Miscellaneous Sites of Concern
MSD	matrix spike duplicate
MRLs	method reporting limits
NEDTS	Navy Environmental Data Transfer Standard
NFESC	Naval Facilities Engineering Service Center
OCHCA	Orange County Health Care Agency
OWS	oil/water separator
PARCCS	precision, accuracy, representativeness, comparability, completeness and sensitivity
PE	performance evaluation
PID	photoionization detector
PPE	personal protective equipment
QA	quality assurance
QC	quality control
QCR	quality control report
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
RPM	remedial project manager
RSD	relative standard deviation
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SDG	sample delivery group
SHSP	Site Health and Safety Plan
SOPs	standard operating procedures
SPCC	system performance check compound

LIST OF ACRONYMS (CONT.)

STLC	Soluble Threshold Limit Concentration
SVOCs	semi-volatile organic compounds
TCLP	Toxicity Characteristic Leaching Procedure
TPH	total petroleum hydrocarbons
TRPH	total recoverable petroleum hydrocarbons
TSA	technical systems audit
TTLC	Total Threshold Limit Concentration
USMC	United States Marine Corps
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
VOA	volatile organic analysis
VOCs	volatile organic compounds

A.1.0 INTRODUCTION

GEOFON, Inc. (GEOFON) has prepared this Sampling and Analysis Plan (SAP) to be implemented during the site verification activities at the former Miscellaneous Sites of Concern (MSC) JP5 Station 574 Site and along the former MSC JP5 Pipeline located at the former Marine Corps Air Station (MCAS), El Toro, California (Figure A.1-1). The site verification activities will be performed at the former MSC JP5 Station 574 Site and along the MSC JP5 Pipeline to evaluate the extent of a jet fuel release in the soil.

This SAP outlines the data quality objectives (DQOs), sampling strategies, and procedures for performing field activities during the site verification. The site verification activities will include drilling of shallow soil borings at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline, handling soil samples, documenting sample information, decontaminating equipment, managing investigation-derived waste (IDW), submitting samples to a chemical laboratory for analysis, and ensuring that quality assurance (QA) and quality control (QC) requirements are met.

GEOFON will perform soil sampling from shallow soil borings at the former MSC JP5 Station 574 and along the former MSC JP5 Pipeline using direct-push drilling methodology. The proposed locations of borings, number of borings, number of soil samples per boring, and soil sampling procedures at the sites are presented in Section A.4.0. The analytical methods to be used for soil sample analysis are presented in Section A.6.0

This SAP is based on the requirements of the following documents:

- Chemical Data Quality Management Plan (Geofon, 2002)
- Guidance for the Data Quality Objectives Process, U.S. Environmental Protection Agency (EPA) QA/G-4 (EPA, 2000)
- EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5 (EPA, 2001)
- Navy Installation Restoration Chemical Data Quality Manual (Naval Facilities Engineering Services Center [NFESC], 1999)
- Environmental Work Instruction 3EN2.1-Chemical Data Validation (U.S. Navy Southwest Division, 2001a)
- Environmental Work Instruction 3EN2.2-Review, Approval, Revision, and Amendment of Sampling and Analysis Plans (U.S. Navy Southwest Division, 2001b)
- Environmental Work Instruction 3EN2.3-Laboratory Quality Assurance Program (U.S. Navy Southwest Division, 2001c)

- Environmental Work Instruction 4EN-Environmental Data Management and Required Electronic Delivery System (U.S. Navy Southwest Division, 2001d)

A.1.1 Site Description and Background

The MCAS El Toro was officially closed in 1999. The facility was a master jet air station supporting the operations and combat readiness of Pacific Fleet Marine Forces. MCAS El Toro provided materials and support for aviation activities of the United States Marine Corps (USMC).

MCAS El Toro is located in a semi-urban agricultural area in Southern California. The station occupies approximately 4,700 acres in central Orange County, and is situated about 8 miles southeast of the City of Santa Ana and 12 miles northeast of the city of Laguna Beach (Figure A.1-1). Most of the land northwest of MCAS El Toro was historically used to grow oranges and other agricultural crops. Land to the south and northwest of the station has been developed as commercial, light industrial, and residential.

The closure of MCAS El Toro as a military facility is a result of the federal 1993 Base Realignment and Closure (BRAC) process. MCAS El Toro is one of 30 California military bases placed on the closure list during or after 1988. The 1993 Base Realignment and Closure Committee slotted MCAS El Toro for closure. The base was revisited with the 1995 BRAC and slotted for closure in 1999. Operational closure of MCAS El Toro was implemented in July 1999.

The former MSC JP5 Station 574 Site and former MSC JP5 Pipeline are located on the main MCAS facility as shown in Figure A.1-2, Site Location Map of MCAS El Toro. A description and status of each of these sites are presented in the following sections.

A.1.1.1 Former MSC JP5 Station 574 Site

The former MSC JP5 Station 574 Site is located northwest of Building 372 in the northeast portion of MCAS El Toro. MSC JP5 Station 574 was a former jet fuel pump station constructed in 1956 and demolished in 1993.

In 1989 and 1990, NDE Environmental Corp. conducted hydrostatic testing of the 3-inch vacuum/return line at MSC JP5 Station 574. A leak was identified in the 3-inch vacuum/return line with an estimated leakage rate of 5 or more gallons per hour.

In 1990, a monitoring well and an 82-foot deep soil boring, MW398-08 and SB398-13, were constructed near Station 574. Benzene, toluene, ethylbenzene and xylenes (BTEX) at concentrations of 1.2 micrograms per liter (µg/L), 26 µg/L, 0.82 µg/L, and 5.6 µg/L, respectively

were detected in the groundwater samples collected from MW398-08. The soil samples collected from SB398-13 at depths of 30 and 80 feet below ground surface (bgs) were analyzed for BTEX and total petroleum hydrocarbons (TPH). BTEX and TPH were not detected at or above laboratory reporting limits in the soil samples.

In 1992, MSC JP5 Station 574 was replaced with two new pump stations, Structures 904 and 905, which were constructed southwest of Station 574 in the former aircraft parking apron (Apron 1). The investigation area for MSC JP5 Station 574 includes the original pump station (574) and the most recently constructed pump stations (904 and 905).

A.1.1.2 Former MSC JP5 Pipeline

The former MSC JP5 Pipeline is comprised of primary and secondary jet fuel supply pipelines in the northeast quadrant of the MCAS El Toro. The primary jet fuel supply pipelines were used to distribute the fuel from the Tank Farm 555 storage tanks to secondary storage tanks within the MCAS El Toro. Secondary jet fuel pipelines then transported the fuel from the secondary storage tanks to the end user, either aircraft or fuel tank trucks. In 1998, service at the MSC JP5 Pipeline was discontinued.

Benzene has been detected in the groundwater from nearby monitoring wells 04-DBMW40, 04-UGMW63 and 18-BGMW01E. In November 1996, benzene was detected in wells 04-DBMW40 and 04-UGMW63 at concentrations of 40 µg/L and 7 µg/L, respectively. In March 1997, benzene was detected at the concentration of 90 µg/L in well 18-BGMW01E. The fueling stations and a dry well near Building 363 in the former truck fueling facility are possible sources of the benzene in the groundwater.

SENSITIVE RECORD

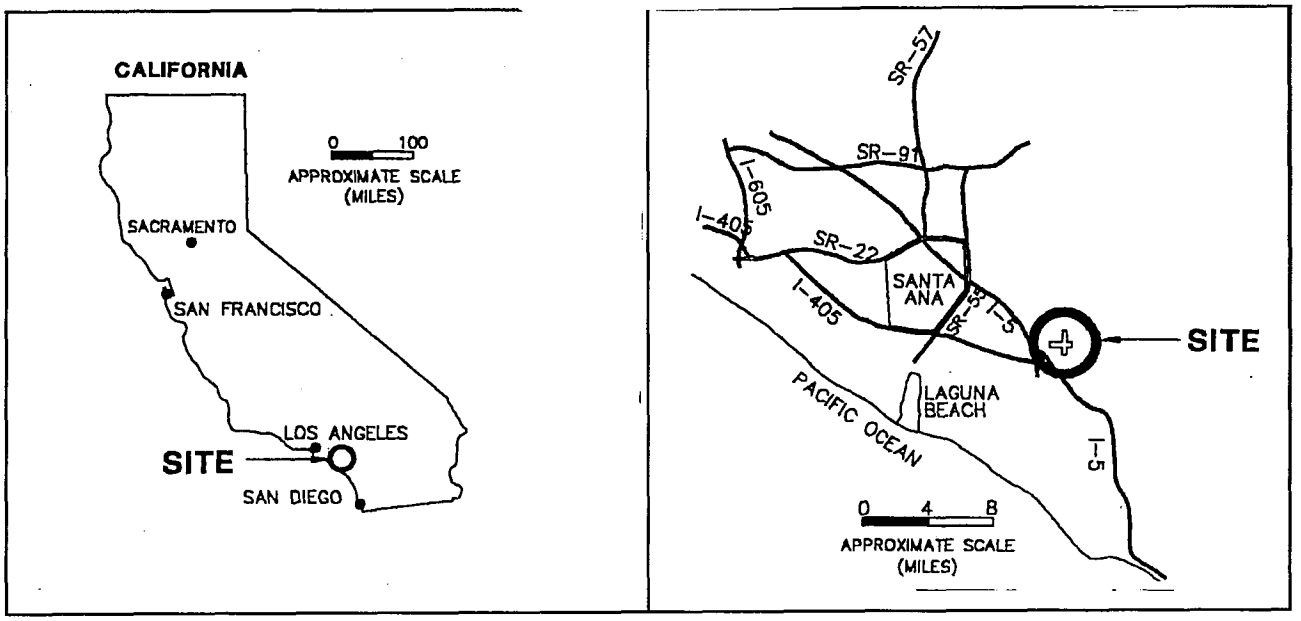
PORTIONS OF THIS RECORD ARE CONSIDERED SENSITIVE AND ARE NOT AVAILABLE FOR PUBLIC VIEWING

FIGURES A.1-1 AND A.1-2

FOR ADDITIONAL INFORMATION, CONTACT:

DIANE C. SILVA, RECORDS MANAGER
NAVAL FACILITIES ENGINEERING COMMAND, SOUTHWEST
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132

TELEPHONE: (619) 556-1280
E-MAIL: diane.silva@navy.mil



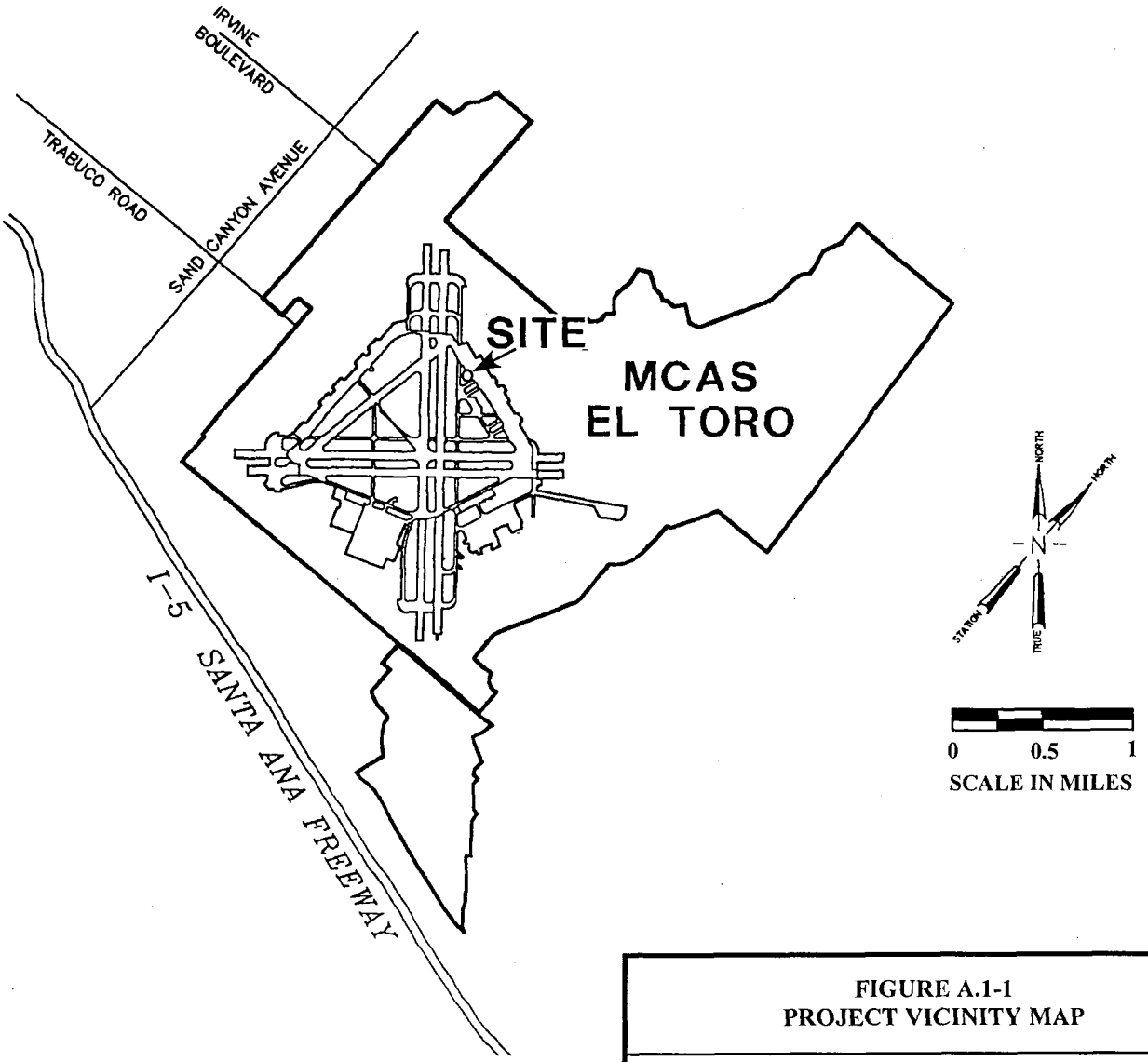


FIGURE A.1-1
PROJECT VICINITY MAP

Former Marine Corps Air Station (MCAS)
El Toro, California

GEOFON INCORPORATED

Date: June, 2004
Contract No.: N68711-01-D-6008

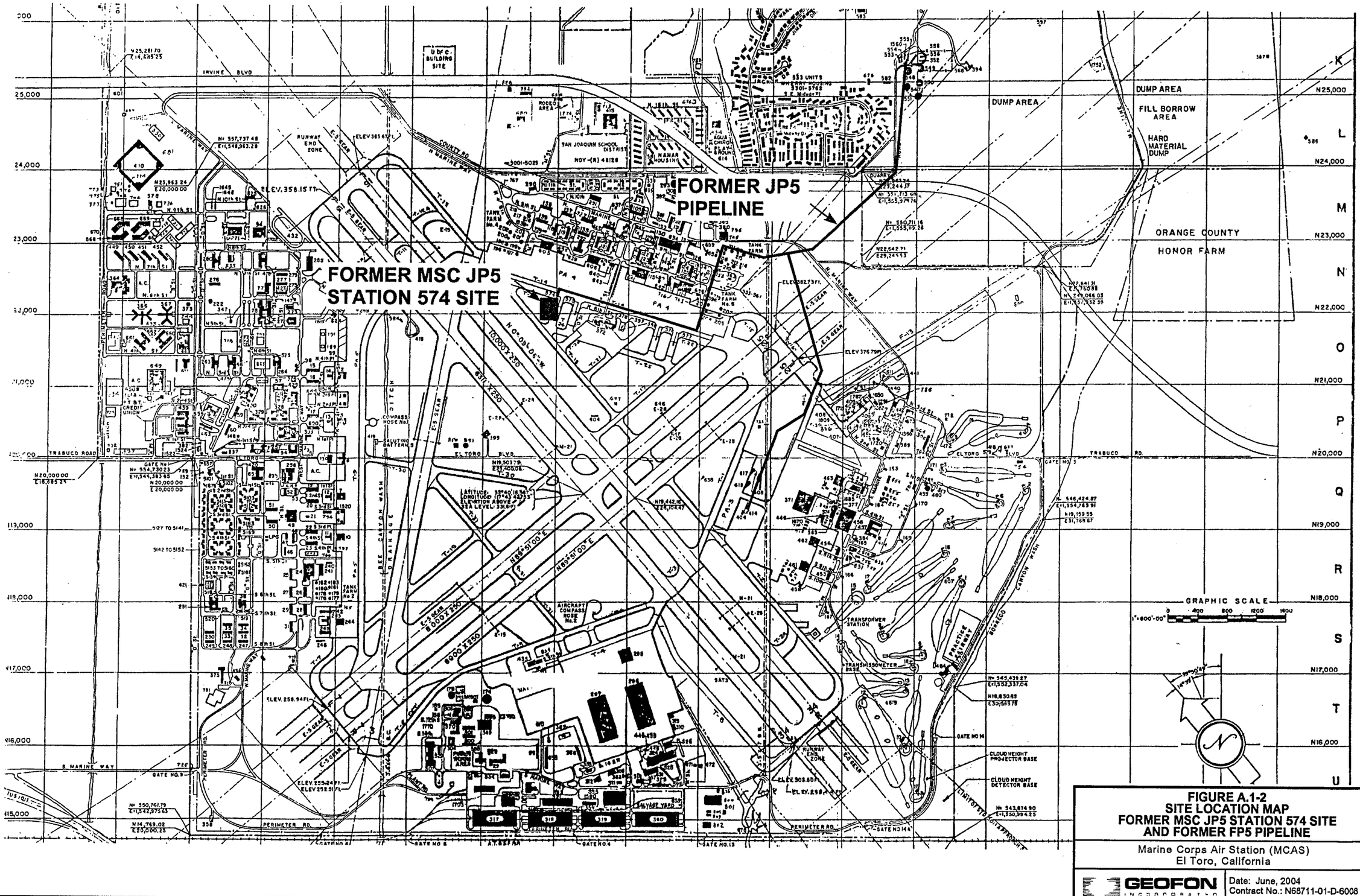


FIGURE A.1-2
SITE LOCATION MAP
FORMER MSC JP5 STATION 574 SITE
AND FORMER FP5 PIPELINE

Marine Corps Air Station (MCAS)
El Toro, California

GEOFON INCORPORATED

Date: June, 2004
Contract No.: N68711-01-D-6008

A.1.2 Objectives

The objectives of this project are to evaluate the extent of a jet fuel release in the soil at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline. In order to meet these objectives, the following is required:

Former MSC JP5 Station 574 Site

- Drill nine (9) shallow soil borings using direct-push drilling methodology to a depth of 20 feet bgs to define the lateral extent of petroleum hydrocarbons in the soil. Collect soil samples at depths of approximately 8 feet bgs and 20 feet bgs. Analyze the soil samples for TPH (as diesel and gasoline) and volatile organic compounds (VOCs).
- Obtain the subsurface soil condition data (i.e. soil type, petroleum hydrocarbon concentration levels in the soil, etc.).

Former MSC JP5 Pipeline

- Drill fifteen (15) shallow soil borings along the pipeline using direct-push drilling methodology to a depth of 20 feet bgs to evaluate the extent of a jet fuel release in the soil. Collect soil samples at depths of approximately 10 feet bgs (or below the pipeline) and 20 feet bgs. Analyze the soil samples for TPH (as diesel and gasoline) and VOCs.
- Obtain the subsurface soil condition data (i.e. soil type, petroleum hydrocarbon concentration levels in the soil, etc.).

This SAP is intended for use as a reference by field personnel during field sampling activities.

The SAP has the following objectives:

- Describe the project data quality objectives (DQOs)
- Derive appropriate QA objectives and QC checks based on these DQOs
- Describe and establish consistent field sampling procedures
- Establish data gathering, sample handling, and documentation methods that will be employed during field activities
- Ensure that the data collected over the course of the project are of known quality to meet their intended use
- Ensure that all components of data acquisition are thoroughly documented, are verifiable, and are defensible

- Outline the criteria for data quality in terms of precision, accuracy, representativeness, comparability, completeness and sensitivity, often referred to as the PARCCS parameters

The SAP is designed to satisfy the data collection requirements of Navy personnel who will review and approve this SAP.

A.1.3 Project Organization

This section presents the specific roles, activities and responsibilities of GEOFON personnel, as well as the internal lines of communication within and between GEOFON and the Navy. Table A.1-1 outlines key personnel and their responsibilities. The project organization chart is presented as Figure A.1-3.

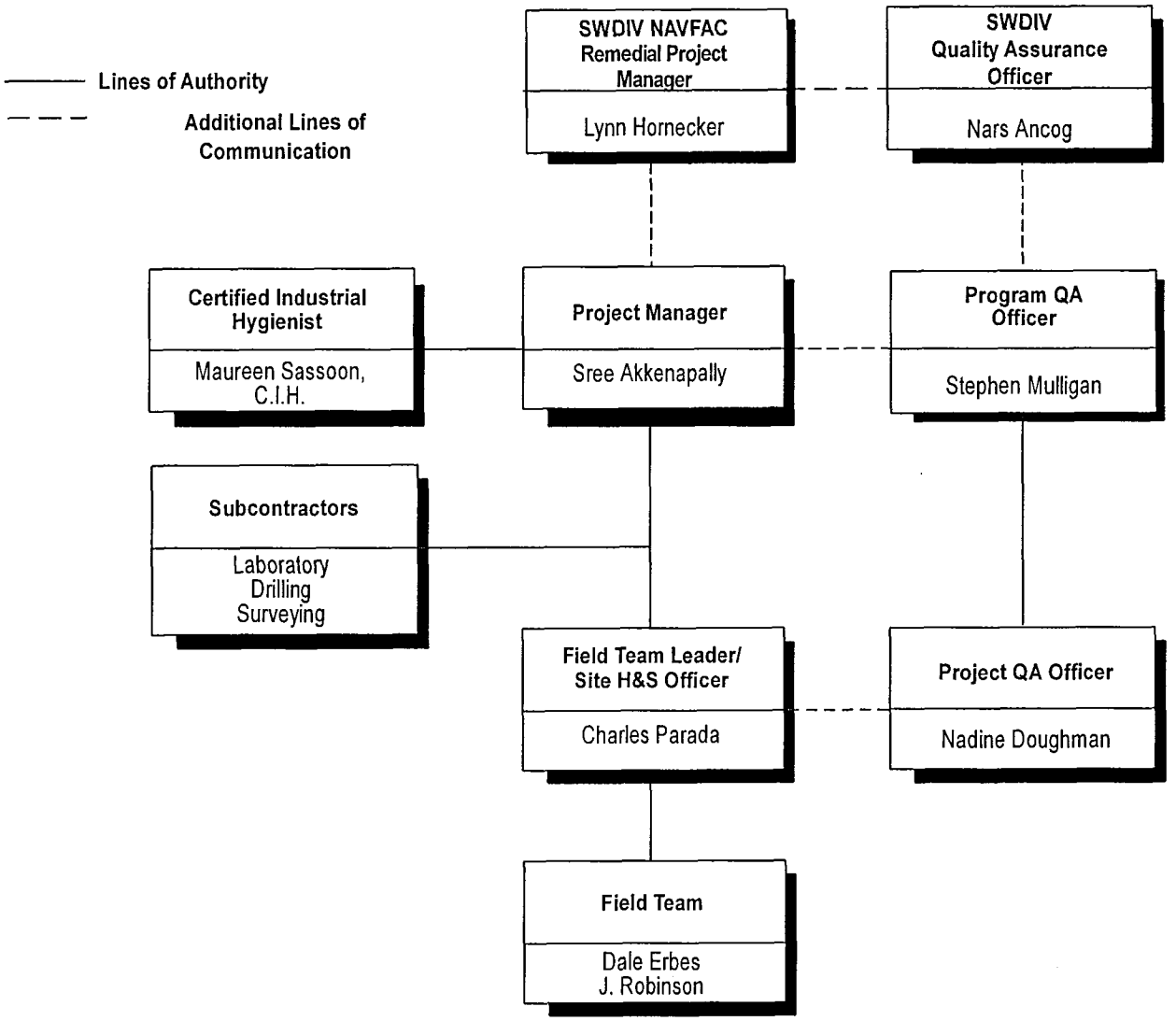
TABLE A.1-1
KEY PERSONNEL AND RESPONSIBILITIES

Name	Organization	Role	Responsibilities	Contact Information
Lynn Hornecker	Navy	Remedial Project Manager	• Responsible for overall project execution and for coordination with base representatives, regulatory agencies and Navy management. • Actively participate in DQO process	Naval Facilities Engineering Command Southwest Division (619) 532-0783
Narciso A. Ancog	Navy	QA Officer	• Responsible for QA issues for all Navy work under this contract • Reviews and approves SAP and any significant modifications • Has authority to suspend project activities if Navy quality requirements are not met	Naval Facilities Engineering Command Southwest Division (619) 532-2540
Sree Akkenapally	GEOFON	Project Manager	• Responsible for implementing all activities called out in the DO • Prepares or supervises preparation of SAP • Monitors and directs field activities to ensure compliance with SAP requirements	GEOFON, Inc. Diamond Bar, CA (909) 396-7662
Stephen Mulligan	GEOFON	Program QA Manager	• Responsible for regular discussion and resolution of QA issues with Navy QA officer.	GEOFON, Inc. Diamond Bar, CA smulligan@Geofon.com (909) 396-7662

TABLE A.1-1
KEY PERSONNEL AND RESPONSIBILITIES

Name	Organization	Role	Responsibilities	Contact Information
Stephen Mulligan (Cont)			• Provides program-level QA guidance to project manager and project teams • Reviews and approves SAPs • Identifies nonconformances through audits and other QA review activities and recommends corrective action	
Nadine Doughman	GEOFON	Project QA Manager	• Responsible for providing guidance to project teams preparing SAPs • Verifies that data collection methods specified in SAP comply with Navy and GEOFON requirements • May conduct laboratory evaluations and audits	GEOFON, Inc. Diamond Bar, CA (909) 396-7662
Charles Parada	GEOFON	Field Team Leader/Site H&S Officer	• Responsible for directing day-to-day field activities conducted by GEOFON and subcontractor personnel • Verifies that field sampling and measurement procedures follow SAP • Provides project manager with regular reports on status of field activities • Responsible for implementing health and safety plan and for determining appropriate site control measures and personal protection levels	(562) 577-4895

FIGURE A.1-3
PROJECT ORGANIZATION CHART



A.2.0 PROJECT QUALITY ASSURANCE OBJECTIVES

The project quality assurance objectives are expressed in terms of DQOs and measurement quality objectives. DQOs are qualitative and quantitative statements that clarify the project objectives; specify the most appropriate type of data for the project decisions; determine the most appropriate conditions from which to collect data; and specify tolerable limits on decision errors. Measurement quality objectives are acceptance criteria or ranges for systematic QC checks that will be incorporated into the sampling and analyses to show that procedures and test results remain reproducible and that the analytical method is actually measuring the quantity of target analytes without unacceptable bias.

A.2.1 Data Quality Objectives (DQOs) Process

To generate data that will meet project-specific requirements, it will be necessary to define the types of decisions that will be made and to identify the purpose of the data. DQOs define data quality requirements based on the intended use of the data. Project-specific DQOs were established to encompass both field and laboratory operations. The project DQOs have been developed in accordance with the USEPA seven-step DQO process as described in QA/G-4 (USEPA, 2000). The seven-step DQO process for the site verification activities to be conducted at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline is presented in Table A.2-1a and Table A.2-1b, respectively.

A.2.2 Measurement Quality Objectives

To ensure that quality data are continuously produced during analysis and allow the eventual compliance review, systematic QC checks will be incorporated into the sampling and analyses to show that procedures and test results remain reproducible and that the analytical method is actually measuring the quantity of target analytes without unacceptable bias. Systematic QC checks will include the scheduled analyses of field and laboratory replicates, standards, surrogates, spiked samples, and blanks as discussed in Section A.7.0. Measurement quality objectives (acceptance criteria or ranges) for these systematic QC checks will be established to verify that data quality indicators (DQIs) support data usability and contract compliance. DQIs, formerly referred to as the PARCCS parameters of precision, accuracy, representativeness, comparability, completeness, and sensitivity, are defined in the following sub-sections. Precision and bias QC limits for each method are identified in Table A.2-2, Quality Control Acceptance Criteria.

TABLE A. 2-1a
DATA QUALITY OBJECTIVES

Step	1	2	3	4	5	6	7
Process	State the problem.	Identify the decision question(s).	Identify inputs that affect the decision.	What are the boundaries of the study?	Identify decision rules.	Limits on decision errors.	Optimize the design.
Site 1 Former MSC JP5 Station 574 Site	In 1989, a leak was identified in the 3-inch vacuum/return line with an estimated leakage rate of 5 or more gallons per hour. In 1990, monitoring well MW398-08 detected benzene, toluene, ethylbenzene and xylenes (BTEX). The site verification activities will be conducted to evaluate the extent of a jet fuel release in the soil.	Do the soil sample results identify significant contamination (i.e. concentrations exceeding LUFT guidance or USEPA Region IX Residential PRGs)?	Soil samples will be collected from the 9 proposed shallow soil borings. Soil samples will be analyzed for VOCs (including BTEX and MTBE) using USEPA Method 8260B and TPH (as gasoline and diesel) using USEPA Method 8015M. Previous soil samples analytical data from 1990.	All sampling will be performed within the immediate vicinity of former MSC JP5 Station 574. The proposed boreholes are within the boundaries of the former MSC JP5 Station 574 Site. The boundaries of the site are 180 feet wide and 270 feet long. The maximum depth of the soil borings will be 20 feet bgs. It is anticipated that this site verification activities and evaluation of the data will take approximately 6 weeks.	If soil sample results identify significant contamination (i.e. concentrations exceeding LUFT guidance or USEPA Region IX Residential PRGs), then additional investigation of the site will be recommended. If soil sample results identify insignificant contamination (i.e. concentrations less than LUFT guidance or USEPA Region IX Residential PRGs), then no further action will be recommended.	A review of past site operations and site investigations results will be performed, and best professional judgment will be used to determine the optimum sampling locations and limit the possibility of sampling design errors. Measurement errors may occur during sample collection (e.g., improper collection technique), QC samples, sampling handling (e.g., high temperature), sample preparation or analysis in the laboratory, or data handling or reduction. Following proper standard operating procedures can eliminate many of these Measurement errors. The specific data types and their acceptable limits of measurement error for the site assessments are as follows: Reproducibility of duplicate sample results: plus or minus 30% for soil. Equipment rinsates and field blanks: no detections of analytes. Laboratory QC recoveries: within method-specific ranges. These data will be evaluated during the data evaluation process.	Nine (9) direct-push shallow soil borings will be drilled in the vicinity of the former MSC JP5 Station 574 to a maximum depth of 20 feet bgs. This design will allow for a quick evaluation of lateral extent of jet fuel release in the soil at the site.

TABLE A 2-1b
DATA QUALITY OBJECTIVES

Step	1	2	3	4	5	6	7
Process	State the problem.	Identify the decision question(s).	Identify inputs that affect the decision.	What are the boundaries of the study?	Identify decision rules.	Limits on decision errors.	Optimize the design.
Site 2 Former MSC JP5 Pipeline	Benzene has been detected in the groundwater from nearby monitoring wells 04_DBMW40, 04_UGMW63 and 18_BGMW01E. The site verification activities will be conducted to evaluate the extent of a jet fuel release in the soil along the Pipeline, especially near the valves, joint boxes, and elbows of the pipe.	Do the soil sample results identify significant contamination (i.e. concentrations exceeding LUFT guidance or USEPA Region IX Residential PRGs)?	Soil samples will be collected from 15 proposed soil borings. Soil samples will be analyzed for VOCs (including BTEX and MTBE) using USEPA Method 8260B and TPH (as gasoline and diesel) using USEPA Method 8015M.	Because the Former MSC JP5 Pipeline is over one (1) mile long, the site boundaries could not be established. The boreholes will be drilled along the 1-mile long former MSC JP5 Pipeline (see Figure B.4-2). The soil boring locations will be near the JP5 Pipeline valves, joint boxes and elbows. The maximum depth of the soil borings will be 20 feet bgs. It is anticipated that this site verification activities and evaluation of the data will take approximately 6 weeks.	If soil sample results identify significant contamination (i.e. concentrations exceeding LUFT guidance or USEPA Region IX Residential PRGs), then additional investigation of the site will be recommended. If soil sample results identify insignificant contamination (i.e. concentrations less than LUFT guidance or USEPA Region IX Residential PRGs), then no further action will be recommended.	A review of past site operations and site investigations results will be performed, and best professional judgment will be used to determine the optimum sampling locations and limit the possibility of sampling design errors. Measurement errors may occur during sample collection (e.g., improper collection technique), QC samples, sampling handling (e.g., high temperature), sample preparation or analysis in the laboratory, or data handling or reduction. Following proper standard operating procedures can eliminate many of these Measurement errors. The specific data types and their acceptable limits of measurement error for the site assessments are as follows: Reproducibility of duplicate sample results: plus or minus 30% for soil. Equipment rinsates and field blanks: no detections of analytes. Laboratory QC recoveries: within method-specific ranges. These data will be evaluated during the data evaluation process.	Fifteen (15) direct-push borings will be drilled along the former MSC JP5 Pipeline especially near the valves, joint boxes, and elbows of the pipe to a maximum depth of 20 feet bgs. This design will allow for a quick evaluation of the jet fuel release along the MSC JP5 Pipeline segments.

Notes:
bgs = below ground surface
BTEX = benzene, toluene, ethylbenzene, and xylene
LUFT = Leaking Underground Fuel Tank
MSC = Miscellaneous Sites of Concern
MTBE = methyl tertiary butyl ether
PRG = Preliminary Remediation Goal
QC = quality control
RWQCB = Regional Water Quality Control Board
TPH = total petroleum hydrocarbons
USEPA = United States Environmental Protection Agency
UST = underground storage tank

A.2.2.1 Precision

Precision refers to the distribution of a set of reported values about the mean, or the closeness of agreement between individual test results obtained under prescribed conditions. Precision reflects the random error and may be affected by systematic error. Precision also characterizes the natural variation of the matrix and how the contamination exists or varies within that matrix. For chemical parameters that do not allow homogenization prior to sample acquisition (e.g., volatile organic analysis), precision values must be reviewed accordingly. In order to assess the effect that these variables have on the total precision of data, both field and laboratory replicates will be acquired for this project. In order to assess matrix heterogeneity or sample handling procedures, field precision will be determined from field duplicate samples or quality assurance split samples. For environmental samples, laboratory precision will be determined from laboratory duplicate samples (i.e., MS/MSD or MD samples). However, to establish the precision of a given analytical method without the effect of a matrix, an LCS is necessary. Precision is most often expressed in terms of relative percent difference (RPD) (relative range for duplicates).

The RPD for a set of duplicate measurements of a variable X is defined as:

$$\text{RPD} = \left(\frac{|X_1 - X_2|}{[(X_1 + X_2)/2]} \right) \times 100\%$$

TABLE A.2-2
QUALITY CONTROL ACCEPTANCE CRITERIA

Analyte/ Method	QC Parameter	Bias Soil (% R)	Precision Soil (% RPD)
CA LUFT/	TPH-extractable	60-150	≤ 50
EPA 8015M	*Surrogate:*		
(Modified)	Bromobenzene	60-150	
Extractable	Hexacosane	60-160	
CA LUFT/	TPH-purgeable	70-140	≤ 50
EPA 8015M	*Surrogate:*		
(Modified)	Bromofluorobenzene	70-150	
Purgeable			
VOCs	Benzene	65-135	≤ 30
EPA 8260B	Chlorobenzene	65-135	≤ 30
	1,1-Dichloroethene	65-135	≤ 30
	Toluene	64-135	≤ 30
	Trichloroethene	61-135	≤ 30
	Surrogate:		
	Dibromofluoromethane	65-135	
	Toluene-D8	65-135	
	4-Bromofluoromethane	65-135	
	1,2-Dichloroethane-D4	52-149	

Explanation:
CA LUFT - California Leaking Underground Fuel Tank
EPA - United States Environmental Protection Agency
QC – quality control
TPH – total petroleum hydrocarbons
VOC – volatile organic compounds
%R - percent recovery
% RPD - percent relative percent difference

A.2.2.2 Bias

Bias refers to the systematic or persistent distortion of a measurement process that causes errors in one direction (above or below the true value or mean). Bias may be affected by errors made in field or laboratory handling procedures. For example, procedural deviations in sample acquisition, incomplete homogenization prior to sub sampling, or incomplete extraction of contaminants from the matrix intensifies bias. Bias is a term that is related to but is not interchangeable with accuracy. Bias assessments will be based upon the analysis of spiked reference materials or spiked samples (i.e., LCS, MS, MSD, surrogates). When the sample matrix is spiked, the result allows an assessment of the effect of the sample matrix on recoveries. The sources of error contributing to the bias of a measurement can be difficult to determine for an entire sample collection/analysis activity. Sources of error may include the loss (or addition) of contaminants from the sampling and analysis process (i.e., sample handling, field cross-contamination, improper sample preservation, sample manipulation during preparation and analysis), interferences present within the sample matrix, and measurement error (i.e., calibration error or drift). Bias values for the LCS represent quantitative limits beyond which data are unacceptable.

Bias values are commonly expressed as percent recovery. Percent recovery (%R) is calculated as follows:

$$\%R = \left(\frac{\left| X_s - X_u \right|}{K} \right) \times 100\%$$

where

X_s = measured value of the spiked sample

X_u = measured value of the unspiked sample

K = known amount of the spike in the sample

When $\%R$ is calculated for the LCS or other reference materials, X_u could be set at zero. The relationship between percent bias ($\%B$) and percent recovery is as follows:

$$\%B = \%R - 100$$

A.2.2.3 Accuracy

Accuracy is the measure of the closeness of an observed value to the "true" value (e.g., theoretical or reference value, or population mean). Accuracy includes a combination of random error and systematic error (bias) components that result from sampling and analytical operations.

A.2.2.4 Representativeness

Representativeness refers to the degree to which sample data accurately and precisely describe the characteristics of a population of samples, parameter variations at a sampling point, or environmental condition. Samples that are not properly collected or preserved (e.g., contaminant loss or addition) or are analyzed beyond acceptable holding times shall not be considered to provide representative data. Representativeness is a parameter that is concerned primarily with the proper design of the sampling program or sub-sampling of a given sample. An assessment of representativeness will include an evaluation of precision. The representativeness criterion is best satisfied in the laboratory by making certain that all sub-samples taken from a given sample are representative of the sample as a whole. This shall include sample premixing/homogenizing prior to and during aliquotting procedures. Samples requiring volatile analysis shall not undergo any premixing or homogenization. Therefore, noting sample characteristics in a case narrative shall assist in the evaluation of data. Representativeness will be assessed by a review of the precision obtained from the field and laboratory duplicate samples. In this way, they provide both precision and representativeness information. Existing project data may be employed to assess the representativeness of a population by defining the continuity of data from point to point.

A.2.2.5 Comparability

Comparability is a qualitative objective of the data, expressing the confidence with which one data set can be compared with another. Sample data shall be comparable for similar samples and sample conditions. This goal is achieved through the use of standard techniques to collect representative samples, consistent application of analytical method protocols, and reporting analytical results with appropriate units.

A.2.2.6 Completeness

Completeness goals, if defined for individual sampling and analytical protocols, are normally combined to assess the expectations of the project as a whole. Completeness is the percentage of measurements that are judged to be usable (i.e., which meet project-specific requirements) compared to the total number of measurements planned. Those data that are validated and need

no qualification or are qualified as estimated are considered usable. Rejected data are not considered usable. Completeness will be calculated following data evaluation. For this project, a completeness goal of 90% is projected.

A.2.2.7 Sensitivity

The term sensitivity is used here to describe the project required reporting limits (PRRLs) established to meet project-specific DQOs. The PRRL is a threshold value below which the laboratory reports a result as non-detected (U), and shall be presented as "less than a concentration value" (< ##). PRRLs will be adjusted based on the sample matrix and any sample dilutions/concentrations necessary.

PRRLs that have been established are identified in Table A.2-3, Project Required Reporting Limits.

TABLE A.2-3
PROJECT REQUIRED REPORTING LIMITS

Parameter/Method	Analyte	Soil		
		PRRL	PRGs	Unit
TPH-D **EPA 8015 Modified**	TPH-extractable	10	NE	mg/kg
TPH-G **EPA 8015 Modified**	TPH-purgeable	1	NE	mg/kg
VOCs **EPA 8260B**	1,1,1-Trichloroethane	10	630,000	µg/kg
	1,1,2,2-Tetrachloroethane	10	380	µg/kg
	1,1,2-Trichloroethane	10	840	µg/kg
	1,1-Dichloroethane	10	3,300	µg/kg
	1,1-Dichloroethene	10	54	µg/kg
	1,2-Dichloroethane	10	350	µg/kg
	1,2-Dichloropropane	10	350	µg/kg
	Acetone	50	1,600,000	µg/kg
	Methyl ethyl ketone (MEK)	10	7,300,000	µg/kg
	Methyl isobutyl ketone (MIBK)	10	790,000	µg/kg
	Methyl tert-butyl ether (MTBE)	10	17,000	µg/kg
	2-Hexanone	50	NE	µg/kg
	Vinyl acetate	10	430,000	µg/kg
	2-Chloroethylvinylether	50	NE	µg/kg
	Benzene	10	650	µg/kg
	Bromodichloromethane	10	1,000	µg/kg
	Bromoform	50	62,000	µg/kg
	Bromomethane	30	3,900	µg/kg
	Carbon disulfide	50	360,000	µg/kg
	Carbon tetrachloride	10	240	µg/kg
	Chlorobenzene	10	150,000	µg/kg
	Chloroethane	30	3,000	µg/kg
	Chloroform	10	240	µg/kg
	Chloromethane	30	1,200	µg/kg
	cis-1,2-Dichloroethene	10	43,000	µg/kg
	cis-1,3-Dichloropropene	10	700	µg/kg
	Dibromochloromethane	10	1,100	µg/kg
	Ethylbenzene	10	230,000	µg/kg

TABLE A.2-3
PROJECT REQUIRED REPORTING LIMITS (CONT'D)

Parameter/Method	Analyte	Soil		
		PRRL	PRGs	Unit
VOCs	Methylene chloride	50	8,900	µg/kg
EPA 8260B	Styrene	10	1,700,000	µg/kg
(Cont'd)	Trichloroethene (TCE)	10	2,800	µg/kg
	Tetrachloroethene (PCE)	10	5,700	µg/kg
	Toluene	10	520,000	µg/kg
	trans-1,2-Dichloroethene	10	63,000	µg/kg
	trans-1,3-Dichloropropene	10	NE	µg/kg
	Vinyl chloride	30	150	µg/kg
	Xylene, Total	10	210,000	µg/kg

Explanation:
EPA - United States Environmental Protection Agency
mg/kg - milligrams per kilogram
NE – not established
PRRL – project required reporting limit
PRGs – preliminary remediation goals
TPH – total petroleum hydrocarbons
TPH-D – total petroleum hydrocarbons as diesel
TPH-G – total petroleum hydrocarbons as gasoline
VOCs – volatile organic compounds
µg/kg – micrograms per kilogram

A.3.0 DOCUMENTS AND RECORDS

Documentation is critical for evaluating the success of any environmental data collection activity. This section outlines standard practices and procedures to be used when documenting field and laboratory activities and the requirements for preparing laboratory data packages. Applicable requirements are identified in the following sub-sections.

A.3.1 Field Documentation

All field documentation shall be properly completed with indelible ink as necessary to support the use of these records in any potential enforcement actions that may result. Corrections to documentation shall be made by placing a single line through the incorrect entry and noting the corrected information, recorder's initials, and the date the correction was performed. Following site activities, all project documentation shall become a part of the final evidence file. These records shall be maintained for a certain period of retention time.

A.3.1.1 Daily Contractor Quality Control Reports (QCR)

During the field investigation or remedial action activities, daily contractor QCRs shall be prepared, dated, signed by the project contractor quality control representative, and sent to the Navy. With respect to geotechnical and chemical procedures, these reports shall include weather information at the time of sampling, field instrument measurements, calibrations, identification of all field and control samples taken, departures from the approved SAP, deviations from approved geotechnical procedures (such as well installation or drilling), any problems encountered, and instructions from Navy personnel. Any deviations that may affect data quality objectives shall be conveyed to Navy personnel (remedial project manager, technical representative, resident officer in charge of construction, etc.).

A.3.1.2 Field Logbooks

Field logbooks shall contain sufficient information to enable the sampling activity to be reconstructed without relying on the collector's memory. Project field logbooks shall be permanently bound and have consecutively numbered water-resistant pages. The site name and project name and number shall be recorded on the inside front cover of the logbook. All pertinent information regarding the site and sampling procedures shall be documented as near to real-time as possible. At the conclusion of each day, the person maintaining the logbook shall sign and date the day's documentation entries. Notations shall be made in logbook fashion, noting the time and date of all entries. Information recorded in other project documents shall not be

repeated in the field logbook, except in summary form to avoid transcription errors. Logbooks shall be kept in the field team member's possession or in a secure place during field work. Following site activities or if the logbook is completely filled, the logbook shall become a part of the project final evidence file as noted previously.

If it is necessary to transfer the logbook to another person during the course of field work, the person relinquishing the logbook will sign and date the logbook at the time it is transferred, and the person receiving the logbook will do likewise.

The following are some suggested topics to include in the field logbook:

- Name and exact location of site of investigation or interest.
- Name and title of person maintaining logbook (author).
- Date and time of arrival and departure at site location.
- Purpose of site visit or sampling activity.
- Name and address of field contact. This may also include information on access agreements.
- Names and responsibilities of all persons on site.
- Names, affiliations, and purpose of all site visitors.
- Level of personal protective equipment worn at the site.
- Weather conditions on the day of sampling, and any additional environmental conditions or observations pertinent to field activities.
- Field instrumentation or equipment used, and purpose of use (i.e., health and safety screening, sample selection for laboratory analysis). Note source, quality, or lot numbers for any supplies or reagents (e.g., sample containers, preservatives, reagents, water for field blanks/field control samples, and decontamination procedures). Retain any certificates or information supplied with the equipment used.
- Type of waste, suspected waste concentrations if known, and sample matrices to be handled.
- Document the sample collection method and any sample handling procedures such as filtration, compositing, and executed preservation techniques used.
- Document the sample location. If a compositing scheme is used, clearly identify appropriate locations for all sample aliquots included within each composite sample. Prepare a dimensional sketch of the general surroundings of the sampling area (site), and/or support with other forms of documentation (i.e., photographic

log). Sample identification numbers should correspond directly with sample locations.

- Identify sample numbers, volumes, and containers (number, size, type) used for each sample collected. Note the date and time of each sample, identify any associated QC samples, or any factors that may affect the quality.
- Record any field measurements, field screening/analytical results generated, calibration methods used, field results, and QC information.
- Identify decontamination procedures employed for sampling equipment.
- Document appropriate references to maps and photographic logs of the sampling site.
- Record information on scheduling modifications, change orders, sampling or drilling decisions/changes.
- Describe the number of shipping coolers packed, note chain-of-custody (COC) numbers or attach a copy of COC, and record the mode of transportation and applicable tracking numbers.
- Record name and address of all receiving laboratories.
- Maintain appropriate documentation for investigative-derived wastes. Note contents and volumes of waste generated, storage, and disposal methods used.

A.3.1.3 Photographic Documentation

All sampling points shall be documented photographically. A record of a sampling event allows positive identification of the sampling point. Photographs are the most accurate and convenient record of field personnel observations. Photographs taken to document sampling points shall include two or more reference points to facilitate relocating the point at a later date. Keeping a record of photographs taken is crucial to their validity as a representation of an existing situation. Photographic documentation is invaluable if the sampling and subsequent analytical data end in litigation, enforcement, or cost recovery actions. For each photograph taken, the following items shall be noted in the field logbook:

- Date.
- Time.
- Photographer (signature).
- Name of site.
- General direction faced and description of the subject.
- Sequential number of the photograph and the roll number.
- Site photo map

A.4.0 FIELD METHODS AND SAMPLING PROCEDURES

This section describes the methods and procedures to be used during the site verification activities at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline with respect to site access, sample collection, sampling equipment decontamination, preservatives, holding times and sample containers. The sampling plan described in the following subsections has been designed in accordance with Chapter 9 of USEPA SW-846.

A.4.1 Site Access

Access to former MCAS El Toro will be arranged through the Navy Caretaker Site Office. GEOFON will give a minimum of 7 days notice to the Caretaker Site Office before requiring access to former MCAS El Toro. The SWDIV point of contact will oversee fieldwork and will also be notified a minimum of 7 days prior to initiating any fieldwork. No vehicle passes or personal identification badges will be required.

A.4.2 Sample Collection

This section describes the number and locations of samples that will be collected during the site verification activities at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline, as well as specific procedures for sample collection.

A.4.2.1 Number of Samples

Table A.4-1 presents the number of samples to be collected for the site verification activities at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline.

In each shallow soil boring at the former MSC JP5 Station 574 Site, soil samples will be collected at depths of 8 and 20 feet bgs. In each shallow soil boring along the former MSC JP5 Pipeline, soil samples will be collected at depths of 10 and 20 feet bgs. Figures A.4-1 and A.4-2 show the proposed shallow soil boring locations from which soil samples will be collected at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline, respectively.

Duplicates will be collected at a rate of 10% of the number of primary soil samples. One equipment rinsate sample will be collected per day and one field blank sample will be collected.

A.4.2.2 Sampling Locations

Refer to Figures A.4-1 and A.4-2 for proposed shallow soil boring locations at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline, respectively. These locations are subject to change depending on their proximity to subsurface utilities. All soil boring locations will be surveyed by a California licensed land surveyor.

TABLE A.4-1
NUMBER OF SAMPLES TO BE COLLECTED FOR EACH SITE

Site Location	Number of Soil Borings	Total Depth of Soil Boring (feet bgs)	Number of Soil Samples Per Boring for Laboratory Analysis	Total Number of Soil Samples
Former MSC JP5 Station 574 Site	9	20	2	18
Former MSC JP5 Pipeline	15	20	2	30

Explanation:
bgs – below ground surface
MSC – Miscellaneous Sites of Concern

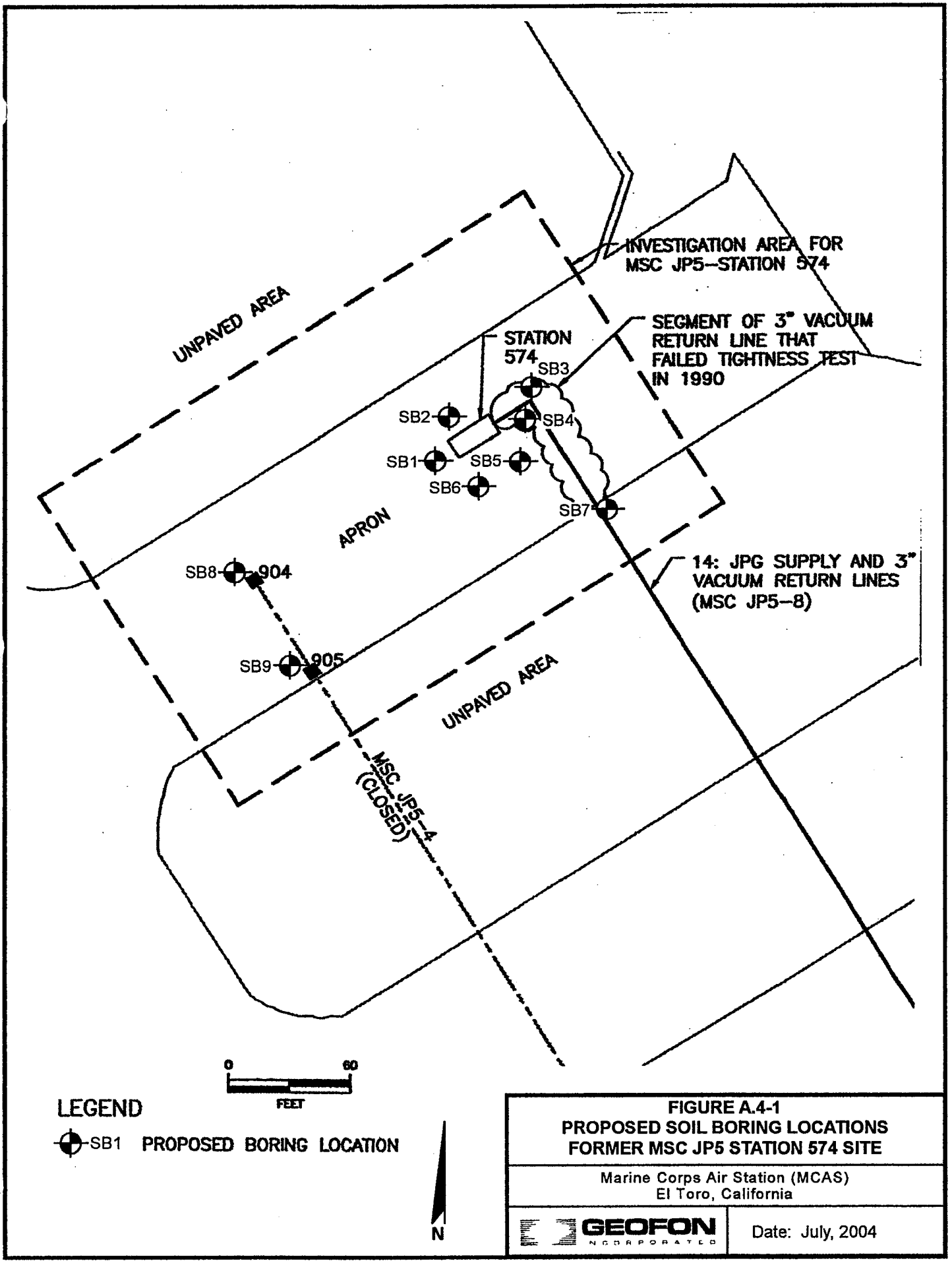


FIGURE A.4-1
PROPOSED SOIL BORING LOCATIONS
FORMER MSC JP5 STATION 574 SITE

Marine Corps Air Station (MCAS)
El Toro, California

GEOFON INCORPORATED

Date: July, 2004

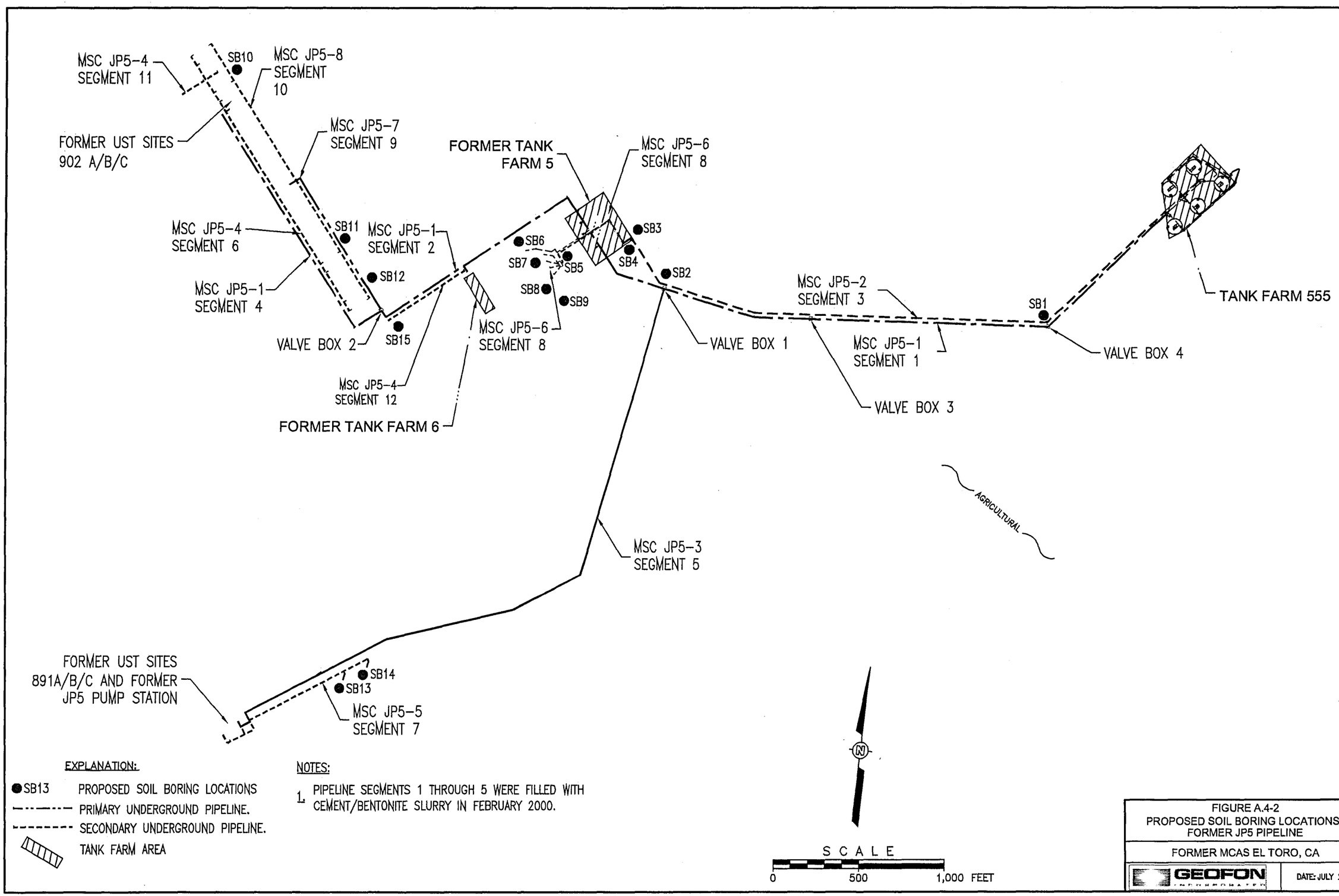


FIGURE A.4-2
PROPOSED SOIL BORING LOCATIONS
FORMER JP5 PIPELINE

FORMER MCAS EL TORO, CA

GEOFON

DATE: JULY 2004

A.4.2.3 Sampling Procedures and Equipment

Soil Boring and Sampling Methodology:

The shallow soil borings will be drilled to the depth of 20 feet bgs at locations shown on Figures A.4-1 and A.4-2 using a direct-push rig at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline. Each boring will be pushed using a 23-ton CPT direct push rig equipped with a soil sampler (probe) to hold the 500-mm-long by 355-mm-diameter stainless steel split barrel sample tube. After pushing the sampler to the desired depth, a soil sample will be collected in the sample tube. Immediately upon retrieval from the ground, the sample tube will be removed from the sampler and Encore samples will then be collected from those samples to be delivered to the analytical laboratory. The Encore samples will be sealed with Teflon™-lined plastic caps to preserve sample integrity and reduce volatilization. After collection of the Encore samples, the sleeves will be capped with Teflon™ squares and plastic end caps. The outer surface of the Encore samples and sleeves will be wiped clean with a fresh paper towel and properly labeled. Next, the Encore samples and sleeves will be placed in individual self-sealing plastic bags and immediately packed into a thermally insulated ice chilled cooler maintained at 4°C prior to and during transportation of the samples to the laboratory.

The soil sampler (probe) will be decontaminated between each sample location using standard detergent and deionized water rinse procedures.

In the event that the direct-push rig is unable to drill through the soil (such as cobbles), then a hollow stem auger drill rig will be used to drill the shallow soil borings.

After the soil sampling is complete, the shallow soil borings will be abandoned by filling them with bentonite chips/cement mix. The small quantities of soil cuttings generated from the borings will be stored and sealed in a 5-gallon bucket. The 5-gallon bucket will be labeled appropriately and retained on site pending laboratory analysis. The 5-gallon bucket will be disposed of in accordance with applicable regulations and following proper manifest procedures.

A GEOFON geologist will visually log the soil borings in accordance with the Unified Soil Classification System, collect soil samples, and monitor all field activities. Prior to the field investigation, GEOFON will visit the site to mark boring locations, notify Underground Service Alert, and obtain any required permits. The RWQCB-Santa Ana Region will be notified 48 hours prior to fieldwork and all site investigation activities will be performed with the RWQCB-Santa Ana Region concurrence.

A.4.3 Sampling Equipment Decontamination Procedures

Where nondisposable sample equipment is used, the following procedures for decontamination of sampling equipment will be performed:

1. Wash with non-phosphate detergent.
2. Rinse with tap-water.
3. Deionized/distilled water rinse.
4. Deionized/distilled water rinse (twice).

Equipment rinsates will be collected daily, but analyzed every other day unless contamination is detected.

A.4.4 Preservatives, Holding Times and Sample Containers

Table A.4-2 presents preservation and container requirements, and permissible holding times to ensure against degradation of sample integrity.

TABLE A.4-2
PRESERVATIVES, HOLDING TIMES AND SAMPLE CONTAINERS

Parameter	Method of Analysis	Container Soil Matrix	Preservative	Holding Time
TPH-Purgeable	EPA 5035/CA LUFT 8015	Three – 5 gram Encore Tubes (or similar)	cool to 4 + 2 °C	48 hours
TPH-Extractable	CA LUFT 8015	Four- 8-oz jars with Teflon™-lined lids or brass sleeves	cool to 4 + 2 °C	14 days
VOCs	EPA 5035/8260B	Three – 5 gram Encore Tubes (or similar)	cool to 4 + 2 °C	48 hours

Explanation:
CA LUFT - California Leaking Underground Fuel Tank (Manual)
EPA - United States Environmental Protection Agency
oz - ounce
VOC - volatile organic compounds
°C - degree Celsius

A.5.0 SAMPLE HANDLING AND CUSTODY

The following section describes sample handling procedures, including sample numbering and labeling, chain-of-custody, and sample packaging and shipment.

A.5.1 Sample Numbering

A sample numbering system shall be used to identify each sample collected and submitted for analysis. The purpose of the numbering system is to assist in the tracking of samples and to facilitate retrieval of analytical results. The sample identification numbers for each sampling effort shall be used on sample labels, sample tracking matrix forms, COC forms, field logbooks, and all other applicable documentation. A listing of all sample identification numbers shall be recorded in the field logbook. Sample numbers will be assigned in the field according to the following sample numbering system:

XXXX	Four character designation of the site (i.e., 0030)
YY	Two character designation of the borehole number (with leading zeros used where necessary)
ZZ	Two character designation of the sampling depth (with leading zeros used where necessary.

For example, in the sample identification number 0030-01-09, "0030" refers to the site, "01" represents the first borehole for that site, and the 09 represents the depth at which the sample was collected.

A complete description of the sample, including detailed sample location and sample type (i.e., waste profile, confirmation, vertical delineation, field duplicate, trip blank, or MS/MSD) information will be recorded in the field logbook. A brief sample description will also be recorded on the COC form in the "Sample Description" column.

A.5.2 Sample Labeling

Sample labels are required for properly identifying samples and evidence. All samples shall be properly labeled with the label affixed to the container prior to transportation to the laboratory. Samples may be photographed so that labels are clearly readable for later identification. Information on sample labels shall include, but not be limited to, the following:

- Project Code. An assigned project number and site name.
- Bore Hole Number. A unique identifier assigned to a soil boring by the sampling team.

- Sample Identification Number. Each sample, including field control samples, collected for a project should be assigned a unique number. This assigned number incorporates information on the sample type and date as noted in Section A.5.1.
- Samplers. Each sampler's name and signature or initials
- Preservative. Whether a preservative is used and the type of preservative.
- Analysis. The type of analysis requested.
- Date/Time. Identify the date and time the sample was taken.
- Type of Sample. The type of sample should be identified as discrete or composite.

A.5.3 Chain-of-Custody (COC)

COC custody procedures provide documentation of the handling of each sample from the time it is collected until it is destroyed. COC custody procedures are implemented so that a record of sample collection, transfer of samples between personnel, sample shipping, and receipt by the laboratory that will analyze the sample is maintained. Records concerning the cleaning of empty sample containers, container shipment from the laboratory to the site and security of empty containers at the site shall also be maintained. The COC record (Figure A.5-1) serves as a legal record of possession of the sample. The COC record is initiated with the acquisition of the sample. The COC record shall remain with the sample at all times and bears the name of the person (field investigator) assuming responsibility for the samples. The field investigator is tasked with ensuring secure and appropriate handling of the bottles and samples. To simplify the COC record and eliminate potential litigation problems, as few people as possible shall handle the sample or physical evidence during the investigation. A sample is considered to be under custody if one or more of the following criteria are met:

- The sample is in the sampler's possession.
- The sample is in the sampler's view after being in possession.
- The sample was in the sampler's possession and then was locked up to prevent tampering.
- The sample is in a designated secure area.

In addition to the COC record, there is also a COC (custody) seal. The COC seal (Figure A.5-2) is an adhesive seal placed in areas such that if a sealed container is opened, the seal would be broken. The COC seal ensures that no sample tampering occurred between the field and the laboratory analysis.

FIGURE A.5-1
CHAIN-OF-CUSTODY RECORD

GEOFON INCORPORATED
22632 GOLDEN SPRINGS DR., SUITE 270
DIAMOND BAR, CA 91765 • (909) 396-7662 • FAX (909) 396-1455

CHAIN-OF-CUSTODY RECORD

LABORATORY COPY

GEOFON's LAB COORDINATOR	LAB COORDINATOR'S PHONE	LAB COORDINATOR'S FAX	LABORATORY SERVICE ID	LABORATORY CONTACT	MAIL REPORT (COMPANY NAME)
PROJECT NAME:	PROJECT LOCATION	PROJECT NUMBER	LABORATORY PHONE	LABORATORY FAX	RECIPIENT NAME
PROJECT CONTACT	PROJECT PHONE NUMBER	PROJECT FAX	LABORATORY ADDRESS		ADDRESS
PROJECT ADDRESS	CITY, STATE AND ZIPCODE	CLIENT	CITY, STATE AND ZIPCODE		CITY, STATE AND ZIPCODE
PROJECT MANAGER	PROJECT MANAGER'S PHONE	PROJECT MANAGER'S FAX			

Item	Sample Identifier	Matrix	Date	Time	Preserved	# of Cont.	QC Level	T.A.T	Analyses	Comments
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

SAMPLES COLLECTED BY:	COURIER AND AIR BILL NUMBER:			COOLER TEMPERATURE UPON RECEIPT:
RELINQUISHED BY	RECEIVED BY	DATE	TIME	SAMPLE'S CONDITION UPON RECEIPT

Distribution: White - Laboratory (To be returned with Analytical Report); Goldenrod - Project File; Yellow - Project Data Manager

FIGURE A.5-2
CHAIN-OF-CUSTODY SEAL

APCL

COOLER CUSTODY SEAL

Phone (909) 590-1828

Date_____

Signature_____

No.

A.5.3.1 Transfer of Custody and Shipment

All sample sets shall be accompanied by a COC record. When transferring possession of samples, the individual receiving the samples shall sign, date, and note the time that he/she received the samples on the COC record. This COC record documents transfer of custody of samples from the field investigator to another person, other laboratories, or other organizational units. Samples shall be properly packaged for shipment and delivered or shipped to the designated laboratory for analyses. Shipping containers shall be secured by using nylon strapping tape and custody seals. The custody seals shall be placed on the container so that it cannot be opened without breaking the seals. The seal shall be signed and dated by the field investigator. When samples are split with a facility, state regulatory agency, or other government agency, the agency representative must sign the COC record, if present. All samples shall be accompanied by the COC record. The original and one copy of the record shall be placed in a plastic bag taped to the inside lid of the secured shipping container. One copy of the record shall be retained by the field investigator or project leader. The original record shall be transmitted to the field investigator or project leader after samples are accepted by the laboratory. This copy shall become a part of the project file. If sent by mail, the package shall be registered with return receipt requested. If sent by common carrier, an air bill shall be used. Receipts from post offices and air bills shall be retained as part of the documentation of the COC. The air bill number or registered mail serial number shall be recorded in the remarks section of the COC record.

Laboratory chain of custody begins with sample receipt and continues until samples are discarded. The laboratory's chain-of-custody, sample storage, and dispersement for analysis shall be documented per specific laboratory SOPs and project requirements. Information on project custody, analysis, and data reporting requirements as noted shall be received by the laboratory prior to the first shipment of incoming samples. The laboratory should designate a specific individual as the sample custodian. The custodian will receive all incoming samples, sign the accompanying custody forms, and retain copies of the forms as permanent records. The laboratory sample custodian will record all pertinent information concerning the samples, including the persons delivering the samples, the date and time received, sample condition at the time of receipt (sealed, unsealed, or broken container; temperature; or other relevant remarks), the sample identification numbers, and any unique laboratory identification numbers for the samples. This information should be entered into a computerized laboratory information management system (LIMS). Once the sample transfer process is complete, the custodian is responsible for maintaining internal logbooks, tracking reports, and other records necessary to maintain custody throughout sample preparation and analysis.

The laboratory will provide a secure storage area for all samples. Access to this area will be restricted to authorized personnel. The custodian will ensure that samples requiring special handling, including samples that are heat- or light-sensitive, radioactive, or have other unusual physical characteristics, will be properly stored and maintained prior to analysis.

A.5.4 Sample Packaging and Shipment

This section describes procedures for properly packaging and shipping environmental samples. Guidelines for proper container and preservative selection can be found in Section A.4.4. Personnel that are involved in packaging, shipping, and receipt of samples shall be aware of Department of Transportation (DOT) regulations, know when to apply them, and know what procedures are needed to support this application. The following general procedures shall apply to the packaging of all environmental samples:

- Verify that the sample label is complete and adequately identifies the items described in Section A.5.2.
- Verify that each sample cap/lid is secured on the bottle, and place each sample in a plastic bag. For multiple VOA vials, all vials from each sample location shall be placed in a small plastic bag at a minimum. Evidence tape or custody seals shall be placed over the sample lid and container, or over the seal of the bag for additional security, if desired.
- Squeeze as much air as possible from the bag, and seal the bag. Trip blanks are packaged in the same manner as that for aqueous VOA samples.
- Prepare the shipping container for use. For a commercial cooler, this includes taping the drain plug shut inside and out, and lining the cooler with a large plastic garbage bag. Place approximately 3 in. of inert packing material in the bottom of the liner. Place vermiculite or perlite on the bottom if the materials are liquid. Alternative shipping containers may be used if approved by project technical personnel.
- Place the samples upright in the lined cooler or storage container in such a way that the samples will not touch each other during shipment. Add inert packing material as necessary to ensure separation of samples.
- With the exception of aqueous metals analyses, all environmental samples should be shipped to the laboratory on ice and chilled to 4 °C ± 2 °C. If any of the shipped samples require cooling, place double bags of ice around the containers. Also include a 40-mL VOA vial filled with water for use as a temperature blank for the laboratory.
- Fill the cooler with packing material and tape the inner liner shut. NOTE: Do not use "environmentally friendly" peanuts made of starch to pack containers of liquids. These packing materials will dissolve when they get wet or moist.

- Place the paperwork being sent to the laboratory inside a plastic bag and tape it to the inside of the cooler lid. Include a copy of the COC form in the paperwork sent to the laboratory. The sampler keeps one copy of the COC form. Include any additional paperwork to notify the laboratory of project information (laboratory notification checklist), or if a sample is suspected of containing any substance for which laboratory personnel should take safety precautions.
- Close the cooler and seal it with strapping tape.
- Place at least two custody seals on the outside of the cooler (one on the front and one on the back). More custody seals may be used at the discretion of the sampler.
- Prepare standard air bill paperwork for shipment of the samples to the laboratory. Personnel should be aware of carrier weight or other policy restrictions

A.6.0 ANALYTICAL METHODS

The following section describes the requirements for analytical laboratories and the analytical methods that will be used.

A.6.1 Laboratory Requirements

Laboratories providing analytical data for this contract shall be currently certified by the California Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP) for analysis of hazardous materials for each method specified and shall have successfully completed the NFESC Laboratory Evaluation Program prior to beginning work. Selected laboratories are responsible for ensuring that their data collection and reporting activities and the associated activities of their subcontractors comply with the Navy's QA/QC requirements as defined in the Navy Installation Restoration Chemical Data Quality Manual (NFESC, 1999).

The laboratory must establish, implement, and maintain a quality system appropriate for the type, range, and volume of analytical services it provides. The elements of this quality system shall be documented within a Laboratory Quality Management Plan (LQMP) or related documentation. The Laboratory Quality Management Plan should present the policies, organization, objectives, functional guidelines, and specific QA and QC activities of the laboratory designed to achieve the data quality requirements when running performance-based methods, such as the SW-846 methods. SOPs pertaining to each element shall be included or referenced as part of this QA Management Plan and should describe the specific operational and analytical procedures as normally implemented by the laboratory.

Laboratory management is responsible for communicating the stated policies and practices to laboratory personnel, ensuring all information is clearly understood and implemented. The laboratory shall perform periodic audits of activities to verify compliance with the quality system. When deviations are discovered, the laboratory shall take immediate corrective action to remedy the situation or practice, notifying any client whose work may have been affected.

A.6.2 Analytical Requirements

For this project, EMAX Laboratory will conduct off-site analysis of soil samples. The laboratory was selected based on their ability to meet the project analytical and QC requirements, as well as their ability to meet the project schedule. The analytical methods selected for this project are standard EPA methods. The methods are identical to the analytical methods used in previous projects at MCAS El Toro and should provide comparable data. All methods are from EPA's

SW-846 "Test Methods for Evaluating Solid Waste" (EPA 1996). TPH-purgeable and TPH-extractable will be analyzed using a SW-846 method (Method 8015B) in conjunction with a procedure described in Appendix D of the State of California Leaking Underground Fuel Tank (LUFT) Field Manual (State of California 1989).

The following EPA SW-846 methods will be used for soil samples:

- Total Petroleum Hydrocarbons-quantified as gasoline (TPH-G) by EPA Method 8015 Modified.
- Total Petroleum Hydrocarbons-quantified as diesel (TPH-D) by EPA Method 8015 Modified.
- VOCs (including Benzene, Toluene, Ethylbenzene, and Total Xylenes [BTEX], Methyl Tertiary-Butyl Ether [MTBE] and fuel oxygenates) by EPA Method 8260B.

A.7.0 QUALITY CONTROL

The entire sequence of sample gathering, preservation, storage, and shipment has unique potential errors associated with it, as do the events that occur in the analytical laboratory. A combination of unique field and laboratory QA/QC protocols and control samples will be incorporated into the project data collection program based upon project DQOs to assess sources of error at each stage of the sampling and analytical process.

A.7.1 Field Quality Control Samples

The applicability and appropriateness of the field sampling protocol shall be verified by the inclusion of a program of scheduled field control samples, such as field replicates (duplicates, splits), field blanks (rinsate [equipment], media, bottle, and trip), background (up gradient) samples, and single- or double-blind PE samples. All field control samples shall be handled exactly as the environmental samples. With the exception of matrix spikes/matrix spike duplicates (MS/MSDs), the identity of field control samples collected shall be held blind to the laboratory until the data are reported.

The following sections discuss the types and purposes of field QC samples that will be collected for this project.

A.7.1.1 Field Replicates

Field replicates are samples taken in quantity at a particular location or time in order to assess error associated with sample heterogeneity, sampling methodology applicability, and sample handling techniques. These replicates may be used for various purposes depending upon the intended use of the data or eventual analysis. The different types of replicates that will be collected for this project include field duplicates and MS/MSDs.

A.7.1.1.1 Field Duplicates

Field duplicates are secondary samples collected at the same time and from the same source as their corresponding primary samples. The purpose of duplicate samples is to evaluate the variability of the contaminant distribution in the sampled matrix. In general, field duplicates will represent at least 10% of all field samples.

Soil sample field duplicates will be collected as homogenized split samples for semi-volatile compound analysis. Some soil types are not suitable for homogenization (i.e. high clay content). In these cases field duplicates may be collected as collocated duplicates. For volatile organic analysis, soil sample field duplicates will be collected as collocated unhomogenized samples.

A.7.1.1.2 Matrix Spikes (MS)/Matrix Spike Duplicates (MSD)

MS/MSD samples are samples spiked at the laboratory with the contaminants of concern and analyzed together with the field samples. MS/MSD measure the laboratory's bias and precision. Additional volumes of sample for MS/MSD will be collected for every 20 field samples collected and will be submitted to the laboratory for MS/MSD analysis. Therefore, a MS/MSD pair will be analyzed at a frequency of 5% of all field samples.

Samples for MS/MSD analysis will be clearly identified on the COC record. MS/MSD samples are not collected for investigation derived waste samples.

A.7.1.2 Field Blanks

Whenever the possibility exists for contributing extraneous material into the sample collection, shipment, or analysis, a blank sample will be used to assess the magnitude of this contribution. Field blanks for this project will include equipment rinsate blanks and a source blank.

A.7.1.2.1 Equipment Rinsate Blanks

Rinsate blanks are samples of analyte-free (deionized) water that are rinsed over decontaminated sampling equipment, collected, and submitted for analysis. These samples are used to assess cross-contamination from the sampling equipment, in addition to incidental contamination from the sample container and/or preservatives. When non-disposable sampling equipment is used, rinsate samples will be collected at a minimum frequency of one per day or per sampling event.

A.7.1.2.2 Source Blank

To evaluate potential cross-contamination from the source of water used for the rinsate, one source blank will also be collected for laboratory analysis. The source water will be transferred into 40-milliliter volatile organic analysis (VOA) vials containing preservatives. The outer surface of the sample container will be wiped with a clean paper towel and a label will be completed properly and placed on the sample container. Then the sample container will be placed in individual self-sealing plastic bags, and immediately packed into a thermally insulated ice chilled cooler maintained at 4°C prior to and during transportation of the samples to the laboratory.

A.7.1.2.3 Temperature Blanks

A temperature blank will be placed in each sealed sample container from collection through shipment. The purpose of the temperature blank is to document the internal temperature of the cooler.

A.7.2 Laboratory Quality Control Samples

Laboratory overall method performance will be monitored by the inclusion of various internal quality control checks that allow an evaluation of method control (batch QC), and the effect of the sample matrix on the data being generated (matrix-specific QC). Batch QC is based on the analysis of a laboratory control sample (LCS) to generate accuracy (precision and bias) data and method blank (MB) data to assess the potential for cross-contamination. Matrix-specific QC shall be based on the use of an actual environmental sample for precision and bias determinations from the analysis of MSs, MSDs, matrix duplicates (MDs), and surrogate spikes. The overall quality objectives are to implement procedures for laboratory analysis and reporting of data that are indicative of the degree of quality consistent with their intended use. The QC protocols (the specific manner in which the QC checks are implemented) shall be specified by the laboratory's QA Management Plan (Section A.6.1). The laboratory shall ensure that the requirements specified in the Navy Installation Restoration Chemical Data Quality Manual are incorporated into the QA Management Plan.

The types of laboratory QC samples that will be used for this project are discussed in the following sections. Table A.2-2 presents project-specific precision and bias goals for these samples.

A.7.2.1 Method Blanks (MBs)

Method blanks are prepared to evaluate whether contamination is originating from the reagents used in sample handling, preparation, or analysis. They are critical in distinguishing between low-level field contamination and laboratory contamination. A method blank consists of laboratory analyte-free water and all of the reagents used in the analytical procedure. It is prepared for every analysis in the same manner as a field sample and is processed through all of the analytical steps. Method blanks will be prepared at the frequency prescribed in the individual analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method.

A.7.2.2 Laboratory Control Samples (LCSs)

A laboratory control sample (LCS) originates in the laboratory as deionized or distilled water that has been spiked with standard reference materials of a known concentration. A LCS is analyzed to verify the accuracy of the calibration standards. These internal QC samples are also used to evaluate laboratory accuracy in the presence of matrix interference for field samples. LCSs are processed through the same analytical procedure as field samples. LCSs will be analyzed at the

frequency prescribed in the analytical method or at a rate of 5 percent of the total samples if a frequency is not prescribed in the method. If percent recovery results for the LCS or blank spike are outside of the established goals, laboratory-specific protocols will be followed to gauge the usability of the data.

A.7.2.3 Surrogate Standards

Surrogate standards consist of known concentrations of nontarget organic analytes that are added to each sample, method blank, and MS/MSD before samples are prepared and analyzed. The surrogate standard measures the efficiency of the analytical method in recovering the target analytes from an environmental sample matrix. Percent recoveries for surrogate compounds are evaluated using laboratory control limits. Surrogate standards provide an indication of laboratory accuracy and matrix effects for every field and QC sample that is analyzed for volatile and extractable organic constituents. Surrogate compounds are used in the analysis of VOCs to monitor purge efficiency and analytical performance, whereas surrogates are used in the analysis of extractable organic compounds to monitor the extraction process and analytical performance.

Factors such as matrix interference and high concentrations of analytes may affect surrogate recoveries. The effects of the sample matrix are frequently outside the control of the laboratory and may present unique problems. Laboratory personnel are required to re-extract (when applicable) and re-analyze samples when associated surrogates are outside of control limits. Data from both analyses of the samples in question are reported.

During validation, data will be qualified as estimated for any result that fails to meet surrogate criteria.

A.8.0 EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

This section outlines the testing, inspection, and maintenance procedures that will be used to keep both field and laboratory equipment in good working condition.

A.8.1 Maintenance of Field Equipment

Preventive maintenance for most field equipment shall be carried out in accordance with procedures and schedules recommended in (1) the equipment manufacturer's literature or operating manual, or (2) standard operating procedures (SOPs) that describe equipment operation associated with particular applications of the instrument. However, more stringent testing, inspection, and maintenance procedures and schedules shall be required when field equipment is used to make critical measurements.

A field instrument that is out of order will be segregated, clearly marked, and not used until it is repaired. The field team leader will be notified of equipment malfunctions so that prompt service can be completed quickly or substitute equipment can be obtained. When equipment condition is suspect, unscheduled testing, inspection, and maintenance shall be conducted. Any significant problems with field equipment will be reported in the daily field QCR.

A.8.2 Maintenance of Laboratory Equipment

Subcontractor laboratories shall provide sufficient equipment, instruments, and related supplies for proper performance of work. All equipment used shall be reflective of the measurement accuracy necessary. The laboratory shall ensure that all equipment and supplies purchased are inspected, a unique identifier assigned to it, and the equipment verified as compliant with all relevant requirements prior to their initial use. Records of all suppliers used to obtain support services and materials shall be maintained.

To minimize downtime and interruption of analytical work, preventive maintenance shall be routinely performed on each analytical instrument. Designated laboratory personnel shall be trained in routine maintenance procedures for all major instrumentation. When repairs are necessary, the equipment shall be taken out of service, repairs performed by either trained staff or trained service engineers, and an evaluation of the impact on previous calibrations or tests performed. Detailed SOPs shall be on file or the information incorporated into method SOPs/LQMP that describes preventive maintenance procedures and schedules. The laboratory shall maintain detailed logs for each instrument documenting the preventive maintenance and repairs performed.

Backup instruments shall be designated in case of an extended breakdown for an analytical instrument. It is the laboratory's responsibility to have a backup plan in force to ensure that all sample holding times can be met. This plan can include rental of backup instruments or the use of another Navy-certified laboratory for a given procedure. All equipment outside of the laboratory's permanent control shall be evaluated to ensure that all relevant requirements are met prior to its initial use. The laboratory shall ensure, and be able to document, that all subcontractors employed are competent to perform the duties requested. The laboratory shall maintain appropriate records or documentation for all instruments and support equipment to identify type of equipment; manufacturer's name or equipment make, model, and any serial numbers or unique identifiers; dates received and placed into service; condition when purchased (new, used, etc.); current location; manufacturer instructions/manuals; history of any damage, modification, or repair; instrument maintenance logs; and calibration/calibration verification run logs.

A.9.0 INSTRUMENT CALIBRATION AND FREQUENCY

The following sections discuss calibration procedures that will be followed to ensure the accuracy of measurements made using field and laboratory equipment.

A.9.1 Calibration of Field Equipment

Field equipment will be calibrated at the beginning of the field effort and at prescribed intervals. The calibration frequency depends on the type and stability of equipment, the intended use of the equipment, and the recommendation of the manufacturer. Detailed calibration procedures for field equipment are available from the specific manufacturers' instruction manuals. All calibration information will be recorded in a field logbook or on field forms. A label that specifies the scheduled date of the next calibration will be attached to the field equipment. If this type of identification is not feasible, equipment calibration records will be readily available for reference.

A.9.2 Calibration of Laboratory Equipment

The calibration of laboratory instruments and support equipment is required to ensure that the analytical system is operating correctly and functioning at the proper precision, bias (accuracy), and sensitivity. Table A.9-1, Summary of Calibration Criteria and Corrective Action Procedures, presents a summary of the QC requirements for each method.

Table A.9-1
Summary of Calibration Criteria and Corrective Action Procedures

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action[a]
CA LUFT 8015M	TPH Extractable or Purgeable	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	%RSD < 20%	Correct problem then repeat initial calibration
		Initial calibration verification	Daily, before sample analysis	Concentration levels of TPH within ±15% of expected value	Correct problem then repeat initial calibration
		Continuing calibration verification	After every 10 samples and at the end of the analysis sequence	All concentration levels within ±15% of initial calibration	Correct problem then repeat initial calibration verification and reanalyze all samples since last successful calibration verification
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Once per analyst	QC acceptance criteria, Table A.2-2	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria
		Method blank	One per analytical batch	No TPH detected ≥ MRL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank
		LCS for all analytes	One LCS per analytical batch	QC acceptance criteria, Table A.2-2	Correct problem then reprep and analyze the LCS and all samples in the affected analytical batch
		Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria, Table A.2-2	Correct problem then re-extract and analyze sample
		MS/MSD	One MS/MSD per every 20 project samples per matrix	QC acceptance criteria, Table A.2-2	None
		MDL study	Once per 12 month period	Detection limits established shall be < the MRLs in Table A.2-3	None
		Results reported between MDL and MRL	None	None	None

Table A.9-1 (Cont)
Summary of Calibration Criteria and Corrective Action Procedures

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action[a]
EPA 8260B	Volatile Organics	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	SPCCs average RF ≥ 0.30[b]; and %RSD for CCCs < 30%; and %RSD for all other calibration analytes ≤ 50%	Correct problem then repeat initial calibration
		Calibration verification	Daily, before sample analysis and every 12 hours of analysis time	SPCCs average RF ≥ 0.30[b]; and CCCs < 25% drift; and all calibration analytes within ± 50% of expected value	Correct problem then repeat initial calibration
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Once per analyst	QC acceptance criteria, Table A.2-2	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria
		Internal standard retention time check	Immediately after or during data acquisition of calibration check standard	Retention time ±30 seconds: EICP area within -50% to +100% of last calibration verification (12 hours)	Inspect mass spectrometer and GC for malfunctions; reanalysis of samples analyzed while system was malfunctioning
		Check of mass spectral ion intensities using BFB	Prior to initial calibration and calibration verification	Refer to criteria listed in the Method SW846	Retune instrument and verify
		LCS for all analytes	One LCS per analytical batch	QC acceptance criteria, Table A.2-2	Correct problem then reprep and analyze the LCS and all samples in the affected analytical batch
		Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria, Table A.2-2	Correct problem then re-extract and analyze sample
		MS/MSD	One MS/MSD per every 20 project samples per matrix	QC acceptance criteria, Table A.2-2	None

Table A.9-1 (Cont)
Summary of Calibration Criteria and Corrective Action Procedures

Method	Applicable Parameter	QC Function	Frequency	Acceptance Criteria	Corrective Action[a]
EPA 8260B (Cont)		MDL study	Once per 12 month period	Detection limits established shall be < the RLs in Table A.2-3	None
		Results reported between MDL and MRL	None	None	None

Explanation:
[a] - All corrective actions associated with GEOFON project work shall be documented, and all records shall be maintained by the laboratory.
[b] - Flagging criteria are applied when the acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

%RSD - percent relative standard deviation
BFB – bromofluorobenzene
CA LUFT – California Leaking Underground Fuel Tank
CCC - calibration check compound
CF – calibration factor
DFTPP – decafluorotriphenylphosphine
EICP – extracted ion current profile
EPA – United States Environmental Protection Agency
GC – gas chromatograph
ISS – internal standard solution
LCS - laboratory control sample
M – modified
MDL - method detection limit
MRL – method reporting limit
MS/MSD - matrix spike/matrix spike duplicate
QC - quality control
RF - response factor
RPD - relative percent difference
SPCC - system performance check compound
TPH - total petroleum hydrocarbons

A.10.0 ASSESSMENT AND OVERSIGHT

This section describes the field and laboratory assessments that may be conducted during the project, the individuals responsible for conducting assessments, corrective actions that may be implemented in response to assessment results, and how quality-related issues will be reported to GEOFON and Navy management.

A.10.1 ASSESSMENT AND RESPONSE ACTIONS

GEOFON and the Navy will oversee environmental data collection using the assessment and audit activities described below. Any problems encountered during an assessment of field investigation or laboratory activities will require appropriate corrective action to ensure that the problems are resolved. This section describes the types of assessments that may be completed, GEOFON and Navy responsibilities for conducting the assessments, and corrective action procedures to address problems identified during an assessment.

A.10.1.1 Field Assessments

GEOFON conducts field assessments to support data quality and encourage continuous improvement in the systems that support environmental data collection. Technical systems audits (TSA) are the type of field assessment most frequently conducted. GEOFON personnel conducting TSAs use personnel interviews, direct observations, and reviews of project-specific documentation to evaluate and document whether procedures specified in the approved the SAP are being implemented. Specific items that may be observed during the TSA include:

- Availability of project plans such as the SAP and SHSP
- Documentation of personnel qualifications and training
- Sample collection, identification, preservation, handling, and shipping procedures
- Sampling equipment decontamination
- Equipment calibration and maintenance
- Completeness of logbooks and other field records (including nonconformance documentation)
- Health and safety procedures

During the TSA, the lead GEOFON assessor verbally communicates any significant deficiencies to the field team leader (FTL) for immediate correction. These and all other observations and comments are documented in a draft TSA report. The draft TSA report is issued to the GEOFON project manager, FTL, program QA manager, and project QA officer in electronic (e-mail)

format within 7 days after the TSA is completed. Project teams shall be required to respond to the draft report within 3 days, and a final TSA report is issued within 7 days after the project team responds.

The GEOFON program QA manager shall determine the frequency and duration of TSAs. Generally, TSAs are conducted early in the project so that any quality issues can be resolved before large amounts of data are collected. The GEOFON program QA manager will notify the Navy QA officer and RPM before a TSA is conducted so that they may attend the TSA and observe the field assessment.

The Navy QA officer may also independently conduct a field assessment of any GEOFON project. Items reviewed by the Navy QA officer during a field assessment would be similar to those described above.

The GEOFON program QA manager, in conjunction with the Navy QA officer, shall select which projects will receive a TSA. A schedule of field activities and planned TSAs is maintained and updated bimonthly. However, projects to receive TSAs are not firmly identified until field sampling activities are being initiated so that scheduling issues can be addressed.

A.10.1.2 Laboratory Assessments

NFESC conducts assessments of all laboratories that analyze samples collected under this contract. These assessments include (1) reviews of laboratory certifications, (2) initial and annual demonstrations of the laboratory's ability to satisfactorily analyze single-blind PE samples, and (3) laboratory audits. Laboratory audits may consist of an on-site review of laboratory facilities, personnel, documentation, and procedures, or an off-site evaluation of the ability of the laboratory's data management system to meet contract requirements.

A.10.1.3 Assessment Responsibilities

GEOFON personnel conducting assessments will be independent of the activity being evaluated. The GEOFON program QA manager will select the appropriate personnel to conduct each assessment and will assign them responsibilities and deadlines for completing the assessment. These personnel may include the program QA manager, project QA officer, or senior technical staff with relevant expertise and assessment experience.

When an assessment is planned, the GEOFON program QA manager selects a lead assessor who is responsible for:

- Selecting and preparing the assessment team

- Preparing an assessment plan
- Coordinating and scheduling the assessment with the project team, subcontractor, or other organization being evaluated
- Participating in the assessment
- Coordinating preparation and issuance of assessment reports and corrective action request forms
- Evaluating responses and resulting corrective actions

After the assessment is completed, the lead assessor will submit an audit report to the GEOFON program QA manger, project manager, and project QA officer; other personnel may be included in the distribution as appropriate. Assessment findings will also be included in the quality control summary report for the project.

The Navy QA officer is responsible for coordinating all audits that may be conducted by Navy personnel for this project. Audit preparation, completion, and reporting responsibilities for Navy auditors would be similar to those described above.

A.10.1.4 Field Corrective Action Procedures

Field corrective action procedures will depend on the type and severity of the finding. GEOFON classifies assessment findings as either deficiencies or observations. Deficiencies are findings that may have a significant impact on data quality and that will require corrective action. Observations are findings that do not directly affect data quality, but are suggestions for consideration and review.

As described in Section A.10.1.1, project teams are required to respond to deficiencies identified in TSA reports. The project manager, FTL, and project QA officer will meet to discuss the deficiencies and the appropriate steps to resolve each deficiency by:

- Determining when and how the problem developed
- Assigning responsibility for problem investigation and documentation
- Selecting the corrective action to eliminate the problem
- Developing a schedule for completing the corrective action
- Assigning responsibility for implementing the corrective action
- Documenting and verifying that the corrective action has eliminated the problem
- Notifying the Navy of the problem and the corrective action taken

In responding to the TSA report, the project team will include a brief description of each deficiency, the proposed corrective action, the individual responsible for determining and implementing the corrective action, and the completion dates for each corrective action. The project QA officer will use a status report to monitor the status of all corrective actions.

The GEOFON program QA manager is responsible for reviewing proposed corrective actions and verifying that they have been effectively implemented. The program QA manager can require data acquisition to be limited or discontinued until the corrective action is complete and a deficiency is eliminated. The program QA manager can also request the reanalysis of any or all data acquired since the system was last in control.

A.10.1.5 Laboratory Corrective Action Procedures

When errors, deficiencies, or out-of-control situations exist, the laboratory's QA program shall include a system of QC activities that measure the system performance to verify that it meets stated requirements and objectives. When the analytical system performance does not meet defined standards, the laboratory shall employ corrective actions to resolve problems and restore proper functioning to the analytical system(s). Laboratory personnel are alerted that corrective actions are necessary under the following conditions:

- QC data are outside the measurement quality objectives for precision and bias
- Blanks or LCSs contain contaminants above acceptable levels
- Undesirable trends are detected in spike recoveries or the RPD between duplicates
- There are unusual changes in method detection limits (MDLs)
- Deficiencies are detected by the QA department during internal or external audits or from the results of performance evaluation (PE) samples
- Inquiries concerning data quality are received from a project manager

Corrective actions are often handled at the bench level by the analyst, who reviews the sample preparation procedures for possible errors and checks the instrument calibration, spike, calibration mixes, instrument sensitivity, and so on. If the problem persists or cannot be identified, the matter will be referred to the laboratory supervisor, manager, or QA department for further investigation. Once resolved, full documentation of the corrective action procedure shall be filed with the project-specific records.

A.10.1.6 Calculation Errors

Reports shall be reissued if calculation or reporting errors are noted with any given data package. The case narrative shall clearly state the reason(s) for reissuance of the report.

A.10.2 REPORTS TO MANAGEMENT

Effective management of environmental data collection requires (1) timely assessment and review of all activities and (2) open communication, interaction, and feedback among all project participants. GEOFON will use the report described below to address any project-specific quality issues and to facilitate timely communication of these issues.

A.10.2.1 Daily Progress Reports

GEOFON will prepare a daily progress report (contractor production reports) to summarize activities throughout the field investigation. This report will describe sampling and field measurements, equipment used, GEOFON and subcontractor personnel on site, QA/QC and health and safety activities, problems encountered, corrective actions taken, deviations from the SAP, and explanations for the deviations. The daily progress report is prepared by the field team leader and submitted to the project manager and to the Navy RPM, if requested. The content of the daily reports will be summarized and included in the final report submitted for the field investigation.

A.11.0 DATA REVIEW, REPORTING AND VALIDATION

This section describes the procedures that are planned to review and validate field and laboratory data. This section also discusses the requirements for preparing laboratory data packages.

A.11.1 Data Review and Verification

Review and verification of the data generated during field and laboratory activities are essential to obtaining data of defensible and acceptable quality.

A.11.1.1 Field Data Review

Project team personnel will verify field data through reviews of data sets to identify inconsistencies or anomalous values. Any inconsistencies discovered will be resolved as soon as possible by seeking clarification from field personnel responsible for data collection. All field personnel will be responsible for following the sampling and documentation procedures described in this project-specific SAP so that defensible and justifiable data are obtained.

Data values that are significantly different from the population are called "outliers." A systematic effort will be made to identify any outliers or errors before field personnel report the data. Outliers can result from improper sampling or measurement methodology, data transcription errors, calculation errors, or natural causes. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in sampling, measurement, transcription, or calculation will be clearly identified in project reports.

A.11.1.2 Laboratory Data Review

All analytical data generated by the laboratory shall be extensively reviewed prior to report release to assure the validity of the reported data. This internal data evaluation process shall cover the areas of data generation, reduction, and a minimum of three levels of documented review. For each level, the review process shall be documented using an appropriate checklist that is signed and dated by the reviewer. The analyst who generates the analytical data has the prime responsibility for the correctness and completeness of the data. Each step of this review process involves evaluation of data quality based on both the results of the QC data and the professional judgment of those conducting the review. This application of technical knowledge and experience to the data evaluation is essential in ensuring that data of known quality are generated consistently. All data generated and reduced shall follow well-documented in-house protocols.

A.11.1.3 Data Qualifiers

Data qualifiers shall be added by the laboratory during the data generation/ review process. These qualifiers will be applied when measurement quality objectives are not met and corrective action is not successful or when corrective action is not performed. All flags used by the laboratory shall be defined completely within the chemical data reportable packages. The following data qualifiers are suggested for use:

- U= Nondetect when analyte concentration is below MRL.
- J= Estimated concentration when analyte concentration falls below the MQL (i.e., lowest calibration standard).
- B= Blank contamination when any associated blanks are above one-half the MRL.
- Q= Data requires usability review due to the exceedance of method-specific holding times, calibration, or batch QC data associated with the samples do not meet stated measurement quality objectives.

These flags shall also identify any suspected bias in the data, either low or high, and whether the estimation is related to the suspected identification (qualitative) or whether the value reported is an approximation (quantitative). The project manager or appropriate technical personnel shall be notified as soon as possible to discuss possible corrective actions should data be qualified. Additional data flagging may be performed based upon overall project-specific requirements, through the use of external data review or validation.

A.11.2 Data Reporting

The data package shall contain enough information to demonstrate that the project DQOs has been fulfilled. In general, one should be able to determine the precision, bias, representativeness, comparability, and sensitivity of the data from information contained in the data package. This description applies to both primary and referee laboratory packages. The amount of information required to demonstrate attainment of DQOs depends upon the acceptable level of uncertainty for the intended data use. In general, the type of data package required will fall into one of two general categories: Comprehensive (EPA Level IV) and Definite (EPA Level III). Data packages will be prepared to meet the requirements for data package contents that are presented in Tables A.11-1 and A.11-4.

For this project, 10 percent of the data shall be submitted in an EPA Level IV equivalent data package and 90 percent submitted in an EPA Level III equivalent data package. All reported

data packages must be retained by the laboratory for a minimum of 10 years. In the event of laboratory closure, all applicable documents must be transferred to the Navy client.

TABLE A.11-1
GC/MS DATA DELIVERABLE PACKAGE REQUIREMENTS

Method	Deliverable Requirement	Equivalent EPA Form	Comprehensive Package (Level IV)	Definitive Package (Level III)
Organic Analysis by GC/MS	Case narrative		X	X
	Corrective action report(s)		X	X
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		X	X
	Chain-of-Custody form, cooler receipt form		X	X
	Sample log-in sheet	DC-1	X	
	Complete SDG file inventory sheet	DC-2-1	X	
	Data summary for each blank and sample (1)	I	X	X
	Tentatively identified compounds (TICs) for each sample (ten peaks)	I,TIC	X	(Only if requested)
	Lab Control Sample/Laboratory Control Duplicate (LCS/LCD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	III (modified)	X	X
	Surrogate recovery report (including concentration spiked, percent recovered, and percent recovery acceptance limits)	II	X	X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	III	X	X
	Instrument performance check (tuning) report	V	X	X
	Initial calibration data (including acceptance limits)	VI	X	X (summary only)
	Continuing calibration data (including acceptance limits)	VII	X	X (summary only)
	Internal standard areas and retention time reports (including acceptance limits and out-of-control flags)	VIII	X	X
	Reconstructed ion chromatogram for each sample and rerun, blank, spike, duplicate, and standard		X	
	Instrument quantitation report		X	
	Raw and background subtracted mass spectra for each target analyte found		X	
	Mass spectra of TICs with library spectra of 5 best-fit matches		X	

TABLE A.11-1
GC/MS DATA DELIVERABLE PACKAGE REQUIREMENTS

Method	Deliverable Requirement	Equivalent EPA Form	Comprehensive Package (Level IV)	Definitive Package (Level III)
Organic Analysis by GC/MS	Sample preparation bench sheets		X	X
	Gel permeation chromatography clean-up logs		X	
	Method blank summary	IV	X	
	Standard preparation logs		X	X
	Analysis run logs	VIII	X	X
	Percent moisture		X	X
	pH		X (2)	

1) Must include: field sample ID, laboratory ID, date/time sampled, date received, date extracted/analyzed, MRL, MDL, dilution factor(s), results, comments, approval signature/date.

2) For water samples volatile analysis only.

TABLE A.11-2
GC OR HPLC DATA DELIVERABLE PACKAGE REQUIREMENTS

GC/HPLC	Deliverable Requirement	Equivalent EPA Form	Comprehensive Package (Level IV)	Definitive Package (Level III)
Organic Analysis by GC or HPLC	Case narrative		X	X
	Corrective action report(s)		X	X
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		X	X
	Chain-of-Custody form, cooler receipt form		X	X
	Sample log-in sheet	DC-1	X	
	Complete SDG file inventory sheet	DC-2-1	X	
	Data summary for each blank and sample (1)	I	X	X
	Lab Control Sample/Laboratory Control Duplicate (LCS/LCD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	III (modified)	X	X
	Surrogate recovery report (including concentration spiked, percent recovered, and percent recovery acceptance limits)	II	X	X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	III	X	X
	Initial calibration data for each column (indicate which column was used for quantitation)	VI	X	X (summary only)
	Continuing calibration data (indicate which column was used for quantitation) and calibration verification data	VII	X	X (summary only)
	Chromatograms for each sample (and reruns), confirmation runs, blank, spike, duplicate, and standards		X	X (2)
	Instrument quantitation report		X	X (2)
	Method blank summary	IV	X	
	Pesticide identification summary	X	X	
	Sample preparation bench sheets		X	X
	Gel permeation chromatography clean-up logs		X	
	Standard preparation logs		X	X
	Analysis run logs	VIII	X	X
	Percent moisture		X	X

1) Must include: field sample ID, laboratory ID, date/time sampled, date received, date extracted/analyzed, MRL, MDL, dilution factor(s), comments, approval signature/date. Results from the primary and secondary columns/detector shall be reported.

2) For petroleum fuels or PCB analyses chromatograms for samples with compound detection only.

TABLE A.11-3
METALS DATA DELIVERABLE PACKAGE REQUIREMENTS

Method	Deliverable Requirement	Equivalent EPA Form	Comprehensive Package (Level IV)	Definitive Package (Level III)
Metals Analysis	Case narrative		X	X
	Corrective action report(s)		X	X
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		X	X
	Chain-of-Custody form, cooler receipt form		X	X
	Sample log-in sheet	DC-1	X	
	Complete SDG file inventory sheet	DC-2-1	X	
	Data summary for each blank and sample (1)	I-IN	X	X
	Lab Control Sample/Laboratory Control Duplicate (LCS/LCD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	VII-IN	X	X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	V (Part 1)-IN	X	X
	Post-digestion spike recovery	V (Part 2)-IN	X	X
	Duplicate sample report	VI-IN	X	X
	Blank results	III-IN	X	X
	Initial and continuing calibration data	II (PART I)-IN	X	X
	ICP interference check sample report	IV-IN	X	X
	Standard addition results	VIII-IN	X	X
	ICP serial dilution results	IX-IN	X	
	Preparation logs	XIII-IN	X	X
	Analysis run logs	XIV-IN	X	X
	Standard preparation logs		X	X
	CRDL standard report	II (Part 2)-IN	X	
	Instrument detection limits	X-IN	X	
	ICP interelement correction factors	XI-IN	X	X
	Data and instrument printouts		X	
	Percent moisture		X	X

1) Must include: field sample ID, laboratory ID, date/time sampled, date received, date extracted/analyzed, MRL, MDL, dilution factor(s), results, comments, approval signature/date.

2) For water samples only.

TABLE A.11-4
INORGANIC DATA DELIVERABLE PACKAGE REQUIREMENTS

Method	Deliverable Requirement	Equivalent EPA Form	Comprehensive Package (Level IV)	Definitive Package (Level III)
Inorganic Chemistry	Case narrative		x	x
	Corrective action report(s)		x	x
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches		x	x
	Chain-of-Custody form, cooler receipt form		x	x
	Sample log-in sheet	DC-1	x	
	Complete SDG file inventory sheet	DC-2-1	x	
	Data summary for each blank and sample (1)	I-IN	x	x
	Laboratory Control Sample/Laboratory Control Duplicate (LCS/LCD) report (concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	VII-IN	x	x
	Matrix Spike (MS) report (concentration spiked, percent recovered, percent recovery acceptance limits)	V(PART1)-IN	x	x
	Duplicate sample report	VI-IN	x	x
	Calibrations, initial and vertification	II(PART1)-IN	x	x
	Copies of sample preparation logs	XIII	x	x
	Copies of analysis run logs	XIV	x	x
	Raw data and instrument printouts		x	
	Copies of standard preparation logs		x	x
	Percent moisture		x	x

1) Must include: field sample ID, laboratory ID, date/time sampled, date received, date extracted/analyzed, analytical results, dilution factors, MRLs, MDLs, comments, approval signature/date.

A.11.2.1 Electronic Data Deliverables (EDDs)

EDDs are required for all soil analytical results at MCAS El Toro. An automated LIMS must be used to produce the EDD. Manual creation of the deliverable (data entry by hand) is unacceptable. The laboratory will verify EDDs internally before they are issued. The EDD will correspond exactly to the hard-copy data. No duplicate data will be submitted. EDDs will be delivered in Geotracker format compatible and Navy Environmental Data Transfer Standards (NEDTS). Results that should be included in all EDDs are as follows:

- Target analyte results for each sample and associated analytical methods requested on the chain-of-custody form
- Method and instrument blanks and preparation and calibration blank results reported for the sample delivery group (SDG)
- Percent recoveries for the spike compounds in the MS, MSDs, blank spikes, or LCSs
- Matrix duplicate results reported for the SDG
- All re-analysis, re-extractions, or dilutions reported for the SDG, including those associated with samples and the specified laboratory QC samples

Electronic copy data must be retained for a minimum of 3 years after final data have been submitted. The subcontractor will use an electronic storage device capable of recording data for long-term, off-line storage. Raw data will be retained on an electronic data archival system.

A.11.3 Data Validation

An independent third-party contractor will validate all laboratory data in accordance with current EPA national functional guidelines (EPA 1994, 1999c). The data validation strategy will be consistent with the requirements of *Environmental Work Instruction 3EN2.1-Chemical Data Validation (U.S. Navy Southwest Division, 2001a)*. For this project, 90 percent of the data will undergo cursory validation (EPA Level III) and 10 percent of the data will undergo full validation (EPA Level IV). Requirements for cursory and full validation are listed below.

A.11.3.1 Cursory Data Validation

Cursory validation will be completed on the summary data packages for analysis of soil samples. The data reviewer is required to notify Geofon and request any missing information needed from the laboratory. Elimination of the data from the review process is not allowed. All data will be qualified as necessary in accordance with established criteria. Data summary packages will consist of sample results and QC summaries, including calibration and internal standard data.

A.11.3.2 Full Data Validation

Full validation will be completed on full data packages for analysis of soil samples. The data reviewer is required to notify Geofon and request any missing information needed from the laboratory. Elimination of data from the review process is not allowed. All data will continue through the validation process and will be qualified in accordance with established criteria. Data summary packages will consist of sample results, QC summaries, and all raw data associated with the sample results and QC summaries.

A.11.3.3 Data Validation Criteria

Table A.11-5 lists the QC criteria that will be reviewed for both cursory and full data validation. The data validation criteria selected from Table A.11-5 will be consistent with the project-specific analytical methods listed in Section A.6.2.

TABLE A.11-5
DATA VALIDATION CRITERIA

Analytical Parameter Group	Cursory Data Validation Criteria (EPA Level III)	Full Data Validation Criteria (EPA Level IV)
Organic Analyses	Method compliance Holding times Calibration Blanks Surrogate recovery Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Internal standard performance Field duplicate sample analysis Other laboratory QC specified by the method Overall assessment of data for an SDG	Method compliance Holding times Calibration Blanks Surrogate recovery Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Internal standard performance Field duplicate sample analysis Compound identification Detection limits Compound quantitation Sample results verification Other laboratory QC specified by the method Overall assessment of data for an SDG
Inorganic and Physical Analyses	Method compliance Holding times Calibration Blanks Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Field duplicate sample analysis Other laboratory QC specified by the method Overall assessment of data for an SDG	Method compliance Holding times Calibration Blanks Matrix spike and matrix spike duplicate recovery Laboratory control sample Field duplicate sample analysis Other laboratory QC specified by the method Detection limits Analyte identification Analyte quantitation Sample results verification Overall assessment of data for an SDG

A.12.0 MANAGEMENT AND DISPOSAL OF INVESTIGATION-DERIVED WASTE

Investigation-derive waste (IDW) generated from the site verification activities will consist of following three types:

- Soil cuttings as a result of drilling and sampling;
- Personal protective equipment (PPE); and
- Wastewater (decontamination water)

Soil Cuttings: Soil IDW will be placed in appropriately labeled containers (DOT-approved 55-gallon drums) and maintained on-site until all analytical work is completed. The analytical results of the soil samples will be used to characterize soil IDW generated at the site. If site samples associated with a particular drum are hazardous, the soil IDW will be disposed as hazardous waste. If the site samples associated with a particular drum are non hazardous, the soil IDW will be disposed as non-hazardous solid waste.

PPE: PPE generated during field activities (e.g., tyveks, gloves, paper towels, and sampling supplies) will be collected in plastic bags and stored in DOT-approved 55-gallon drums. The bags will be labeled to indicate the soil boring location, contents, and collection date. If the soil collected from the soil boring is characterized as hazardous, then the corresponding PPE will be disposed as hazardous waste. Otherwise, all PPE will be disposed as non-hazardous waste.

Wastewater: Decontamination water will be contained in properly labeled DOT-approved 55-gallon drums or Baker tanks. All liquid IDW will be transported off-site for appropriate treatment. Additional samples of liquid IDW will be analyzed for the contaminants of concern for disposal purposes. Decontamination water samples for waste characterization will be collected using disposable bailers. The samples will be collected in new, precleaned, bottle(s) with the appropriate preservative provided by the analytical laboratory. The samples will be labeled and packaged for laboratory submittal. The following summarizes the sampling procedures to be used:

1. Obtain a disposable bailer. A new bailer shall be obtained for each sample event.
2. Put on a new, clean, and chemical-resistant pair of disposable gloves.
3. Secure the bailer with nylon cord.
4. Lower the bailer into the drum. Allow sufficient time for the bailer to fill with water.

5. Retrieve the bailer and fill appropriate bottle(s) for analyses being requested. Note: For MS/MSD samples only, collect three sets of bottles.
6. Cap the bottle(s) and wipe any moisture from the outside of the bottle(s).
7. Affix a signed and dated custody seal over the cap(s) of bottle(s).
8. Place a sample label, completed with the information described in Section A.5.2, on the bottle.
9. Place the bottle in a resealable bag.
10. Place the resealable bag containing the sample in a cooler with bagged ice for shipment to the analytical laboratory.

Off-site disposal of waste will be coordinated by GEOFON. The Navy will be the generator and will sign any manifests. All waste will be stored on-site no longer than 90 days after date of generation. IDW will be profiled, transported, and disposed off in accordance with applicable Federal, State, and local regulations.

Waste classification criteria are listed in Table A.12-1, Waste Classification Criteria.

TABLE A.12-1
WASTE CLASSIFICATION CRITERIA

Parameter	Method[a]	Regulatory Threshold Limit		
		CA Hazardous Waste (mg/kg) (TTLC)	CA Hazardous Waste (mg/L) (STLC)	RCRA Hazardous Waste (mg/L) (TCLP)
TPH	EPA Modified Method 8015	TBD	TBD	TBD
VOCs Benzene	EPA Method 8260B	NA	NA	0.5
Carbon tetrachloride	EPA Method 8260B	NA	NA	0.5
Chlorobenzene	EPA Method 8260B	NA	NA	100
Chloroform	EPA Method 8260B	NA	NA	6
1,4-dichlorobenzene	EPA Method 8260B	NA	NA	7.5
1,2-dichlorobenzene	EPA Method 8260B	NA	NA	0.5
1,1-dichloroethene	EPA Method 8260B	NA	NA	0.7
Hexachloroethane	EPA Method 8260B	NA	NA	3
Methyl ethyl ketone	EPA Method 8260B	NA	NA	200
Tetrachloroethene	EPA Method 8260B	NA	NA	0.7
Trichloroethene	EPA Method 8260B	2,040	204	0.5
Vinyl chloride	EPA Method 8260B	NA	NA	0.2

TABLE A.12-1 (CONT)
WASTE CLASSIFICATION CRITERIA

Parameter	Method[a]	Regulatory Threshold Limit		
		CA Hazardous Waste (mg/kg) (TTLC)	CA Hazardous Waste (mg/L) (STLC)	RCRA Hazardous Waste (mg/L) (TCLP)
Ignitability (for liquids only, direct analysis)	EPA Method 1010	< 60°C	< 60°C	< 60°C

Explanation:
a – Test Methods for Evaluating Solid Waste. Physical Methods, SW-846 (EPA, 1994c)
1L – one liter
CA – California
DDD –dichlorodiphenyldichloroethane
DDE –dichlorodiphenylchloroethane
DDT – dichlorodiphenyltrichloroethane
EPA – United States Environmental Protection Agency
NA – not applicable
mg/kg – milligrams per kilogram
mg/L – milligrams per liter
RCRA – Resource Conservation and Recovery Act
TBD – To be determined by the individual waste facility
TCLP –Toxicity Characteristic Leaching Procedure
TPH - total petroleum hydrocarbons
TTLC – Total Threshold Limit Concentration
STLC – Soluble Threshold Limit Concentration
VOC – volatile organic compound
°C – degrees Celsius
< - less than

A.13.0 REFERENCE SOURCES

American Society for Testing and Materials, 2000, *Annual Book of Standards.*

Hazardous Waste Remedial Action Program, 1990, *Requirements for Quality Control of Analytical Data, DOE/HWP-65/R1.*

Naval Facilities Engineering Service Center, 1999, *Navy Installation Restoration Chemical Data Quality Manual.*

U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans, EM 200-1-3.*

U.S. Environmental Protection Agency, 1983, *Methods for Chemical Analysis of Water and Waste.*

U.S. Environmental Protection Agency, 1991, *Contract Laboratory Program Statement of Work (SOW) for Inorganic Analysis, ILM04.0.*

U.S. Environmental Protection Agency, 1994, *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.*

U.S. Environmental Protection Agency, *Compendium of ERT Standard Operating Procedures (SOPs).*

U.S. Environmental Protection Agency, 1996, *Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846, Update III.* September.

U.S. Environmental Protection Agency, 1997a, *Guidance for the Data Quality Objectives Process for the Hazardous Waste Sites, EPA QA/G-4HW.*

U.S. Environmental Protection Agency, 1997b, *Guidance for Quality Assurance Project Plans, EPA QA/G-5.*

U.S. Environmental Protection Agency, 1999a, *Contract Laboratory Program Statement of Work for Organic Analysis, OLM04.2.*

U.S. Environmental Protection Agency, 1999b, *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, Second edition.

U.S. Environmental Protection Agency, 1999c, *Contract Laboratory Program National Functional Guidelines for Organic Data Review.*

U.S. Environmental Protection Agency, 2000, *Guidance for the Data Quality Objectives Process, EPA QA/G-4.*

U.S. Environmental Protection Agency, 2001. *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, Office of Environmental Information*, EPA/240/B-01/003, March.

U.S. Navy Southwest Division, 2001a, *Environmental Work Instruction 3EN2.1-Chemical Data Validation.*

U.S. Navy Southwest Division, 2001b, *Environmental Work Instruction 3EN2.2-Review, Approval, Revision, and Amendment of Sampling and Analysis Plans.*

U.S. Navy Southwest Division, 2001c, *Environmental Work Instruction 3EN2.3-Laboratory Quality Assurance Program.*

U.S. Navy Southwest Division, 2001d, *Environmental Work Instruction 4EN-Environmental Data Management and Required Electronic Delivery System.*

DTSC. DTSC Letter to Mr. Dean Gould, BRAC Environmental Coordinator, Marine Corps Air Station (MCAS), El Toro, California, dated October 10, 2000.

APPENDIX B

SITE SPECIFIC HEALTH AND SAFETY PLAN

APPENDIX B
SITE SPECIFIC HEALTH AND SAFETY PLAN

FOR
SITE VERIFICATION ACTIVITIES AT
FORMER MCS JP5 STATION 574 SITE AND JP5 PIPELINE
FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

Contract Number N68711-01-D-6008

Delivery Order No. 0006

Prepared for:

Department of the Navy,
Southwest Division
Naval Facilities Engineering Command
1220 Pacific Highway
San Diego, California 92132

Prepared by:

GEOFON, INC.
22632 Golden Springs Dr., Suite 270
Diamond Bar, California 91765

GEOFON Project No. 4-12806

July 28, 2004

APPENDIX B
SITE SPECIFIC HEALTH AND SAFETY PLAN

FOR

SITE VERIFICATION ACTIVITIES AT

FORMER MCS JP5 STATION 574 SITE AND JP5 PIPELINE

FORMER MARINE CORPS AIR STATION

EL TORO, CALIFORNIA

Contract Number N68711-01-D-6008
Delivery Order No. 0006

Prepared by:

Nadine Doughman — 7-28-04

Nadine Doughman
Project Engineer

Date

Reviewed by:

S. V. Sree — 7/28/2004

Sree Akkenapally, R.E.A.
Project Manager

Date

Reviewed by:

M Sassoon CIH #5203 — 7-28-04

Maureen Sassoon, C.I.H.
Project Health and Safety Manager

Date

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ATTACHMENTS

B.1.0 INTRODUCTION

GEOFON, Inc. (GEOFON) has prepared this Site Health and Safety Plan (SHSP) to be implemented during the site verification activities at the former Miscellaneous Sites of Concern (MCS) JP5 Station 574 Site and the former MSC JP5 Pipeline at the former Marine Corps Air Station (MCAS), El Toro, California (Figure B-1). The site verification activities will be performed at the former MSC JP5 Station 574 Site and along the former MSC JP5 Pipeline to evaluate the extent of a jet fuel release in the soil.

The work is being provided for the Department of the Navy, Southwest Division (SWDIV) under United States Navy (USN) Contract No. N68711-01-D-6008 (Delivery Order No. 0006), and will be completed in accordance with the Statement of Work (SOW) dated 29 January 2004 and all federal, state and local regulations.

B.1.1 Purpose and Objectives

This SHSP and all on-site activities will be performed in accordance with the U.S. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHAIUSCG/EPA, October 1985; Title 29, Code of Federal Regulations (CFR), 1910.120, 1910.165, 1910.1030, 1910.1200, 1910.134; California Code of Regulations (CCR), Title 8, Section 5192; the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM-385-1-1, (September 1996); and the Navy/Marine Corps Installation Restoration Manual (February 1997), and in accordance with other applicable documents.

The SHSP objectives are to insure that all necessary precautions for field work are in place and that appropriate health and safety procedures are followed at all times to protect personnel, to provide the necessary protection to prevent damage, injury, or loss of property and equipment; and to respond quickly and effectively to GEOFON related activities.

All GEOFON employees involved in field work at the site have completed the required 40 hours initial training, maintain qualification through annual refresher training, are under a program of medical monitoring, and are certified to wear respiratory protection, as specified in 29 CFR part 1910.139. Full details of GEOFON's Training, Respiratory Protection, and Medical Monitoring Program are given in the Standard Operating Procedures attached to the GEOFON Corporate Health and Safety Manual.

It is recognized that conditions on a site may change or that more information may become available during the operation. If during the operation, it is determined that the conditions are not as described, or the protection specified in the site safety plan requires modifications, work

will cease, and the Site Health and Safety Officer (HSO) will contact the Project Manager (PM) for guidance. Work will not resume until authorized by the PM.

B.1.2 Site Location and Background

B.1.2.1 Former MCS JP5 Station 574 Site

The former MSC JP5 Station 574 Site is located northwest to Building 372 in the northeast portion of MCAS El Toro. MSC JP5 Station 574 was a former jet fuel pump station constructed in 1956 and demolished in 1993.

In 1989 and 1990, NDE Environmental Corp. conducted hydrostatic testing of the 3-inch vacuum/return line at MCS JP5 Station 574. A leak was identified in the 3-inch vacuum/return line with an estimated leakage rate of 5 or more gallons per hour.

In 1990, a monitoring well and an 82-foot deep soil boring, MW398-08 and SB398-13, were constructed near Station 574. The groundwater samples collected from MW398-08 detected benzene, toluene, ethylbenzene and xylenes (BTEX) at concentrations of 1.2 micrograms per liter (µg/L), 26 µg/L, 0.82 µg/L, and 5.6 µg/L, respectively. The soil samples collected from SB398-13 at the depths of 30 and 80 feet below ground surface (bgs) were analyzed for BTEX and total petroleum hydrocarbons (TPH). BTEX and TPH were not detected at or above laboratory reporting limits from the soil samples.

In 1992, MSC JP5 Station 574 was replaced with two new pump stations, Structures 904 and 905, which were constructed southwest of Station 574 in the former aircraft parking apron (Apron 1). The investigation area for MSC JP5 Station 574 includes the original pump station (574) and the most recently constructed pump stations (904 and 905).

B.1.2.2 Former MCS JP5 Pipeline

The former MSC JP5 Pipeline is comprised of primary and secondary jet fuel supply pipelines in the northeast quadrant of the MCAS El Toro. The primary jet fuel supply pipelines were used to distribute the fuel from the Tank Farm 555 storage tanks to secondary storage tanks within the MCAS El Toro. Secondary jet fuel pipelines then transported the fuel from the secondary storage tanks to the end user, either aircraft or fuel tank trucks. In 1998, service at the MSC JP5 Pipeline was discontinued.

Benzene has been detected in the groundwater from nearby monitoring wells 04_DBMW40, 04_UGMW63 and 18_BGMW01E. In November 1996, benzene was detected from 04_DBMW40 and 04_UGMW63 at the concentrations of 40 micrograms per liter (µg/L) and 7 µg/L, respectively. In March 1997, benzene was detected at the concentration of 90 µg/L from

18_BGMW01E. The fueling stations and a dry well near Building 363 in the former truck fueling facility are possible sources of the benzene in the groundwater.

B.1.3 Scope of Work

The scope of work for this project includes the following:

Former MCS JP5 Station 574 Site

- Drill nine (9) soil borings using direct push drilling methodology to a depth of 20 feet bgs to define the lateral extent of petroleum hydrocarbons in the soil. Collect soil samples at the depths of approximately 7 feet bgs and 20 feet bgs. Analyze the soil samples for TPH (as diesel and gasoline) and VOCs.

Former MCS JP5 Pipeline

- Drill fifteen (15) soil borings using direct push drilling methodology to a depth of 20 feet bgs to define the lateral extent of petroleum hydrocarbons in the soil. Collect soil samples at the depths of approximately 10 feet bgs (or below the pipeline) and 20 feet bgs. Analyze the soil samples for TPH (as diesel and gasoline) and VOCs.

These tasks are further detailed in the Task Hazard Analysis included as an Attachment. A detailed description of the scope of work to be performed at the site is presented in Sections 5.0 and 6.0 of the Work Plan.

B.2.0 KEY PERSONNEL AND RESPONSIBILITIES

Key personnel for this project include the project manager (PM) Sree Akkenapally, Health and Safety Officer (HSO) Curtis O'Connor; the Certified Industrial Hygienist (CIH) Maureen Sassoon; the Quality Assurance (QA) Manager Richard Hoffman, the Site Safety Officer (SSO) Charles Parada and project and subcontractor personnel. An alternate SSO with the required training will be assigned when the SSO is not on-site. All project field staff, including subcontractor personnel, have completed comprehensive health and safety training, which meets the requirements of Title 29 Code of Federal Regulations Part 1910.120 (20 CFR 1910.120). Both the SSO and the alternate SSO will have:

- Completed the required additional training for this project assignment;
- The authority to monitor and correct health and safety problems as they arise;
- The responsibility for completing the Field Health & Safety Meeting Records.

Specific project safety responsibilities for these key personnel are detailed below. This SHSP has been developed for GEOFON field personnel. Subcontractor personnel will follow this SHSP or a Plan approved by GEOFON.

B.2.1 PM Responsibilities

As the Project Manager (PM), Sree Akkenapally is responsible for generating, organizing, and compiling the SHSP, which describes planned field activities and potential hazards that may be encountered at the site. The PM is also responsible for ensuring that adequate training and site safety briefing(s), including the provision of safety equipment, are provided to the project field team. The PM will provide a copy of this SHSP to each member of the project field team and one copy to each subcontractor prior to field activities. Associated health and safety responsibilities will include:

- Coordinating the activities of all contractors' field personnel, including their signed acknowledgment of the SHSP.
- Selecting a SSO and field personnel for the contractual site work to be undertaken.
- Ensuring that the tasks assigned to the contractor are being completed as planned and are kept on schedule.
- Providing authority and resources to ensure that the SSO is able to implement and manage safety procedures.
- Preparing reports and recommendations about the project to the client and the concerned contractor's personnel.

- Ensuring that the SSO is aware of all of the provisions of this SHSP and in instructing all personnel on site about safety practices and emergency procedures defined in this plan.
- Ensuring that the SSO is monitoring site safety.

B.2.2 HSO/CIH Responsibilities

The Health and Safety Officer (HSO), Curtis O'Connor, and the Certified Industrial Hygienist (CIH), Maureen Sassoon will be responsible for developing and coordinating the health and safety program. They will also be responsible for reviewing and approving the SHSP for accuracy and incorporating new information or guidelines that aid the PM and SSO in further definition and control of the potential health and safety hazards associated with this project. The PM and the SSO also have the authority to suspend or modify work practices for safety reasons, and to dismiss individuals whose on-site conduct endangers the health and safety of others.

B.2.3 SSO Responsibilities

The Site Safety Officer (SSO), Charles Parada, has a direct line of authority from the GEOFON's Corporate Health and Safety Officer to implement specific health and safety requirements for specific site activities, and for ensuring that all team members, including subcontractor(s), comply with the SHSP. It is the SSO's responsibility to inform the subcontractor(s) and other field personnel of chemical and physical hazards, as they become aware of them. Additional SSO responsibilities include:

- Ensuring that all project-related personnel have signed the personnel agreement and acknowledgments contained in this SHSP (Attachments B-1 and B-2).
- Providing site safety briefing for team members.
- Evaluating weather conditions and chemical hazard information and making recommendations to the PM about any modification to work plans or personal protective equipment (PPE) requirements to maintain personnel safety.
- Monitoring the compliance activities and the documentation processes.
- Approving all field personnel working on site while taking into consideration their level of training, physical capacity and their eligibility to wear protective equipment necessary for the assigned tasks.
- Inspecting all personal PPE prior to use.
- Assisting the PM in SHSP documenting compliance by completing standard forms.
- Monitoring the compliance of field personnel for the routine and proper use of protective equipment that has been required for each task.

- Assisting in, and evaluating the effectiveness of, decontamination procedures for personnel, protective equipment, sampling equipment, heavy equipment and vehicles.
- Enforcing the "buddy system" as appropriate for site activities.
- Posting location and route to the nearest medical facility and arranging for emergency transportation to the nearest medical facility.
- Posting the telephone numbers of local public emergency services; (i.e., police and fire).
- Stopping operations that threaten the health and safety of the field team or the surrounding population.
- Entering the exclusion area in emergencies after he has notified emergency services and taken appropriate precautions.
- Observing field team members for signs of exposure, stress, or other conditions related to pre-existing physical conditions or site work activities.

B.2.4 Project Field Staff Responsibilities

The project field staff is responsible for ensuring that activities are performed in accordance with the SHSP and that deviations from the plan are based upon field conditions encountered and are well documented in field notes. Field staffs' health and safety responsibilities include:

- Following the SHSP;
- Reporting to the PM any unsafe conditions or practices;
- Reporting to the PM all facts pertaining to incidents that result in injury or exposure to toxic materials or chemicals of concern;
- Reporting to the PM equipment malfunctions or deficiencies, and;
- Reviewing the SHSP in the field, as necessary.

It is the responsibility of individual organizations involved in the field activities to ensure understanding of and compliance to the SHSP by its on-site employees or representatives working in controlled areas. Failure by any person to adhere to this plan may result in removal from site activities.

B.2.5 Subcontractor Responsibilities

All subcontractors are responsible for their own health and safety program and the health and safety of their own employees. This requirement is based on OSHA regulations, which recognize the employer-to-employee responsibility for health and safety. A copy of their written

program must be submitted for review to the project manager, if requested. If the subcontractor chooses to follow this SHSP, GEOFON will provide copies to the subcontractor's employees and they will be required to sign the SHSP as part of the GEOFON safety protocol.

B.3.0 HAZARD/RISK ASSESSMENT

This section discusses chemical, physical and environmental hazards that workers on the site may encounter. Section 3.1 discusses each contaminant of potential concern (COPC) and includes information such as exposure limits and signs and symptoms of exposure. Section 3.2 discusses physical hazards identified with this site including those associated with drilling, soil removal, construction and demolition, use of heavy equipment and fire and electrical hazards. Environmental hazards discussed in Section 3.3 are associated with the physical location of the site, weather conditions (such as heat stress and noise) and contact with flora and fauna.

Daily "Tailgate" safety meetings are held at the start of each workday where potential chemical, physical, and environmental hazards and preventative safety measures are discussed. A Task Hazard Analysis has been developed for each general contract activity and is presented as Table B-1. This analysis identifies the sequence of work, specific hazards anticipated, and the control measures to be implemented to minimize or eliminate each hazard. The analysis will be used to augment daily safety meetings intended to heighten safety and hazard awareness on the job.

B.3.1 Chemical Hazards

A list of the contaminants of potential concern (COPC) and other compounds identified at the site and their associated exposure limits are presented in the following table.

CHEMICAL NAME	PEL / TLV (PPM)	STEL (PPM)	ACTION LEVEL (PPM)
TOTAL PETROLEUM HYDROCARBONS (TPH)	- / -	-	10
BENZENE	1 / 0.5 (S)	-	10
TOLUENE	50 / 50 (S)	150	10
ETHYLBENZENE	100 / 100	125	10
XYLENE	100 / 100	150	10

(S) = Skin Notation

Permissible Exposure Levels (PELs) are Occupational Safety and Health Administration (OSHA) permissible exposure limits for airborne concentrations of toxic substances measured as an 8-hour time-weighted average (TWA). The OSHA PELs are the recognized levels that will be adhered to. Short Term Exposure Levels (STELs) are OSHA short-term exposure limits measured as a 15-minute TWA. OSHA requires that controls be implemented when employee exposure exceeds these limits. If contaminant concentrations listed in the table exceed the above Action Levels, engineering control measures will be implemented.

B.3.1.1 Benzene

Benzene is a colorless, highly flammable liquid with an aromatic odor, which is produced by the burning of natural products. It is also a component of products derived from coal and petroleum. It is found in gasoline and other fuels, and is used in the manufacture of plastics, detergents, pesticides and other chemicals.

Inhalation of very high levels of benzene can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, unconsciousness and death. Ingestion of high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death. Benzene is a known human carcinogen. Long-term exposure to high levels of benzene can cause leukemia, a cancer of the blood-forming organs. Benzene can cause harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

Benzene is incompatible with strong oxidizers and is a dangerous fire hazard. It has a lower explosive limit of 1.3 percent and an upper explosive limit of 7.1 percent. The ACGIH recommended TLV for an 8-hour exposure is 0.5 ppm. The Cal-OHSA PEL is 1 ppm, with a skin notation.

B.3.1.2 Ethylbenzene

Ethylbenzene is a colorless, flammable liquid with an aromatic odor. This compound is employed as a solvent and as an intermediate in the production of styrene. Ethylbenzene is also found in automotive or aviation gasoline. Significant amounts of ethylbenzene are also found in mixed xylenes, which are used as diluents for paints.

Ethylbenzene toxicity is characterized by its irritancy to the skin, and less markedly, to the mucous membranes. Ethylbenzene is the most severe skin irritant of the benzene series. Symptoms resulting from exposure may include irritation of the eyes, headaches, dermatitis, narcosis and coma.

At 1,000 ppm, ethylbenzene causes distinctive eye irritation and tearing, but tolerance develops rapidly; and at 200 ppm, the vapor has a transient irritant effect on human eyes. No systemic effects are expected at levels producing distinctively disagreeable skin and eye irritant.

Ethylbenzene is incompatible with strong oxidizers and can be dangerous fire hazard. It has a lower explosive limit of 1.0 percent and an upper explosive limit of 6.7 percent. The odor threshold for ethylbenzene in air and in water is 0.029 ppm. The ACGIH recommended TLV for an 8-hour exposure is 100 ppm. The Cal-OSHA PEL is 100 ppm.

B.3.1.3 Toluene

Toluene is used as constituent in the formation of automotive and aviation fuels. Toluene is a colorless liquid with an aromatic odor. It is flammable by standard tests in air and is not soluble in water. The major response to toluene at high concentrations is depression of the central nervous system. Olfactory fatigue occurs rapidly upon exposure. Eye irritation occurs around 300 to 400 ppm. The lower explosive limit is 1.3 percent and the upper limit is 7.1 percent. The ACGIH recommended TLV for an 8-hour exposure is 50 ppm. The Cal-OSHA PEL is 50 ppm with a skin notation.

B.3.1.4 Xylene

Xylene is clear flammable liquid with an aromatic odor. Commercial xylene is a mixture of the isomers; ortho-,meta, and para- xylene. Xylene mixtures may also contain ethylbenzene and toluene. Xylene is a solvent and a constituent of paint, lacquers, varnishes, cleaning fluids and aviation fuel.

Xylene vapors may cause irritation of the eyes, nose and throat. Skin contact may cause dermatitis. When inhaled at high concentrations the initial signs of exposure may include a flushing or reddening of the face and a feeling of increased body heat, owing to the dilation of the superficial blood vessels. Additional symptoms may include: blurred vision, dizziness, tremors, staggering, drowsiness, salivation, cardiac stress, CNS depression, unconsciousness and eventually coma. Extremely high concentrations may cause pulmonary edema, anorexia, nausea, vomiting and abdominal pain. Pulmonary retention of xylene vapors in human subjects amounts to 64 percent of inhaled dose, xylene may also be absorbed through the skin and does not appear to be influenced by the application of barrier creams. Xylene is metabolized to methylhippuric acid, which is excreted in the urine and can be used as a biologic indicator of exposure.

Xylene is incompatible with strong oxidizers and can be a dangerous fire hazard. It has a lower explosive limit of 1.1 percent and an upper limit of 7.0 percent. The odor threshold for xylene in air is about 1 ppm. The odor threshold for meta-xylene in air is 1.1 ppm and in water is 0.017 ppm. The ACGIH recommended TLV for an 8-hour exposure is 100 ppm. The Cal-OSHA PEL is also 100 ppm.

B.3.2 Physical Hazards

There are numerous physical hazards associated with this project which, if not identified and addressed, could present accidents and personal injury to field personnel, as well as operational problems. Field personnel should maintain awareness of potential safety hazards and should immediately inform the SSO of any new hazards so that corrective measures can be taken.

B.3.2.1 Slips, Trips and Falls

During field activities, work will occur in areas where job supplies and other equipment at ground level present possible slip, trip and fall hazards. In addition, wet weather conditions may also pose such hazards. Work locations will be kept as tidy as possible and free of ground debris. Personnel will wear appropriate footwear for site conditions and walk carefully.

B.3.2.2 Head and Back Injuries

As minimum requirements, hard hats and safety glasses will be donned prior to performing any site activities. This will prevent minor head injuries caused while working around and under piping and other process related structures. At the daily safety meeting, personnel will be instructed in proper lifting techniques and will not lift heavy items without assistance.

B.3.2.3 Overhead Power Lines and Underground Utilities

All field vehicles and equipment will be maintained at a minimum distance of 20 feet, in vertical and horizontal directions from all electrical power lines (energized lines) and/or electrical equipment with a voltage less than or equal to 50 kilovolts (kV). If the voltage exceeds 50 kV, the clearance will be increased by 4 inches for every 10 kV over that voltage.

Various forms of underground utility lines or pipes may be encountered during field activities. Prior to the start of intrusive operations, authorization from all concerned public and base utility department offices will be received. Should intrusive operations cause equipment to come in contact with utility lines, the SSO and HSO will be notified immediately. Work will suspend until the appropriate actions for the particular situations can be taken.

B.3.2.4 Heavy Equipment

The use of heavy equipment presents the greatest potential for injury to personnel. The moving parts of heavy equipment create pinch points, which can cause serious injury. In all cases, rotating shafts or gears should be covered to prevent accidental contact. In some cases, where rotating parts cannot be adequately guarded, only experienced operators should be allowed to work around these rotating parts. All mobile equipment operators will have had the required training and should have demonstrated the necessary skills to operate the heavy equipment. The primary hazard around heavy equipment is the lack of visual contact with equipment operators. Personnel approaching heavy equipment while operating will observe the following protocols:

- Make eye contact with the operator (and spotter)
- Signal the operator to cease heavy equipment activity
- Approach the equipment and inform the operator of intentions.

All personnel working around heavy equipment will wear a hard hat, steel-toed boots and a brightly-colored shirt/vest. Mobile equipment should be equipped with occupant restraints and/or rollover protection according to 29 CFR 1926, Subpart O. All heavy equipment and trucks (except for pick-up trucks) will have back-up alarms.

B.3.2.5 Electrical Hazards

In order to prevent accidents caused by electric shock, the SSO will inspect all electrical connections on a daily basis. He will shut down and lockout any equipment which is found to have frayed or loose connections in accordance with GEOFON Standard Operating Procedures for Mechanical & Electrical Lockout/Tagout, Section L. The equipment will be de-energized and tested before any electrical work is done. All equipment will be properly grounded prior to and during all work activities performed on site.

B.3.2.6 Fire and Explosion Hazards

Occurrence of elevated concentrations of volatile organic compounds increases the potential fire and explosion hazard. Explosive concentrations of these constituents could develop in small and confined spaces. Explosivity will be monitored with a Lower Explosive Limit/Oxygen (LEL/O_2) meter in accordance with requirements found in Section 6.0. Monitored areas will include all excavations, trenches, and locations that could potentially pose hazards as field activities progress. If concentrations of volatile hydrocarbon vapors are greater than 20% of the LEL, work will immediately cease. Natural ventilation or engineering control measures such as forced ventilation or dry ice (CO_2) will be used to reduce vapor concentrations.

B.3.2.7 Confined Space Entry

Confined space entry is not part of the subject field activities. Should confined space entry be required to complete the subject field activities, an amendment to this plan must be prepared.

B.3.3 Environmental Hazards

Environmental hazards associated with this site will be discussed at the orientation meeting prior to the start up of field activities. Personal will be appraised of symptoms of exposure to certain biological hazards and heat stress.

B.3.3.1 Heat Stress

The potential for heat stress is a concern when field activities are performed on hot, sunny days and will be accentuated if protective clothing is worn. Heat stress prevention measures and monitoring will be implemented if ambient temperatures are above 90 degrees Fahrenheit (F).

Precautions to prevent heat stress will include work/rest cycles so that rest periods are taken before excessive fatigue occurs and regular intake of water occurs to replace that lost from sweating. Work/rest cycles will be based on monitoring the heart rate (pulse) of each individual worker. Rest breaks will be long enough to reduce the heart rate (HR) below levels calculated according to the following method:

i) Workers will initially determine their resting HR prior to starting work activities.

ii) At the start of the rest period, workers will determine their initial HR. This initial HR should not exceed the individual's age-adjusted maximum HR, which equals [(0.7)(220 age in years)]. At 1 minute into the rest period, the recovery HR will be determined. The recovery HR should not exceed 110 beats per minute.

iii) If the initial HR exceeds the age-adjusted maximum HR or the 1-minute recovery HR is greater than 110 beats per minute, then the next work period will be decreased by 10 minutes.

An initial work/rest cycle of 1 hour of work and 15 minutes of rest is recommended for protection of staff when the heat stress hazard is high. The recommended cycle will be adjusted up or down based upon worker monitoring, environmental conditions, and the judgment of the SSO. At any time, field team members recognize the signs or symptoms of heat stress prior to a scheduled rest period, they will notify the SSO immediately and call for a rest period. Heat stress due to water loss can be prevented. To prevent dehydration, water intake must approximate sweat loss.

Water intake guidelines are as follows:

i) The sense of thirst is not an adequate indicator of water replacement needs during heat exposure. Therefore, water must be replaced at prescribed intervals, as follows:

   (a) Before work begins, drink two 8-ounce glasses of water;

   (b) During each rest period, drink at least two 8-ounce glasses of water.

ii) Plain water, served cool, is excellent. An adequate supply of drinking water (at least one gallon per person per day) and clean cups will be readily available (i.e., at the support vehicle) to provide water during rest periods.

iii) Adding salt to water is not recommended. However, other fluids, in addition to water, could include fruit juices and diluted electrolyte replacement drinks (diluted 3:1 with water). Do not use salt tablets!

Heat stress, if not prevented, will result in heat stress illnesses. Two critical illnesses, if not recognized and treated immediately, can become life threatening: heat exhaustion and heat

stroke. Heat exhaustion will result if the prevention measures described above are not implemented. If ignoring the signs and symptoms of heat exhaustion and measures described above are not implemented, heat exhaustion will lead to the development of heat stroke. Heat stroke is an immediate, life-threatening condition that results because the body's heat regulating mechanisms shut down, and the body cannot cool itself sufficiently. As heat is excessively stored in the body, brain damage can result causing permanent disability or death!

B.3.3.2 Heat Exhaustion

The signs and symptoms of heat exhaustion are headache; dizziness; nausea; weakness; fainting; profuse sweating; loss of appetite; approximately normal body temperature; dilated pupils; weak and rapid pulse; shallow and rapid breathing; possible cramps in abdomen and extremities; possible vomiting; difficulty walking; and **skin that is cool and sweaty to the touch with pale to ashen-gray coloring.**

First aid for heat exhaustion is as follows:

- Immediately remove yourself or the victim to the support area.
- Decontaminate, as practical, before entering the support area.
- Start cooling, but be careful not to cause a chill (i.e., rest in shade and apply wet towel to forehead; open up and/or remove clothing as much as practical, especially chemical-resistant clothing).
- If the victim is conscious, have them slowly drink cool water.
- If vomiting, and/or the signs and symptoms are not lessening within an hour, call for emergency help and/or transport the victim to emergency room.
- It is likely that a heat exhaustion victim will be unable to work for the rest of the day.

B.3.3.3 Heat Stroke

The signs and symptoms of heat stroke are **hot, dry skin to the touch with reddish coloring;** body temperature >105 degrees °F; no sweating; mental confusion; deep, rapid breathing that sounds like snoring progressing to shallow, weak breathing; headache; dizziness; nausea; vomiting; weakness; dry mouth; convulsions; muscular twitching; sudden collapse; and possible unconsciousness.

First aid for heat stroke is as follows:

- Immediately remove the victim to the support area; prior to entering the support area, remove and dispose the victim's chemical-resistant clothing.

- Cool the victim rapidly using whatever means are available, such as shade, opening up and/or removing clothing, soaking clothing/skin with water and fanning, placing victim in vehicle using air conditioning on maximum.
- Do not give drinking water to victim and treat for shock, if needed.
- Transport the victim to the emergency room or call for emergency help - no exceptions for a heat stroke victim.

B.3.3.4 Noise

Noise is a potential hazard in areas where heavy equipment, power tools, pumps or generators are being operated. Equipment operation may produce noise levels that reach or exceed 85 decibels (dBA), the action level established by the Occupational Safety and Health Administration (OSHA). Exposure to elevated noise levels can lead to temporary or permanent hearing loss and can also cause muscle tension and irritability. The SSO will ensure hearing protection is utilized when noise levels are elevated. Elevated noise levels will be evaluated by the SSO when equipment is operated. Excess noise levels can be estimated using the following rule of thumb. When normal voice communication is not possible between field personnel who are no more than three feet apart, hearing protection will be utilized. Hearing protection will involve the use of disposable earplugs during operations that present a noise hazard. Hearing protection will be required if employees are exposed to sound pressure levels greater than 90 dBA.

B.3.3.5 Biological Hazards

There are a variety of biological hazards to which personnel may be exposed while performing work. These hazards may include animal bites, insect stings, contact with poisonous plants and exposure to pathogenic (disease producing microorganisms). Serious and/or threatening chemical and physical hazards frequently overshadow any potential exposure to biological hazards. However, specific biological hazards can cause injury and even death. Therefore, when appropriate, such hazards will be identified and evaluated in conjunction with all other actual or potential hazards associated with an operation and steps taken to control exposure. Procedures as prescribed in the First Aid Book will be properly implemented. Paramedics will be summoned for serious injuries.

B.4.0 SITE CONTROL AND WORK ZONES

Control will be established around the drilling and sampling areas and other work location to protect untrained or unprotected workers from exposure to contaminants or other hazards. The SSO or his designated work location safety representative will be responsible for delineating these areas based upon results of monitoring obtained during work operations and site specific conditions (e.g. proximity of roads or buildings and terrain peculiarities).

B.4.1 Exclusion and Contamination Reduction Zone

Work locations where ongoing operations create the potential for contact with or inhalation (above action levels) of contaminants will be considered to be limited-access, controlled areas. An Exclusion Zone (EZ) must be established at each such work location. This will serve to prevent unauthorized access by personnel when there is the potential for exposure to contaminants. Once work begins, no one will be allowed within the EZ without wearing the designated level of protective equipment and meeting the training and medical monitoring requirements specified in this plan.

(EZ) will be established at the drilling and sampling location to prevent unauthorized access by personnel when there is the potential for exposure to contaminants. No one will be allowed within the EZ without wearing the designated level of protective equipment and meeting the training and medical monitoring requirements specified in this Plan.

A single entry/exit point should be established at the edge of each EZ to facilitate control of personnel entering the area, and as location for the set-up of decontamination stations outside the EZ. An area 10 feet around this decontamination/entry area, but outside the boundary of the EZ itself, should be considered as having the potential for exposure to contaminants brought out of the EZ by work personnel, and therefore should also be access-controlled. This area will be designated as the Contamination Reduction Zone (CRZ), and should be located upwind from the work location, if possible.

Initial requirements for EZ set-up are presented here as a guide, however location-specific factors must be considered. It must be emphasized that the EZ limits must be sufficient to prevent anyone outside the zone from being exposed to any contaminated materials, or airborne contaminants released during work activities in access of the action levels established in Table B-2, as well as physical hazards due to the operations. The CRZ must be large enough to encompass decontamination activities and prevent unauthorized personnel from approaching closer than 10 feet away from all activities (decontamination, etc.) in all directions except toward the exclusion zone (where full PPE use is in effect).

Typical distances for initial EZ set up are:

Drilling Operations:

Thirty feet (if feasible) in all directions from the outer extent of the work location

Soil Sampling:

Ten feet in all directions from the sampling location (using visual control only)

Decontamination:

Thirty feet (if feasible) in all directions from the decon location for large (vehicle, drilling equipment, etc.) efforts conducted at a decon pad. For personal and small parts decon conducted at the work location, keep activities within the applicable EZ/CRZ established for that operation

The EZ should be delineated, where practical, using yellow "CAUTION" tape and/or fencing to provide a physical barrier to any non-site personnel. Placement of vehicles can be used to provide additional security. The use of "CAUTION" tape (or other visible marker) to delineate the CRZ is not required so long as access to the area is limited to work personnel only. At the conclusion of all hazardous work location tasks, controlled areas must be properly cleaned to be non-hazardous ("clean") prior to relaxation of entry control procedures and PPE requirements.

B.4.2 Support Zone

Areas outside the controlled-access portions of the work location (EZs and CRZs) are considered to be the Support Zone (SZ). In this area the potential to encounter contamination is highly unlikely. The SZ can be used for set up and storage of all equipment, vehicles and supplies which are not required for immediate use in the EZ and can serve as a work area for all non-hazardous tasks which might be undertaken (e.g., paperwork). In most instances, the boundaries of the SZ will not be delineated in any special way, and can be regarded as the general area of work location that is outside the controlled-access areas.

B.4.3 Adjacent Buildings and Operations

All buildings existing within less than 30 feet of the exclusion zone will have those exits locked with barricade tape and warning signs posted inside and out. Air monitoring at the exclusion zone perimeter will include locations closest to the adjacent building or operation. The impacted building occupants will be verbally informed of the work well in advance of the field activities by coordinating through the POC/NTR. In addition, the impacted building occupants will be advised to use an alternate entrance or exit.

B.4.4 Visitor Requirements

Visitors will not be permitted within any EZ or within five feet of the CRZ. All visitors, regardless of affiliations or approvals, will not be permitted within any EZ unless they provide documentation of the training and medical surveillance requirements specified in this plan, and have read and signed this Site Health and Safety Plan. Under no circumstances shall anyone enter the area without authorization from the GEOFON SSO. This shall include client, utility, and regulatory representatives.

B.5.0 PERSONAL PROTECTIVE EQUIPMENT

B.5.1 EPA Levels of Protection

The harmful effects that chemical substances have on the human body often necessitate the use of respiratory protection and personal protective clothing. Proper selection of personal protective equipment (PPE) depends upon a number of factors. Protection against different types of chemicals and differing concentrations of those substances can be quite varied. The tasks to be performed and the probability of exposure to the substances must also be considered when specifying protective clothing.

Once the specific hazard has been identified, appropriate PPE can be selected. The protection level assigned must match the hazard confronted. The specific equipment comprising each level of protection will vary slightly, but are defined primarily by the type of respiratory protective equipment used, and secondly by skin protection.

The following list briefly describes the EPA Level categories:

Level A: Used when the greatest level of skin, eye, and respiratory protection is needed and consists of a totally encapsulated suit with supplied breathing air.

Level B: Used when the highest level of respiratory protection is needed but a lesser level (than Level A encapsulating suit) of skin protection is required.

Level C: Used when criteria for using air-purifying respirators are met and a lesser level of skin protection is required.

Level D: Used only as a work uniform and in areas without respiratory hazards.

B.5.2 Anticipated Levels of Protection

Based on the hazard analysis for this project, EPA defined Level D protective clothing will be the primary level of protection worn during site activities. The level of protection can and will be upgraded to EPA Level C if necessary, based on air monitoring (Section 6.0) or individual site hazards.

B.5.2.1 Level D

Level D protection is the lowest level of personal protection allowed on hazardous waste sites. Respiratory protection is not required, as the atmosphere is assumed to be breathable and uncontaminated.

Level D protection will consist of the "basic work clothing" plus:

- Hard hat;
- Coveralls/Standard Work Clothing;
- Safety glasses with protective side shields;
- Safety-toed work boots;
- Chemical-resistant (e.g., butyl or nitrile) inner gloves
- Immediately available half-face, air purifying respirator with NIOSH/MSHA approved combination organic vapor/acid gases/high efficiency dust filter (HEPA) cartridges (yellow/magenta).

Earplugs will be worn if, at any time, verbal communication becomes difficult to comprehend within a radius of three feet. Hard hats, safety glasses (goggles), and safety shoes must meet American National Standards Institute (ANSI) approval.

B.5.2.2 Level C

Level C protection is defined by the use of a full-face and/or half-face, air-purifying respirator. This level is used when low levels of contaminants of a known nature are present, sufficient oxygen is available, and are not considered immediately dangerous to life and health (IDLH).

Level C will consist of Level D above, plus:

- Half-face, air-purifying respirator with NIOSH/MSHA approved combination organic vapor/acid gases/high efficiency dust filter (HEPA) cartridges (yellow/magenta).
- Chemical-resistant or polyethylene-coated disposable outer coveralls (i.e. Tyvek™)
- Chemical-resistant (e.g., nitrile) outer gloves (taped to outer coveralls)
- Chemical-resistant (e.g., nitrile) inner gloves
- Chemical-resistant safety boots (taped to coveralls)

B.5.2.3 Levels A & B

Levels A and B protection are not anticipated during field activities. If it appears that these levels may be required, the SSO will immediately shut down and secure the operation and contact the HSO/CIH and POC/NTR for further guidance. The SSO will be responsible for determining the appropriate level of personal protection to be used based on the action levels established in this document. The SSO with the consent of the CIH and PM shall notify the POC/NTR prior to implementing any modifications to the PPE or levels of protection.

B.6.0 EXPOSURE MONITORING

This section outlines monitoring strategies that may be used to assess employee exposure to chemical hazards. The concentration or volatile organic vapors will be monitored using direct-reading instruments in both the worker breathing zones and at the boundaries of the EZ. Direct-reading instrumentation provides immediate values of specified contaminants. These techniques are useful screening methods for evaluating the proper level of personal protection and assistance in the determination of response action in emergency situations. The direct-reading instruments that will be used include a photo-ionization detector (PID) and an LEL/O_2 meter.

All direct-reading instruments will be calibrated daily or before each use and records detailing date, time, span gas, or other standard and the name of the person performing the calibration will be kept. The calibration gas for the PID is usually isobutylene. The calibration gas for the LEL is usually a methane/air or a hexane/air mixture. Oxygen is calibrated against normal air in a clean environment. A 100% nitrogen calibration gas will be used to "zero" the oxygen sensor. The direct-reading instruments will be calibrated in accordance with the standard operating procedures accompanying each instrument. The SSO will charge the batteries and verify that instruments are fully charged before each use.

B.6.1 Perimeter/Personnel Air Monitoring Activities

Air monitoring for background levels of air contamination upwind of each work location will be performed prior to the start of work. Monitoring with the PID in worker breathing zones and at the boundaries of the EZ will be conducted during excavation operations, soil sampling, and bulk soil handling and every 15 minutes when a potential for an exposure/event exists. If the PID reading shows a sustained concentration greater than 10 ppm above background, all personnel at the work location will wear an air-purifying respirator. If any time during field activities, the PID reading at the breathing zone reaches or exceeds 100 ppm, work will be discontinued, field personnel will move to the predetermined safe area for the site, and engineering measures shall be implemented until lower organic vapor readings are obtained. If PPE must be upgraded due to consistent organic vapor readings in excess of 100 ppm or other work conditions, then the work will not continue until SHSP has been revised to reflect new working conditions. Action levels for respiratory protection are presented in Table B-2.

B.7.0 DECONTAMINATION

Decontamination involves the physical removal and/or neutralization of harmful contaminants. The extent of decontamination depends on the hazard and the quantities of the contaminant.

Contamination can occur from:

- Contacting vapors, gases, mists, or air particulates;
- Splashes while sampling or opening containers;
- Walking or driving through puddles or on contaminated soil;
- Handling contaminated instruments or equipment;
- Assisting contaminated personnel during project operations, decontamination procedures, and emergencies;
- Vinyl Gloves (butyl gloves), and;

All decontamination will be performed by personnel wearing a level of protective gear that is appropriate for the level of decontamination.

B.7.1 Decontamination Procedures

Contamination reduction procedures appropriate for the existing work area will be developed and specified by the SSO. Such procedures must be in place before site operations begin, and they must remain in place (modified as necessary) throughout the period of activity. Whenever possible, the need for decontamination should be reduced through work practices that minimize contact with contaminants. Personnel should avoid walking through heavily contaminated areas, should not kneel or directly touch contaminated materials and should use remote handling and sampling techniques when feasible. Decontamination will be performed only in designated areas. Separate areas may be set up for equipment and personnel.

B.7.2 Decontamination Hazards

Contamination on the upper areas of protective clothing poses a greater risk to the worker because volatile compounds could make breathing hazardous both for the worker and for the decontamination personnel. There is also an increased probability of contaminant contact with the skin when the worker is doffing the upper part of the clothing. Disposable items (Tyvek™ coveralls, inner gloves, and safety-boots) must be replaced as they become heavily soiled, torn at any portion, or when personnel break for extended periods of time.

Dual respirator canisters will be changed as deemed appropriate by site air monitoring data and personnel determination of contaminant breakthrough. The assigned level of protection for a site also impacts the complexity of the decontamination effort. The higher the level of protection, the more equipment must be managed with every site entry or exit.

B.7.3 Personnel Decontamination

Decontamination procedures are carried out on all personnel leaving hazardous waste sites. Under no circumstances (except emergency evacuations) will personnel be allowed to leave the site without decontamination. Decontamination of personnel should be performed in the CRZ when exiting the EZ and should consist primarily of soap and water washing and water rinse of exterior protective gear to remove contaminants, followed by doffing of the gear. Coveralls should be removed by turning the clothing inside out. A procedure appropriate to the degree of contamination should be established. The extent of washing required, or modifications to the sequence, may be specified as appropriate.

B.7.3.1 Level D Personnel Decontamination

Personnel exiting the EZ while site activities require the use of Level D PPE (Section 5.1) will perform decontamination in accordance with the following guidelines:

- Place tools, instruments, samples and trash at an appropriate location. Plastic bags will be available for trash. Waste PPE will not be placed in the same containers as general trash;
- Inspect equipment and samples and, if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned off of equipment, samples, and tools prior to removal from the EZ;
- Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed;
- Prior to exiting the EZ areas, personnel will wash their hands with soap and water in order to minimize the potential for contaminant exposure.

B.7.3.2 Level C Personnel Decontamination

Personnel involved in site activities, which require the use of Level C PPE (Section 5.1) will observe the decontamination procedures outlined below.

These guidelines consist of the following:

- Place tools, instruments, samples and trash at an appropriate location. These areas should be clean and dry, and will be supplied with plastic trash bags. Waste PPE will not be placed in the same containers as general trash.
- Inspect equipment and tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned off of equipment, samples and tools prior to removal from the EZ areas.
- Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.
- Wash and Rinse outer work gloves and boots (boot covers) with soap and water.
- Wash/brush off outer protective coverall (Tyvek).
- Untape wrists and ankles.
- Remove outer work gloves and place them in a specified waste PPE container.
- Remove outer Tyvek coveralls and place them in a specified waste PPE container.
- Remove eye protection.
- Remove respirator mask, if worn.
- Wash hands using a soap and water solution.

B.7.4 Equipment Decontamination

Decontamination will be performed on heavy equipment, tools, sampling equipment, sample containers and the decontamination equipment itself after all decontamination activities have been completed. Before entering the site, all equipment will be cleaned to remove potential contaminants. Wherever possible, gross contamination of equipment will be removed in the EZ prior to bringing equipment back to the CRZ or decontamination area. General equipment decontamination consists of a soap and water wash followed by a water rinse. The following procedures shall be implemented if and when necessary:

B.7.4.1 Tools

Tools will be dropped into a plastic pail, tub or other container in the EZ. They will be brushed off, rinsed, and transferred into a second pail to be carried to the decontamination station. Generally, tools will be washed with a detergent solution and then final rinsed with de-ionized water. Do not use wooden tools, as they cannot be adequately decontaminated due to their absorptive properties.

B.7.4.2 Sampling Equipment

Sampling equipment will be decontaminated before and between sampling to prevent cross contamination, and when the equipment leaves the EZ. Sampling equipment may include trowels, shovels, bailers, split-spoon sampler, sleeves and backhoe buckets. All sampling equipment will be decontaminated using an Alconox wash, or equivalent, followed by two clean water rinses. The sampling tool will then be rinsed with de-ionized or distilled water and air-dried.

B.7.4.3 Heavy Equipment

Backhoes, loaders and other heavy equipment shall be cleaned with high-pressure water or a portable high-pressure steam spray followed by a soap and water wash and rinse. Loose material shall be removed by brush. All decontamination water be collected, stored in 55-gallon steel drums and sampled to determine the proper disposal characterization.

B.7.4.4 Respirator Decontamination

Respirators, when worn, will be discarded or decontaminated daily. Taken from the storage area, the masks will be disassembled, the cartridges either set aside or disposed of and the rest placed in a cleansing solution. Personnel will inspect their own masks to be sure of proper strap adjustment for correct fit. Certain parts of contaminated respirators, such as the harness assembly or cloth components, are difficult to decontaminate. If grossly contaminated, they will be discarded and replaced.

In addition to being decontaminated, all respirators, protective clothing, and other personal articles must be sanitized before they can be used again. The insides of masks and clothing become soiled from exhalation, body oils, and perspiration. Field personnel shall follow the manufacturer's instructions for respirator mask sanitization.

B.7.5 Disposal of Decontamination Waste

Solid and liquid decontamination waste should be containerized. Solids may be either double-bagged or placed in a sealed drum or equivalent container. Liquids will be collected during decontamination and placed in 55-gallon drums or pumped into holding tanks for future testing

and disposal. The drums will be clearly labeled for content, the operation from which they were filled, and the dates. Waste will not be stored on-site for more than 90 days.

B.7.6 Decontamination during Emergencies

Often during emergencies the need to quickly respond to an accident or injury must be weighed against the risk to the injured party from chemical exposure. Time lost or the additional handling of an injured person during the decontamination process may cause greater harm to the individual than the exposure that would be received by undressing that person without proper decontamination. This decision must be made by the SSO. The SSO, as the on-site focus for safety matters, must be familiar with the safety criteria and the logic behind them. Each operation is different, and the risks to personnel from exposure vs. injury also vary.

An additional consideration to include when bypassing decontamination of injured personnel is the acceptance of contaminated personnel at emergency medical facilities. Many facilities will not accept contaminated personnel. Site response personnel should accompany contaminated victims to the medical facility to advise on matters involving decontamination. A copy of SHSP will accompany the injured worker to the medical facility.

B.7.6.1 Physical Injury

Physical injuries can range from minor to life threatening. Life-saving care should be instituted immediately without considering decontamination. The outside garments can be removed (depending on the weather) if this does not cause delays, interfere with treatment, or aggravate the problem. Respiratory masks and backpack assemblies must always be removed. Fully encapsulating suits or chemical-resistant clothing can be cut away.

If the outer contaminated garments cannot be safely removed, the individual should be wrapped in plastic, rubber, or blankets to help prevent contaminating medical personnel and/or the inside of ambulances. Outside garments are then removed at the medical facility. No attempt should be made to wash or rinse the victim unless it is known that he has been contaminated with an extremely toxic or corrosive material that could also cause severe injury or loss of life. For minor medical problems or injuries, the normal decontamination procedure should be followed.

B.7.6.2 Heat Stress

Heat-related illness ranges from heat fatigue to heat stroke, the latter being the most serious. Heat stroke requires prompt treatment to prevent irreversible damage to health or death. Protective clothing may have to be cut off. Less serious forms of heat stress require prompt attention or they may lead to a heat stroke. Unless the victim is obviously contaminated, decontamination should be omitted or minimized and treatment begun immediately.

B.7.6.3 Chemical Exposure

Chemical exposure can be divided into two categories:

1. Direct contact through touch (e.g. acid burns), inhalation, and/or ingestion.
2. Indirect contact through gross contamination of clothing or equipment

Only a qualified physician can treat contaminant inhalation and/or ingestion injuries. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract its effect. First-aid treatment will involve flooding the affected area with copious quantities of water. The treatment of acid or base exposure will also be the same.

When protective clothing is grossly contaminated, contaminants may be transferred to the wearer or to treatment personnel and cause injuries. Unless splashing may cause severe medical problems, the protective clothing should be washed off as rapidly as possible and carefully removed. Personnel must be aware of the chemical properties of the site hazards as well as the decon rinse solutions used to prevent cross contamination during the sampling process.

B.8.0 EMERGENCY PROCEDURES

B.8.1 Communications

Communication program including the use of signals, and cellular phones among workers shall be implemented during the project. Workers are to use the "buddy system" at all times and be cognizant of the reduction of communication abilities in high noise areas. The specific hand signals to be used during the project shall be discussed in the tailgate safety meeting. In case of an emergency, an air horn shall be used to alert site personnel. Any sounding of this device shall be cause to stop work and retreat to the predetermined safe area for further direction or information. The emergency meeting location for this project will be adjacent to the main gate on Trabuco Road. The emergency evacuation route is presented in Figure B-2.

B.8.2 First Aid

A first aid kit and fire extinguisher will be located in the SZ. The first aid kit will contain the American Red Cross first aid manual. If an injured individual requires further attention, the individual will be immediately transported to the nearest hospital. A map illustrating the route to the nearest emergency medical facility will be present on site (Figure B-3). If necessary, the victim will be decontaminated prior to transport to the facility; if the injury is serious, decontamination is of secondary importance. A copy of this SHSP will accompany the injured worker(s) to the medical facility. All accidents, without regard to severity, will be reported, in writing, to the HSO by the PM within 24 hours.

General first aid procedures are outlined below.

- Skin Contact: Use copious amounts of soap and water. Wash/rinse affected area thoroughly and then provide appropriate medical attention. Eyewash and emergency shower or drench system will be provided on-site at the contamination reduction zone and/or support zone as appropriate. Eyes should be rinsed for 15 minutes upon chemical contact.
- Inhalation: Move to fresh air and, if necessary, decontaminate and transport to hospital. Any loss of consciousness or exposure to airborne toxic substances, even if the individual appears to have fully recovered, will require immediate treatment or surveillance by a qualified physician.
- Ingestion: Notify Poison Control Center and emergency medical facility and transport to nearest emergency medical facility immediately.
- Puncture Wound or Laceration: Decontaminate and transport to emergency medical facility. Apply direct compression to stop or slow the flow of blood. Universal precautions, in order to prevent contacting the blood of another, shall be implemented.

B.8.3 Emergency Assistance

The name, telephone number, and location of police, fire, and other emergency response agencies will be posted in the support zone. If emergency personnel are called to the site, efforts should be made to accommodate their operations in the support zone. Emergency telephone numbers for this project are presented in Table B-3.

B.9.0 SPILL AND DISCHARGE CONTROL PLAN

A Spill and Discharge Control Plan has been developed to prevent the contamination of soils, water, atmosphere, uncontaminated areas/surfaces, equipment or material by the uncontrolled release of hazardous waste and materials to the removal and disposal operations involved in this project. The following spill control equipment will be available in the event of a liquid or solid spill:

B.9.1 Solid Material Spills

- Sand or other appropriate spill absorbent material
- Backhoe
- 55-gallon drums
- Shovels
- Decontamination supplies and protective clothing
- Hand operated pump

Regardless of the type of spill (liquid or solid), the following measures will be taken to isolate the spilled material(s):

- Isolate and contain the hazardous spill area
- Restrict access of unauthorized personnel
- Prevent contact with the spilled material
- Relocate upwind and up gradient of the spilled material
- Take air, soil, or appropriate samples to determine if clean-up is complete

B.9.2 Liquid Material Spills

Liquid spills during tank content removal should be adsorbed with sand or other appropriate absorbent material. The absorbent material will be incorporated into the contaminated stockpiled soil. The final disposition of the absorbent material will be determined in conjunction with the stockpiled soil.

In the event of a discharge of liquid into the soil, GEOFON will immediately identify the location of the discharge and take appropriate remedial actions to eliminate further spillage. The discharged liquid material will be controlled and disposed of as described above. The process shall be coordinated with the POC/NTR and the RPM.

B.10.0 MEDICAL SURVEILLANCE

B.10.1 Medical Examination Requirements

All GEOFON and Subcontractor project personnel working on-site will have undergone either a baseline or annual medical monitoring examination within 11 months prior to participation in fieldwork. Medical screening is conducted at the start of employment and annually thereafter, and may consist of the following as directed by the medical doctor:

- Medical and occupational history
- Physical examination, with particular attention to the cardiopulmonary system, general physical fitness, skin, blood forming, hepatic, renal, and nervous systems:
- Urinalysis
- Blood analysis
- Pulmonary function test
- Additional tests as appropriate, including
- Chest X-ray
- Electrocardiogram

Based on this examination, the physician will certify in writing whether the individual is capable of full participation in the program, or whether that person must work within certain restrictions. Personnel may be excluded from this project for medical reasons. Any person exposed to high levels of hazardous substances will be required to undergo a repeat medical surveillance examination at, or if necessary, before the conclusion of the project to determine the medical implications of the exposure. Any person suffering a lost-time injury or illness must have medical approval prior to returning to work on-site.

B.10.2 Record Keeping

All medical records must be maintained by the employer for a period of at least 30 years after the employee's termination of employment, in accordance with OSHA regulations on confidentially and record keeping. Prior to the initiation of work, subcontractors will submit to the GEOFON HSO copies of medical fitness certifications for each employee to be assigned to the site. The certifications will state that the employee has received a medical examination within the previous 12 months and has been determined fit to perform onsite work.

B.11.0 TRAINING

As required by OSHA regulations (29 CFR 1910.120), all GEOFON and Subcontractor personnel involved in hazardous waste site operations are required to receive an initial 40 hours of health and safety training and receive refresher training annually. All site personnel will complete this general (not site-specific) training by before assignment to the project. The course content of this training will include, but not be limited to the following:

- Names of personnel and alternates responsible for Site safety and health
- Safety, health, and other hazards present on the Site
- Using protective clothing and equipment
- Work practices by which the employee can minimize risks from hazards
- Safe use of engineering controls and equipment on the Site
- Medical surveillance requirements including recognition of symptoms and signs which might indicate overexposure to hazards
- Emergency response procedures
- Refresher training requirements

In addition, the on-site management and supervisors/HSO will receive an additional eight hours of specialized hazardous waste operations management training with eight-hour refresher training annually. This training will include, but not limited, to the following:

- The employer's safety and health program
- Associated employee training program
- PPE program
- Spill containment program
- Health hazard monitoring procedures and techniques
- CPR/First Aid Training

The HSO will keep copies of the certification for the completion of such training for all site workers on-site in a file. Workers without such certification will not be allowed to work at the site. Prior to commencement of field operations at the project site, personnel will receive site-specific training (briefed in the tailgate safety meeting), this training will include a review of all information contained in this Health and Safety Plan with particular emphasis on the following:

- Types and anticipated levels of hazardous substances known to be present on-site, their permissible exposure limits, health effects, and exposure routes.
- The need for personal protective equipment.
- The importance of maintenance and attention to proper fit of personal protective equipment.
- Prescribed decontamination procedures.
- Safe work practices, such as proper site entry and egress, and proper hygiene during meal and rest breaks.
- Recognition, in oneself and others, of physical conditions requiring immediate medical attention, especially heat stress, and application of simple first aid measures.
- Procedures to be followed in case of emergencies.

In addition to the 40-hour training, GEOFON personnel involved in the field operations will have an additional three (3) days of field experience under the direction of a skilled supervisor on similar kind of projects.

B.12.0 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the PM or HSO/CIH will determine if work can continue without endangering the health and safety of the field workers. The HSO/CIH will monitor the weather news both at AM and PM through the Radio and will document it in the contractor production report. He will also coordinate with the local/base observatory to obtain more specific information about the current weather conditions at the base. The coordination with the observatory will be done through the POC/NTR. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries
- Dangerous weather-related working conditions (e.g., high winds, rain, smog, fog)
- Limited visibility
- Potential for electrical storms. No outdoor activities will be permitted during electrical storms.

B.13.0 REFERENCE SOURCES

The content of this plan is consistent with the following regulatory requirements and guidelines:

- Occupational Safety and Health Standards, Title 29 CFR Parts 1910 and 1926, U.S. Department of Labor, Occupational Safety and Health Administration (OSHA).
- Occupational Safety and Health Administration (OSHA) Standards: Title 29 Code of Federal Regulations (CFR) Sections 1910.1001 and 1926.58 (as amended), 1910.134, 1910.20 and 1910.1200.
- U.S. Environmental Protection Agency (EPA) Standards; Title 40 CFR, Part 61, Subpart M; Title 40 CFR, Part 763, Subpart E; Title 40 CFR Part 763, Subpart G.
- OSHA Standards for Hazardous Waste Operations and Emergency Response, Final Rule. 29 CFR 1910.120.54 FR 9294, March 6, 1989.
- OSHA Air Contaminants: Permissible Exposure Limits (PELs) 29 CFR 1910.1000.54 FR 2332, January 19, 1989.
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/EPA/USCG, DHHS (NIOSH) Publication No. 85-115, 1985.
- Navy/Marine Corps Installation Restoration Manual, February 1997.
- U.S. Army Corps of Engineers Safety & Health Requirements Manual, EM 385-1-1. September 1996.
- Occupational Diseases, A Guide to their Recognition, USDHEW (1977)
- Tyver D.F. and K.A. Anderson, Industrial Medicine Desk Reference, Chapman & Hall (1986)
- Chemical Information File, USDOL-OSHA 1985
- OSHA CD-ROM A95-2 (1995 3Q)
- Hamilton. A. and H. L. Hardy, Industrial Toxicology, 3rd. ed., Publishing Sciences Group, Inc., Acton, Mass, (1974)
- Williams, P.L. & J.L. Burston, Industrial Toxicology, VNR 1985
- NIOSH Pocket Guide to Chemical Hazards. DOHS Pub No. 90-117
- National Library of Medicine, Specialized Information Services (TOXNET)
- GEOFON, Health and Safety Policy and Procedures Manual, December 1997.

FIGURES

SENSITIVE RECORD

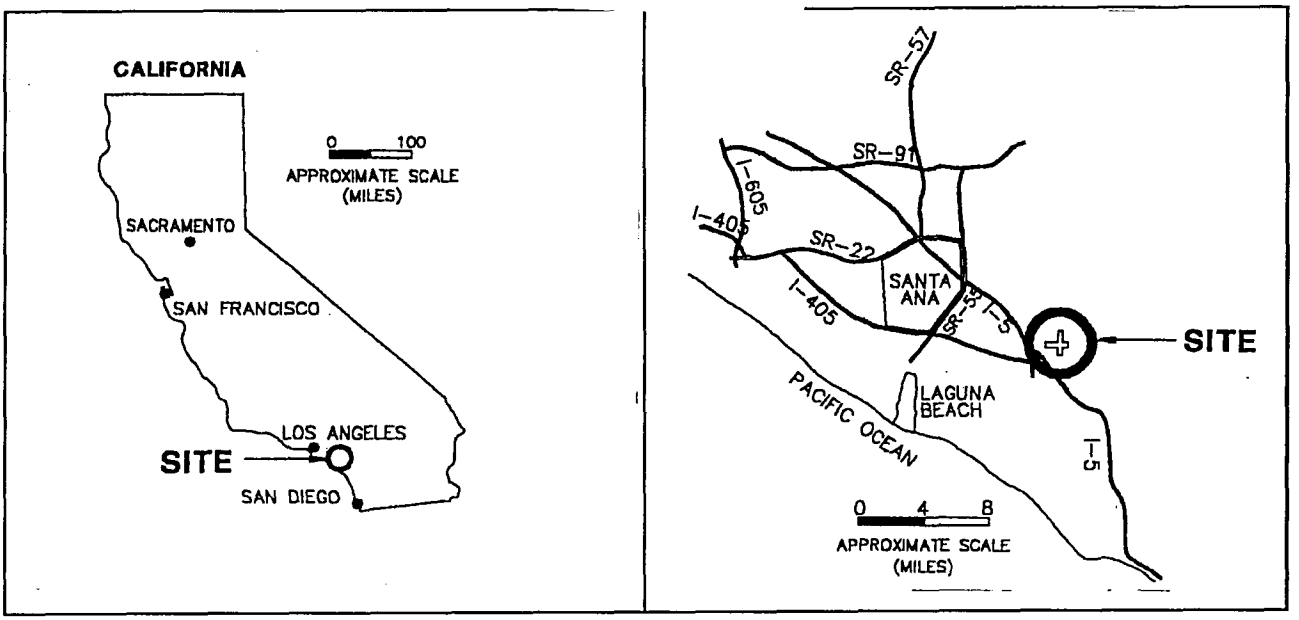
PORTIONS OF THIS RECORD ARE CONSIDERED SENSITIVE AND ARE NOT AVAILABLE FOR PUBLIC VIEWING

FIGURES B-1 THROUGH B-3

FOR ADDITIONAL INFORMATION, CONTACT:

DIANE C. SILVA, RECORDS MANAGER
NAVAL FACILITIES ENGINEERING COMMAND, SOUTHWEST
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132

TELEPHONE: (619) 556-1280
E-MAIL: diane.silva@navy.mil



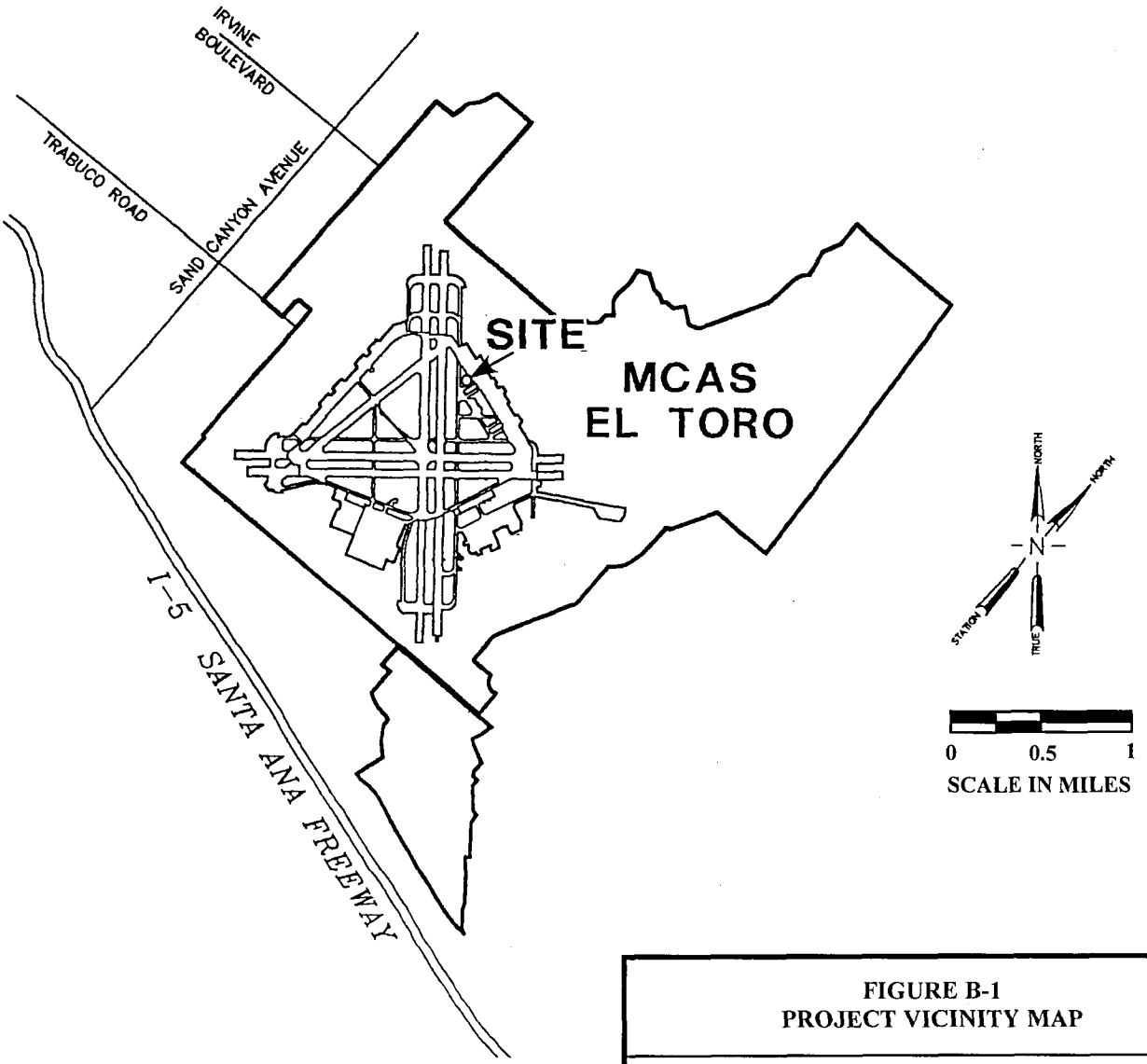


FIGURE B-1
PROJECT VICINITY MAP

Former Marine Corps Air Station (MCAS)
El Toro, California

GEOFON INCORPORATED

Date: June, 2004
Contract No.: N68711-01-D-6008

SENSITIVE

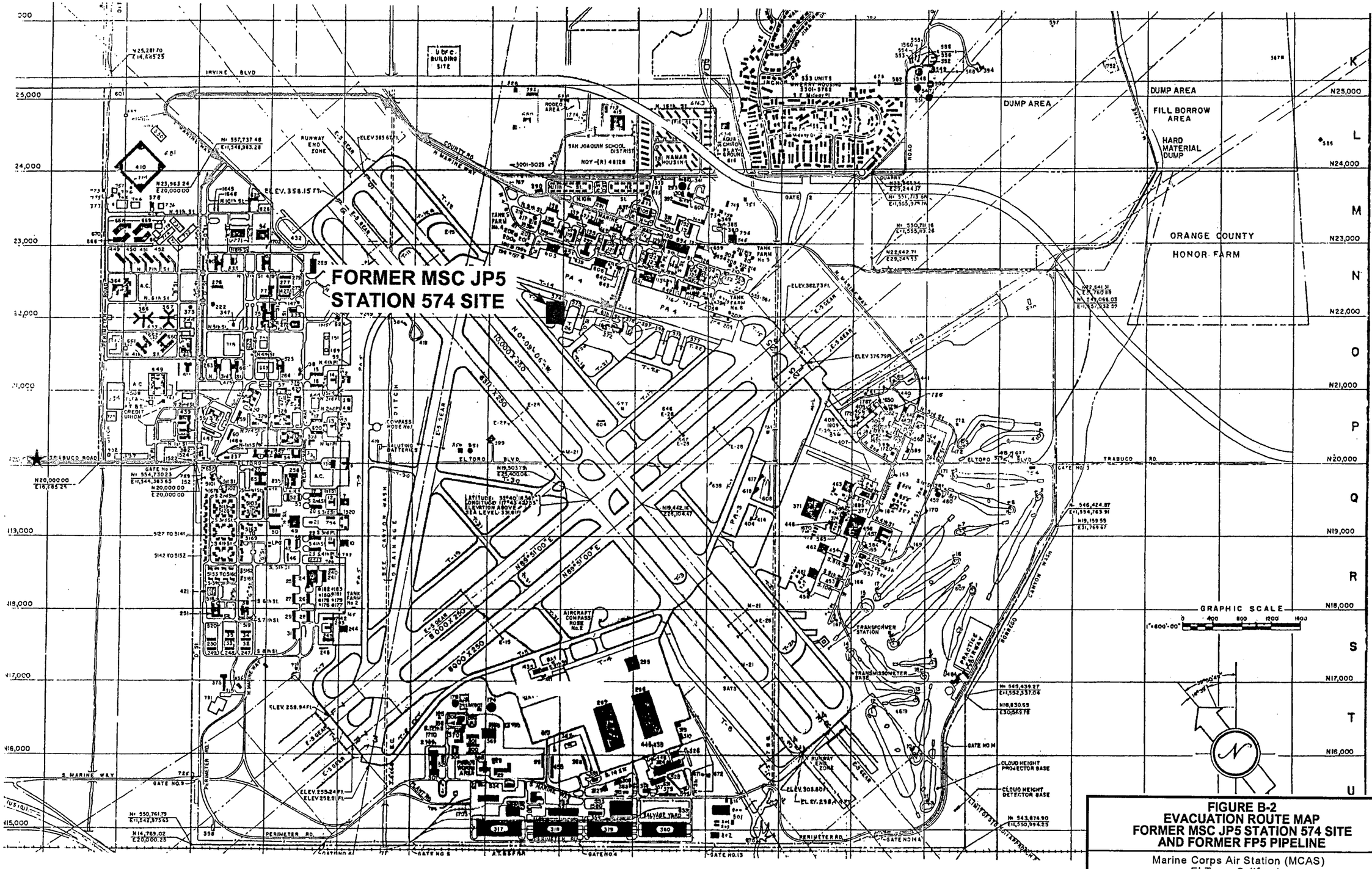


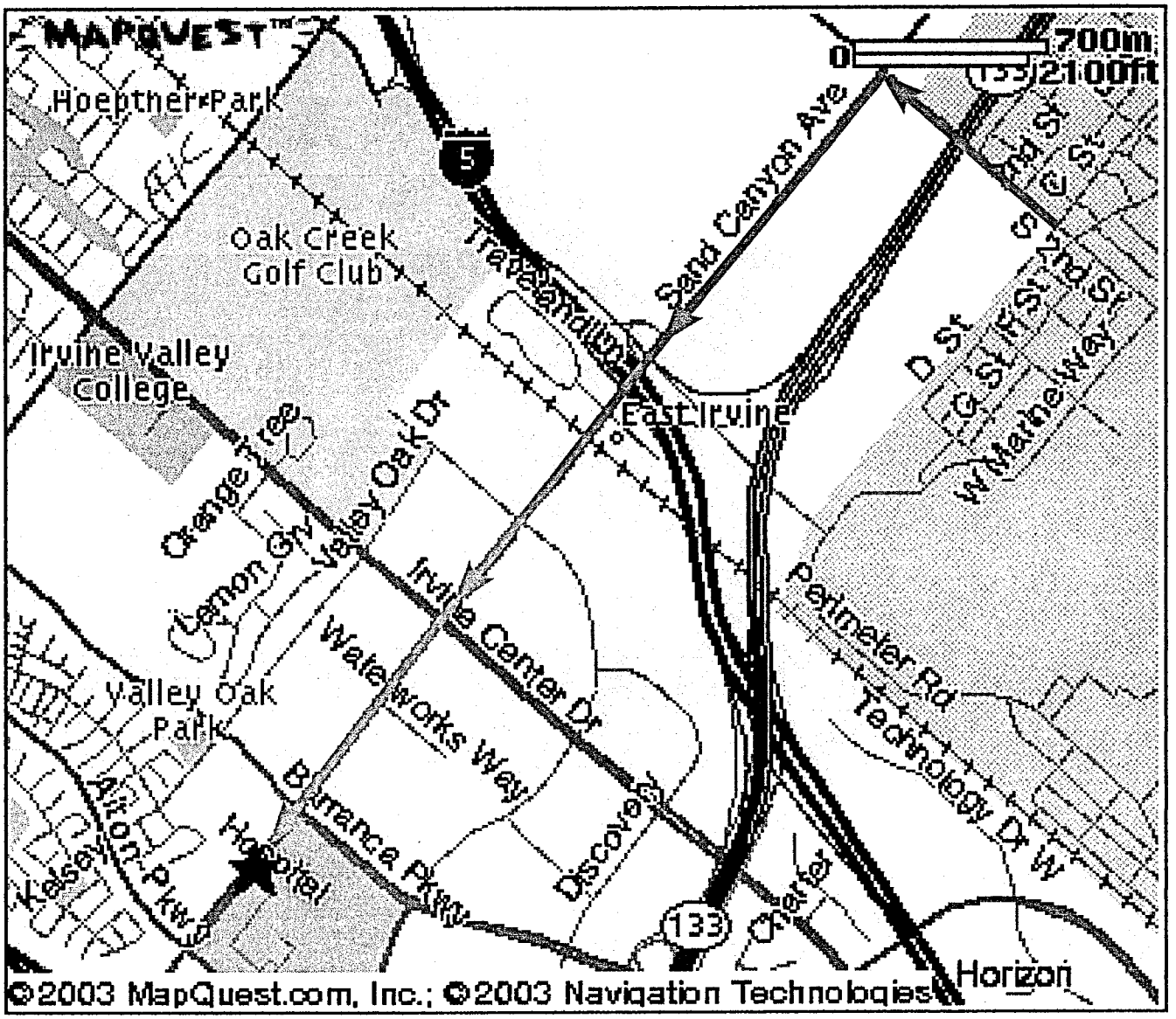
FIGURE B-2
EVACUATION ROUTE MAP
FORMER MSC JP5 STATION 574 SITE
AND FORMER FP5 PIPELINE

Marine Corps Air Station (MCAS)
El Toro, California

GEOFON INCORPORATED

Date: June, 2004
Contract No.: N68711-01-D-6008

SENSITIVE



Route to Hospital:

Exit MCAS, El Toro on Trabuco Road
Turn Left onto Sand Canyon Ave
Proceed approximately 2 miles south
to the Irvine Medical Center

Hospital Address and Telephone:

Irvine Regional Hospital and Medical Center
16200 Sand Canyon Avenue
Irvine, CA. 92618
Emergency Room Operator (949) 753-2250

Reference: Map Provided by Mapquest.com

N

FIGURE B-3
ROUTE TO HOSPITAL MAP

Marine Corps Air Station, El Toro, California

GEOFON INCORPORATED

Date: June, 2004
Contract No.: N68711-02-F-8210

TABLES

TABLE B-1
TASK HAZARD ANALYSIS # 1

ACTIVITY: **Mobilization, Site Setup and, General Work Procedures** **ANALYZED BY:** Nadine Doughman **DATE:** _____ **REVIEWED BY:** Maureen Sassoon, CIH **DATE:** _____

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Mobilization of Equipment and Supplies	Slip, Trip, and Fall Hazards	• Work areas shall be visually inspected. Slip, trip, and fall hazards shall be marked, barricaded, or eliminated as feasible. • Proper illumination shall be maintained in all work areas.
	Heavy Equipment Hazards	• There shall be one spotter/signal person per piece of machinery. • Communication such as hand signals, two-way radios, etc. shall be utilized by the operation and surrounding personnel. • Equipment will be operated by trained/experience personnel only • All self-propelled equipment shall be equipped with Roll-Over Protection Systems (ROPS), seat belt, and back-up alarms. • Equipment shall not be used on unstable or unsafe inclines • Hard hats and colored vests will be required when working around moving equipment, cranes, and construction vehicles. • Do not stand beneath suspended equipment or in the path of moving vehicles.
Installation of Temporary Support Facilities	Noise Exposure	• Hearing protection will be required when sound levels exceed 85 dBA continuously. Areas where hearing protection is required shall display warning signs requiring hearing protection.
	Heat Stress	• Follow the heat stress procedures referenced in the SHSP.
	Noise Exposure	• Hearing protection will be required when sound levels exceed 85 dBA continuously. Areas where hearing protection is required shall display warning signs requiring hearing protection.
	Hand/Power Tools	• Inspect hand/power tools before each use. • Use tools designed for the activity.
	Heat Stress	• Follow the heat stress procedures referenced in the SHSP.

TABLE B-1 (CONT'D)
TASK HAZARD ANALYSIS # _1_

ACTIVITY: **Mobilization, Site Setup and, General Work Procedures** **ANALYZED BY:** Nadine Doughman **DATE:** _____ **REVIEWED BY:** Maureen Sassoon, CIH **DATE:** _____

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Installation of Temporary Support Facilities (Continued)	Electrical Hazards	• Only qualified electricians shall be allowed to hook up electrical circuits. • All extensions cords shall be inspected daily for structural integrity, ground continuity, and damaged areas. • Shut down and lockout any equipment which is found to have frayed or loose connections in accordance with GEOFON Standard Operating Position for Mechanical& Electrical Lockout/Tagout, Section L. • Electric wire or flexible cord passing through work area shall be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections or pinching. • All electrical circuits shall be grounded in accordance with the National Electrical Code or other applicable regulations or standards

TABLE B-1 (CONT'D)
TASK HAZARD ANALYSIS # 2

ACTIVITY: **Drilling of Soil Borings** **ANALYZED BY:** Nadine Doughman **REVIEWED BY:** Maureen Sassoon, CIH
DATE: _____ **DATE:** _____

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Drilling of Soil Borings	Heavy Equipment Hazards	• Inspect drilling equipment at beginning and during each shift. • Equipment will be operated by trained/experienced personnel only. • All self-propelled equipment shall be equipped with Roll-Over Protection Systems (ROPS), seat belt, and back-up alarms. • Restrain loose clothing with duct tape to prevent entanglement in moving parts. • Keep feet and hands clear of moving/suspended materials or equipment. • Keep machine guards in place. • Hard hats and orange colored vests will be required when working around moving equipment, cranes, and construction vehicles. • Do not stand beneath suspended equipment or in the path of moving vehicles.
	Overhead and Underground Utilities	• Notify underground utilities prior to drilling. • Keep boom at least 20 feet away from overhead utilities.
	Chemical Hazards	• Exclusion zone shall be delineated and Level D PPE shall be worn. • Air monitoring shall be performed using direct reading instruments (PID and/or LEL/O_2) • Use ambient air monitoring and visual monitoring to verify selection of PPE
	Slip, Trip, and Fall Hazards	• Work areas shall be visually inspected. Slip, trip, and fall hazards shall be marked, barricaded, or eliminated as feasible. • Proper illumination shall be maintained in all work areas.
	Noise Exposure	• Hearing protection will be required when sound levels exceed 85 dBA continuously. Areas where hearing protection is required shall display warning signs requiring hearing protection.

TABLE B-1 (CONT'D)
TASK HAZARD ANALYSIS # _3_

ACTIVITY: **Soil Sampling** **ANALYZED BY:** Nadine Doughman **REVIEWED BY:** Maureen Sassoon, CIH

DATE: _____ **DATE:** _____

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Soil Sampling	Chemical Hazards	• Level D PPE shall be worn. • Air monitoring shall be performed using direct reading instruments (PID and/or LEL/O_2) • Use ambient air monitoring and visual monitoring to verify selection of PPE
	Hand/Power Tools	• Inspect hand/power tools before each use. • Use tools designed for the activity.
	Cross Contamination	• Sampling equipment will be decontaminated before and between sampling. • Sampling equipment will be decontaminated per Section 7.4
	Slip, Trip, and Fall Hazards	• Work areas shall be visually inspected. Slip, trip, and fall hazards shall be marked, barricaded, or eliminated as feasible. • Proper illumination shall be maintained in all work areas.

TABLE B-1 (CONT'D)
TASK HAZARD ANALYSIS # 4

ACTIVITY: **Demobilization** **ANALYZED BY:** Nadine Doughman **REVIEWED BY:** Maureen Sassoon, CIH
DATE: **DATE:**

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Mobilization of Equipment and Supplies	Slip, Trip, and Fall Hazards	• Work areas shall be visually inspected. Slip, trip, and fall hazards shall be marked, barricaded, or eliminated as feasible. • Proper illumination shall be maintained in all work areas.
	Heavy Equipment Hazards	• There shall be one spotter/signal person per piece of machinery. • Communication such as hand signals, two-way radios, etc. shall be utilized by the operation and surrounding personnel. • Equipment will be operated by trained/experience personnel only • All self-propelled equipment shall be equipped with Roll-Over Protection Systems (ROPS), seat belt, and back-up alarms. • Equipment shall not be used on unstable or unsafe inclines • Hard hats and colored vests will be required when working around moving equipment, cranes, and construction vehicles. • Do not stand beneath suspended equipment or in the path of moving vehicles.
Installation of Temporary Support Facilities	Noise Exposure	• Hearing protection will be required when sound levels exceed 85 dBA continuously. Areas where hearing protection is required shall display warning signs requiring hearing protection.
	Heat Stress	• Follow the heat stress procedures referenced in the SHSP.
	Noise Exposure	• Hearing protection will be required when sound levels exceed 85 dBA continuously. Areas where hearing protection is required shall display warning signs requiring hearing protection.
	Hand/Power Tools	• Inspect hand/power tools before each use. • Use tools designed for the activity.
	Heat Stress	Follow the heat stress procedures referenced in the SHSP.

TABLE B-1 (CONT'D)
TASK HAZARD ANALYSIS # 4

ACTIVITY: **Demobilization** **ANALYZED BY:** Nadine Doughman **REVIEWED BY:** Maureen Sassoon, CIH
DATE: **DATE:**

PRINCIPLE STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Installation of Temporary Support Facilities (Continued)	Electrical Hazards	• Only qualified electricians shall be allowed to hook up electrical circuits. • All extensions cords shall be inspected daily for structural integrity, ground continuity, and damaged areas. • Shut down and lockout any equipment which is found to have frayed or loose connections in accordance with GEOFON Standard Operating Position for Mechanical& Electrical Lockout/Tagout, Section L. • Electric wire or flexible cord passing through work area shall be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections or pinching. • All electrical circuits shall be grounded in accordance with the National Electrical Code or other applicable regulations or standards

TABLE B-2

ACTION LEVELS
FORMER MCAS EL TORO, CALIFORNIA

Monitoring Device	Action Level	Action
PID or Equivalent	0 to 10 PPM in Breathing Zone	Wear Level D PPE
PID or Equivalent	> 10 to 100 PPM in Breathing Zone	Don Air-Purifying respirator
PID or equivalent	> 50 PPM 3" from soil	Initiate control measures
PID or equivalent	> 100 PPM	Work will be discontinued, personnel will evacuate to the predetermined safe area, and control measures initiated

PID: Photo-ionization Detector
PPM: Parts Per Million
PPE: Personal Protective Equipment

TABLE B-3
EMERGENCY TELEPHONE NUMBERS
MARINE CORPS AIR STATION (MCAS), EL TORO

Emergency Services		
Fire Department		911
Irvine Police (Main Gate)		Land Line (949) 654-7863
Ambulance Service		911
Irvine Medical Center		(949) 753-2000 Administration
16200 Sand Canyon Avenue, Irvine, CA.		(949) 753-2250 Emergency Room
Poison Control Center		(800) 544-4404
Department of Environmental Services		(800) 258-6942
National Response Center		
Toxic Chemicals and Oil Spills		(800) 424-8802
GEOFON, Inc.		
Asrar Faheem	Senior Project Manager	Office (909) 396-7662
		Cellular (619) 843-5975
Sree Akkenapally	Project Manager	Office (909) 396-7662
		Cellular (714) 920-7154
Curtis Conner	Health & Safety Officer	Cellular (949) 981-6757
Steve Mulligan	Corporate QC Officer	Cellular: (714) 920-7154
Dr. Maureen Sassoon	Certified Industrial Hygienist	Office (310) 544-2912
Charles Parada	Site Safety Officer	Cellular: (562) 577-4895
To Be Named	Alternate Site Safety Officer	
Onsite Contacts		
Scott Kehe	ROICC	Office (949) 726-2506
		Cellular: (619) 778-7464
Ed Nunn	CSO	(619) 572-1404
Navy Contacts		
Lynn Hornecker	RPM, SWDIV	Office (619) 532-0783
Gracy Tinker	CS, SWDIV	Office: (619) 532-0782
		Fax: (619) 532-0780
Regulatory Agencies		
Arghavan Rashidi-Fard	OCHCA	Office (714) 667-3713
John Broderick	CRWQCB, Santa Ana Region	Office: (909) 782-4494

ATTACHMENT B-1

SAFETY COMPLIANCE AGREEMENT FORM

SAFETY COMPLIANCE AGREEMENT FORM

Site: Former MSC JP5 Station 574 Site and JP5 Pipeline, Former MCAS El Toro, California
SWDIV Contract No.: N68711-01-D-6008

I the undersigned, acknowledge that I have attended the safety meeting, and. I have read and understood this safety plan, and do agree to assertively adhere to the specifications within. I understand that I may be prohibited from continuing work on the project for failing to comply with this Health and Safety Plan.

SIGNATURE & NAME	COMPANY	DATE
_____	_____	_____
( )		
_____	_____	_____
( )		
_____	_____	_____
( )		
_____	_____	_____
( )		
_____	_____	_____
( )		
_____	_____	_____
( )		
_____	_____	_____
( )		
_____	_____	_____
( )		
_____	_____	_____
( )		

Meeting Conducted by: _____

ATTACHMENT B-2

SAFETY COMPLETION REPORT

SAFETY COMPLETION REPORT

A completed copy of this report is to be placed into the project files within seven days of the completion of site work.

Site Name: _____ Project: _____

Project Manager: _____ SSO: _____

Safety Plan:

Was the plan complete? _____

Was the plan appropriate to conditions found onsite? _____

Was more information on the site available but not included? _____

Was the plan clear and understandable? _____

Plan implementation:

What levels of protection were used? A____ B____ C____ D____

Field Air Monitoring Results:

	High	Low	Typical
Former MSC JP5 Station 574 Site	_____	_____	_____
Former MSC JP5 Pipeline Segments	_____	_____	_____

Air Monitoring Results: _____

_____

Any Equipment Problems? (Include ID #) _____

_____

Level of General Site Control (Good, Moderate, Poor): _____

Evaluate General GEOFON and Subcontractor Compliance/Performance:

_____

_____

_____

Comments: _____

_____

_____

_____