PORT OF OAKLAND

Need to:
- verify BTEX soil C.U. levels
- Req notification for witness sampling

#1222

January 27, 1999

Mr. Barney Chan
Alameda County Health Care Services Agency
Environmental Protection (LOP)
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Subject: **Final Work Plan for the Remediation of the Petroleum Hydrocarbon Release, Pacific Dry Dock Yard II, 321 Embarcadero Road, Oakland**

Dear Mr. Chan:

Please find enclosed the final work plan prepared by the Port of Oakland's as-needed consultant, Camp, Dresser & Mckee, Inc., that addresses the contamination and remediation of petroleum hydrocarbon release at 321 Embarcadero Road, Oakland. The work plan describes activities to be conducted by the Port of Oakland and its remediation contractor, including: soil excavation in the area of the two former USTs; removal of abandoned piping; disposal of wastes generated during excavation; soil and groundwater sampling; and health and safety requirements.

If you have any questions regarding the work plan, please contact me at 510-272-1184. Thank you for your attention in this matter.

Sincerely,

Douglas P. Herman
Assistant Port Environmental Scientist

encl.

cc: Michele Heffes (w/encl)

Neil Werner (w/o encl)
Joyce Washington "
Randy Smith, CDM "

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530 Water Street ■ Jack London Square ■ P.O. Box 2064 ■ Oakland, California 94604-2064
Telephone (510) 272-1100 ■ Fax (510) 272-1172 ■ TDD (510) 763-5703 ■ Cable address, PORTOFOAK, Oakland

SCA

Environmental, Inc.

Engineering and Environmental Consultants

January 25, 1999

Mr. Randy Smith, PE
Camp Dresser & McKee, Inc.
100 Pringle Avenue, Suite 300
Walnut Creek, CA 94596

RE: Final Work Plan - Subsurface Investigation & Remediation
Two Underground Storage Tank Sites
Pacific Dry Dock Yard II, 321 Embarcadero, Port of Oakland, CA
SCA Project No.: F-3070

Dear Mr. Smith:

Attached please find one copy of the Final Work Plan for this project. This Final Work Plan incorporates comments from Barney Chan of the Alameda County Health Care Services Agency (ACHSA), letter dated December 4, 1998. ACHSA's comments and the changes made are summarized as follows:

Review Comment (Abridged)	Response to Comment	Corresponding Section(s) in Workplan
In the absence of site-specific toxicity data, use the cleanup levels from the December 11, 1997 SFIA Water Board Order.	SFIA Order 95-136 and the December 11, 1997 and July 16, 1998 updates have been incorporated into the Final Work Plan.	Appendix A, Table 2
Industrial PRGs may be used for semi-volatile levels	Industrial PRGs have been incorporated into the Final Work Plan.	Appendix A, Table 2
Use a more appropriate screening tool for TPHd, TPHmo, and semi-volatile compounds.	Final Work Plan has been modified to reference a field screening kit instead of a PID for this purpose. A PID will still be used for health and safety monitoring.	Section 3.10 (page 9) 10 Appendix A, Section 1.
Clarification needed for conditions under which excavation would be terminated	When the concentration of contaminant increases with the distance from the UST, it is highly possible that there is another source of contamination other than the UST. In any event, terminating the excavation would be proposed for the ACHSA representative's approval in the field. This change has been incorporated into the Final Work Plan.	Section 2.2.2 (page 3)

(continued:)

(continued:)

Review Comment (Abridged)	Response to Comment	Corresponding Section in Workplan
Will saturated soils be excavated?	Yes.	Section 3.9 (page 9)
One soil sample from each sidewall is appropriate. One soil sample from below piping should be collected every 20 feet.	Additional sidewall samples have been added to Table 3 for each excavation. Soil samples will be collected from below piping, every 20 feet, at joint or elbow if possible.	Appendix A, Table 3 (proposed samples) Appendix A, Section 1.2
Clarification of analytical methods. 8260 can be run in lieu of 8021. Method 8270 can be run in lieu of 8310.	Methods 8260 and 8270 will be used. Reference to methods 8021 and 8310 have been removed from Table 4.	Appendix A, Table 4 (sample preservation and handling requirements)

If you have any questions, please do not hesitate to contact us at (415) 397-9936.

Sincerely,
SCA ENVIRONMENTAL, INC.

Andy Hilliard for

Henry Lee, MS, EIT
Project Engineer

Andy Hilliard, CIH, CSP, CHMM
Vice President

f/d: cover letter.rtf/f-3070 zip

FINAL WORK PLAN
FOR SUBSURFACE INVESTIGATION & REMEDIATION
TWO UNDERGROUND STORAGE TANK SITES
PACIFIC DRY DOCK YARD II
321 EMBARCADERO, PORT OF OAKLAND
OAKLAND, CA

Prepared For:

Port of Oakland
530 Water Street
Oakland, California 94604-2064

Prepared By:

***SCA** Environmental, Inc.*
Four Embarcadero Center, Suite 480
San Francisco, CA 94111
TEL: (415) 397-9936
FAX: (415) 397-1406

SCA PROJECT NO.: F-3070

JANUARY 25, 1999

Final Work Plan
for Subsurface Investigation and Remediation
Two Underground Storage Tank Sites
Pacific Dry Dock Yard II
321 Embarcadero, Port of Oakland
Oakland, CA

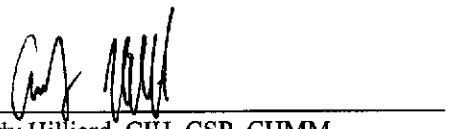
Prepared for:

Port of Oakland
530 Water Street
Oakland, California 94604-2064

January 25, 1999

SCA Project No. F-3070

Prepared by:



Andy Hilliard, CIH, CSP, CHMM
Task Manager, SCA Environmental, Inc.

Reviewed by:

Randall Smith, PE
Project Manager, Camp Dresser & McKee, Inc.

SCA ENVIRONMENTAL, INC.
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TABLES

1.0 INTRODUCTION

The objective of the work proposed in this Workplan is to fully characterize the lateral and vertical extent of residual petroleum hydrocarbons and semi-volatile organic compounds (SVOCs) remaining in the areas where two USTs were removed from the former Pacific Dry Dock Yard II in Oakland, California (site). The team of Camp Dresser & McKee, Inc. and SCA Environmental, Inc. (CDM/SCA) has prepared this Workplan for the Port of Oakland.

This Workplan describes activities to be conducted by the Port of Oakland and its Remediation Contractor, including: soil excavation in the area of the two former USTs; removal of abandoned piping; disposal of wastes generated during excavation; soil and groundwater sampling; and health and safety requirements.

The work to be performed under this Workplan is intended to satisfy the requirements of the Lead Agency, the Alameda County Health Care Services Agency. In addition, the work will satisfy the provisions of Title 40 Code of Federal Regulations, part 261et seq (40 CFR 261), Title 22 and Title 23 of the California Code of Regulations, and Health & Safety Code Division 20, Chapters 6.5 and 6.7.

On behalf of the Port, Innovative Technical Solutions Inc. (ITSI) conducted the following activities in June, 1998:

1. Removal of an approximately 5,000 gallon diesel storage tank at the former Power House building (Building 303). This tank served a boiler and possibly other equipment in the building. Waste oil may also have been stored in this tank.

2. Removal of an approximately 5,000 gallon diesel oil storage tank at the former Machine Shop building (Building 301). This tank served a boiler and possibly an emergency generator. Waste oil may also have been stored in this tank.

The work covered under this Workplan includes these tasks:

1. Over-excavation at the former locations of the two USTs.
2. Shoring or benching excavations for safety reasons (as needed).
3. Removal of portions of existing building foundations to access underlying impacted soils and piping.
4. Stockpiling soils from excavation.
5. Collecting confirmation samples of soil at excavation boundaries (sidewalls and bottom of excavation) and along pipelines at joints or visible leaks.
6. Screening soil samples in the field with field screening kit (for petroleum hydrocarbon constituents).
7. Collecting confirmation samples of groundwater from excavation areas.
8. Forwarding selected soil and groundwater samples for laboratory confirmation analysis.
9. Site restoration, including backfill of excavations.
10. Completion of a letter report summarizing findings and results of excavation work.

2.0 SITE BACKGROUND

2.1 PACIFIC DRY DOCK YARD II

The Pacific Dry Dock Yard II consists of approximately 4 acres located along the Oakland Inner Harbor in Oakland, California (Figure 1). The site is bounded by Embarcadero to the northeast, Kaiser Sand and Gravel to the southeast, the Lake Merrit Channel to the northwest, and the harbor to the southwest. Previous site investigations indicate that the site is underlain by 15 to 20 feet of fill consisting of gravel, sand, silt, and clay. The fill is underlain by Bay Mud. Groundwater has been reported at the site from two feet to five feet below ground surface (bgs) and flows to the northwest (Geomatrix, September 1997).

The site was first acquired by the Port of Oakland in 1909, and was used as a dry dock and ship refurbishing facility since at least 1913. The site was extensively developed by the US Navy in 1942 as a ship refurbishing facility. This development apparently involved filling portions of the site, sitework, installation of utilities, and construction of buildings, a pier, and other improvements. The Navy operated the site until approximately 1951, after which the site was operated as a dry dock and ship refurbishing facility by various private parties. These activities have ended in recent years, and the site is currently slated for redevelopment as a waterfront park.

In June 1998, ITSI removed two underground storage tanks from the facility. The tanks, identified as "GF-11" and "GF-12" were located proximate to Buildings 303 and 301, respectively. The tanks were single-walled steel and approximately 5,000 gallons each. A construction detail drawing dated January 1947 shows the tank at Building 301 as having an internal steam coil to heat the product. No detail drawing was available to CDM/SCA for the Building 303 tank.

Prior to removal of the tanks themselves, ITSI removed approximately 3,000 gallons of product from the tanks. ITSI's personnel considered the product to visually resemble waste oil, and performed soil and groundwater sampling for constituents commonly associated with waste oil tanks.

The site currently contains a number of building foundations and abandoned utilities. The site is not currently actively used (except for temporary storage of boats at the northeast end). Figure 2 shows some of the current structures at the site.

2.1.1 Geology and Soil Information

The site is nearly level, with a height between five and eight feet above mean sea level. The shallow soils consist of gravel, sand, silt, and clay fill material extending from the surface to the underlying bay muds between 15 and 20 feet below ground surface (bgs). The bay muds consist of silty clays, clays with shell fragments, and thin water-saturated layers of sands and gravels (Versar 1996).

2.1.2 Surface Water and Groundwater Information

The site has no active use of potable water. When the site was active, potable water was provided by the East Bay Municipal Utility District. Shallow groundwater has never been used as a potable or non-potable water supply, based on CDM/SCA's review of available documents.

Surface runoff at the site is directed to the Lake Merrit Channel or to the Oakland Harbor by means of surface runoff, or through stormwater runoff systems.

Groundwater has been recorded between two and five feet depth below ground surface (bgs) in monitoring wells (Versar 1996) and was encountered at between six feet and eight feet bgs in the UST excavations (ITSI 1998). Groundwater flow is tidally influenced, but was calculated to have an overall gradient of 0.0015 to the northwest (Versar 1996).

2.1.3 Sensitive Ecosystems

The site itself is covered with asphalt or concrete in most areas, and has no sensitive ecosystems. However, the adjacent Lake Merrit Channel and Oakland Harbor contain sensitive aquatic life. Runoff from the site would directly impact this ecosystem.

2.2 SCOPE OF PROJECT

Two former UST locations will be over-excavated to remove product-impacted soils. Abandoned product piping will be removed. Building foundations will be removed in localized areas to access the soils and piping.

Following removal of piping and visibly-impacted soils, soil and groundwater sampling will be performed. Soil samples will be screened with a field screening kit (for petroleum hydrocarbons). Depending upon the results, samples will be forwarded to the off-site laboratory for analysis. After completion of excavation, groundwater samples will be collected, and forwarded to the off-site laboratory for analysis.

2.2.1 Project Completion

Pending approval by the Lead Agency, the excavation work will be considered complete when the following analytical goals are met for soil samples from sidewalls and bottom of excavation:

1. Petroleum hydrocarbon, VOC, and SVOC concentrations in soil are less than the recommended "clean fill" levels listed in Table 2.

2. See Table 3 for proposed number and location of samples; and Table 4B for proposed sample analyses to be performed.

2.2.2 Conditions Under Which Excavation May Be Terminated

Pending approval by the Lead Agency, the excavation will be terminated under any of the following circumstances:

1. Continued excavation would be unsafe due to soil stability or groundwater intrusion.
2. Continued excavation is infeasible due to presence of building structures.
3. Soil sample results do not match a typical leaking UST pattern, indicating that the contaminant source may not be the UST.
4. When the concentration of contaminant increases with the distance from the UST, it is highly possible that there is another source of contamination other than the UST. A request will be made to the Lead Agency to terminate the excavation if this is observed.

2.3 SURFACE CONDITIONS

The site currently contains a number of building foundations and abandoned utilities. Cover over the previous excavation areas consists of gravel backfill (see Figure 3). Adjacent areas to both UST sites include concrete driveways (4" or thicker reinforced concrete or concrete asphalt) and building footings, foundations, and slabs (reinforced concrete with underlying pilings of wood or reinforced concrete).

The UST removed near the Power House was adjacent to a former Aboveground Storage Tank (AST) containment structure. This structure consisted of a reinforced concrete slab and concrete block walls approximately 4 feet high.

2.4 SUBSURFACE CONDITIONS

Stockpiled soils from the two USTs were returned to the excavations, along with additional gravel fill. These soils were described as "sand with gravel (fill material)" (ITSI, 1998). Soils surrounding these excavations are expected to include clay, silt, sand, and gravel.

Subsurface utilities and building foundations are expected to be encountered in the excavations. The Remedial Contractor will clear the utilities using Underground Service Alert and a private Utility Locator.

2.5 ENVIRONMENTAL CONDITIONS

2.5.1 Contaminants of Concern and Previous Findings (Non-UST Areas)

A number of previous investigations have been performed at the site. These investigations were not specifically directed at the two UST areas. The investigations identified a number of contamination areas in soil, groundwater, and tidal sediment, apparently related to the facility's former uses as a dry dock and ship refurbishing facility. Contaminants identified included petroleum hydrocarbons, metals, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). We understand, based on discussion with Port of Oakland personnel, that the ACHSA is in the process of evaluating the site for closure for these previously-identified contaminants.

2.5.2 Contaminants of Concern and Previous Findings (UST Areas)

As a result of the Geomatrix April 1997 site evaluation, two suspect USTs were noted, one at the Power House (Building 303) referred to as "GF-11" and one at the former Machine Shop/ Pipe Shop (Building 301) referred to as "GF-12". The USTs were removed by Innovative Technical Solutions Inc. (ITSI) in June, 1998.

2.5.2.1 GF-11 Removal

The tank referred to as GF-11 was located adjacent to Building 303, the Power House. The tank apparently served the adjacent Boiler Room, and probably contained diesel or other heavy-chain petroleum hydrocarbon. The tank may have contained waste oil as well. There is a possibility that the tank served other equipment in Building 303. SCA's site reconnaissance identified one other possible equipment pad in the building. This pad may have had a boiler, emergency generator, or other equipment which used product supplied by the GF-11 tank (see Figure 3 for approximate location).

During removal, the exterior of the tank appeared to have an oily residue. No discernible holes in the UST were noted. The excavation dimensions were 20 feet long by 8-11 feet wide. Groundwater was encountered at 6 feet bgs and visible product staining was noted at the southwestern wall of the excavation from 3 feet bgs to the bottom of the excavation (ITSI, 1998).

Product piping from GF-11 ran under the adjacent building slab, and was cut and left in place. The exact extent of product piping is not known. The piping may terminate a few feet under the slab, adjacent to the former boiler. The piping may also serve other equipment in the building, such as at the equipment pad in the center of the building. In this case, the piping may run a considerable distance into the building.

During the UST removal, soil sampling was conducted by ITSI in the excavation in two locations. Results are listed in Table 1. In summary, TPHd was identified at up to 2,800 mg/kg, and TPHmo at up to 3,100 mg/kg. Most other compounds were below applicable regulatory levels, although a number of SVOCs were identified at concentrations up to 1,700 µg/kg for individual species (pyrene).

Groundwater sampling was performed and results are tabulated in Table 1. In summary, however, TPHg was identified at 1.0 mg/L, and TPHd at 91 mg/L. SVOCs were identified at up to 1.7 mg/L (pyrene). Lead was detected at 0.350 mg/L.

2.5.2.2 GF-12 Removal

The tank referred to as GF-12 was located adjacent to Building 301. The tank apparently served the adjacent Boiler Room, and probably contained diesel or other heavy-chain petroleum hydrocarbon. The tank may have contained waste oil as well. There is a possibility that the tank served other equipment in Building 301. A 1947 drawing of Building 301 shows a Generator Room in the center of the building on the southeast side (see Figure 3 for approximate location).

During removal, no discernible holes in the UST were noted. The excavation dimensions were 19 feet long by 13 feet wide. Groundwater was encountered at 7.5 feet bgs and visible product staining was noted at the southwestern wall of the excavation from 6 feet bgs to the bottom of the excavation (ITSI, 1998).

Product piping from GF-12 ran under the adjacent building slab, and was cut and left in place. The exact extent of product piping is not known. The piping may terminate a few feet under the slab, adjacent to the former boiler. The piping may also serve other equipment in the building, for example the Emergency Generator (see Figure 3). In this case, the piping may run a considerable distance into the building.

During the UST removal, soil sampling was conducted by ITSI in the excavation in two locations. Results are listed in Table 1. In summary, TPHd was identified at up to 640 mg/kg, and TPHmo at up to 1,400 mg/kg. Most other compounds were below applicable regulatory levels, although a number of SVOCs were identified at concentrations up to 6.4 mg/kg for individual species (fluoranthene).

Groundwater sampling was performed and results are tabulated in Table 1. In summary, TPHg was identified at 1.0 mg/L, and TPHd at 34 mg/L. SVOCs were identified at up to 0.15 mg/L (pyrene). Lead was detected at 0.14 mg/L.

3.0 INVESTIGATION AND REMEDIATION ACTIVITIES

3.1 GENERAL

The project goal is over-excavate the two UST sites. Successful completion of the project goal will be defined by collection of soil samples meeting the criteria listed in Section 2.2 of this Workplan.

3.2 REGULATORY REQUIREMENTS

The Remediation Contractor will perform all Workplan items in accordance with the latest edition and/or amendments of the applicable local, state, and federal statutes and regulations, including:

- CFR 1926, Safety and Health Regulations for Construction
- CFR 261, Identification and Listing of Hazardous Waste
- CFR 262 and 263, Standards for Generators and Transporters of Hazardous Wastes
- CFR Part 280 et seq, Standards for Owners and Operators of Underground Storage Tanks
- CFR 172 Hazardous Materials Tables and Communication
- CCR, Construction Safety Orders
- CCR, Hazardous Wastes
- CCR, Groundwater
- Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites, August 10, 1990
- Rationale for Modifying the Tier 1 Petroleum Hydrocarbon Saltwater Ecological Protection Zone (SEPZ) Levels for the San Francisco International Airport Board Order 95-136 (including December 11, 1997 and July 16, 1998 addenda).

3.3 HEALTH AND SAFETY PLAN REQUIREMENTS

The Remediation Contractor will prepare a HASP prior to beginning field work. The HASP will have the following elements:

1. The HASP will be prepared and signed by an American Board of Industrial Hygiene (ABIH) Certified Industrial Hygienist.
2. The HASP will include a list of planned site tasks and an Activity Hazard Analysis for each task. The analysis shall follow Army Corps of Engineers EM-385 methodology.
3. A summary of chemicals which might be encountered by workers at the site, carcinogenicity, teratogenicity, health effects, and relevant occupational standards for each (OSHA PEL, ACGIH TLV, etc.)
4. Required Personal Protective Equipment (PPE) to be used on various tasks of the project, with reference to the Remediation Contractor's Respiratory Protection Program.
5. Air sampling to be performed, including calibration protocols for each instrument, and details on outside laboratories for any personal monitoring.
6. Trigger points for air sampling to upgrade or downgrade PPE.
7. Training requirements for staff who will be working at the site.
8. Location and details of decontamination systems for workers leaving the excavation areas.

9. Emergency Response Plan, including route map to nearest hospital; and emergency contact numbers.
10. Medical monitoring requirements for staff who will be working at the site.
11. Hearing protection protocols and reference to Remediation Contractor's Hearing Conservation Program.
12. Fire and Explosion safety requirements, including locations of fire extinguishers, type of extinguishers, flammable storage locations, smoking limitations, response to fire, etc.
13. Electrical safety requirements, including tool inspection
14. Slip, trip, and fall prevention guidelines.
15. Sanitation protocols, including temporary facilities, source of drinking water, etc.

3.4 INVESTIGATION ACTIVITIES AND SAMPLING AND ANALYSIS PLAN

The Remediation Contractor will collect all samples and sampling data in a "defensible" manner. All sampling will comply with the latest version of the USEPA document SW-846. The end goal of all sampling will be to justify closure of the two sites by ACHSA; or to indicate additional investigation required, if any.

An outline Sampling and Analysis Plan is included in Appendix A of this document, and details all sampling and analysis to be performed.

3.5 PERMIT AND NOTIFICATION REQUIREMENTS

The Remediation Contractor will perform the following notifications:
1. ACHSA will be notified one week prior to beginning of field work.
2. The Port of Oakland will be notified prior to beginning field work. The Remediation Contractor will coordinate with Douglas Herman or designated representative for site access and security.
3. Underground Service Alert (USA) and the Remediation Contractor's Utility Surveyor will require advance notice to identify utilities in the excavation areas.

3.6 SITE ACTIVITIES AND PROJECT PHASING

There are no current activities at the site, other than limited storage of boats towards the north end of the site. The Remediation Contractor will maintain control of the site and be responsible for site security during all field work. The field work portion of the project will be completed in a single mobilization, lasting approximately seven working days.

3.7 DEMOLITION OF FOUNDATIONS AND SURFACE COVER

Demolition will involve the removal of surface coverings and improvements, including concrete block walls, reinforced concrete pavement, asphalt concrete, and concrete slabs and footings. Demolition will be performed only to access impacted soils and product piping.

The Remediation Contractor will initially sawcut all slabs and pavements to be removed. The water used in saw-cutting will be collected and will not be allowed to drain into storm drains or the Harbor. Following sawcutting, materials will be broken up with a backhoe equipped with a concrete breaker bar.

Foundations and slabs will be left in place wherever possible, since their removal will be time-consuming. Concrete debris will be stockpiled at the site for use as backfill. Excess concrete debris will be transported off-site for recycling or disposal as construction debris at a Class III landfill.

3.8 EXCAVATION STABILITY: SHORING AND SLOPING

The soils expected to be encountered (sand and gravel fills, and some clay and silt) may not stand vertically at cut faces. Vibrations from construction equipment and vehicles increases the chance of slope failure at the edges of the excavations.

To address these concerns, the Remediation Contractor will slope back soils at the edges of excavations. Where there is not adequate room for sloping, or where the excavation might undermine utilities or adjacent structures, the Remediation Contractor will provide shoring systems.

The Remediation Contractor will prepare a written plan for shoring and sloping prior to start of field work. The plan will address the allowable side slopes and the recommended design and installation of the shoring system. The plan will be written and stamped by a California-registered Civil Engineer. The plan will comply with Title 8 CCR, Construction Safety Orders.

3.9 EXCAVATION SIZE AND DEPTH

The exact size and depth of the excavations which will be required is not known. At a minimum, the extent of the UST removal excavations must be met.

The excavation is expected to encounter water-saturated soils at depths of between two and five feet bgs. Excavation through standing water is proposed until the target depth is reached. Specific excavation, shoring, water management, and backfilling procedures will be presented in a written plan to be prepared with Excavation Contractor input prior to start of work.

The excavation at Building 303 was 20 feet long by 8 - 11 feet wide. Exact depth was not recorded but probably in excess of 10 feet bgs. The over-excavation will be a minimum of 26 feet long by 17 feet wide, with a minimum depth of 10 feet bgs. Excavation for piping may be up to 40 feet long, depending upon whether the UST supplied other equipment in the building.

The excavation at Building 301 was 19 feet long by 13 feet wide. Exact depth was not recorded but probably in excess of 10 feet bgs. The over-excavation will be a minimum of 25 feet long by 19 feet wide, with a minimum depth of 10 feet bgs. Excavation for piping may be up to 100 feet long, depending upon whether the UST supplied an Emergency Generator or other equipment located in the building.

Figure 4 shows estimated sizes of excavation at both locations.

3.10 STOCKPILE STORAGE AND SAMPLING REQUIREMENTS

Soils will be screeened with a field screening kit as they are removed from the excavation. Soils will be separated into "potentially clean" and "potentially impacted" stockpiles based upon the kit results, and any visible evidence of staining.

Containment areas will be prepared for all stockpiled soils by placing a layer of 30 mil polyethylene sheeting on the ground, with the edges running over straw bale berms. Soils will be placed on the sheeting and then covered with weighted 10-mil polyethylene sheeting.

The 10-mil sheeting will cover the soil and go over the straw bale berms, to prevent collection of rainwater, or transport of contaminants by rainwater. Covering the stockpiles will also minimize fugitive dust emissions during windy periods (note that soils are anticipated to be primarily saturated with groundwater, further minimizing dust emissions).

Each stockpile cover will be labeled with a unique ID code, spray-painted onto the 10-mil polyethylene cover. This ID code will be used for all laboratory samples, photographs collected, project correspondence, etc. The ID code will incorporate the UST number (GF-11, GF-12).

Stockpiles will be sampled at least once for every 20 cubic yards (measured loose) which is excavated. Requirements for sample collection and analysis are included in Appendix A, the Sampling and Analysis Plan.

3.11 GROUNDWATER MANAGEMENT

Free product will be skimmed from groundwater in the excavation on an ongoing basis during excavation. At the completion of the soil excavation activities, one sample will be collected from standing water in each excavation area, prior to backfilling with coarse aggregate. Each sample will be analyzed using the methods listed in Table 4A.

3.12 EQUIPMENT DECONTAMINATION REQUIREMENTS

The Remediation Contractor will set up a Contamination Reduction Zone (CRZ) near each excavation. Approximate locations are shown in Figure 4.

The CRZs shall function to remove any residual contamination from backhoes, trucks, and other large equipment which was used for the project. The CRZs shall contain a means to effectively clean equipment with minimal water use; and a means to control and capture the water generated.

No equipment which has been used in or near the excavations will leave the site without being thoroughly decontaminated in the CRZ. Furthermore, equipment will not be allowed to track soils from the excavations to other areas of the site.

3.13 SPILL PREVENTION AND CONTROL

The Remediation Contractor will take all precautions to avoid spills. This will include:

- Preparation of a written spill prevention and response plan for the project.
- Overspill containment for all hazardous or flammable liquids being used.

In the event of a spill, the Remediation Contractor will act with all expediency to minimize impacts to humans and to nearby aquatic ecosystems. The Remediation Contractor will notify the Port of Oakland and any relevant agencies in the event of a spill.

3.14 TRANSPORTATION AND DISPOSAL OF PROJECT WASTES

3.14.1 Contaminated Materials

The Remediation Contractor will transport off-site all contaminated materials (piping, soil, water) to disposal sites approved to accept these type of wastes. Clean materials (soil and construction debris) may be used to backfill the excavations. Definitions of clean materials acceptable for fill are included in Table 2.

3.14.2 Hazardous Waste Manifest System

All hazardous waste materials being transported off-site will be transported under the California waste manifest system. Manifests will be signed only by Port of Oakland staff or a designated representative. The Remediation Contractor will obtain a Generator ID number and prepare manifests in advance, and will provide the Port of Oakland with a minimum of 24 hours of notice prior to needing a manifest signed.

Non-hazardous waste which is being transported off-site will be transported under a bill-of-lading or similar document control system.

3.15 EXCAVATION BACKFILL

Backfill will consist of porous gravel or other backfill. This material will meet the permeability requirements for California Department of Transportation (CalTrans) Class III aggregate base.

3.16 SURFACE COVER

Existing surface covers will not be replaced, as the site is due for development as a waterfront park or open-space area. The excavations will be slightly over-filled (to allow for settling) with a 2% slope from center of excavation to match line of existing surfaces.

3.17 REPORTING

A report will be provided to the ACHSA summarizing all field activities. The report will include all relevant information about sampling methodologies, sample results and interpretations, and a description of all field work. Waste manifests and certificates of receipt will be included as well.

4.0 REFERENCES

Bell, F.G. (ed.), 1987. Ground Engineer's References Book: Butterworth's, Boston.

Geomatrix Consultants (Geomatrix), April 1997, *Site Evaluation Report, Former Pacific Dry Dock Facility, Yard II, Port of Oakland, 321 Embarcadero, Oakland, California.*

Geomatrix, September 1997, *Draft Work Plan for Additional Environmental Investigation, Pacific Dry Dock Yards I and II, 1441 and 321 Embarcadero, Oakland, California.*

Innovative Technical Solutions, Inc. (ITSI), September 1998, *Tank Closure Report, Port of Oakland Tank Numbers GF-11 and GF-12, Pacific Dry Dock (Crowley Yard II), 325 Embarcadero Street, Oakland, CA.*

State Water Resources Control Board, *Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Storage Tank Sites*, 1990

US Environmental Protection Agency (USEPA), 1989. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final.* EPA/540/G-89/002.

USEPA, 1991a. *Description and Sampling of Contaminated Soil - A Field Pocket Guide.* EPA/625/12-91/002.

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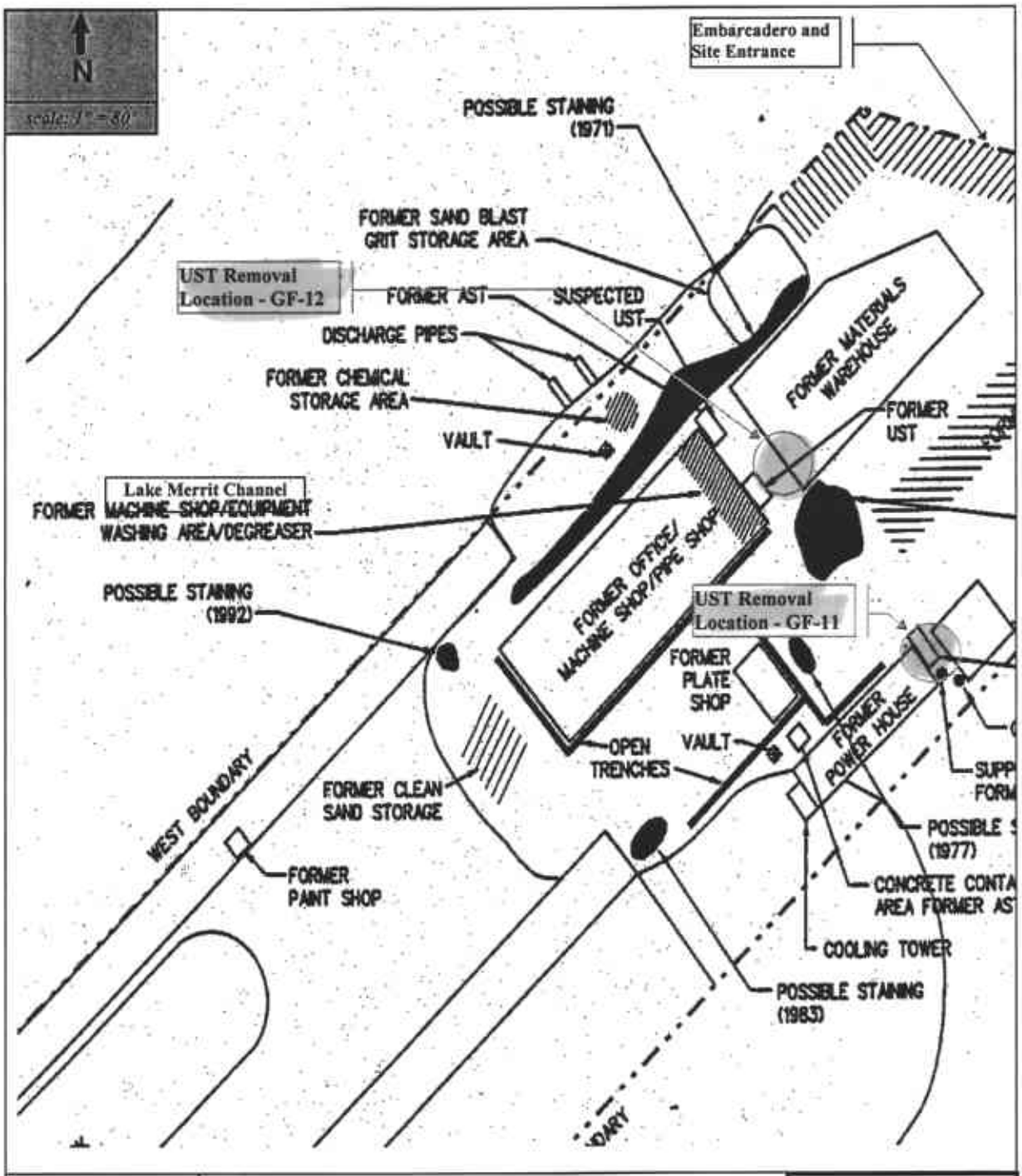
Versar, Inc., March 1996, *Preliminary Investigation and Evaluation Report, Former Pacific Dry Dock and Repair Company Yard II Facility, Oakland, California.*

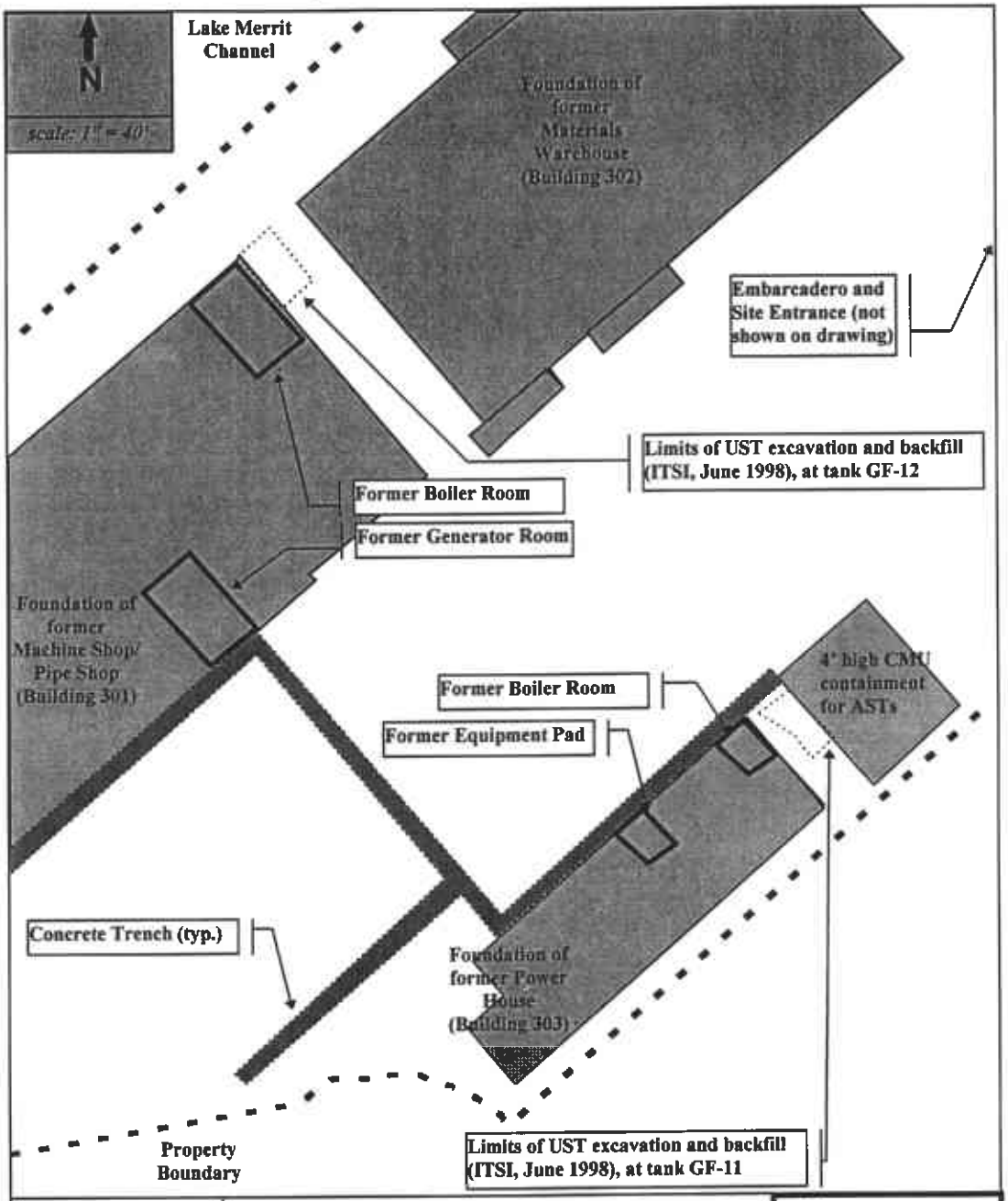
FIGURES

Base map from *The Thomas Guide, 1995 Alameda County Street Guide and Directory.* Reproduced with permission from Thomas Bros. Maps.

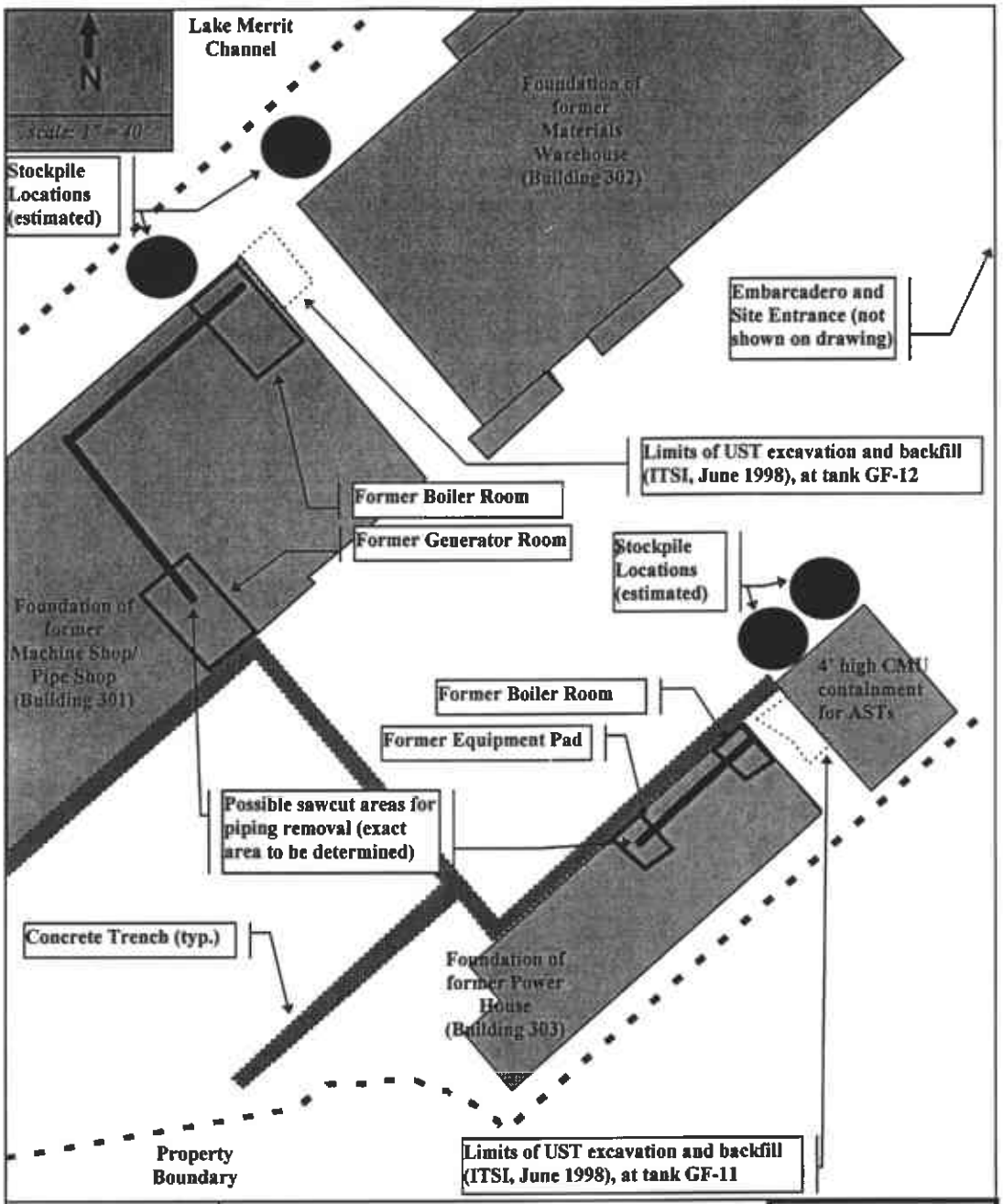
Background: Thomas Bros. Guide 1995	**Site Location** **Pacific Dry Dock Yard II**	1 FIGURE
SCA Project No. F-3070	**321 Embarcadero Street, Oakland, CA**	
Drafted: RC Reviewed: AWH	*Work Plan by SCA Environmental, Inc.* *4 Embarcadero Center, Suite 480, San Francisco, CA 94111*	



Background: Geomatrix Site Evaluation 1997	**Partial Site Plan** **Pacific Dry Dock Yard II** **321 Embarcadero Street, Oakland, CA**	2
SCA Project No. F-3070	*Work Plan by SCA Environmental, Inc.* *4 Embarcadero Center, Suite 480, San Francisco, CA 94111*	FIGURE
Drafted: RC Reviewed: AWH		



Background: ITSI UST Removal Report 1998	**Detail Plan - GF-11 and GF-12 Subsites** Pacific Dry Dock Yard II	3
SCA Project No. F-3070	321 Embarcadero Street, Oakland, CA	FIGURE
Drafted: RC Reviewed: AWH	*Work Plan by SCA Environmental, Inc.* *4 Embarcadero Center, Suite 480, San Francisco, CA 94111*	



Background: ITSI UST Removal Report 1998	**Over-Excavation Plan - GF-11 and GF-12** Pacific Dry Dock Yard II	4
SCA Project No. F-3070	321 Embarcadero Street, Oakland, CA	FIGURE
Drafted: RC Reviewed: AWH	*Work Plan by SCA Environmental, Inc.* *4 Embarcadero Center, Suite 480, San Francisco, CA 94111*	

APPENDIX A
SAMPLING AND ANALYSIS PLAN REQUIREMENTS

1.0 SOIL SAMPLING

This section outlines the procedures for subsurface soil sampling at the Pacific Dry Dock. Sampling rationales and field procedures are described below.

1.1 SCREENING SAMPLES

Screening for soil samples will be performed with one or more commercially-available field screening kits, selected by the Project Chemist prior to the beginning of work. Kits will address heavy-chain hydrocarbons in the diesel and motor oil ranges; and will adress semivolatile compounds known to be present based upon the former sampling performed at this site.

A photoionization detector will be on-site for health and safety monitoring, but will not be used for soil screening.

1.2 RATIONALES FOR SAMPLE LOCATIONS

Sampling locations will be at the bottom of the excavations, at either end of the excavation (typically a north-south orientation); and at sidewalls at the water/soil interface. These locations are considered most likely to be impacted in the event of a release from a UST. Piping samples will be at 20' intervals, biased towards joints and elbows, or visible corroded areas or leaks, where possible.

1.3 SAMPLE COLLECTION AND ANALYSIS PROCEDURES

Soil sample containers will be 2 inch by 6 inch stainless steel or brass tubes. Once the sample is collected the ends will be covered with Teflon® sheeting and plastic end caps. The end caps will be wrapped with a non-cohesive tape and the sample will be affixed with a label. Samples will be packaged in separate Ziploc™-type plastic bags and packed in ice to 4 +/-2 degrees Centigrade (°C). The ice will be double-bagged in Ziploc™-type plastic bags during shipment to the contract laboratory.

The Chain-of-Custody (COC) record will be placed in a Ziploc™-type plastic bag and taped to the inside lid of the cooler. The cooler will then be sealed with tape and custody seals on the front as well as both sides of the cooler lid if the samples will be shipped through an intermediary (courier) to the analytical laboratory. If sample custody is transferred directly from the Remediation Contractor to the analytical laboratory personnel, no custody seal will be necessary.

Soil sample locations are detailed in Table 3. Sample analyses to be performed are detailed in Table 4B.

2.0 GROUNDWATER SAMPLING

This section outlines the procedures for subsurface water sampling at the Pacific Dry Dock. Sampling rationales and field procedures are described below.

2.1 SCREENING SAMPLES

No screening samples will be performed.

2.2 RATIONALES FOR SAMPLE LOCATIONS

Sampling locations will be biased towards worst-case areas where soil has staining or discoloration; or where groundwater has a sheen.

2.3 SAMPLE COLLECTION AND ANALYSIS PROCEDURES

Samples will be collected with disposable bailers, from the center of the excavation Dissolved-phase water will be targeted (i.e., not surface layer or separated-phase product).

Once the sample is collected the sample will be affixed with a label. Samples will be packaged in separate Ziploc™-type plastic bags and packed in ice to 4 +/-2 degrees Centigrade (°C). The ice will be double-bagged in Ziploc™-type plastic bags during shipment to the contract laboratory.

The Chain-of-Custody (COC) record will be placed in a Ziploc™-type plastic bag and taped to the inside lid of the cooler. The cooler will then be sealed with tape and custody seals on the front as well as both sides of the cooler lid if the samples will be shipped through an intermediary (courier) to the analytical laboratory. If sample custody is transferred directly from the Remediation Contractor to the analytical laboratory personnel, no custody seal will be necessary.

Groundwater sample locations are detailed in Table 3. Sample analyses to be performed are detailed in Table 4A.

3.0 GENERAL REQUIREMENTS

3.1 FIELD MEASUREMENT PROCEDURES AND CRITERIA

All samples will be carefully measured in the field using a 100-foot tape measure, and will be tied into at least two permanent landmarks, such as utility poles or edges of buildings situated at approximately 90° angles from the sampling locations. Sampling locations and landmarks will be identified on a field site map with measured footages. Within the parameters of the field conditions, footages will be accurate to one foot and will be cross-checked whenever possible (note that this work will not be conducted by a licensed surveyor).

3.2 DECONTAMINATION

All equipment contacting soil (including sample tubes) will be decontaminated prior to use. Measures will be taken to assure that contamination of clean equipment will not occur. Clean sampling equipment will not be placed on the ground or other contaminated surfaces prior to use. All non-disposable sampling equipment will be decontaminated.

The decontamination procedures for hand equipment are as follows:

1. Pre-rinse to dislodge soil or waste sample remains.
2. Non-phosphate detergent wash and tap water rinse.
3. Reagent grade deionized water rinse.
4. Second reagent grade deionized water rinse.
5. Methanol rinse (if necessary).
6. Air dry.

3.3 SAMPLE NUMBERING SYSTEM

A unique identification number will be assigned to each sample. This number is typically an alphanumeric sequence or integer that serves as an acronym to identify the sample. Specific sample identification procedures will follow the strategy as outlined within the project specific Field Sampling Plan. Specific sample identification procedures will follow a basic strategy as outlined below.

- Primary Samples:
  Project ID - Location Code - Depth BGS
- QA or QC Duplicate Sample:
  Project ID - Location Code - Depth BGS-QA or QC code
- Trip Blank:
  Project ID - Date (MMDDYY) - TB - Cooler ID

Table 3 summarizes anticipated sample IDs for all samples for this project.

All information pertaining to a particular sample will be referenced by its identification number. It will be recorded on the sample container, in the field log book, and on the sample chain-of-custody form. Following sample

collection, the sample label is completed in waterproof ink and secured to the sample container with clear tape wider than the label itself.

Each sample collected at the site will be labeled with the following information:

- Sample identification number;
- Sample location;
- Date and time of collection;
- Initials of person collecting the sample;
- Analysis requested;
- Preservation; and

Any other information pertinent to the sample.

TABLES

Tank Removal Results

Table 1
Summary of Analytical Data from ITSI 1998 Tank Removal Report

Sample Location and ID	Analyte	Result	Units	Detection Limit (for ND results)
GF-11 Bottom of excavation, north end. **S-A-7-N**	TPH-diesel	2800	mg/kg	
	TPHmo	3100	mg/kg	
	TPHg	8.9	mg/kg	
	Halogenated Volatile Organics (EPA 8010)	ND	µg/kg	5-20 µg/kg, depending upon compound
	MTBE	ND	µg/kg	20 µg/kg
	BTEX	ND	µg/kg	5 µg/kg
	SVOCs by 8270B	ND for all except:	µg/kg	330-1700 µg/kg, depending upon compound
	Acenapthene	210	µg/kg	
	Fluorene	240	µg/kg	
	Phenanthrene	1300	µg/kg	
	Anthracene	380	µg/kg	
	Fluoranthene	1600	µg/kg	
	Pyrene	1700	µg/kg	
	Benzo(a) anthracene	770	µg/kg	
	Chrysene	920	µg/kg	
	Benzo(b,k) fluoranthene	1200	µg/kg	
	Benzo (a) pyrene	540	µg/kg	
	Cadmium	ND	mg/kg	
	Chromium (Total)	41	mg/kg	
	Lead	24	mg/kg	
	Nickel	36	mg/kg	
	Zinc	82	mg/kg	

Sample Location and ID	Analyte	Result	Units	Detection Limit (for ND results)
GF-11 Bottom of excavation, south end. S-A-7-S	TPH-diesel	300	mg/kg	
	TPHmo	590	mg/kg	
	TPHg	7.6	mg/kg	
	Halogenated Volatile Organics (EPA 8010)	ND for all except:	µg/kg	5-20 µg/kg, depending upon compound
	Chlorobenzene	6.1	µg/kg	
	1,4-dichlorobenzene	5.0	µg/kg	
	MTBE	ND	µg/kg	20 µg/kg
	BTEX	ND	µg/kg	5 µg/kg
	SVOCs by 8270B	ND for all except:	µg/kg	330-1700 µg/kg, depending upon compound
	Fluoranthene	190	µg/kg	
	Pyrene	320	µg/kg	
	Benzo(b,k) fluoranthene	290	µg/kg	
	Cadmium	ND	mg/kg	
	Chromium (Total)	24	mg/kg	
	Lead	5.4	mg/kg	
	Nickel	17	mg/kg	
	Zinc	110	mg/kg	

Sample Location and ID	Analyte	Result	Units	Detection Limit (for ND results)
GF-12 Bottom of excavation, south end. S-B-8-S	TPH-diesel	640	mg/kg	
	TPHmo	740	mg/kg	
	TPHg	14	mg/kg	
	Halogenated Volatile Organics (EPA 8010)	ND	µg/kg	5-20 µg/kg, depending upon compound
	MTBE	ND	µg/kg	20 µg/kg
	BTEX	ND	µg/kg	5 µg/kg
	SVOCs by 8270B	ND for all except:	µg/kg	330-1700 µg/kg, depending upon compound
	Phenanthrene	1000	µg/kg	
	Fluoranthene	2400	µg/kg	
	Pyrene	2400	µg/kg	
	Benzo(a) anthracene	1400	µg/kg	
	Chrysene	1600	µg/kg	
	Benzo(b,k) fluoranthene	2600	µg/kg	
	Benzo (a) pyrene	900	µg/kg	
	Cadmium	ND	mg/kg	5.0
	Chromium (Total)	19	mg/kg	
	Lead	33	mg/kg	
	Nickel	20	mg/kg	
	Zinc	110	mg/kg	

Sample Location and ID	Analyte	Result	Units	Detection Limit (for ND results)
GF-12 Bottom of excavation, north end. S-B-8-N	TPH-diesel	270	mg/kg	
	TPHmo	1400	mg/kg	
	TPHg	<1	mg/kg	
	Halogenated Volatile Organics (EPA 8010)	ND	µg/kg	5-20 µg/kg, depending upon compound
	MTBE	ND	µg/kg	20 µg/kg
	BTEX	ND	µg/kg	5 µg/kg
	SVOCs by 8270B	ND for all except:	µg/kg	670-3300 µg/kg, depending upon compound
	Acenaphthene	350	µg/kg	
	Fluorene	470	µg/kg	
	Phenanthrene	1000	µg/kg	
	Anthracene	1100	µg/kg	
	Fluoranthene	6400	µg/kg	
	Pyrene	5000	µg/kg	
	Benzo(a) anthracene	3100	µg/kg	
	Chrysene	3400	µg/kg	
	Benzo(b,k) fluoranthene	4900	µg/kg	
	Benzo (a) pyrene	1200	µg/kg	
	Indeno (1,2,3-cd) pyrene	430	µg/kg	
	Dibenz (a,h anthracene)	410	µg/kg	
	Cadmium	ND	mg/kg	
	Chromium (Total)	26	mg/kg	
	Lead	19	mg/kg	
	Nickel	24	mg/kg	
	Zinc	93	mg/kg	

Sample Location and ID	Analyte	Result	Units	Detection Limit (for ND results)
GF-11 Stockpile. S-SP1-A,B,C,D	TPH-diesel	620	mg/kg	
	TPHmo	1900	mg/kg	
	TPHg	7.1	mg/kg	
	Halogenated Volatile Organics (EPA 8010)	ND	µg/kg	5-20 µg/kg, depending upon compound
	MTBE	ND	µg/kg	20 µg/kg
	BTEX	ND	µg/kg	5 µg/kg
	SVOCs by 8270B	ND for all except:	µg/kg	330-1700 µg/kg, depending upon compound
	Phenanthrene	470	µg/kg	
	Fluoranthene	2700	µg/kg	
	Pyrene	3400	µg/kg	
	Benzo(a) anthracene	1900	µg/kg	
	Chrysene	2300	µg/kg	
	Benzo(b,k) fluoranthene	3700	µg/kg	
	Benzo (a) pyrene	1200	µg/kg	
	Indeno (1,2,3-cd) pyrene	410	µg/kg	
	Cadmium	ND	mg/kg	
	Chromium (Total)	18	mg/kg	
	Lead	11	mg/kg	
	Nickel	17	mg/kg	
	Zinc	89	mg/kg	

Sample Location and ID	Analyte	Result	Units	Detection Limit (for ND results)
GF-12 Stockpile. S-SP2-A,B,C,D	TPH-diesel	240	mg/kg	
	TPHmo	910	mg/kg	
	TPHg	1.1	mg/kg	
	Halogenated Volatile Organics (EPA 8010)	ND	µg/kg	5-20 µg/kg, depending upon compound
	MTBE	ND	µg/kg	20 µg/kg
	BTEX	ND	µg/kg	5 µg/kg
	SVOCs by 8270B	ND for all except:	µg/kg	330-1700 µg/kg, depending upon compound
	Fluoranthene	460	µg/kg	
	Pyrene	540	µg/kg	
	Chrysene	380	µg/kg	
	Benzo(b,k) fluoranthene	68	µg/kg	
	Cadmium	ND	mg/kg	
	Chromium (Total)	31	mg/kg	
	Lead	52	mg/kg	
	Nickel	23	mg/kg	
	Zinc	130	mg/kg	

Sample Location and ID	Analyte	Result	Units	Detection Limit (for ND results)
GF-11 Groundwater Sample. **W-TP-A**	TPH-diesel	91,000	µg/L	
	Oil & Grease	ND	µg/L	5.0
	TPHg	1,000	µg/L	
	Halogenated Volatile Organics (EPA 8010)	ND for all except:	µg/L	1-20 µg/L, depending upon compound
	Chlorobenzene	32	µg/L	
	1,4-dichlorobenzene	8.9	µg/L	
	1,2-dichlorobenzene	5.5	µg/L	
	MTBE	3.8	µg/L	1 µg/L
	BTEX	ND for all except:	µg/L	1 µg/L
	Ethylbenzene	1.3	µg/L	
	Xylene	0.5	µg/L	
	SVOCs by 8270B	ND for all except:	µg/L	330-1700 µg/L, depending upon compound
	Phenanthrene	150	µg/L	
	Anthracene	130	µg/L	
	Fluoranthene	1400	µg/L	
	Pyrene	1700	µg/L	
	Benzo(a) anthracene	930	µg/L	
	Chrysene	880	µg/L	
	Benzo(b,k) fluoranthene	1600	µg/L	
	Benzo (a) pyrene	760	µg/L	
	Indeno (1,2,3-cd) pyrene	250	µg/L	
	Benzo (g,h,I) perylene	260	µg/L	
	Cadmium	ND	µg/L	5.0
	Chromium (Total)	570	µg/L	
	Lead	350	µg/L	
	Nickel	510	µg/L	
	Zinc	2400	µg/L	

Sample Location and ID	Analyte	Result	Units	Detection Limit (for ND results)
GF-12 Groundwater Sample. **W-TP-B**	TPH-diesel	34,000	µg/L	
	Total Oil and Grease	56,000	µg/L	
	TPHg	1,000	µg/L	
	Halogenated Volatile Organics (EPA 8010)	ND	µg/L	1-20 µg/L, depending upon compound
	MTBE	ND	µg/L	1 µg/L
	BTEX	ND	µg/L	1 µg/L
	SVOCs by 8270B	ND for all except:	µg/L	330-1700 µg/L, depending upon compound
	Fluoranthene	90	µg/L	
	Pyrene	150	µg/L	
	Benzo(a) anthracene	59	µg/L	
	Chrysene	38	µg/L	
	Benzo (a) pyrene	51	µg/L	
	Cadmium	ND	µg/L	5.0
	Chromium (Total)	68	µg/L	
	Lead	140	µg/L	
	Nickel	54	µg/L	
	Zinc	420	µg/L	

Table 2
Recommended Clean Soil Contaminant Levels for On-Site Fill

Analyte	Maximum Allowable Limit
[A]Total Petroleum Hydrocarbons as Diesel (TPHd)	less than 267 mg/kg
[A]Total Petroleum Hydrocarbons as Gasoline (TPHg)	less than 26 mg/kg
[B]Total Petroleum Hydrocarbons as Motor Oil (TPHmo)	1000 mg/kg
Lead [C,D]-Total [C]-Soluble by Waste Extraction Test [C] -Soluble by TCLP	 -less than 1,000 mg/kg -less than 5 mg/L -less than 5 mg/L
[C,D] Other metals	• less than residential Preliminary Remediation Goal (EPA Region IX, 1998, and CalEPA, 1994); and • less than relevant Title 26 and Title 22 hazardous waste disposal criteria
[C,D] Volatile Organic Compounds -Benzene -Toluene -Ethylbenzene -Xylene -MTBE	 -2.7 mg/kg -2,700 mg/kg -5 mg/kg -990 mg/kg -ND
[C,D] Semi-Volatile Organic Compounds	• less than industrial Preliminary Remediation Goals (EPA Region IX, 1998, and CalEPA, 1994); and • less than relevant Title 26 and Title 22 hazardous waste disposal criteria

A. Values from Table 2: Saltwater Ecological Protection Zone Tier 1 Standards, from Regional Water Quality Control Board document RWQCB Order 95-136; supplemented by *Rationale for Modifying the Tier 1 Petroleum Hydrocarbon Saltwater Ecological Protection Zone (SEPZ) Levels for the San Francisco International Airport Board Order 95-136,* dated 12/10/97 and reviewed by RWQCB staff 7/16/98.

B. Values from Table 1 of *Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Storage Tank Sites*, 1990.

C. From hazardous waste definitions, 22 CCR and 26 CCR.

D. Industrial Preliminary Remediation Goals (EPA Region IX, 1998, and CalEPA, 1994)

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Table 3
Proposed Samples

Sample Type	Sample ID*	Description
Confirmation Samples for Excavation (GF-11)	GF11-B-10'-N	From bottom of excavation at end
	GF11-B-10'-S	From bottom of excavation at end
	GF11-SW-6'-W	From sidewall at water-soil interface
	GF11-SW-6'-E	From sidewall at water-soil interface
	~~GF11-SW-6'-N~~	~~From sidewall at water-soil interface~~ Not Nec.
	~~GF11-SW-6'-S~~	~~From sidewall at water-soil interface~~
Confirmation Samples for Product Piping (GF-11)	GF11P-3'-A	At 20' intervals
	GF11P-3'-B	At 20' intervals
Stockpile Sample (GF-11)	GF11-SP1-A, B, C, D	From "clean" stockpile; multi-point composite which is combined by laboratory (not in field). One sample required per 20 cubic yards. OK
	GF11-SP2-A, B, C, D	From "impacted" stockpile; multi-point composite which is combined by laboratory (not in field). One sample required per 20 cubic yards. OK
Groundwater Samples for GF-11	GF11-GW-6'-A	From center of excavation
Confirmation Samples for Excavation (GF-12)	GF12-B-10'-N	From bottom of excavation at end
	GF12-B-10'-S	From bottom of excavation at end
	GF12-SW-6'-W	From sidewall at water-soil interface
	GF12-SW-6'-E	From sidewall at water-soil interface
	~~GF12-SW-6'-N~~	~~From sidewall at water-soil interface~~ } not necess
	~~GF12-SW-6'-S~~	~~From sidewall at water-soil interface~~
Confirmation Samples for Product Piping (GF-12)	GF12P-3'-A	At 20' intervals
	GF12P-3'-B	At 20' intervals
Stockpile Sample (GF-12)	GF12-SP1-A, B, C, D	From "clean" stockpile; multi-point composite which is combined by laboratory (not in field). One sample required per 20 cubic yards.
	GF12-SP2-A, B, C, D	From "impacted" stockpile; multi-point composite which is combined by laboratory (not in field). One sample required per 20 cubic yards.
Groundwater Samples for GF-12	GF12-GW-6'-A	From center of excavation
Rinsate Blank from Equipment	GF11-Rins-A	From sampling equipment (6" tube)
	GF12-Rins-B	From sampling equipment (6" tube)

Sample IDs may change in field, due to differing depth of samples. Numbers of samples will be adjusted to fit actual field conditions, instructions from Lead Agency, etc.

Table 4A
Container, Preservation and Storage Requirements

4A: Groundwater Samples

Parameters	Analytical Method	Sample Container	Required Preservation	Storage	Hold Time
VOCs	8260A	3-40 ml VOA glass (per method)	HCL to pH<2	4°C; store away from light	14 days[1]
TPH - gasoline	8015M (purgeable)	3-40 ml VOA glass	HCL to pH<2	4°C; store away from light	14 days[1]
SVOCs	8270B	2-1 liter amber glass (per method)	None	4°C; store away from light	7 days/40 days[2]
TPH - diesel and motor oil	8015m (extractable)	2-1 liter amber glass	None	4°C; store away from light	7 days/40 days[2]
Selected Metals	6010A/7000 (series)	1-500 ml poly	HNO_3 to pH<2[3]	4°C; store away from light	6 months
Mercury	7471A	1-500 ml glass	HNO_3 to pH<2	4°C; store away from light	28 days
Temperature Blanks	1-40 ml VOA glass[6]	1-40 ml VOA glass[6]	None	Store with samples in cooler[7]	NA

Notes:
[1] Extraction within 7 days if sample is not preserved
[2] Extraction within 7 days.
[3] Not preserved for samples to be analyzed for dissolved metals, then preserved immediately upon arrival at laboratory.
[4] Not used.
[5] Not used.
[6] VOA filled with deionized water.
[7] Measure temperature immediately upon arrival at laboratory.
[8] TPH samples will be prepared for analysis at the laboratory using a silica gel trap to remove entrained polar compounds.
[9] Metals samples will be filtered at the laboratory prior to analysis.

Table 4B
Container, Preservation and Storage Requirements

4B: Soil Samples

Parameters	Analytical Method	Sample Container	Storage	Hold Time
VOCs	8260A	1-brass liner	4°C; store away from light	14 days
TPH - gasoline	8015M (purgeable)	1-brass liner	4°C; store away from light	14 days
TPH - diesel and motor oil	8015m (extractable)	1-8 oz. glass wide mouth jar or brass liner	4°C; store away from light	7 days/40 days[1]
SVOCs	8270B	1-8 oz. glass wide mouth jar or brass liner	4°C; store away from light	7 days/40 days[1]
Temperature Blanks	1-40 ml VOA glass[3]	1-40 ml VOA glass[3]	Store with samples in cooler[4]	NA

Notes:
[1].Extraction within 7 days.
[2] Not used.
[3] VOA filled with deionized water.
[4] Measure temperature immediately upon arrival at laboratory.