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MARE ISLAND
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Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Building 127, Room 112
San Diego, California 92132-5190

CONTRACT NO. N44255-95-D-6030
DO NO. 0094

FINAL
WORK PLAN
Revision 0
July 11, 2001

UNDERGROUND FUEL OIL PIPING AND TPH CONTAMINATED SOIL REMOVAL

MARE ISLAND ELEMENTARY SCHOOL AT THE FORMER MARE ISLAND NAVAL SHIPYARD VALLEJO, CALIFORNIA

DCN: FWSD-RACII-01-0262

FOSTER WHEELER ENVIRONMENTAL CORPORATION
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TRANSMITTAL/DELIVERABLE RECEIPT

Contract No. N44255-95-D-6030 (RAC II)

Document Control No. 01-0262 Rev. 0

File Code: 5.0

TO: Contracting Officer
Naval Facilities Engineering Command
Southwest Division
Mr. Richard Lovering, 02R1.RL
1220 Pacific Highway
San Diego, CA 92132-5190

DATE: 07/11/01
DO: 0094
LOCATION: NSY Mare Island

FROM:
Neil Hart, Program Manager

DESCRIPTION: Final Work Plan, Underground Fuel Oil Piping and TPH Contaminated Soil Removal, Rev. 0, 07/11/01

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July 11, 2001
FWSD-RACII-01-0262
FWSD-RACII-01-0263
5.0 DELIVERABLES

Commander
Naval Facilities Engineering Command
Southwest Division
Attn: Mr. Duane Rollefson (Code 06CM.DR)
1220 Pacific Highway
San Diego, CA 92132-5191

SUBJECT: FINAL WORK PLAN, DELIVERY ORDER 0094, REMEDIAL ACTION CONTRACT FOR UNDERGROUND FUEL OIL PIPING AND TPH CONTAMINATED SOIL REMOVAL, THE FORMER MARE ISLAND NAVAL SHIPYARD, VALLEJO, CALIFORNIA

Ref: Contract N44255-95-D-6030 (RACII), Environmental Remediation Contract for Sites in Washington, Oregon, Idaho, Montana, and Alaska

Dear Mr. Rollefson:

Foster Wheeler Environmental is pleased to provide the attached Final Work Plan and Final Health and Safety Plan (14 copies) for the subject project. The Work Plan includes the Field Sampling Plan, the Quality Assurance Program Plan, and the Contractor's Quality Control Plan. In addition, comment response matrices have been included in the inside folder flap of each Work Plan. The Site Specific Health and Safety Plan includes the Base Wide Health and Safety Plan as an attachment.

We are prepared to respond to any comments you may have on the attached documents.

If you have any questions or require further information, please contact Mr. Kent Weingardt at ext. 232.

Sincerely,
FOSTER WHEELER ENVIRONMENTAL

Neil Hart
Program Manager
Navy RAC

Attachments

1230 COLUMBIA STREET, SUITE 640, SAN DIEGO, CA 92101
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RESPONSE TO REGIONAL WATER QUALITY CONTROL BOARD COMMENTS
DRAFT WORK PLAN
UNDERGROUND FUEL OIL PIPING AND
TPH CONTAMINATED SOIL REMOVAL
MAY 2, 2001
MARE ISLAND ELEMENTARY SCHOOL AT THE
FORMER MARE ISLAND NAVAL SHIPYARD

SOUTHWEST DIVISION NAVAL FACILITIES ENGINEERING COMMAND

DCN: FWSD-RACII-01-0257

July 11, 2001

Comments by: Gary J. Riley, Water Resource Control Engineer (RWQCB)
Dated: 8 June 2001
Response by: Kent Weingardt, P.E., Foster Wheeler Environmental Corporation (FWENC)

Comments to Draft Work Plan for Former Mare Island Naval Shipyard (MINS) dated 2 May 2001

Comment 1. The Navy's proposed confirmation sampling regime for the hydrocarbon-impacted soil excavation is too limited. The proposed sampling includes only two soil samples for each "hot spot" excavation: one collected from the bottom of the excavation and one from the sidewall. These excavations are proposed to be 50 feet in diameter and 5 to 6 feet deep. This corresponds to a sidewall of up to 942 square feet, and an excavated area of 1,963 square feet. RWQCB requests the confirmation sampling regime include a minimum of four soil samples collected from the excavation sidewalls at a depth representing the highest observed concentrations, and two soil samples from the base of each excavation. One of the base samples should be analyzed for CERCLA contaminants in addition to petroleum hydrocarbons. Additionally, groundwater samples must be collected if encountered. Groundwater analysis should not be restricted to petroleum only but also address the potential for non-petroleum contamination.	**Response 1.** Agreed. The confirmation sampling regime will include a minimum of four soil samples collected from the excavation sidewalls at a depth representing the highest observed concentrations based on past investigative findings, biased sampling through visual observations, or other field observations, and two soil samples from the base of each excavation. One of the base samples will be analyzed for CERCLA contaminants in addition to petroleum hydrocarbons. Groundwater is deeper than the proposed excavations and is not anticipated on being encountered. However, if encountered, a grab sample will be obtained and analyzed for both petroleum and non-petroleum constituents.

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DCN: FWSD-RACII-01-0257

July 11, 2001

Comments by: Gary J. Riley, Water Resource Control Engineer (RWQCB)
Dated: 8 June 2001
Response by: Kent Weingardt, P.E., Foster Wheeler Environmental Corporation (FWENC)

Comment 2. In accordance with Tri-Regional Board Guidelines for UST investigations and to address site-specific concerns, soil samples for petroleum hydrocarbon analysis should be collected for every 20 linear feet of known or suspected piping and at all known or suspected pipeline valves or junctions. Samples collected every 40 feet along known or suspected pipelines should be analyzed for petroleum and non-petroleum contamination.	**Response 2.** Where accessible, soil samples for petroleum hydrocarbon analysis will be collected for every 40 linear feet of known or suspected piping and at all known or suspected pipeline valves or junctions. Samples collected every 40 feet along known or suspected pipelines will be analyzed for petroleum and non-petroleum contamination. However, because of accessibility problems, only six (6) samples (roughly 31 to 108 feet apart) will be collected from underneath Building 2001 in the vicinity of where the 10-inch pipeline use to be. These 6 samples will be tested for both petroleum hydrocarbons and non-petroleum contaminants (CERCLA contaminants). A map has been attached to these comments depicting the proposed locations of the samples to collected underneath Building 2001.
Comment 3. Historical information provided in the work plan does not provide information on why the 6-inch line is not believed to extend beneath Building 864. Please clarify this in the revised work plan.	**Response 3** All of the drawings found in previous investigative reports do not show the 6-inch line extending beneath Building 864. However, the possibility of the line extending under the building has not been ruled out. The 6-inch pipeline underlying 9th Street will be field located via potholing and the extents of the pipe will be determined through excavation activities. Samples will be collected in the area of the 6-inch pipeline between Building 864 and Building 2001. However, the space between the buildings is too tight, and there are too many field obstructions to perform exploratory investigation in this area.

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Comments by: Gary J. Riley, Water Resource Control Engineer (RWQCB)
Dated: 8 June 2001
Response by: Kent Weingardt, P.E., Foster Wheeler Environmental Corporation (FWENC)

Comment 4. The work plan text does not state that the excavation centered at sampling location IR23GB060 will not meet the proposed 50-foot diameter due to the proximity of Building 864. Please revise the text to state how large the excavation will be in this area and what measures will be taken to ensure the integrity of the building is not affected by the proposed excavation. In addition, the planned confirmation sampling for this excavation should include a minimum of three sidewall samples and one bottom sample. One of the sidewall samples should be collected from the sidewall adjacent to the building to evaluate the presence of contamination remaining under the building. The bottom sample should be analyzed for non-petroleum contamination as well as petroleum hydrocarbons.	**Response 4.** Agreed. The text will be revised to state that this excavation area will have a 25-foot radius, with the center of the radius being approximately 10 feet from to the west of Building 864. It should be noted that the sample point (IR23GBO60) indicating the presence of TPH is only at a 2-foot depth. At 4-feet deep in this area no TPH was detected. Consequently, the excavation depth at this "hot spot location" will be between 4 and 6 feet. To maintain the integrity of the building, the excavation will slope upward toward the building from the center point of the radius. Therefore, the excavation depth will be much shallower the closer you get to the building. Shoring will also be used in the excavation area where required. In addition, the planned confirmation sampling for this excavation will include a minimum of three sidewall samples and one bottom sample. One of the sidewall samples will be collected from the sidewall adjacent to the building to evaluate the presence of contamination remaining under the building. The bottom sample will be analyzed for non-petroleum contamination as well as petroleum hydrocarbons.
Comment 5. Section 1.4, Page 1-4: The table should be revised to include the correct phone number for the Navy Remedial Project Manager.	**Response 5.** Agreed. The table will be revised to include the correct phone number for the Navy Remedial Project Manager.
Comment 6. Section 2.0, Page 2-1: The third paragraph should be revised to state that the DTSC and the RWQCB did not object to an approach of "...a Non-CERCLA removal action as long as this is what all available data shows." Additionally, please delete the last sentence of the third paragraph on Page 2-1.	**Response 6.** Agreed. The third paragraph will be revised to state that the DTSC and the RWQCB did not object to an approach of "...a Non-CERCLA removal action as long as this is what all available data shows." Additionally, the last sentence of the third paragraph on Page 2-1 will be deleted.

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Dated: 8 June 2001
Response by: Kent Weingardt, P.E., Foster Wheeler Environmental Corporation (FWENC)

Comment 7. Section 2.0, Page 2-2: The text should specify what "additional paperwork" may be required depending on the amount of additional contamination identified. This could include a report of unauthorized release from the fuel oil pipeline.	**Response 7.** Agreed. Per conversation with Mr. Al Netto of the Solano County Department of Environmental Management (SCDEM), the text will be revised to state: "If contamination is found, the Navy, RWQCB, DTSC and U.S. EPA will be notified, in addition to SCDEM. SCDEM also requires notification…" The additional paperwork that was referred to is an Environmental Questionnaire for Part I of Initial Study, which is a standard application form provided by the Solano County Department of Environmental Management.
Comment 8. Section 2.1, Page 2-2: The first paragraph of this section suggests use of RBSLs for surface soils where groundwater is not currently or potentially used as a drinking water source. RWQCB Order No. 00-132 identifies groundwater at Mare Island as having, among others, potential beneficial use as municipal and domestic water supply. The work plan does not provide a basis for the selection of the RBSL to use in this instance.	**Response 8.** According to the June 9, 1997 PRC Environmental Management, Inc. report titled "Draft Technical Memorandum, Assessment of Beneficial Uses of Groundwater, Mare Island, Vallejo, California"; the groundwater underlying the project site was assessed to not be suitable for domestic drinking water supply. It was also found to be unsuitable for industrial and agricultural purposes due to the salinity levels of the groundwater. Therefore, for this project site, it is suggested that the clean-up goals for surface soils where groundwater is not currently or potentially used as a drinking water source be utilized, which for TPH impacted soil is 500 mg/kg diesel – we are proposing the more conservative level of 400 mg/kg to be consistent with other work that has been done at Mare Island. This explanation will be added to the text of this section along with the referenced document.

RESPONSE TO REGIONAL WATER QUALITY CONTROL BOARD COMMENTS
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July 11, 2001

Comments by: Gary J. Riley, Water Resource Control Engineer (RWQCB)
Dated: 8 June 2001
Response by: Kent Weingardt, P.E., Foster Wheeler Environmental Corporation (FWENC)

Comment 9. Section 5.10, Page 5-7: The first bullet item in this section states one boring will be advanced every 100 feet along the 10-inch pipeline. See General Comment 2 above.	**Response 9.** Agreed. Where accessible, soil samples for petroleum hydrocarbon analysis will be collected for every 40 linear feet of known or suspected piping and at all known or suspected pipeline valves or junctions. Samples collected every 40 feet along known or suspected pipelines will be analyzed for petroleum and non-petroleum contamination. However, because of accessibility problems, only six (6) samples (roughly 31 to 108 feet apart) will be collected from underneath Building 2001 in the vicinity of where the 10-inch pipeline use to be. These 6 samples will be tested for both petroleum hydrocarbons and non-petroleum contaminants (CERCLA contaminants). A map has been attached to these comments depicting the proposed locations of the samples to collected underneath Building 2001.
Comment 10. Section 6.2.2, Page 6-3: Text of the final bullet item on this page should be revised from "registered engineer" to "registered professional engineer".	**Response 10.** Agreed. Text of the final bullet item on this page will be revised from "registered engineer" to "registered professional engineer".

RESPONSE TO REGIONAL WATER QUALITY CONTROL BOARD COMMENTS
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Comments by: Gary J. Riley, Water Resource Control Engineer (RWQCB)
Dated: 8 June 2001
Response by: Kent Weingardt, P.E., Foster Wheeler Environmental Corporation (FWENC)

Comment 11. Appendix A, Section 4.3, Page 4-1: See General Comment 1 above.	**Response 11.** Agreed. The confirmation sampling regime will include a minimum of four soil samples collected from the excavation sidewalls at a depth representing the highest observed concentrations based on past investigative findings, biased sampling through visual observations, or other field observations, and two soil samples from the base of each excavation. One of the base samples will be analyzed for CERCLA contaminants in addition to petroleum hydrocarbons. Groundwater is deeper than the proposed excavations and is not anticipated on being encountered. However, if encountered, a grab sample will be obtained and analyzed for both petroleum and non-petroleum constituents.
Comment 12. Appendix B, Section 2.1, Page 2-1: See Comment 5 above.	**Response 12.** Agreed. The table will be revised to include the correct phone number for the Navy Remedial Project Manager.
Comment 13. Appendix F, Section 3.0, page 3-1: The second recommendation based on findings of the preliminary investigation at the school site states additional exploratory excavations will be performed to verify that the 10-inch fuel line does not remain in place between Building 2001 and the Former UST 772. However, no mention of such excavation work is made in the work plan. Please clarify this discrepancy and provide information on all of the methods proposed for verifying that this line was indeed removed.	**Response 13.** The following will be added to the note for the 10-inch pipeline in Section 5.6, Page 5-3: "Several exploratory excavations (potholes) will be performed in the vicinity of this former pipeline between the West end of Building 2001 and the school fenceline in the direction of the former UST 772. These excavations will be utilized to confirm that the pipeline does not exist in this area. The excavations will utilize a single sweep of a backhoe bucket to the presumed depth of the former line. These areas will be restored as appropriate."

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July 11, 2001

Comments by: Gary J. Riley, Water Resource Control Engineer (RWQCB)
Dated: 8 June 2001
Response by: Kent Weingardt, P.E., Foster Wheeler Environmental Corporation (FWENC)

Comment 14. Site-Specific Health and Safety Plan (SSHSP), Section 2.0, Page 2-1 and Table 3: See Comment 5 above.	**Response 14.** Agreed. The table will be revised to include the correct phone number for the Navy Remedial Project Manager.

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DCN: FWSD-RACII-01-0257

July 11, 2001

Comments by: Gary J. Riley, Water Resource Control Engineer (RWQCB)
Dated: 8 June 2001
Response by: Kent Weingardt, P.E., Foster Wheeler Environmental Corporation (FWENC)

Comment 15. Response to RWQCB Comment 2: The Navy is proposing a 40-foot sampling interval instead of the 20-foot interval specified in Tri-Regional Board guidelines. Please provide clarification of why it is the Navy's position that the proposed sampling frequency is adequate for this site. Regardless of the sampling frequency agreed to, samples will be required at all known or suspected valves or junctions, and from visibly contaminated areas.	**Response 15.** There are three pipeline investigation areas that would include the potential sampling frequency as proposed. They are listed below with the rationale for the 40-foot sampling frequency: 1. <u>10" pipeline that ran under building 2001</u>: This fuel line was reportedly located within a non-pressurized (3' X 5') concrete duct from the fuel oil pipeline vault in Cedar Avenue, to the UST 772 pump pit. If the 10" line had a release, it would've been contained within the ductwork and because of the viscosity of the fuel oil, the potential for a release to the environment as a result of misalignment or cracks in the ductwork are low. Most (if not all) of this 10" fuel oil line was removed during the construction of building 2001 (this will be verified during our field exercise). There were no discussions of a modification to the building 2001 construction contract for any environmental cleanup or other environmental actions associated with the pipeline removal. The assumption is that there was no release caused by the demolition of the pipeline and associated ductwork. The majority of the 10" pipeline was located under building 2001 and as such, there are limited sampling access points as discussed in our response to comments. In early April 2001, the Navy performed a pothole excavation at the east end of building 2001 (near mid-point of the building and the previous SSPORTS excavation project). This pothole excavation did not indicate any visual or field screening method indications of a release in this area (although no sampling was performed to verify). And lastly, TtEMI performed sampling along the north side of the 10" pipeline (although not directly adjacent) and did not reveal any impacts as a result of the pipeline. Therefore, based on the configuration of the former pipeline and the fact that previous work

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July 11, 2001

Comments by: Gary J. Riley, Water Resource Control Engineer (RWQCB)
Dated: 8 June 2001
Response by: Kent Weingardt, P.E., Foster Wheeler Environmental Corporation (FWENC)

has not indicated any release, the Navy believes that sampling every 20 feet is overly aggressive. Since it is desirable to minimize our impacts to school property, while at the same time obtaining useful and meaningful data, the Navy would like to relax the sampling frequency in this area to one sample every 40 feet. We feel this frequency is conservative and justified.

2. 6" pipeline between buildings 864 and 2001: Although this location may have some site constraints, the sampling locations will be very near the 20-foot sampling frequency as requested. This segment should not be an issue for the sampling frequency.

3. 6" pipeline under 9th street: This pipeline is planned to be removed in its entirety. In addition to the proposed 40-foot sampling frequency, we will be able to visually inspect the pipeline and excavation during this removal for pipeline deterioration and potential releases. We will also be using field-screening techniques to monitor contamination that cannot be visually identified. We will be taking biased samples in those locations that appear to be contaminated either by visual or field-screening methods. Any contamination that is discovered will be removed. We consider the 40-foot sampling frequency to be a conservative and justified approach when factoring the visual and field-screening methods during the excavation.

If the sampling frequency was every 20 feet as requested versus the 40 feet as planned, this will cost the Navy approximately another $3,000 to this project (5 additional locations at the 10" fuel line, and 3 additional locations for the 9th street excavation).

RESPONSE TO U.S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
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DCN: FWSD-RACII-01-0257

July 11, 2001

Comments by: Carolyn d'Almeida, Remedial Project Manager (USEPA)
Dated: 8 June 2001
Response by: Kent Weingardt, P.E., Foster Wheeler Environmental Corporation (FWENC)

Comments to Draft Work Plan for Former Mare Island Naval Shipyard (MINS) dated 2 May 2001

Comment 1. (Page 2-2) Please provide additional background in the final work plan on the selection of 400 mg/kg as proposed criteria for the removal of contaminated soil and provide a risk-based explanation of why this number is considered protective for a school site.	**Response 1.** According to the June 9, 1997 PRC Environmental Management, Inc. report titled "Draft Technical Memorandum, Assessment of Beneficial Uses of Groundwater, Mare Island, Vallejo, California"; the groundwater underlying the project site was assessed to not be suitable for domestic drinking water supply. It was also found to be unsuitable for industrial and agricultural purposes due to the salinity levels of the groundwater. Therefore, for this project site, it is suggested that the clean-up goals for surface soils where groundwater is not currently or potentially used as a drinking water source be utilized, which for TPH impacted soil is 500 mg/kg diesel – we are proposing the more conservative level of 400 mg/kg to be consistent with other work that has been done at Mare Island. This explanation will be added to the text of this section along with the referenced document. This level is considered protective of a school site because it is a Risk Based Screening Level for residential areas (the most conservative area). These values have been put forth by the RWQCB guidance document entitled "Application of Risk Based Screening Levels and Decision making to Sites With Impacted Soil and Groundwater. In addition, all other past sampling points that show detectable levels of TPH down to 100 mg/kg are underneath paved areas, which provides a migration pathway barrier to direct exposure of contaminants which further reduces the risk of exposure.

RESPONSE TO U.S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
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DCN: FWSD-RACII-01-0257

July 11, 2001

Comments by: Carolyn d'Almeida, Remedial Project Manager (USEPA)
Dated: 8 June 2001
Response by: Kent Weingardt, P.E., Foster Wheeler Environmental Corporation (FWENC)

Comment 2. Sampling approach: EPA agrees with the RWQCB that the sampling frequency (one every 100 feet, per page 4-1) is inadequate. In addition, since the purpose of this sampling event is to determine the need for excavation rather than risk characterization, it would be appropriate to take biased samples from any area where soils appeared to be contaminated with oily stains or odors. The plan should allow for the collection of such additional discrete samples, in addition to the samples at regular intervals.	**Response 2.** Where accessible, soil samples for petroleum hydrocarbon analysis will be collected for every 40 linear feet of known or suspected piping and at all known or suspected pipeline valves or junctions. Samples collected every 40 feet along known or suspected pipelines will be analyzed for petroleum and non-petroleum contamination. However, because of accessibility problems, only six (6) samples (roughly between 31 and 108 feet apart) will be collected from underneath Building 2001 in the vicinity of where the 10-inch pipeline use to be. These six samples will be tested for both petroleum hydrocarbons and non-petroleum contaminants (CERCLA contaminants). A map has been attached to these comments depicting the proposed locations of the samples to collected underneath Building 2001.
Comment 3. Response to EPA comment #1 looks ok; please incorporate explanation of how cleanup level was selected into the workplan; I'm mainly concerned that the public be informed of the basis of the decision	**Response 3.** Agreed. The explanation of how the cleanup level was selected will be incorporated into the Work Plan.
Comment 4. Comment #2 requested that biased samples be included in addition to sampling at regular intervals, in the event that any visibly contaminated material be encountered during excavation.	**Response 4.** Agreed. Biased samples will be included in addition to sampling at regular intervals, if any visible contaminated soil is encountered during excavation activities. The Work Plan and the Field Sampling Plan will be revised to incorporate taking biased samples as described above.

ADDITIONAL CHANGES TO
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- The Site Superintendent will be changed from Sean Delaney to Randy Rose. The Site Health and Safety Specialist will be changed from Sean Delaney to Matt Letany. The Project QC Manager will be changed from Terri Ryland to Randy Rose. These changes will be made to both the Work Plan and the Site-Specific Health and Safety Plan.

- Building 864 on Figure 4-3 of the Work Plan and Figure 1 of the Field Sampling Plan will be edited to more closely reflect the actual building layout. Also, seven buildings that exist along side 9th Street on the school property will be added to these drawings, as well as a maintenance building that is located near Tisdale Avenue.

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ABBREVIATIONS AND ACRONYMS

AST	aboveground storage tank
bgs	below ground surface
BMP	Best Management Practice
Cal/EPA	California Environmental Protection Agency
Cal-OSHA	California Occupational Safety and Health Administration
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CO	Contracting Officer
CQC	Contractor Quality Control
CSO	Caretaker Site Office
CY	cubic yard
DO	Delivery Order
DOT	Department of Transportation
DTSC	Department of Toxic Substances Control
EFANW	Engineering Field Activities Northwest
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
FOST	Findings of Suitability for Transfer
FWENC	Foster Wheeler Environmental Corporation
FSP	Field Sampling Plan
HDPE	high-density polyethylene
HSP	Health and Safety Plan
IR	Installation Restoration
IRP	Installation Restoration Program
LDR	Land Disposal Restriction
mg/kg	milligrams per kilogram
MINS	Mare Island Naval Shipyard
Navy	U.S. Navy
NCP	National Contingency Plan
NTR	Navy Technical Representative
PCB	polychlorinated biphenyl
PESM	Program Environmental Health and Safety Manager

ABBREVIATIONS AND ACRONYMS
(Continued)

PID	photoionization detector
PjM	Project Manager
PPE	personal protective equipment
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QC	quality control
RAC	Remedial Action Contract
RBSL	risk-based screening level
RCRA	Resource Conservation and Recovery Act
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
RWQCB	Regional Water Quality Control Board
SCDEM	Solano County Department of Environmental Management
SHSO	Site Health and Safety Officer
SHSP	Site-Specific Health and Safety Plan
SS	Site Superintendent
STLC	soluble threshold limit concentration
SVOC	semivolatile organic compound
SWDIV	Southwest Division Naval Facilities Engineering Command
TCLP	toxicity characteristic leaching procedure
TPH	Total Petroleum Hydrocarbons
TSDF	treatment, storage, and disposal facility
UST	underground storage tank
VOC	volatile organic compound
WMP	Waste Management Plan

1.0 INTRODUCTION

The U.S. Navy (Navy) has awarded Delivery Order (DO) No. 0094, underground fuel oil piping and total petroleum hydrocarbon (TPH) contaminated soil removal at the former Mare Island Naval Shipyard (MINS), Vallejo, California, to Foster Wheeler Environmental Corporation (FWENC). This project will be conducted under Engineering Field Activities Northwest Remedial Action Contract (EFANW RAC II) No. N44255-95-D-6030, Environmental Remediation Contract for Sites in Washington, Oregon, Idaho, Montana, and Alaska.

This project is being undertaken to locate and remove underground fuel oil pipelines and petroleum soil contamination on property occupied by the Mare Island Elementary School. The pipelines are associated with the a former aboveground storage tank (AST) 636 that was located on the school grounds, and a former underground storage tank (UST) 772 located on the property adjacent to the school grounds. The soil contamination is in the vicinity of the former AST 636. The detailed description of the project location, site features and history, and associated maps and figures are presented in Section 4.1.

The Navy currently owns the school property. The Navy is planning to transfer the property to the Department of Education under a Public Benefit Conveyance. As part of this transfer, the Navy will prepare a Findings of Suitability for Transfer (FOST) for the property. This investigation and removal action is needed to meet the requirements of the FOST.

This Work Plan provides project background and the approach, means, and methods for performing the scope of work detailed below. Additional plans that are necessary to execute this work are included as appendices to this document and include:

- Field Sampling Plan (FSP)
- Quality Assurance Project Plan (QAPP)
- Contractor Quality Control Plan (CQC) Plan

Also, site health and safety requirements are documented in two stand-alone documents:

- Base-Wide Health and Safety Plan
- Site-Specific Health and Safety Plan (SHSP)

These documents are required to be followed for the execution of this project and will be available at all times on the project site.

1.1 PROJECT OBJECTIVE

The overall objective of this project is to ensure that any environmental impacts associated with past Navy storage and fuel oil transfer operations at the site (i.e. the storage and transfer of fuel oil from the tanks) have been adequately addressed. The objectives are defined as follows:

1. Verify the existence of, and locate, any remaining pipelines
2. Determine if a release has occurred from these pipelines
3. If a release has occurred, remove the impacted media
4. Remove accessible pipelines
5. Remove impacted soil around former AST 636

1.2 SCOPE OF WORK

The scope of work for this project is to address any potential impacts to the Elementary School property that may have occurred as the result of fuel oil storage and transfer activities on and near the property.

Specifically, the scope includes the verification and location of three sections of buried pipeline that may have been left in place on or near school property. The location and configuration of the pipelines of concern are detailed in Section 4.1. If it is found that these pipelines can be excavated (i.e. excavation would not impact the structural integrity of site buildings), they will be tested for integrity, flushed, and removed. Post-excavation sampling will be performed to determine if there was a release from the excavated pipelines. Excavated materials will be characterized and transported to a permitted and approved disposal facility.

Where pipelines are not accessible, direct-push sampling near the pipelines will be used to determine if a release has occurred.

A soil removal action will also be conducted near the former AST 626 located in the schoolyard. Past sampling has shown that there are several discrete areas where TPH levels exceed 400 milligrams per kilogram (mg/kg). These areas are referred to as "hot spots" in this Work Plan and will be excavated. Previous sampling has indicated that the hot spots are restricted to the first 6 feet below ground surface (bgs). Each excavation will be up to 6 feet deep, 50 feet in diameter, and centered around the location where the sample was collected. The excavated soils will be characterized and transported to a permitted and approved disposal facility. Post-excavation screening and sampling will be conducted within each excavation to verify that TPH concentrations no longer exceed 400 mg/kg.

All excavations will be backfilled with clean material and surface conditions will be restored to previous conditions consistent with site use.

A closeout report will be prepared once field activities are complete. The report will summarize all site work and findings.

1.3 PROJECT SCHEDULE

The project schedule is depicted in Figure 1-1.

All fieldwork is scheduled to occur when the Elementary School is out of session to minimize impacts to school operations. There are two school breaks during which work is scheduled.

The first break occurred between March 16, 2001 and April 13, 2001. During this time, FWENC performed site mapping and geophysical surveying, along with a limited exploratory excavation to better define site parameters. This effort was done with approval from DTSC and the RWQCB. The results of this effort are summarized in Appendix F.

The second (summer) break occurs between July 27, 2001 and September 4, 2001. The fieldwork described in this Work Plan is scheduled to be performed during this period.

In order to perform the work as scheduled, it is necessary to expeditiously finalize the Work Plans. Agencies are encouraged to shorten the scheduled review time for this Work Plan.

1.4 PROJECT ORGANIZATION

The project organization chart is shown on Figure 1-2.

The Southwest Division Naval Facilities Engineering Command (SWDIV) Remedial Project Manager (RPM) for this project is Duane Rollefson. Mr. Rollefson is the technical lead for this project for the Navy.

Mr. Izzat Ahmadiyya is the Navy Technical Representative (NTR)/Resident Officer in Charge of Construction (ROICC). Mr. Ahmadiyya will be the primary point of contact for the field activities at the former MINS. He will act as a liaison between FWENC and the Navy's Caretaker Site Office (CSO). He is responsible for oversight and quality control of the field activities for the Navy.

Mr. Tilmon Thornton is the SWDIV Contracting Officer (CO). He is responsible for contract administration.

FWENC's Project Manager (PjM) is Mr. Kent Weingardt, P.E. Mr. Weingardt is responsible for overall project coordination, budget control, schedule control, and communication with the Navy. Mr. Weingardt will make occasional visits to the site to perform inspections and to attend meetings during fieldwork.

FWENC's Site Superintendent (SS) is Mr. Randy Rose. Mr. Rose is responsible for all aspects of the fieldwork related to this project. He is also responsible for coordinating with the NTR on all issues associated with work conducted in the field, enforcing all applicable Health and Safety requirements, and ensuring that all CQC requirements are met. Mr. Rose will also assume the

responsibilities of the Site QC Representative, who will also be responsible for general field engineering activities. Mr. Rose will be on site at all times when field activities are taking place.

The FWENC Site Health and Safety Specialist (SHSS) is Matt Letany. The FWENC SHSS will be on-site at all times during field activities.

FWENC's Program Environmental Health and Safety Manager (PESM), Mr. Roger Margotto, CIH, will address any Health and Safety issues associated with this project. Although not on site during field activities, Mr. Margotto will provide oversight through regular phone meetings and reviews with the field crew. Health and Safety site inspections will be performed on a regular basis during the course of fieldwork by Mr. Margotto's delegate in the Bay Area.

FWENC's Compliance Officer and Regulatory Specialist, Mr. Craig O'Rourke, will be available to provide guidance, direction, and consultation with respect to environmental protection and regulatory compliance. Mr. O'Rourke will be notified of all environmental issues and/or concerns. Mr. O'Rourke will make at least one site visit during field activities and will maintain in regular contact with the PjM and SS to ensure compliance/regulatory issues are being properly addressed.

The FWENC Program Quality Control (QC) Manager, Ms. Mary Schneider, will ensure that all project activities are in compliance with contractual quality control requirements. Ms. Schneider is responsible for reviewing all project deliverables, QC reports, and change documentation. She is also responsible for designating the Site QC Representative who will ensure work is being conducted in accordance with project plans.

The following is a list of the key contacts for those involved with the project:

Agency	Contact	Project Title
Southwest Division Naval Facilities Engineering Command 1220 Pacific Highway San Diego, CA 92132-5190	Duane Rollefson (619) 532-4343	Remedial Project Manager (RPM)
Navy Facilities Engineering Command San Francisco Bay Area 2450 Saratoga Street, Suite 200 Alameda, California 94501	Izzat Ahmadiyya (510) 749-5947	Navy Technical Representative (NTR)/ Resident Officer in Charge of Construction (ROICC)
Southwest Division Naval Facilities Engineering Command 1220 Pacific Highway San Diego, CA 92132-5190	Tilmon Thornton (619) 532-0943	Contracting Officer (CO)
FWENC 1230 Columbia Street, Suite 640 San Diego, CA 92101	Kent Weingardt, P.E. (619) 471-3532 (360) 908-0697 (cellular)	Project Manager (PjM)

Agency	Contact	Project Title
FWENC 1230 Columbia Street, Suite 640 San Diego, CA 92101	Randy Rose (619) 471-3523	Site Superintendent (SS)/Project QC Manager
FWENC 1230 Columbia Street, Suite 640 San Diego, CA 92101	Roger Margotto, CIH (619) 471-3503 (714) 810-3742 (pager)	Project Environmental Health and Safety Manager (PESM)
FWENC NAVWPNSTA Seal Beach PMO Site Trailer Industrial & Gardeners Road 800 Seal Beach Boulevard Seal Beach, CA 90740	Matt Letany (562) 598-6150	Site Health and Safety Specialist (SHSS)
FWENC 1940 E. Deere Ave., Suite 200 Santa Ana, CA 92705	Craig O'Rouke (949) 756-7511	Compliance Officer and Regulatory Specialist
FWENC NAVWPNSTA Seal Beach PMO Site Trailer Industrial & Gardeners Road 800 Seal Beach Boulevard Seal Beach, CA 90740	Mary Schneider (562) 598-6150 ext. 5881 (714) 620-4551 (cell)	Program Quality Control (QC) Manager

2.0 REGULATORY FRAMEWORK

Environmental investigation and remediation of MINS is being conducted under the Department of Defense Installation Restoration Program (IRP). Former UST 772 and former AST 636, and associated piping collectively comprise Installation Restoration (IR) Site 23. Activities conducted under the IRP are generally performed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the National Contingency Plan (NCP). Under Executive Order 12580, the Navy is the lead agency responsible for the cleanup effort, but the California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC), and the San Francisco Bay Area Regional Water Quality Control Board (RWQCB) are involved in IRP oversight. The US EPA is also involved with the CERCLA cleanup activities at the former MINS, however, is not expected to be an active participant on this project. The US EPA will be provided copies of the Work Plan and eventual closure report.

However, in a letter to the DTSC, dated August 29, 2000, the Navy requested the DTSC's concurrence for transferring this site out of the CERCLA program and into the UST program administered by the RWQCB and Solano County Department of Environmental Management (SCDEM). The primary consideration for the Navy's request for this transfer of regulatory program oversight was the Navy's determination that IR Site 23 involves only hydrocarbon contamination and does not include releases of CERCLA contaminants. This recommended transfer is consistent with page 3 of the 1998 schedule and assumptions addendum to the Federal Facility Site Remediation Agreement for MINS.

In a meeting held on March 19, 2001 to discuss this project, the Navy requested that the agencies revisit the August 29, 2000 letter which summarizes the data pointing only to petroleum as a contaminant of concern at the site. The DTSC and the RWQCB did not object to an approach of a Non-CERCLA removal action as long as this is what all available data shows. However, the DTSC and the RWQCB both recommended that soil samples collected during the project be analyzed for various constituents and not be restricted to hydrocarbon contaminants only. Until the soil analytical data is obtained, both DTSC and the RWQCB requested that both agencies be viewed on an equal basis and both should receive documents for review. DTSC further stated that they will submit comments but will not need to give final approval or acceptance on the Work Plans.

According to Mr. Al Netto of the SCDEM, their involvement in this project would be limited to their requirement for permits for the direct-push soil borings being performed at MINS. However, permits would not be required for the removal of the fuel oil pipelines because SCDEM views this site as a closed UST site, and therefore the piping associated with the closed UST and the AST is not considered part of the UST system any longer. Mr. Netto indicated notification of SCDEM would be required if contamination is found as a result of the borings. If

contamination is found, the Navy, RWQCB, DTSC and U.S. EPA will be notified, in addition to SCDEM. SCDEM also requires notification if any abandoned USTs are found during the excavation work being done at the site.

This work described in this plan is consistent with the work being performed as a Non-CERCLA removal action. Apart from this project, the Navy, DTSC, and RWQCB will convene on further actions that may be required under CERCLA.

2.1 SOIL SCREENING LEVELS

The Navy will utilize a 400 mg/kg soil screening level for TPH when determining whether additional action is warranted in locations where there is evidence of hydrocarbon contamination. According to the June 9, 1997 PRC Environmental Management, Inc. report titled "Draft Technical Memorandum, Assessment of Beneficial Uses of Groundwater, Mare Island, Vallejo, California" the groundwater underlying the project site was assessed to be unsuitable for domestic drinking water supply. It was also found to be unsuitable for industrial and agricultural purposes due to the salinity levels of the groundwater. Therefore, for this project site, it is suggested that the clean-up goals for surface soils where groundwater is not currently or potentially used as a drinking water source be utilized, which TPH impacted soil is 500 mg/kg for diesel. The Navy, however, is proposing the more conservative level of 400 mg/kg (gasoline), which is the soil screening level that was utilized during a previous removal and abandonment of over 19,000 linear feet of fuel pipelines across MINS (SSPORTS, 1997). These levels are supported by the Bay Area RWQCB's January 2001 draft procedure for closure of aboveground tanks and pipelines. The draft procedure references risk-based screening levels (RBSLs) that were presented in a Bay Area RWQCB Interim Final guidance document entitled, "Application of Risk-Based Screening Levels and Decision making to Sites With Impacted Soil and Groundwater," August 2000. RBSL Table B from the guidance document refers to various "Surface Soil" (< 3 meters) RBSLs for TPH in a residential land use scenario where groundwater is not currently, or potentially, used for drinking water. The TPH RBSLs referenced in the table are as follows:

TPH (gasoline)	400 mg/kg
TPH (middle distillates)	500 mg/kg
TPH (residual fuels)	500 mg/kg

Although diesel range TPH constituents are the primary contaminants of concern associated with the former fuel pipelines, as an added measure of conservatism and to be consistent with the previous pipeline removal projects conducted across MINS, the Navy intends to use the 400 mg/kg RBSL for TPH impacted soil. This level is considered protective of a school site because it is a RBSL (set forth by the RWQCB) for residential areas, which is the most conservative area. In addition, all other past sampling points that show detectable levels of TPH

down to 100 mg/kg are underneath paved areas, which provides a migration pathway barrier to direct exposure of contaminants which further reduces the risk of exposure.

It is not anticipated that excavation will be required below 3 meters bgs and that the TPH RBSLs will increase at this depth.

3.0 ENVIRONMENTAL PROTECTION PLAN

The purpose of the Environmental Protection Plan (EPP) is to describe the methods and rationale to protect the environmental resources at MINS during remediation procedures associated with the removal of fuel oil pipelines, if encountered. This EPP provides site-specific information for the environmental condition survey, protection of land resources, protection of water resources, and protection of air resources.

3.1 PROTECTION OF WATER RESOURCES

Construction activities will be conducted in a manner as to prevent chemicals, fuels, oils, greases, and contaminated material from entering nearby surface waters and to minimize infiltration of contaminants to groundwater. Erosion control techniques will be utilized if heavy precipitation appears to be imminent. Erosion control may include temporary soil berms, sand bags, silt fencing, and/or hay bales.

3.2 PROTECTION OF AIR RESOURCES

Organic vapor emissions are expected to be minimal during excavation activities. In order to determine airborne contaminant levels in accordance with the SHSP, personnel and ambient air monitoring will be conducted as necessary. This ensures that respiratory protection will be adequate and that harmful levels of airborne contaminants are not leaving the site. The SHSP provides additional information regarding monitoring and the equipment to be used.

FWENC personnel and subcontractors will take appropriate measures to control and minimize dust emissions at MINS during excavation. Dust emissions will be monitored by visual observation and with the use of a MiniRam™ dust meter (discussed in the SHSP). Temporary dust control will be addressed as necessary during soil excavation, handling, and backfilling activities by one or more of the following methods:

- Apply water to the work and traffic areas, as necessary, to minimize dust emissions
- Cover the excavated areas and temporary stockpiles with weighted plastic sheeting to minimize wind and/or stormwater erosion
- When transporting soil from excavations to the staging areas, trucks will be covered with plastic to minimize generation of dust
- Erect temporary wind barriers or enclosures around specific dust-generating work areas, if appropriate, to minimize wind and/or stormwater erosion

4.0 SITE CONDITIONS

The information regarding the location and history of MINS and the Mare Island Elementary School property, the local hydrogeology, surface water, topography, and climate are presented in this section.

4.1 SITE DESCRIPTION AND BACKGORUND

The former MINS is located approximately thirty miles northeast of San Francisco in Vallejo, California (see Figure 4-1, Regional Map; and Figure 4-2, Facility Location Map). MINS is separated from the city of Vallejo by the Mare Island Strait. The Shipyard is only accessible through two entranceways. The main entrance is located at Tennessee Street and Wilson Avenue via the Causeway, and the other entrance is from Highway 37 at the northern end of the facility.

MINS was in operation from 1854 to 1996. Its primary mission was the construction, repair, and overhaul of naval ships. Over a period of about 90 years, an estimated 40,000 linear feet of fuel oil pipelines were installed; however, the exact linear footage is not known since detailed installation drawings are either unavailable or incomplete. The fuel oil pipelines were abandoned in-place, except for instances where removal was required because of interference with new construction or installation of new utility lines.

The project site, which is on the active public elementary school property located west of Cedar Avenue between Tisdale Avenue and 9th Street in the central portion of Mare Island, was originally designated as IR Site 23. The activities conducted under this work plan are being managed as a non-CERCLA removal action (see Section 2.0 of this document). The only anticipated contaminants of concern are petroleum hydrocarbons associated with diesel and heavier fuel compounds. The site contained former AST 636 and its associated piping as well as piping from former UST 772. The former UST 772 was located on property adjacent to the elementary school. AST 636, a 15,000-barrel (630,000 gallons) steel AST, was constructed in the early 1930s and was used to store fuel oil for the Mare Island steam power plant (Building 121). The tank was surrounded by a clay berm. Building 748, the fuel pumphouse, was reportedly constructed next to the northeastern side of this berm during the early 1930s [PRC Environmental Management, Inc. (PRC, 1997)]. A 10-inch pipe from Building 748, running northeast across Cedar Avenue and down 8th Street to Building 121, was also constructed during this time. AST 636, Building 748, and the piping in between were decommissioned and removed in the early to mid-1970s, however, it is unknown if there was an environmental investigation associated with the removal procedures. The asphalt playground was expanded to its current extent, covering the former AST 636 location.

In 1942, a partially buried, 50,000-barrel (2.1 million gallons) reinforced concrete tank (UST 772) used for storing fuel oil for the central steam power plant, was constructed approximately 150 feet north of AST 636 (PRC, 1997). The bottom of the 20-foot-high tank extended to approximately 9 feet below prevailing grade and was surrounded by a soil containment berm. The tank, decommissioned in January 1994, was removed in 1997. The site of former UST 772, adjacent to the elementary school property, is currently unpaved. A closure report for UST 772 was prepared and issued to the appropriate agencies [Roy F. Weston, Inc. (Weston), 2001]. Closure activities for this adjacent property are being addressed by other contractors as part of the transfer of MINS property.

Subsurface piping from the UST 772 was connected to existing piping from AST 636 at Building 748, which runs east to the Mare Island Strait at Berth 10. The original 10-inch piping from both tanks was constructed in a single, concrete-lined trench extending from the tanks to Cedar Avenue. The trench estimated to be 5 feet wide and between 3 and 6 feet deep also contained two 4-inch hot water supply pipes to decrease the viscosity of the fuel oil [International Technology Corporation (IT), 1989]. In 1949, the fuel supply piping to the steam plant was replaced with a new 10-inch pipeline, rerouted under 8th Street. This section extends approximately 140 feet in the southeast direction from former UST 772, before bending east at a 45-degree angle and continues for approximately 140 feet, then turns east 45 degrees again and parallels the long axis of Building 765 to Cedar Avenue (IT, 1989).

In 1975, as part of site reconstruction, the portion of the 10-inch fuel pipe from UST 772 to Cedar Avenue (via former Building 748) was capped and abandoned. The fuel pipe was replaced with an 8-inch steel fuel pipe constructed within a 4-foot-wide concrete trench. The trench depth varied between 3 and 5 feet and extended from UST 772 to the existing piping at the intersection of Cedar Avenue and 8th Street (PRC, 1997).

In 1996, the Supervisor of Shipbuilding, Conversion and Repair, Portsmouth, VA Environmental Detachment Vallejo, CA (SSPORTS) was tasked by Engineering Field Activity (EFA)-West to execute the removal of abandoned underground fuel oil pipelines at MINS. The removal work began in November 1996 and finished in July 1999. The SSPORTS Environmental Detachment was subsequently disestablished as a Navy Activity and Roy F. Weston, Inc. contracted with the Navy to finish the preparation of the Summary Report, employing displaced SSPORTS employees previously assigned to the Task.

In the end, the 8-inch pipe and concrete trench along with over 17,000 linear feet of other pipe was excavated and removed from the site by the former SSPORTS Environmental Detachment (Weston, 2001). However, there is speculation that three sections of fuel oil pipeline were left in place in the vicinity of the former AST 636 and UST 772. These include:

- The 10-inch pipeline that runs from the former UST 772 to Cedar Avenue (approximately 575 feet). However, construction drawings for the Mare Island Elementary School show that this line was removed during construction of Building 2001, which was built over the location of the 10-inch pipeline.
- A 120-foot section of 6-inch pipe that runs north from between Buildings 1052 and 1054 and extends under 9th Street.
- A 75-foot section of 6-inch pipe that appears to be under the western end of Building 2001.

A Site Plan, detailing the area of the site described above, is included as Figure 4-3.

4.2 GEOLOGY AND HYDROGEOLOGY

Two geologic units have been identified at the MINS site. These include (1) unconsolidated materials and (2) bedrock. The upper geologic unit consists of unconsolidated materials of various lithologies. The uppermost portion is light brown, sandy silt that ranges in thickness from 1 to 4 feet. This surficial sandy silt unit is 4-feet thick near the former UST 772. Underlying the sandy silt layer is dark gray clayey silt ranging in thickness from 2 to 7 feet. The clayey silt may be associated with the placement of a containment berm during the construction of UST 772. South and west of UST 772, the brown sandy silt is not present, and the uppermost portion of the unconsolidated materials is predominately the dark gray clayey silt. Underlying the dark gray clayey silt layer is a pale brown silty sand, which may represent the weathered zone of the underlying bedrock (PRC, 1997).

The unconsolidated materials are underlain by bedrock that consists of pale brown sandstone, which appears to be associated with the Panoche Formation underlying Mare Island. Bedrock is approximately 15 feet bgs in the southern area of the site, and at 25 feet bgs at the northern edge of the site (PRC, 1997).

Based on the lithologies of the geologic materials, three hydrogeologic units have been identified. The uppermost hydrogeologic unit is composed of coarse-grained materials such as sand and gravel. These materials are relatively permeable and are generally confined to the immediate tank area and associated piping trenches. The second hydrogeologic unit is the silty sand portion of the unconsolidated materials. Silty sands are permeable, but typically exhibit relatively low hydraulic conductivities. The third hydrogeologic unit is the bedrock that underlies the other two units. This unit exhibits low hydraulic conductivity (PRC, 1997).

Groundwater at the site has been classified by the Navy as "non-beneficial use" because of the site's close proximity to a body of salt water, thus, the underlying groundwater is assumed to be brackish. The groundwater at the site has previously been measured at depths ranging from 3.4 to 12.4 feet below grade. From previous site investigations, it was determined that the groundwater exhibits a high seasonal fluctuation (PRC, 1997). In general, water levels are

highest during the wet season (November to April) and lowest during the dry season (May to October), and vary by approximately 2.5 to 5 feet over the annual hydrologic cycle (PRC, 1997).

4.3 SURFACE WATER

Mare Island is surrounded by the Mare Island Strait to the east, by the San Pablo Bay to the west, and by Carquinez Strait to the south. There are no surface water bodies within the boundary area of concern.

4.4 TOPOGRAPHY

The site, and the area surrounding the site, has little variation in ground elevation. The site topography is considered flat. Surface features include the school buildings, pavement and curbing, paved playground area, and landscaped or turfed areas. It appears most of the areas of piping and contamination are under asphalt pavement. The site staging area, located along Tisdale Avenue (Figure 4.2), sits at a lower elevation than the rest of the site. The edge of the school property slopes down to meet Tisdale Avenue and the site staging area, along the western edge of the property. Because of the slope, it should be noted that there is not direct access between the eastern edge of the school property and the staging area.

4.5 CLIMATE

The local climate is characterized by mild winters and summers. Mean monthly temperatures range from a low of 47 degrees Fahrenheit in January to a high of 68 degrees Fahrenheit in July and August. Average annual precipitation is 25.2 inches. Precipitation typically occurs from November through March.

5.0 FIELD ACTIVITIES

This section describes the specific activities involved in preparation for, and field implementation of, the pipeline removal activities and excavation of TPH impacted sites associated with former AST 636 at the MINS.

5.1 PERMITTING AND NOTIFICATIONS

Permits for the soil borings are required and will be obtained from the SCDEM. A SCDEM permit will not be required for removal of the pipelines at the MINS, as it is regarded as a closed UST site. A Dig Permit will also be acquired from the Navy's CSO at MINS. In accordance with the "Call before you Dig Law," Underground Service Alert will be notified at 1-800-227-2600 prior to any excavation or drilling activities to ensure utilities will not be disturbed. As part of the pre-construction investigation activities, FWENC has performed a detailed geophysical survey of the site to note any subsurface interferences. This information is in included in Appendix F of this Work Plan.

In addition, during pipe removal activities involving the section of 6-inch pipeline underlying 9th Street, a road closure will be coordinated with the CSO as well as the City of Vallejo. The city road closure process involves notification of the local fire and police departments.

A permit for trenches and excavation work within the State of California has been obtained by FWENC from the California Department of Industrial Relations, Division of Occupational Safety and Health Administration (Cal-OSHA). A copy of this annual permit (No. 2001-903457), along with an Activity Notification Form, is included as Appendix E. Under this permit, it is required that the nearest Cal-OSHA field office be notified of any planned excavation activity at least 5 days before the planned event. An Activity Notification Form must also be completed and faxed to the nearest Cal-OSHA field office 5 days prior to the planned activity.

This Work Plan will be submitted to the Navy, San Francisco Bay Area RWQCB, and the DTSC. Following finalization of this Work Plan, FWENC will notify the RWQCB, the DTSC, the City of Vallejo, the CSO, as well as school personnel regarding the detailed schedule of the anticipated work.

5.2 PRE-CONSTRUCTION MEETING

A pre-construction meeting will be held between the Navy RPM, FWENC PjM and SS, the NTR/ROICC, DTSC, RWQCB, CSO, and the appropriate representative from the City of Vallejo and the elementary school. The purpose of this meeting is to develop a mutual understanding of the planned site activities, the CQC details including forms to be used, administration of on-site

work, and coordination of the construction management. FWENC will prepare minutes of the meeting for submittal to the NTR/ROICC.

5.3 MOBILIZATION

Prior to mobilization, the appropriate Navy personnel, the City of Vallejo, and the school personnel will be notified about the planned schedule for mobilization and the MINS closure activities. If required by the NTR/ROICC, a list of the field personnel including the required personal data will be delivered to the Navy as needed in order to arrange for authorized entry and badges. Upon receipt of appropriate records and authorizations, the field personnel and equipment will be mobilized to the site.

Mobilization activities include setting up field office trailer (10'x28'), movement of equipment and materials to the site, as well as training and site orientation of field personnel. The electrical hook-up will need to be coordinated with the NTR/ROICC and Island Power. Mobilization will also involve the establishment of a suitable equipment storage area to support the project activities. The official project storage and staging area is shown on Figure 4-3 and is located off school property along Tisdale Avenue on the west side of the school. The project trailer will be located in this area. Other temporary storage and laydown areas will be required throughout the project site near the work location and will be appropriately designated and secured.

FWENC and its subcontractors will provide materials, labor, and equipment necessary to accomplish the work and complete the construction tasks as identified in this Work Plan. Equipment will be selected and sized to perform the designated tasks associated with asphalt and/or concrete breaking and handling, excavation, placement, and compaction of backfill, and all related material handling, loading, transporting, and disposal activities. The following equipment is anticipated to be mobilized to the site:

- Backhoe
- Rubber-tired loader
- Dump truck (end dump)
- Water trucks (as needed)
- Excavator
- Compaction equipment

FWENC will utilize the existing water supply at the site during field activities. The water for all flushing activities will be obtained from a fire hydrant within close proximity to the planned operations. This will be coordinated through the City of Vallejo Fire Department. Back-flow prevention devices will be used as necessary.

All construction equipment will be delivered to the site in a clean condition. All equipment will be photographed upon delivery to the site.

5.4 SITE PREPARATION

Site setup activities include the set up of temporary field facilities, site-specific security, as well as excavation, boring, and utility markout. Soil and water storage areas will also be established where necessary. Soil stockpile areas will be constructed by placing 20-mil high-density polyethylene (HDPE) liner and berming the area to prevent runoff.

5.5 SITE SECURITY

All excavation and work areas will be properly barricaded for non-worker safety. Barricades will include caution tape, temporary fencing, or other appropriate barriers, depending on the location and surrounding uses of each site. All excavation areas will be secured with the use of temporary fencing. Signs stating "No Entry" will be placed on the temporary fencing.

5.6 EXCAVATION

This section describes excavation of soil hot spots and pipeline overburden. Pipeline removal is discussed in Section 5.8. Based on previous field investigations and site tank and pipeline removal activities, there are six locations where excavation activities are planned. They include, but are not limited to, the following locations:

Pipelines

- The 10-inch pipe running from former UST 772 to Cedar Avenue (approximately 575 feet)

  Note: According to the Bissel & Karn, Inc. as-built drawing for Building 2001, dated February 6, 1987, the 10-inch fuel oil line and enclosing concrete trench were removed during construction of Building 2001. This was confirmed with the exploratory excavation that was completed on April 6, 2001 (see Appendix F).

  Several exploratory excavations (potholes) will be performed in the vicinity of this former pipeline between the West end of Building 2001 and the school fenceline in the direction of the former UST 772. These excavations will be utilized to confirm that the pipeline does not exist in this area. The excavations will utilize a single sweep of a backhoe bucket to the presumed depth of the former line. These areas will be restored as appropriate.

- A 120-foot section of 6-inch pipe that runs north from between Buildings 1052 and 1054, and extends under 9th Street

  Note: The 75-foot section of 6-inch pipe that appears to be under the western end of Building 2001 is not planned to be excavated since such action would impact the structural integrity of the buildings in the area.

Former AST 636

- Four hot spot areas in the vicinity of former AST 636. Each excavation will be up to 50 feet in diameter and to a depth of up to 6 feet, with the exception of the excavation surrounding sampling point IR23GB060. Due to close proximity of sampling point IR23GB060 to Building 864, the excavation area will roughly be half the size of the other three. To maintain the integrity if the building, the excavation in this area will slope upward toward the building from the center point of the radius (approximately 10 feet West of Building 864). Therefore the excavation depth will be much shallower closer to the building. Proper shoring techniques will be used in all excavation areas, where required. The approximate excavation limits are shown on Figure 5-1 and are based on past analytical results as shown on this figure. The objective is to excavate soils that appear to exceed 400 ppm diesel. The historic sampling results shown in Table 5-1 provides the basis for establishing targeted removal areas. The basis for this target level is described in Section 2.0 of this Work Plan.

The excavation process will begin by breaking and removing any overlaying asphalt, vegetative cover, and concrete in the proposed excavation areas. In areas near utilities, it will be necessary to hand excavate to determine the precise location of the utilities in or near the excavation areas. Potholing (exploratory excavation by hand or heavy equipment) will also be used to locate the sections of fuel lines to be removed. Once the utilities and fuel oil pipelines are located, the soil overlaying the fuel oil pipelines and the impacted soil found in the vicinity of former AST 636 will be removed and placed in a dump truck for transport to the designated soil/materials laydown area. Stockpiled soil will be segregated based on visual observation and use of field monitoring equipment. Stockpiles will be covered with 10-mil visqueen and weighted with sandbags to protect from rain and prevent wind blown materials. Any soil that is deemed to be petroleum-impacted will be separated from soils which appear to be clean.

Soil from the AST 636 Area will not be used as backfill. It will be sampled and characterized for offsite disposal.

Soil from the pipeline removal will be screened for contaminants by visual inspection and the use of a photoionization detector. If there is no indication of petroleum impact, the soil will be reused as backfill in the pipeline excavation area (not in the AST 636 Area).

To the extent feasible, excavations will be backfilled by the end of each workday to prevent leaving excavations open overnight. If this is not possible, other site security measures (in addition to the aforementioned fencing and signs) will be utilized. Such measures could include:

- Steel road plates
- On-site security personnel

At the completion of the excavation activity, characterization sampling will be performed on the remaining stockpiles of soil. The soil will be characterized, profiled, and properly disposed at an offsite facility.

While not anticipated to be necessary in any of the excavations, shoring will be utilized if it is deemed necessary for the protection of adjacent structures or to protect workers within the excavation. Excavation sidewalls that are not shored will be sloped in accordance with Cal-OSHA guidelines. Any underground structures (i.e., manholes) and utilities that hinder the safe, efficient removal of the fuel oil pipelines will be removed with the excavation equipment.

Greensand, a sandblast material generated at MINS, has previously been encountered as backfill in utility trenches throughout Mare Island. Greensand, a slag byproduct of nickel smelting, has been shown to contain unacceptable levels of contaminants other than petroleum. Greensand was generated after the fuel lines of concern were installed, therefore, it is not anticipated to be encountered during the fuel line excavation. Regardless, all excavations and soil borings will be visually inspected for greensand. Greensand is easily recognizable in soil samples due to its characteristic green color and sandy texture. If greensand is encountered during the excavation process, its location will be documented and the Navy will be immediately notified. The greensand will then be removed, segregated from other non-impacted soils, characterized, and properly disposed.

Although FWENC does not anticipate encountering any historical artifacts during field operations, FWENC will stop work and notify the Navy if evidence of historical artifacts is encountered. The RPM will be responsible for contacting federal, state, and local authorities to determine if the site may contain important historical artifacts that would qualify the site for placement on the National Registrar of Historical Places. Work stopped due to evidence of historical artifacts will not resume until the SWDIV Contract Specialist issues a written authorization to proceed.

Similar stop-work procedures will be followed in the event that ordinance-related material is encountered. Ordnance-related material is not anticipated to be encountered at this site.

5.7 PIPELINE DECONTAMINATION

Once the fuel lines have been located, they will be assessed for their ability to be vacuum-tested and decontaminated (flushed) prior to excavation. If two ends of the lines are accessible, each end will be excavated to access the pipe. A vacuum test will be performed by sealing one end of the pipeline segment and applying a vacuum to the opposite end of the line using a vacuum truck. The internal pressure will be lowered to approximately 60 percent of standard atmospheric pressure. The ability of the line to maintain the applied pressure will provide an indication as to whether or not the integrity of the line has been compromised. The Navy will be notified of the test results.

Once exposed, visqueen will be placed underneath the pipelines in the trench, where accessible, and absorbent materials will be readily available in case a spill occurs. The fuel oil pipelines will be cleaned and flushed with the use of a hydroblaster with a line mole attachment. A vacuum truck will be used to collect the residual product/rinsate from this process. Pipeline cleaning will continue until the rinsate generated during the cleaning process appears to be clean and free of any visual contamination. It is anticipated that the total amount of rinsate generated will equal approximately three volumes of the pipeline being cleaned. Rinsate will be placed in drums and/or temporary storage tanks in the designated storage area, at which time they will be sampled and analyzed to determine treatment and/or disposal options.

If the pipeline(s) cannot be vacuum-tested, or fails the test, it will not be flushed in-place. Instead, these sections will be completely exposed and visqueen will be placed under the pipes in the trench before they are gravity drained to the greatest extent possible, and then sealed prior to removal to contain potential spills. Once this procedure is completed, the pipelines will then be removed (see Section 5.8). If the pipelines that fail the vacuum test are inaccessible, and cannot be removed, then the ends of the pipeline will be exposed and visqueen will be placed in the trench prior to gravity draining the pipes. Once the pipes are drained to the greatest extent possible, the ends will be sealed and the pipe will be abandoned in-place.

The FSP details the sample designation methodology and additional information regarding the sampling procedure. The FSP is included as Appendix A. Additional information on quality assurance/quality control (QA/QC) for sampling and analysis is included in the QAPP as Appendix B.

Any sludge or solids that are encountered during the decontamination activities will be containerized in 55-gallon drums prior to characterization and off-site disposal.

5.8 PIPELINE REMOVAL

Once the fuel lines have been tested and cleaned, and soil overburden has been removed, the lines will be cut and removed. Prior to cutting or removal of the fuel oil pipelines, it will be necessary to inert the air within the pipeline through the use of dry ice, or other approved material. After the air within the pipeline is inert, the piping will be cut into 12-foot sections, removed, and transported to the materials laydown area. Piping and steel resulting from construction activities will be transported to an off-site disposal/recycling facility.

For segments of pipe that cannot be vacuum tested (or fail) and cannot be flushed in-place, the following approach will be used:

- Soil overburden will be removed / piping exposed.
- Piping will be cut in-place using "cold-cutting" methods.

- When cutting, attempts will be made to crimp the pipe ends to help prevent any outflow of pipe residuals.
- Removed pipe segments will be laid on plastic and wrapped if evidence of leakage is noted.
- Sections of pipe will be placed in lined truck for transport to an off-site decontamination facility.

5.9 POST REMOVAL SOIL SAMPLING

Once the targeted excavation limits have been reached (hotspots) or the fuel lines have been removed, samples will be collected from the excavations to confirm that contaminants have been adequately removed. Soil samples will be collected from pipeline removal and petroleum-impacted excavation sites with the bucket of the excavator using a clean, disposable, sampling scoop. The samples will be transferred into laboratory-provided glass sample containers, which will be capped, labeled, placed in a cooler with ice, and transported to a State of California-certified laboratory. The attached FSP (Appendix A) details the sampling procedures and methodology. Soil sample locations and depths will be measured and documented.

Groundwater at the site is deeper than the proposed excavations and is not anticipated on being encountered. However, if encountered, a grab sample will be collected and analyzed for both petroleum and non-petroleum constituents.

5.10 DIRECT-PUSH BORINGS

Direct-push sampling will be conducted at the site to acquire soil samples in locations that are by other means inaccessible or impractical. Locations for direct-push borings will be coordinated between the FWENC Site Superintendent and the ROICC, and will be based on reconnaissance (land survey and geophysical survey) and review of existing drawings. Once the locations have been determined and marked out, demolition of the surface features (concrete, asphalt coring) may be necessary. It will then be necessary to hand auger to 5 feet bgs to clear for any underground utilities. The direct-push borings will then be performed in order to collect soil samples underlying present or former pipeline locations. The location and depths of the soil samples will be documented.

Direct-push sample acquisition is planned for the following locations:

- Where accessible, one boring every 40 feet along the 10-inch pipeline (running from former UST 772 to Cedar Avenue) that appears to run under Building 2001. However, because of accessibility problems, only six (6) samples (roughly between 31 and 108 feet apart) will be collected from underneath Building 2001 in the vicinity of where the 10-inch pipeline use to be.

  Because it appears that this pipe may have been removed, attempts will be made to sample as close to the former location as possible, given site constraints and limitations of direct push sampling.

- Up to three borings near the 6-inch line (75-foot section at the western end of Building 2001). Again, attempts will be made to sample as close to the line as possible given site constraints and the limitations of the equipment in this area.

Soil samples collected from the borings will be sent to a California state-certified laboratory for analysis. If it is determined, based on the analytical results, that a release has occurred, then the RWQCB, the DTSC, and the SCDEM will be contacted and notified of the level of contamination found at the site. The borings will be backfilled with a bentonite slurry and a grout plug from 0-2 feet bgs.

5.11 OVER-EXCAVATION

In order to maximize the use of field equipment within time constraints (school breaks) associated with the field activities at this site, it is prudent to immediately address any soil contamination if encountered.

Following pipeline removals and soil excavation near former AST 636, FWENC will determine the likelihood of an existence of petroleum impacted through field observations and soil screening with the use of a photoionization detector (PID), and will visually screen the excavations for Greensand. If no evidence of impacts are detected by these methods, backfilling will commence immediately.

In the event that impacted soils are encountered during pipeline removals and/or excavation, the area in question will be over-excavated to remove contaminated soil. Localized over-excavation will be performed until no further impacts are observed. Prior to performing any over-excavation, however, the Navy will be notified to provide FWENC authorization to perform the additional excavation. Soil samples will be collected from the bottom and sides of these areas to confirm adequate cleanup or identify remaining contaminant concentrations.

Excavated soil will be transported to the designated soil/materials laydown area, where it will be segregated and characterized as per the FSP. Analytical results of chemical analysis performed on the over-excavation soil will be used to determine if the soil can be re-used. Soil not suitable for re-use will be transported offsite for treatment and/or disposal.

5.12 BACKFILL

Upon approval from the ROICC, FWENC will backfill the excavated areas. Approved backfill material will be moved from the stockpile area using a clean rubber-tire loader or transported to the site by dump truck. Backfill material will be placed in 6- to 12-inch lifts into the excavation for compaction. Water will be applied, as needed, to control dust and facilitate compaction. The applicable requirements, as specified in the Technical Specifications (Appendix D), will be followed during backfilling.

5.13 SITE RESTORATION

At the completion of backfilling, each site will be restored to its pre-demolition/excavation condition. Site restoration activities may include reconnecting utilities in the area, placement of concrete and asphalt pavement, restriping pavement in affected areas, placement of sod, and possible hydroseeding natural surfaces, if required. Placement of asphalt and concrete will be performed in accordance with applicable requirements detailed in the Technical Specifications (Appendix D).

5.14 DEMOBILIZATION

Demobilization activities consist of decontamination of all equipment, cleaning the project site, inspection, and certification of completion. The activities will include decontamination and removal of all construction equipment and materials, as well as collection and disposal of all disposable equipment for which decontamination is inappropriate. Equipment decontamination records will be maintained for each piece of equipment. Decontamination procedures are presented in the SHSP.

Prior to removal from the site, all decontaminated equipment and material will be inspected and accepted by the SHSO. This individual will certify that decontamination was performed for all necessary equipment and materials. A copy of each decontamination certificate will be provided to the Navy, RPM, ROICC, and vendors, if requested. The original certificate will be maintained in the project file. Utility disconnections will be coordinated with the ROICC, the CSO, and Island Power.

6.0 WASTE MANAGEMENT PLAN

This Waste Management Plan (WMP) identifies the types and amounts of waste expected to be generated during removal of the former fuel pipelines and associated petroleum contaminated soil at or near the Mare Island Elementary School property at the MINS. Waste management activities from generation through storage (including waste characterization, packaging, storage, and management while in storage) are identified. The transportation and disposition of waste materials at appropriate disposal and recycling facilities are also discussed.

The WMP provides information on the management and disposal of wastes, including potentially hazardous wastes such as contaminated soil, personal protective equipment (PPE), and residual pipeline contents associated with project activities. An additional goal of the WMP is to ensure that waste minimization practices are followed, to the extent practical, to reduce the volume of waste that will be generated, stored, and removed from the site for disposal. The WMP is a primary component of FWENC Corporate Compliance Program. It includes onsite environmental compliance inspections and will be revised if the scope of this project or applicable regulations change.

6.1 PROJECT WASTE DESCRIPTIONS

This section presents information on anticipated individual waste streams that may be generated during the project activities. Potential waste streams associated with the project activities can be categorized as follows:

- Contaminated soil (including potentially non-hazardous soil, Resource Conservation and Recovery Act (RCRA) hazardous and non-RCRA hazardous waste) excavated from around the former AST site and pipeline areas
- Residual fuel liquids, sludges, and materials from within the pipelines
- Excavated steel pipelines
- Wastewater, including water generated from personnel and equipment decontamination activities
- Non-hazardous solid waste, including trash, empty calibration gas canisters, and inert construction debris (e.g., concrete, asphalt, and piping)
- Used PPE
- Contaminated polyethylene sheeting from soil stockpiles
- Scrap metal from concrete rebar, manhole covers, etc.

6.2 WASTE MANAGEMENT

The requirements of the state and federal hazardous waste generation, characterization, storage, treatment, and management regulations of Title 22, California Code of Regulations (22 CCR), Sections 66261, 66262, and 66264 and Title 40, Code of Federal Regulations (40 CFR), Parts 261, 262, and 264 are applicable to the management of hazardous wastes generated during project activities. A summary of the key aspects of the waste management program for both hazardous and non-hazardous wastes is provided below and summarized in Table 6-1, Hazardous Waste Management Requirements Summary.

6.2.1 Waste Classification

Unless excavated soil and other materials are predetermined to be hazardous waste, Section 66261, 22 CCR and Part 261, 40 CFR require a determination of whether or not the excavated material is a hazardous waste. Where a clear hazardous waste determination cannot be made, stockpiles of soil and other materials will be sampled and analyzed for disposal purposes. A determination will then be made as to whether the material is a hazardous waste under both federal and state regulations. The California State requirements for determining whether a waste is hazardous under the toxicity characteristic requires a soluble threshold limit concentration (STLC) leaching procedure and a total analysis for certain inorganics and organics that is generally more conservative than the federal toxicity characteristic leaching procedure (TCLP). California also has additional hazardous waste classification criteria (including 96-hour fish bioassays) that may need to be considered on a case-by-case basis. Therefore, some wastes may be considered hazardous wastes under California regulations and not under federal regulations. These wastes are referred to as non-RCRA hazardous wastes.

Based on background information and current analytical data for the general areas to be excavated, only TPH impacted soil is anticipated. Therefore, soil to be excavated will likely consist primarily of non-hazardous waste, but some quantities of non-RCRA hazardous and RCRA hazardous waste may be encountered. Prior investigations at MINS have encountered "greensand" used for fill material in various areas across MINS. Therefore, in an attempt to further characterize the degree and extent of contamination at the site, additional sampling and analysis activities will be performed during soil excavation activities. Additional soil samples will be collected and analyzed for total metals, TPH, and volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, and, if warranted, for STLC and TCLP analyses of these constituents.

In addition to the excavated soil, the waste classification requirements will also apply to decontamination water generated from daily decontamination activities, used PPE, and construction debris generated during project activities. Wastewater resulting from decontamination procedures will be collected in an approved container. The container(s) will be sampled to determine proper disposition of the wastewater. Unless saturated or stained with

contaminants, used PPE and construction debris will generally be presumed to be non-hazardous once decontaminated.

6.2.2 Waste Accumulation and Storage

Section 66262, 22 CCR and Part 262, 40 CFR consists of regulations applicable to the generation, storage, management, and accumulation of non-RCRA and RCRA hazardous wastes. Specific requirements apply to the accumulation time for hazardous wastes onsite, and to the accumulation and labeling of hazardous wastes. In addition to the excavated soil, this project will result in the temporary accumulation of other hazardous wastes. These wastes, which may include decontamination water, used oil and fluids from equipment, and used PPE will be managed, accumulated, and inspected in accordance with the regulations.

Soil and Material Stockpiles

Soil, asphalt, and concrete excavated during this project will be segregated and stockpiled in lined and bermed areas. It is anticipated that the excavated material will consist of non-RCRA hazardous and non-hazardous soil, asphalt, and concrete. If soil excavated from the area is determined to be RCRA hazardous then the new (effective June 1, 1999) RCRA Staging Pile regulations of Part 264.554, 40 CFR may apply and the Staging Piles will be managed accordingly. Through proper designation and management of a Staging Pile for RCRA hazardous wastes, the land disposal restrictions, minimum technology requirements, and the waste pile permitting requirements of RCRA are not applicable.

If the concrete and asphalt are determined non-hazardous, roll-off containers or stockpiles will be marked as "Concrete Intended for Recycling" and "Asphalt Intended for Recycling" to prevent commingling with hazardous wastes. Concrete and asphalt will be sent to an approved recycling facility.

For non-RCRA hazardous soil, in accordance with Division 20, Chapter 6.5, Section 25123.3 of the California Health and Safety Code, the material can be stockpiled at the site for up to 90 days without satisfying all substantive requirements of a hazardous waste facility permit provided the following conditions are met:

- The soil does not contain free liquids
- The waste is accumulated on an impermeable surface (minimum 20-mil thick liner)
- The generator controls against wind dispersion and rain runoff
- The generator inspects the site weekly and after storms to ensure the erosion controls are working properly

- After final offsite transportation, the accumulation site is inspected and remediated as necessary
- The site is certified for compliance with these standards by a registered professional engineer

In addition to the aforementioned requirements, the State Water Resources Control Board Policy Number 92-08, which pertains to the control of storm water discharges from construction activities, may also be relevant and appropriate to the temporary storage of stockpiled materials. Therefore, appropriate best management practices (BMPs) will also be implemented to protect stockpiles from erosion and from storm water run-on and runoff. These BMPs include erosion control, storm water drainage control, secondary containment, fugitive emissions and wind dispersion control, and spill prevention.

Wastewater

Wastewater generated from decontamination procedures will not likely exceed hazardous waste levels. Nevertheless, all water generated will be collected and stored onsite in Department of Transportation (DOT)-approved container(s). The containers will be managed in accordance with the requirements listed below. The contents of the container will be characterized according to the requirements of Section 66261, 22 CCR to determine appropriate disposal options.

When possible, waste fluids generated from heavy equipment maintenance activities will be collected and removed from the site by the maintenance contractor for recycling. If waste fluids are required to be stored on site, they will be labeled accordingly, contained within 55-gallon DOT-approved drums and situated within a pre-designated and properly designed hazardous waste container storage area. Hazardous wastes containing free liquids will meet the following secondary containment standards:

- A base free of cracks or gaps and sufficiently impervious to contain leaks, spills, and accumulated precipitation until the collected material is detected and removed
- The base will be sloped or the containment system will be otherwise designed and operated to drain and remove liquids resulting from leaks, spills, or precipitation. Alternatively, the containers may be elevated on pallets to prevent contact with accumulated liquids
- The containment system must have sufficient capacity to contain 10 percent of the volume of containers or the volume of the largest container, whichever is greater
- Spilled or leaked waste and accumulated precipitation will be removed from the sump or collection area in a timely manner to prevent overflow of the collection system

Residual Pipeline Liquids, Sludges, and Materials

Residual liquids, sludges, rinsate, and materials will be removed from all pipelines prior to removal. Residual materials will be removed by a vacuum truck and disposed of based on the contents sample analysis. If additional material is generated after the initial removal, it will be containerized in 55-gallon DOT-approved drums. The drums will be stored within the designated (less than 90 days) hazardous waste storage area, and managed in accordance with the requirements of the container management regulations codified in 22 CCR, Sections 66264.170 through 66264.178.

Pipeline Segments, Used PPE, and Other Debris

Excavated scrap metal and piping sections, along with other debris (plastic liners) will be inspected for visible signs of contamination. Where possible, these items will be decontaminated (treated) under the hazardous debris rule in Section 66268.45. The decontaminated items will be placed in a lined stockpile or roll-off bin for subsequent disposal or recycling as a non-hazardous waste. The stockpiles or bins of metal will be labeled as "Scrap Metal Intended for Recycling." Scrap metal will be sent to an approved scrap metal recycling facility. Decontaminated plastic liners can be disposed of as common trash if the only known contaminant was petroleum.

Removed asphalt and concrete that does not have evidence of visible contamination can be stockpiled and recycled at an approved facility.

PPE that does not have visible evidence of contamination can be directly disposed of as common trash.

Debris and PPE that cannot be decontaminated and has visible signs of contamination will be segregated and contained (drums or roll-off bins), and managed as potentially hazardous waste in accordance with the requirements of the container management regulations in 22 CCR Sections 66264.170 through 66264.178, pending characterization and appropriate disposal.

6.2.2.1 Container Labeling

All containers of waste (including hazardous and non-hazardous) will be labeled with indelible ink with the following information: source and location, contents and quantity, accumulation start date, date container sampled, parameters analyzed for, and the words "Analysis Pending – Potentially Hazardous." If containers are determined to contain hazardous waste they will immediately be labeled with a completed "Hazardous Waste" label, which will include:

- U.S. Environmental Protection Agency (EPA) identification number of the generator (MINS)
- Name and address of the generator (MINS)
- EPA and/or California waste code

- DOT shipping name (prior to offsite shipment)
- Description of contents
- Date of generation (date first drop of waste placed in container)

An inventory of waste containers will be maintained and, as necessary, weekly inspections of container storage areas will be conducted and logged while wastes remain in these areas to ensure the integrity of the containers and secondary containment, to check for leaks or spills, and to ensure labels and markings are in good condition.

6.2.2.2 Waste Accumulation Areas

Hazardous waste storage areas also require:

- A sign, with the legend "Danger Hazardous Waste Area-Unauthorized Personnel Keep Out" (written in English and Spanish), will be posted at each 90-day accumulation area in sufficient numbers to be seen from any approach. The signs will be legible from a distance of at least 25 feet.
- Aisle space will be maintained to allow the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of the facility operation in an emergency, unless aisle space is not needed for any of these purposes.
- The following emergency equipment will be located or available to personnel during active waste management activities at each accumulation area:
  - A device, such as a telephone or a hand-held two-way radio, capable of summoning emergency assistance
  - Portable fire extinguishers, fire control equipment, spill control equipment, and decontamination equipment
  - Water at adequate volume and pressure to supply water hose streams, foam producing equipment, automatic sprinklers, or water spray systems

Bulk quantities of fuel, oil, or other hazardous materials will not be stored onsite. Equipment fueling and maintenance activities will be performed by an offsite contractor on an as-needed basis.

6.2.3 Waste Disposal

Soil excavated during this project, which may include RCRA and non-RCRA hazardous wastes and non-hazardous wastes, will be stockpiled, profiled, and sent offsite for disposal. Non-soil related wastes, which may include decontamination water, pipeline residual materials, construction debris, used PPE, and used oil will be managed in accordance with the regulations and transported offsite for appropriate recycling or disposal. Each waste stream requiring offsite disposal will be sampled and analyzed to ensure that it is properly characterized and meets the

waste acceptance criteria and packaging requirements for the proposed treatment, storage, and disposal facility (TSDF) prior to transport. Used PPE, and construction debris (e.g., oversized material, polyethylene sheeting, and piping, etc.) that is determined to be a hazardous waste and is unsuitable for treatment or decontamination, will be sent offsite to a Class I hazardous waste landfill facility. Waste oil and other fluids generated during equipment maintenance activities will be collected, contained, and sent offsite for recycling.

All waste will be disposed of only at an appropriate waste disposal facility approved by SWDIV and FWENC and permitted for the disposal of the particular type of waste generated. Final designation of the approved offsite disposal facilities will occur after competitive procurement of qualified and approved facilities.

6.2.4 Waste Transportation

FWENC is responsible for shipping hazardous waste offsite from MINS. Offsite disposal or recycling of hazardous wastes will be in accordance with the DOT Hazardous Material Transportation regulations of Parts 171-177, 49 CFR, and Part 262, Subpart B, 40 CFR and Section 66262, 22 CCR, which involve packaging, placarding, labeling, and manifesting requirements, and with appropriate Land Disposal Restriction (LDR) certification notices per Part 268, 40 CFR and Section 66268, 22 CCR. All DOT functions will be performed by personnel having the required DOT training. In addition, all transporter and disposal contractors will be subject to FWENC's subcontractor qualification process. MINS ROICC personnel will be responsible for signing all hazardous waste manifests, waste profiles, and land disposal restriction documentation. Under no circumstances will FWENC personnel sign hazardous waste manifests, profiles, or land disposal certifications. Each shipment of a suspected hazardous material will be properly classed using the Hazardous Materials Table in Part 172.101, 49 CFR. Determination of the transporters will occur after competitive procurement of qualified and approved facilities.

6.3 WASTE MINIMIZATION

To minimize the volume of waste, the following general guidelines will be followed:

- Materials will not be contaminated unnecessarily
- Work will be planned, based on the work procedure to be used
- Only the material (i.e., chemicals) needed to perform the work activity will be taken
- Additional material can be brought to the work location if it is found to be necessary
- Materials can be stored in large containers, but the smallest reasonable container will be used to transport the material to the location where it is needed
- Cleaning and extra sampling supplies will be maintained outside any potentially contaminated area to keep them clean and to minimize additional waste generation

- Prefabricated materials, barriers, support equipment, etc. will be maintained or constructed outside potentially contaminated areas
- Mixing of detergents or decontamination solutions will be performed outside potentially contaminated areas
- Drop cloths or other absorbent material will be used to contain small spills or leaks
- Containers will be used to minimize the spread of contamination
- Contaminated materials will not be placed with clean materials
- Wooden pallets inside the exclusion zone will be covered with plastic
- Material and equipment will be decontaminated and reused when practicable
- Volume reduction techniques will be used when practicable
- Waste containers will be verified to ensure they are solidly packed to minimize the number of containers
- Only appropriately-sized waste containers adequate to contain the volume of waste generated will be used
- Less hazardous substances will be used whenever possible (i.e., only the volume of standard solutions needed for testing will be brought; minimal amounts of decontamination water and solvent rinses will be used)

6.4 WASTE MANAGEMENT INSPECTION AND DOCUMENTATION PROGRAM

6.4.1 Inspections

While all waste accumulation areas will be informally inspected on a daily basis, formal inspections of all hazardous waste accumulation areas will be conducted and recorded at least weekly in accordance with the hazardous waste generator regulations of Part 262, 40 CFR and Section 66262, 22 CCR. In addition, soil stockpiles (staging piles) will be inspected daily, excluding weekends and holidays, to ensure liners are in place, the stockpiles are adequately covered, and the covers are anchored sufficiently. Inspections will be conducted by the Site Superintendent or his designee. Inspections will be logged in a field notebook, and a weekly inspection checklist will be completed. The container storage area will be inspected to ensure the following:

- Containers are in good condition. If a container is not in good condition or appears to be leaking, the waste will be transferred to another container
- Containers are made of materials that will not react with, and are otherwise compatible with, the hazardous waste to be stored
- Containers are closed at all times, except when adding or removing waste

6.4.2 Documentation

Documentation requirements apply to all waste managed during project activities. Field records will be kept of all waste generation activities. All pages of the field data record log shall be signed and dated by the supervising field leader who is entering the data. In addition, the following information will be recorded in the log:

- Description of generating activities
- Location of waste generation (including depth, if applicable)
- Type and volume of waste
- Date and time of generation
- Description of any waste sampling, including:
  - Type of analysis
  - Laboratory where sample is to be sent
  - Sampling method
  - Name of sampler
- Name of person recording information and Site Superintendent

Hazardous Waste Manifests and LDR Certification

All hazardous waste transported from the site will be accompanied by a Hazardous Waste Manifest. MINS ROICC personnel will be responsible for reviewing and signing all waste documentation, including waste profiles, manifests, and LDR notifications (manifest packages). Prior to signing the manifest, MINS ROICC personnel will ensure that pre-transport requirements of packaging, labeling, marking, and placarding are met according to Parts 262.30 to 262.33, 40 CFR and Parts 100 to 178, 49 CFR.

The Navy will receive one copy of the manifest; the remaining copies will be given to the transporter. The manifest will be returned to the Navy's signatory official for the base's record-keeping requirements.

Copies of all manifests for waste generated at the site will be kept in a compliance file within FWENC's project files. The PjM will also provide the Navy with the generator's copy of the manifest for the Navy to submit to the state.

An LDR form will accompany the shipment of hazardous waste to the TSDF. The TSDF will be notified prior to the waste being sent. The following items must accompany the notification and are included in one of the following facility-specific forms:

- EPA Hazardous Waste Generator Identification number for Mare Island
- Manifest number, including state disposal application number
- Waste analysis data

- If the waste is also restricted, corresponding concentration-based or technology-based treatment standards or prohibition

RCRA recordkeeping requirements according to Parts 262.20 to 262.44, 40 CFR, will be adhered to, including retention of signed copies of manifests from the designated facility that received the waste. Additionally, biennial and exception reporting information will be submitted, as necessary, according to Sections 66262.41 and 66261.42, 22 CCR and Parts 262.41 and 262.42, 40 CFR. Additional reporting may be required in accordance with Sections 66262.43, 22 CCR and Part 262.43, 40 CFR. The Navy, as the generator, is responsible for reporting applicable information. FWENC will assist the Navy in reporting while on site, as directed by the RPM.

Certificates of waste treatment and/or disposal will be obtained from the treatment and disposal facilities and provided to the Navy, as necessary.

7.0 REFERENCES

International Technology Corporation. 1989. Excerpt from Untitled Report. June 16.

PRC Environmental Management, Inc. 1997. *Draft Final Remedial Investigation Report, Operable Unit 2, Mare Island, Vallejo, California*. January 31.

PRC Environmental Management, Inc. 1997. *Draft Technical Memorandum, Assessment of Beneficial Uses of Groundwater, Mare Island, Vallejo, California*. June 9.

Roy F. Weston, Inc. 2001. *Removal Summary Report for Fuel Oil Pipelines (Draft Report)*. February 16.

SSPORTS Environmental Detachment. 1997. *Work Plan, Fuel Oil Line Removal/Closure, Mare Island Naval Shipyard (Revision B)*. August 18.

TABLES

TABLE 5-1

HISTORIC SOIL SAMPLE ANALYTICAL RESULTS
NEAR FORMER AST 636

Point ID	Sample ID	Easting	Northing	Sample Date	Sample Depth (Top) (feet)	Sample Depth (Bottom) (feet)	Diesel Range Organics (mg/kg)	DI_RO_Q	Motor Oil Range Organics (mg/kg)	MO_RO_Q	Gasoline Range Organics (mg/kg)	GA_RO_Q
IR23GB026	144IR23GP013	1489600.100000	585768.720000	1993-07-13	3.00	5.00	8400.00		0.00	U	0.00	U
	144IR23GP014	1489600.100000	585768.720000	1993-07-13	6.00	7.50	0.00	U	0.00	U	0.00	U
	144IR23GP015	1489600.100000	585768.720000	1993-07-13	8.00	10.00	0.00	U	0.00	U	0.00	U
	144IR23GP016	1489600.100000	585768.720000	1993-07-13	10.00	12.00	0.00	U	0.00	U	0.00	U
	144IR23GP017	1489600.100000	585768.720000	1993-07-13	12.00	14.00	0.00	U	0.00	U	0.00	U
IR23GB035	144IR23GP055	1489613.300000	585819.820000	1993-07-16	1.50	2.50	0.00	U	0.00	U	0.00	U
	144IR23GP056	1489613.300000	585819.820000	1993-07-16	3.50	5.00	100.00		0.00	U	0.00	U
	144IR23GP057	1489613.300000	585819.820000	1993-07-16	6.50	7.50	0.00	U	0.00	U	0.00	U
	144IR23GP058	1489613.300000	585819.820000	1993-07-16	10.00	11.00	0.00	U	0.00	U	0.00	U
	144IR23GP059	1489613.300000	585819.820000	1993-07-16	11.50	12.50	0.00	U	0.00	U	0.00	U
IR23GB037	144IR23GP064	1489656.300000	585744.700000	1993-07-19	1.50	2.50	550.00		0.00	U	0.00	U
	144IR23GP065	1489656.300000	585744.700000	1993-07-19	4.00	5.00	760.00		0.00	U	0.00	U
	144IR23GP066	1489656.300000	585744.700000	1993-07-19	8.00	9.00	0.00	U	0.00	U	0.00	U
IR23GB043	144IR23GP116	1489639.800000	585841.650000	1993-07-26	1.50	2.50	650.00		0.00	U	0.00	U
	144IR23GP117	1489639.800000	585841.650000	1993-07-26	4.50	5.00	1300.00		0.00	U	0.00	U
	144IR23GP126	1489639.800000	585841.650000	1993-07-28	6.00	7.00	0.00	U	0.00	U	0.00	U
IR23GB044	144IR23GP119	1489666.300000	585800.370000	1993-07-27	1.50	2.50	29.00	J	170.00		0.00	U
	144IR23GP120	1489666.300000	585800.370000	1993-07-27	4.00	5.00	0.00	U	0.00	U	0.00	U
IR23GB045	144IR23GP121	1489681.100000	585766.280000	1993-07-27	1.50	2.50	47.00		0.00	U	0.00	U
	144IR23GP122	1489681.100000	585766.280000	1993-07-27	4.00	5.00	80.00		94.00	J	0.00	U
	144IR23GP199	1489681.100000	585766.280000	1993-08-06	6.50	7.00	0.00	U	0.00	U	0.00	U
IR23GB047	144IR23GP133	1489707.800000	585701.220000	1993-07-28	2.00	2.50	270.00		0.00	U	0.00	U
	144IR23GP134	1489707.800000	585701.220000	1993-07-28	4.50	5.00	0.00	U	0.00	U	0.00	U
IR23GB048	144IR23GP128	1489670.400000	585720.510000	1993-07-28	1.50	2.00	350.00		0.00	U	0.00	U
	144IR23GP129	1489670.400000	585720.510000	1993-07-28	4.50	5.00	50.00		0.00	U	0.00	U
	144IR23GP130	1489670.400000	585720.510000	1993-07-28	7.00	8.00	0.00	U	0.00	U	0.00	U
IR23GB050	144IR23GP136	1489725.800000	585750.860000	1993-07-29	2.00	2.50	290.00		0.00	U	0.00	U
	144IR23GP137	1489725.800000	585750.860000	1993-07-29	4.50	5.00	0.00	U	0.00	U	0.00	U
IR23GB051	144IR23GP138	1489711.900000	585784.360000	1993-07-29	1.50	2.50	67.00		0.00	U	0.00	U
	144IR23GP139	1489711.900000	585784.360000	1993-07-29	4.50	5.00	0.00	U	0.00	U	0.00	U
IR23GB052	144IR23GP140	1489695.500000	585809.190000	1993-07-29	2.00	2.50	220.00		0.00	U	0.00	U
	144IR23GP141	1489695.500000	585809.190000	1993-07-29	4.00	5.00	0.00	U	0.00	U	0.00	U
IR23GB053	144IR23GP142	1489662.800000	585857.860000	1993-07-29	2.00	2.50	0.00	U	0.00	U	0.00	U
	144IR23GP143	1489662.800000	585857.860000	1993-07-29	4.50	5.00	150.00		0.00	U	0.00	U
	144IR23GP198	1489662.800000	585857.860000	1993-08-06	6.00	7.00	0.00	U	0.00	U	0.00	U
IR23GB060	144IR23GP180	1489752.900000	585713.860000	1993-08-04	2.00	2.50	570.00		0.00	U	0.00	U
	144IR23GP181	1489752.900000	585713.860000	1993-08-04	4.00	5.00	0.00	U	0.00	U	0.00	U
IR23GB061	144IR23GP182	1489767.700000	585777.740000	1993-08-04	1.50	2.50	27.00	J	0.00	U	0.00	U
	144IR23GP183	1489767.700000	585777.740000	1993-08-04	4.00	5.00	0.00	U	0.00	U	0.00	U
IR23GB066	144IR23GP194	1489741.200000	585644.160000	1993-08-05	1.50	2.50	47.00	J	0.00	U	0.00	U
	144IR23GP195	1489741.200000	585644.160000	1993-08-05	4.00	5.00	0.00	U	0.00	U	0.00	U
	144IR23GP196	1489741.200000	585644.160000	1993-08-05	6.50	7.00	0.00	U	0.00	U	0.00	U

Notes:

The above analytical data is extracted from the PRC Environmental Management, Inc. report (PRC, 1997)

Highlighted Point IDs represent center of proposed "hot spot" excavations

Sample in red denotes a sample that has a TPH concentration greater than 400 mg/kg

J - estimated value

U - not detected

mg/kg - milligrams per kilogram

TABLE 6-1

HAZARDOUS WASTE MANAGEMENT REQUIREMENTS SUMMARY

Waste Types	Characterization Requirements	Containment Requirements	Storage Requirements	Transportation Requirements	Disposal Requirements
Excavated Soil	Unless a waste determination (e.g., RCRA hazardous, non-RCRA hazardous, or non-hazardous) can be made based on generator knowledge, stockpiled soil will be sampled in accordance with the FSP. Samples will be run for potential contaminants including: VOCs, SVOCs, PCBs, TPH, total metals analysis, and STLC or TCLP.	Contain in stockpiles with underlying 20-mil polyethylene liners.	All excavated soil will be stockpiled on liners and will have appropriate erosion, wind, and storm water run-on and runoff controls. Stockpiles will be identified as hazardous or non-hazardous waste. If RCRA hazardous, the stockpiles will be managed in accordance with the staging pile requirements of 40 CFR Section 264.554. Stockpiles will be covered at the end of each day and when not being actively managed. In addition, storm water best management practices will be employed.	If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the Navy. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements.	The waste will be containerized and sent offsite for disposal at an appropriate Class I, II or III facility, depending on the contaminant matrix. An ESQ Scientist must approve any TSDF and/or transporter prior to shipment of waste.
Soil and Drill Cutting Material from Site Investigation Work	Unless a waste determination (e.g., RCRA hazardous, non-RCRA hazardous, or non-hazardous) can be made based on generator knowledge, the material will be sampled to determine appropriate management and disposal procedures. Samples will be run for potential contaminants including: VOCs, SVOCs, PCBs, TPH, total metals, and pesticides analysis, and STLC or TCLP.	Contain within 55-gallon metal drums (1A2) or leak-proof covered roll-off containers.	Unless pre-determined to be hazardous or known to be non-hazardous, containers and roll-offs will be marked with the following information: **POTENTIALLY HAZARDOUS SOIL/DRILL CUTTING MATERIAL - ANALYSIS PENDING** Drums and roll-off containers will be sealed/covered when not being loaded/unloaded, and they will be elevated to prevent contact with any ponded precipitation and/or liquids. Drums and roll-off containers are to be labeled and stored in pre-designated waste storage area with secondary containment.	If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the Navy. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements.	The waste will be containerized and sent offsite for disposal at an appropriate Class I, II or III facility, depending on the contaminant matrix. An ESQ Scientist must approve any TSDF and/or transporter prior to shipment of waste.

TABLE 6-1

HAZARDOUS WASTE MANAGEMENT REQUIREMENTS SUMMARY

Waste Types	Characterization Requirements	Containment Requirements	Storage Requirements	Transportation Requirements	Disposal Requirements
Decontamination Pad Solid Residuals	Unless a waste determination (e.g., RCRA hazardous, non-RCRA hazardous, or non-hazardous) can be made based on generator knowledge, the material will be sampled to determine appropriate management and disposal procedures. Samples will be run for potential contaminants including: VOCs, SVOCs, PCBs, TPH, and total metals, and pesticides analysis, and STLC or TCLP.	Residues accumulated in designated Decontamination area will be routinely removed and placed in containers.	Unless predetermined to be hazardous or known to be non-hazardous, containers will be marked as follows: **POTENTIALLY HAZARDOUS DECON PAD RESIDUALS - ANALYSIS PENDING** The storage accumulation clock starts from the date that waste is first put into the container. Containers are to be labeled and stored in pre-designated waste storage area with secondary containment.	If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the Navy. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements.	The waste will be containerized and sent offsite for disposal at an appropriate Class I, II or III facility, depending on the contaminant matrix. An ESQ Scientist must approve any TSDF and/or transporter prior to shipment of waste.
Wastewater (e.g., Decontamination Water and Collected Storm water)	Unless a waste determination (e.g., RCRA hazardous; non-RCRA hazardous, or non-hazardous) can be made based on generator knowledge, the material will be sampled to determine appropriate management and disposal procedures. Samples will be run for potential contaminants including: VOCs, SVOCs, PCBs, TPH, total metals, and pesticides analysis.	DOT-approved 55-gallon (bunghole-type) metal drums (1A1)	Unless predetermined to be hazardous or known to be non-hazardous, containers will be marked as follows: **POTENTIALLY HAZARDOUS DECONTAMINATION WATER (OR STORM WATER) - ANALYSIS PENDING** and include the accumulation date; composition and physical state of the waste; hazardous properties; and name and address of generator. Containers will be sealed when not being filled/unloaded. Containers will be elevated to prevent contact with any ponded precipitation and/or liquids. Store in pre-designated waste storage areas with secondary containment.	If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the Navy. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements.	The waste will be containerized and sent offsite for disposal at an appropriate facility based on the contaminant matrix. An ESQ Scientist must approve any TSDF and/or transporter prior to shipment of waste.

TABLE 6-1

HAZARDOUS WASTE MANAGEMENT REQUIREMENTS SUMMARY

Waste Types	Characterization Requirements	Containment Requirements	Storage Requirements	Transportation Requirements	Disposal Requirements
Debris (clay balls, rock, concrete, asphalt, and oversized material)	Unless a waste determination (e.g., RCRA hazardous, non-RCRA hazardous, or non-hazardous) can be made based on generator knowledge, the material will be sampled to determine appropriate management and disposal or recycling procedures. Samples will be run for potential contaminants including: VOCs, SVOCs, PCBs, TPH, total metals, and pesticides analysis, and STLC or TCLP. Debris not having contact with waste or contaminated soil may be characterized as a non-hazardous solid waste.	Hazardous debris moved from point of generation to the decontamination area. Hazardous debris stored in bins.	Decontaminated debris (debris that meets the debris treatment standard and is not contaminated with a listed waste) and non-hazardous debris may be stored in non-hazardous solid waste roll-offs. Hazardous debris that cannot be decontaminated and does not meet the debris treatment standards will be stored in containers and/or bins and will be marked **"HAZARDOUS WASTE"** and include the accumulation date; composition and physical state of the waste; hazardous properties; and name and address of generator. Containers and/or bins will be sealed/ covered when not being loaded/unloaded. Containers will be elevated to prevent contact with any ponded precipitation and/or liquids.	No special transporter requirements for debris determined to be non-hazardous. Contracted solid waste management company to collect material. If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the Navy. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements.	Non-hazardous debris or debris treated to meet "Alternate Treatment" standards may be disposed off-site at an approved solid waste landfill or recycled. Hazardous waste will be containerized and sent offsite for disposal at an appropriate Class I TSDF. An ESQ Scientist must approve any TSDF and/or transporter prior to shipment of waste.
Non-hazardous waste (trash, inert construction debris, calibration canisters, clean polyethylene liners, etc.)	Materials generated during the removal action project and not contaminated with any waste or waste residue may be characterized as a non-hazardous solid waste.	Waste to be stored in non-hazardous roll-offs.	Non-hazardous waste to be stored separate from hazardous waste and labeled accordingly to prevent commingling of hazardous and non-hazardous wastes.	No special transporter requirements for wastes determined to be non-hazardous. Contracted solid waste management company to collect material.	Non-hazardous waste to be disposed offsite at an approved Class III solid waste landfill.

TABLE 6-1

HAZARDOUS WASTE MANAGEMENT REQUIREMENTS SUMMARY

Waste Types	Characterization Requirements	Containment Requirements	Storage Requirements	Transportation Requirements	Disposal Requirements
Polyethylene Liners (Contaminated)	Liners used for containing hazardous soil will be presumed to be hazardous.	Liners will be stored in roll-offs.	Labeling should consist of a completed commercial hazardous waste label. Roll-offs will be marked "**HAZARDOUS WASTE**" and include the accumulation date; composition and physical state of the waste; hazardous properties; and name and address of generator. Roll-offs will be sealed/covered when not being loaded/unloaded. Roll-offs will be elevated to prevent contact with any ponded precipitation and/or liquids.	Since material is presumed to be a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the Navy. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements.	Hazardous waste will be containerized and sent offsite for disposal at an appropriate Class I TSDF. An ESQ Scientist must approve any TSDF and/or transporter prior to shipment of waste.
Scrap Metal (rebar, manhole covers, etc.)	Unless generator knowledge is sufficient to make a non-hazardous determination, metal debris will be decontaminated in accordance with the hazardous debris treatment standards before it can be managed as scrap metal for recycling.	Segregate scrap metal from other construction debris following decontamination.	Mark roll-off container "**Scrap Metal Intended for Recycling**" to prevent commingling with hazardous wastes and construction debris.	No special transporter requirements for scrap metal determined to be non-hazardous. Contracted scrap metal recycling company to collect material.	Scrap metal will be sent to an approved scrap metal recycling facility.

TABLE 6-1

HAZARDOUS WASTE MANAGEMENT REQUIREMENTS SUMMARY

Waste Types	Characterization Requirements	Containment Requirements	Storage Requirements	Transportation Requirements	Disposal Requirements
PPE	Run total analysis and STLC or TCLP, or use process knowledge to make a waste determination. Decontaminated PPE can be managed as a non-hazardous solid waste.	Use double plastic bags at point of generation to transport to the 90-day accumulation area. DOT-approved 55-gallon metal drums (1A2).	Labeling should consist of a completed commercial hazardous waste label. Containers will be sealed/covered when not being loaded/unloaded. Containers and roll-offs will be elevated to prevent contact with any ponded precipitation and/or liquids. Store in pre-designated waste storage areas with secondary containment.	If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the Navy. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements. Decontaminated PPE may be placed into non-hazardous solid waste roll-off to be picked up by contracted solid waste disposal contractor.	Decontaminated PPE may be disposed at an approved Class III solid waste landfill. If a hazardous waste, PPE will be disposed at an approved RCRA TSDF. An ESQ Scientist must approve any TSDF and/or transporter prior to shipment of waste.
Unidentified Waste Streams (i.e., waste streams that may be generated during site activities but have yet to be identified)	Unless a waste determination (e.g., RCRA hazardous, non-RCRA hazardous, or non-hazardous) can be made based on generator knowledge, the material will be sampled to determine appropriate management and disposal procedures. Samples will be run for potential contaminants including: VOCs, SVOCs, PCBs, TPH, total metals analysis, and STLC or TCLP.	DOT-approved 55-gallon metal drums (1A1 or 1A2) depending on whether a liquid or solid.	If hazardous waste, labeling should consist of a completed commercial hazardous waste label. Containers will be sealed/covered when not being managed. Containers will be elevated to prevent contact with any ponded precipitation and/or liquids. If a hazardous waste, the storage accumulation clock starts from the date that waste is first put into the container destined for off-site disposal (90-day max. allowed). Store in pre-designated waste storage areas with secondary containment.	If material is a hazardous waste, a hazardous waste manifest and DOT vehicle placarding are required. Must use a Cal/EPA permitted transporter. Must also have LDR certifications as necessary. Hazardous waste manifest to be signed by the Navy. Individuals involved in overseeing or shipping hazardous materials must meet DOT training requirements.	The waste will be containerized and sent offsite for disposal at an appropriate Class I, II or III facility, depending on the contaminant matrix. An ESQ Scientist must approve any TSDF and/or transporter prior to shipment of waste.

TABLE 6-1

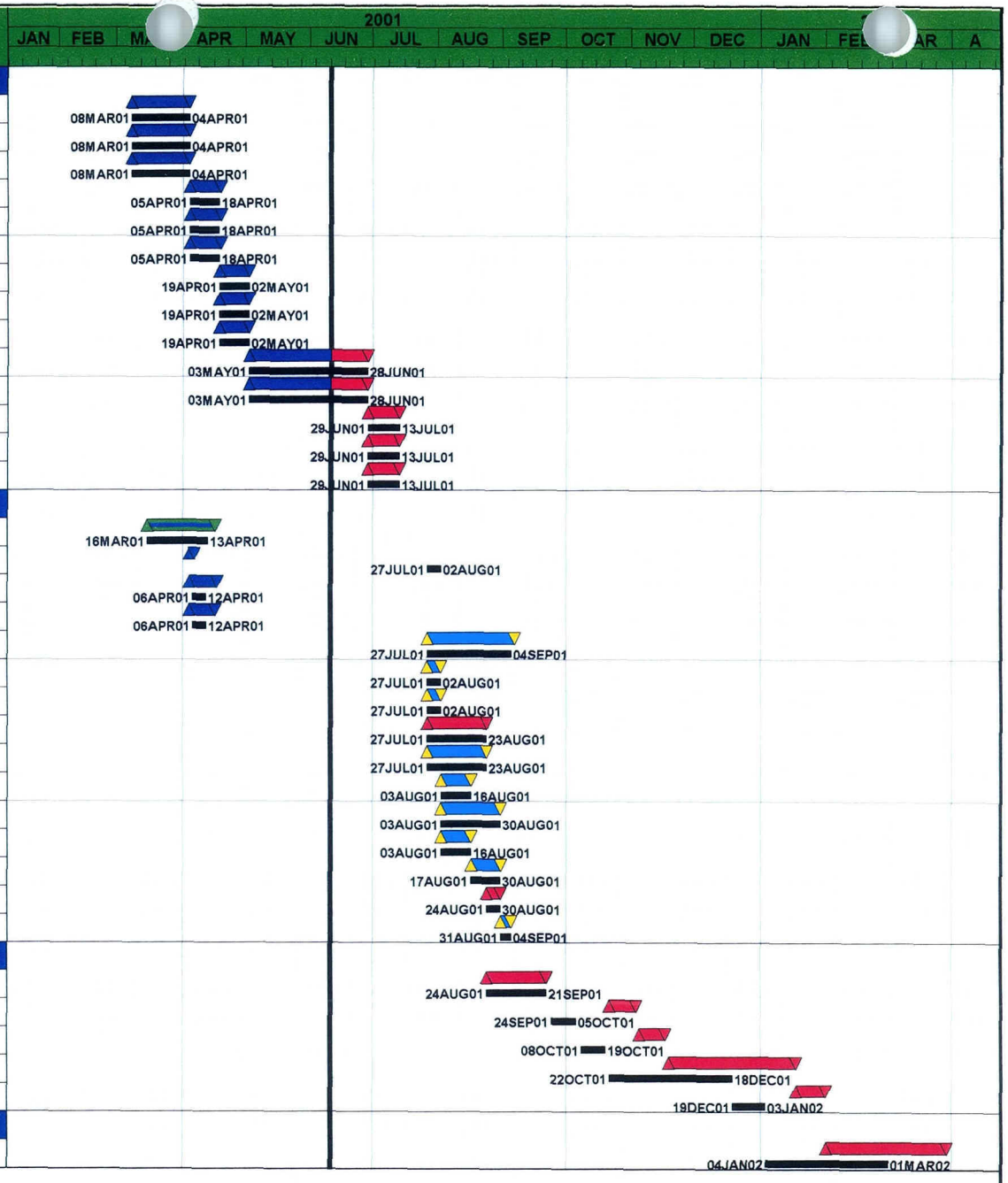
HAZARDOUS WASTE MANAGEMENT REQUIREMENTS SUMMARY

Notes:

Cal/EPA	-	California Environmental Protection Agency
DOT	-	Department of Transportation
ESQ	-	environmental safety and quality
FSP	-	Field Sampling Plan
LDR	-	land disposal restriction
Navy	-	U.S. Navy
PCB	-	polychlorinated biphenyl
PPE	-	personal protective equipment
RCRA	-	Resource Conservation and Recovery Act
STLC	-	soluble threshold limit concentration
SVOC	-	semivolatile organic compound
TCLP	-	toxicity characteristic leaching procedure
TPH	-	total petroleum hydrocarbon
TSDF	-	treatment, storage, and disposal facility
VOC	-	volatile organic compound

FIGURES

Activity Description	Early Start	Early Finish
Pre-Construction Submittals		
Prepare/Submit Pre-Draft Work Plan	08MAR01A	04APR01A
Prepare/Submit Pre-Draft SAP	08MAR01A	04APR01A
Prepare/Submit Pre-Draft SHSP	08MAR01A	04APR01A
Navy Review/Comment Pre-Draft Work Plan	05APR01A	19APR01A
Navy Review/Comment Pre-Draft SAP	05APR01A	19APR01A
Navy Review/Comment Pre-Draft SHSP	05APR01A	19APR01A
Incorporate Navy Comments Work Plan	19APR01A	02MAY01A
Incorporate Navy Comments SAP	19APR01A	02MAY01A
Incorporate Navy Comments SHSP	19APR01A	02MAY01A
Agency Review Draft Work Plan	03MAY01A	28JUN01
Agency Review Draft SAP SHSP	03MAY01A	28JUN01
Prepare Submit Final SAP	29JUN01	13JUL01
Prepare Submit Final Work Plan	29JUN01	13JUL01
Prepare Submit Final SHSP	29JUN01	13JUL01
Construction		
School Spring Break	16MAR01A	16APR01A
Site Survey	05APR01A	06APR01A
Site Recon	05APR01A	17APR01A
Geophysical Survey	05APR01A	16APR01A
School Summer Break	27JUL01	06SEP01
Mobilization	27JUL01	02AUG01
Fencing	27JUL01	02AUG01
Excavation	27JUL01	23AUG01
Pipeline Removal	27JUL01	23AUG01
Soil Sampling	03AUG01	16AUG01
Soil Analytical	03AUG01	30AUG01
Disposal of Waste	03AUG01	16AUG01
Transportation of Waste	17AUG01	30AUG01
Restoration	24AUG01	30AUG01
Demobilization	31AUG01	04SEP01
Post Construction Submittals		
Prepare/Submit Pre-Draft Closure Report	24AUG01	21SEP01
Navy Review/Comment Pre-Draft Closure Report	22OCT01	02NOV01
Incorporate Navy Comments Closure Report	05NOV01	16NOV01
Agency Review Draft Closure Report	19NOV01	17JAN02
Prepare Submit Final Closure Report	18JAN02	31JAN02
Job Closeout		
Closeout	01FEB02	29MAR02



Start Date	08FEB01
Finish Date	29MAR02
Data Date	11JUN01
Run Date	06JUL01 09:31

Early Bar
Planned Bar
Progress Bar
Critical Activity

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Foster Wheeler Environmental Corp.
Southwest Division RAC III
DO 0094
Underground Fuel Pipeline &
TPH Removal, Mare Island

Figure 1-1

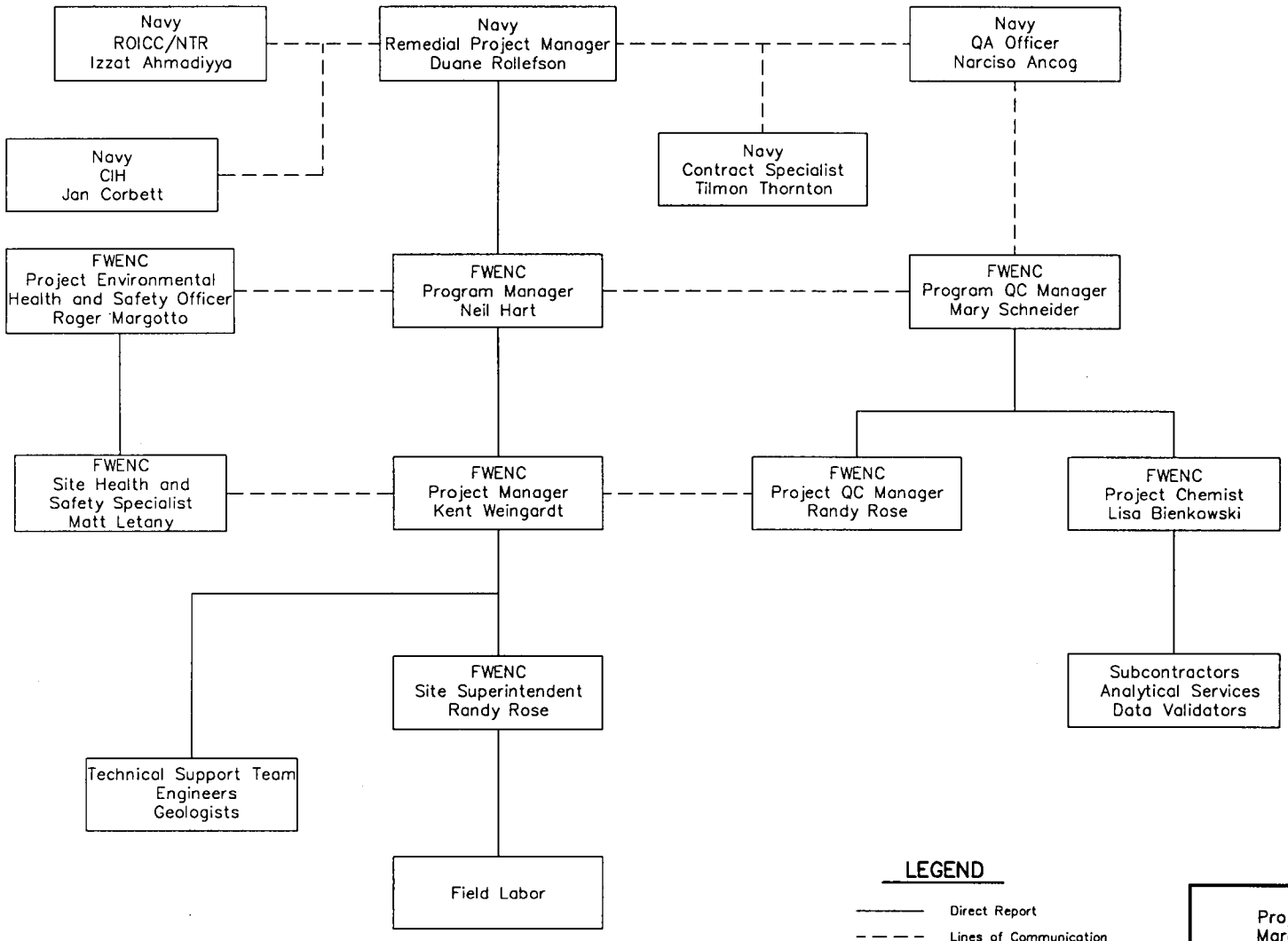

Figure 1–2
Project Organization Chart
Mare Island Naval Shipyard
DO #0094

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

N00221_000685
MARE ISLAND

SENSITIVE RECORD

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

FIGURES 4-1 THROUGH 4-3

FIGURE 5-1 – AST 636 "HOT SPOT" REMOVAL EXCAVATION PLAN

FOR ADDITIONAL INFORMATION, CONTACT:

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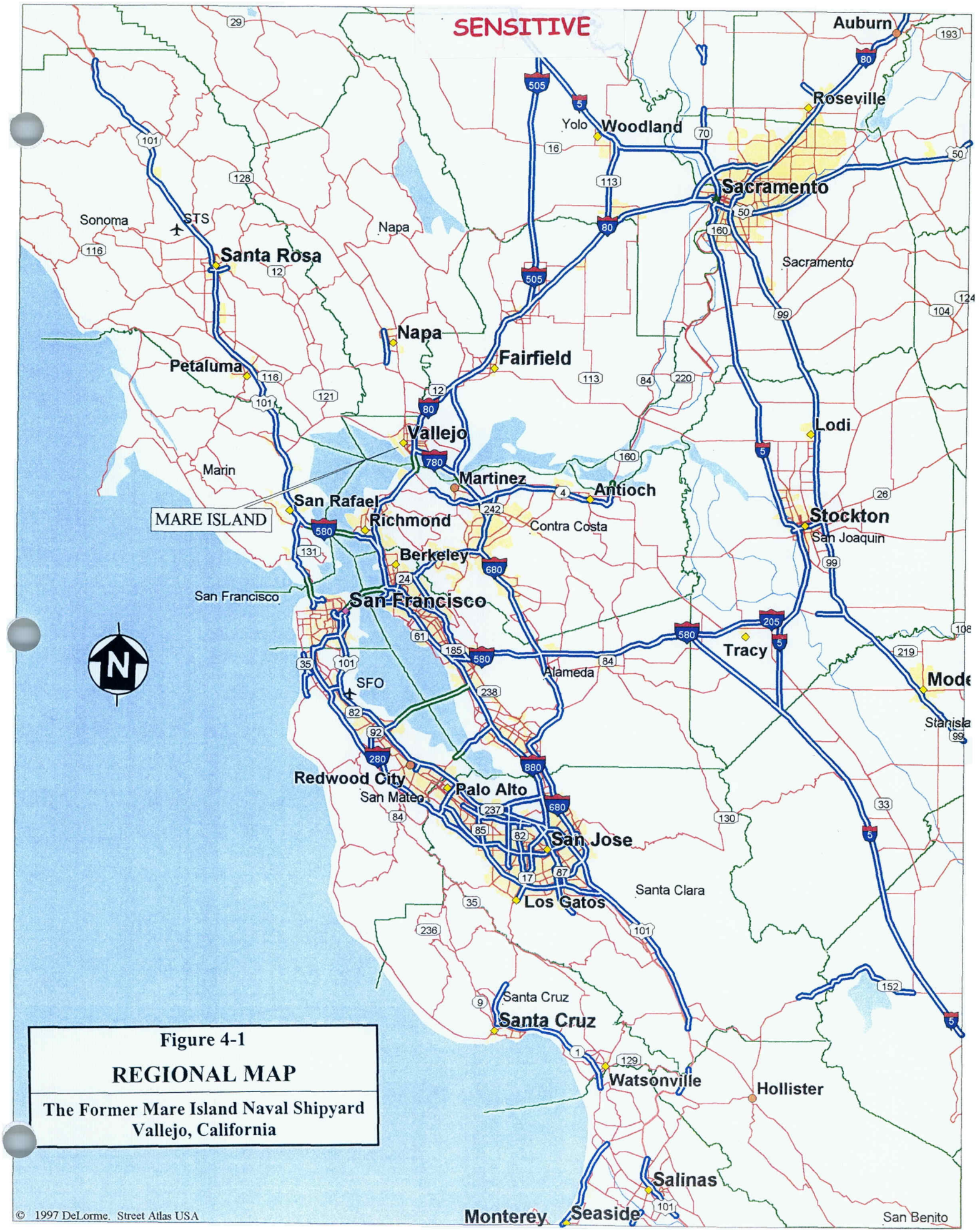


Figure 4-1

REGIONAL MAP

The Former Mare Island Naval Shipyard
Vallejo, California

SENSITIVE

Figure 4-2

FACILITY LOCATION MAP

The Former Mare Island Naval Shipyard
Vallejo, California

SENSITIVE

SENSITIVE

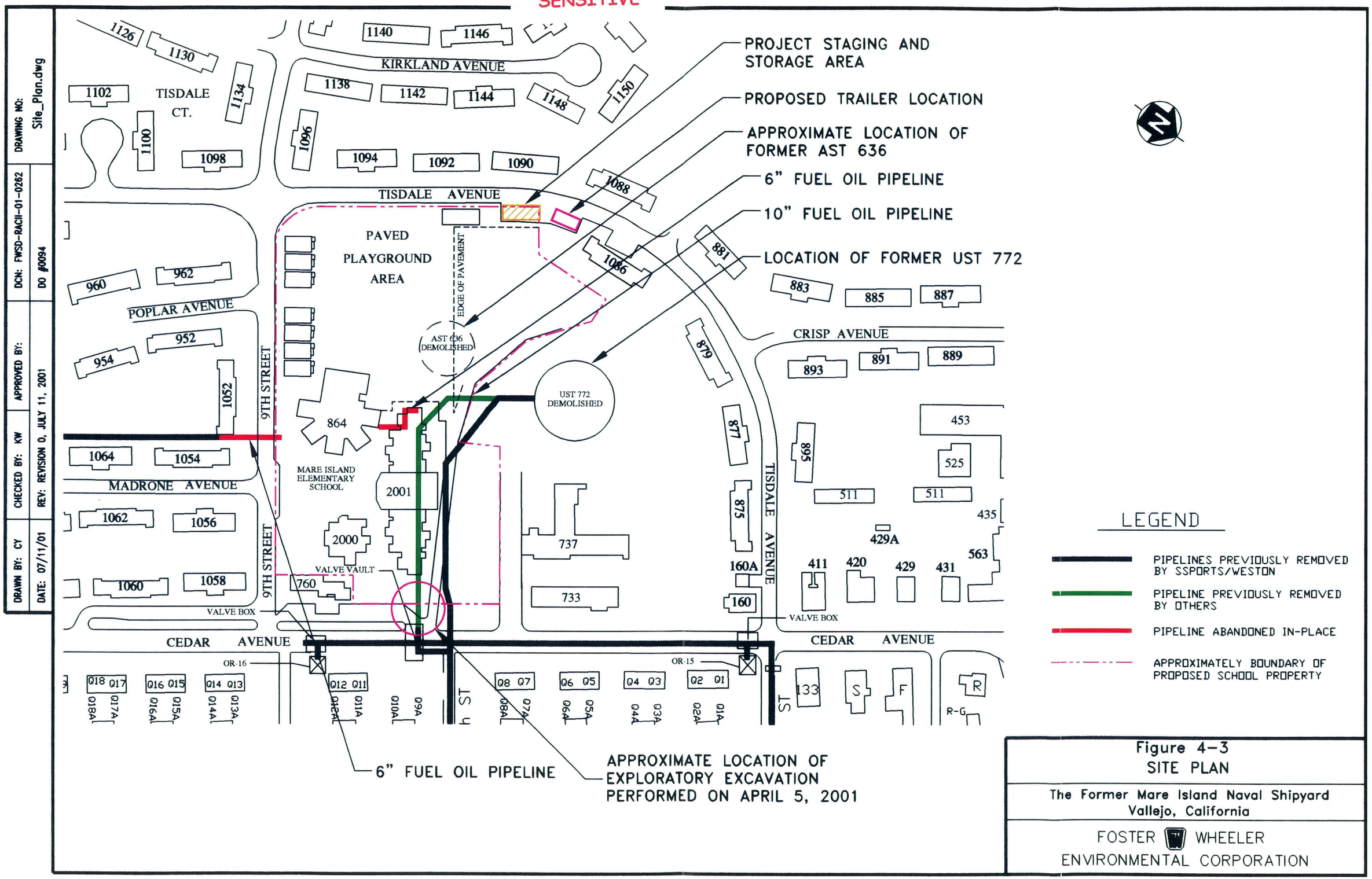


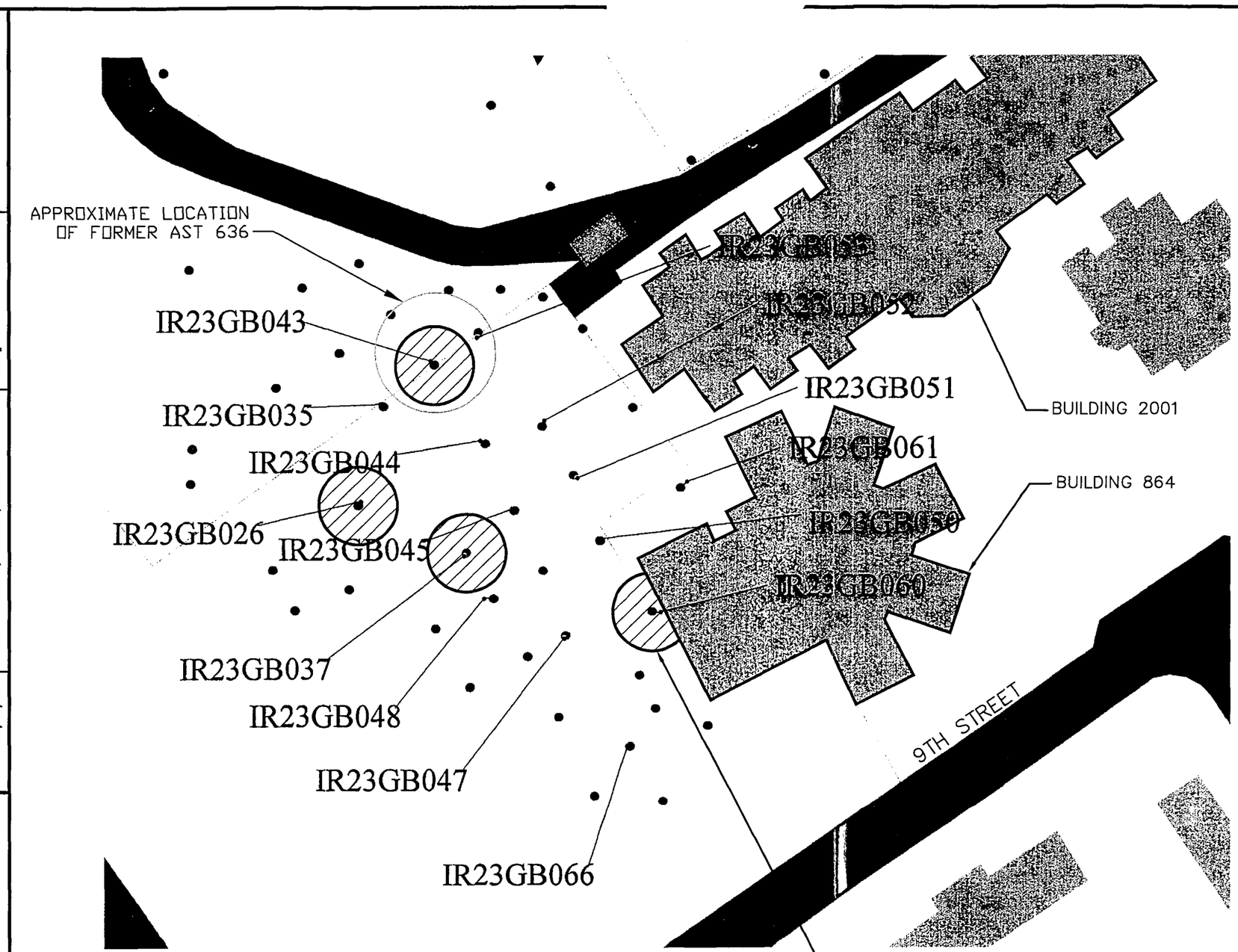
Figure 4-3
SITE PLAN

The Former Mare Island Naval Shipyard
Vallejo, California

FOSTER WHEELER ENVIRONMENTAL CORPORATION

SENSITIVE

DRAWN BY: CY	CHECKED BY: KW	APPROVED BY:	DCN: FWSD-RACII-01-0262	DRAWING NO: MARE ISLAND.DWG
DATE: 07/11/01	REV: REVISION 0, JULY 11, 2001		DO #0094	



LEGEND

- SAMPLE BORING LOCATION W/ NO DETECTABLE TPH
- IR23GB051 — SAMPLE BORING LOCATION W/ RESULTS OF TPH < 400 mg/kg
- IR23GB051 — SAMPLE BORING LOCATION W/ RESULTS OF TPH > 400 mg/kg

NOTES:

Excavation areas to be excavated to a depth of approximately 4 to 6 feet below grade, or until TPH levels are below 400 mg/kg.

Refer to Table 5-1 for TPH concentrations at each of the identified sample locations.

The base drawing with the sample locations was extracted from the Navy's ArcView database.

Figure 5-1
AST 636 "HOT SPOT" REMOVAL EXCAVATION PLAN

The Former Mare Island Naval Shipyard
Vallejo, California

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

APPENDIX A

FIELD SAMPLING PLAN
(FSP)

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Building 127, Room 112
San Diego, California 92132-5190

CONTRACT NO. N44255-95-D-6030
DO NO. 0094

APPENDIX A

FINAL

FIELD SAMPLING PLAN

Revision 0
July 11, 2001

UNDERGROUND FUEL OIL PIPING AND TPH CONTAMINATED SOIL REMOVAL

MARE ISLAND ELEMENTARY SCHOOL AT THE FORMER MARE ISLAND NAVAL SHIPYARD VALLEJO, CALIFORNIA

DCN: FWSD-RACII-01-0262

FOSTER WHEELER ENVIRONMENTAL CORPORATION
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Program Quality Control Manager — Date: 7/6/01

Approved by: Narciso A. Ancog
SWDIV Quality Assurance Officer — Date: 7/10/01

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ABBREVIATIONS AND ACRONYMS

°C	degree Celsius
AST	aboveground storage tank
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain-of-Custody
DO	Delivery Order
DTSC	Department of Toxic Substance Control
EFANW	Engineering Field Activities Northwest
EPA	U.S. Environmental Protection Agency
EWI	Environmental Work Instruction
FSP	Field Sampling Plan
FWENC	Foster Wheeler Environmental Corporation
HCl	hydrochloric acid
HDPE	high-density polyethylene
HNO_3	nitric acid
H_2SO_4	sulfuric acid
mg/kg	milligrams per kilogram
MINS	Mare Island Naval Shipyard
mL	milliliter
MS/MSD	matrix spike/matrix spike duplicate
NFESC	Naval Facilities Engineering Service Center
PCB	polychlorinated biphenyl
PID	photoionization detector
PPE	personal protective equipment
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RAC	Remedial Action Contract
RWQCB	Regional Water Quality Control Board
STLC	soluble threshold limit concentration
SVOC	semivolatile organic compound

ABBREVIATIONS AND ACRONYMS
(Continued)

SWDIV	Southwest Division Naval Facilities Engineering Command
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbon
TRPH	total recoverable petroleum hydrocarbon
UST	underground storage tank
VOA	volatile organic analysis
VOC	volatile organic compound
WET	waste extraction test

1.0 INTRODUCTION

This Field Sampling Plan (FSP) was prepared by Foster Wheeler Environmental Corporation (FWENC) to support sampling activities in and around Building 2001 (Elementary School) at the former Mare Island Naval Shipyard (MINS) in Vallejo, California. This FSP was prepared on behalf of the United States Department of the Navy, Southwest Division Naval Facilities Engineering Command (SWDIV) under Delivery Order (DO) No. 0094, issued under Engineering Field Activities Northwest Remedial Action Contract (EFANW RAC II) No. N44255-95-D-6030. This FSP and the Quality Assurance Project Plan (QAPP) complete the project-specific Sampling and Analysis Plan required for this project.

The purpose of this FSP is to provide field sampling procedures and data gathering methods that will be used to support sampling activities. This FSP will be used by field personnel as a reference. The purpose of the QAPP is to describe the quality assurance objectives and quality control requirements for this project. Data quality objectives are described in the QAPP.

This work is being performed as a Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) removal action. The San Francisco Bay Area Regional Water Quality Control Board (RWQCB) and the Department of Toxic Substances Control (DTSC) will be included in project oversight.

1.1 OBJECTIVE

The site in and around Building 2001 consists of former Aboveground Storage Tank (AST) Site 636, former Underground Storage Tank (UST) Site 772, and the associated piping of these tanks. Remaining piping of concern includes:

- A 10-inch pipeline that appears to run underneath Building 2001 from the former UST 772 to Cedar Avenue (approximately 575 feet)
- A 120-foot section of 6-inch piping that runs north between Buildings 1052 and 1054 and extends under 9th Street
- A 75-foot section of 6-inch pipe that appears to be under the western end of Building 2001.

These former tanks and pipelines were used to contain and transfer a mixture of bunker C oil and possibly diesel fuel (hereafter referred to as fuel oil). The project cleanup goal for fuel oil in soil is 400 milligrams per kilogram (mg/kg) (see Work Plan for basis for this number).

The first objective of this project is to locate and remove accessible piping associated with the previously removed tanks (which will include pipeline decontamination) and perform confirmation soil sampling of the pipeline trenches. In locations where the pipelines are

inaccessible, (i.e. underneath buildings), slanted direct push borings will be performed to accomplish sampling and thereby determine if a release has occurred.

The second objective of this project is to excavate contaminated soil hotspots (located through previous investigations) at the former AST Site 636 and perform confirmation soil sampling.

2.0 BACKGROUND

Site location and background, including site descriptions, are presented in Section 4.0 of the Work Plan. Information presented in the Work Plan will not be duplicated in this FSP.

3.0 MAPS

The Site Map is attached to the end of this FSP as Figure 1.

4.0 SAMPLING STRATEGY

This section discusses collection and analysis of samples to meet the project objectives during field activities.

4.1 PIPELINE CONFIRMATION SOIL SAMPLING

Confirmation soil samples will be collected after removal of the pipelines from within the excavation. Where accessible, one soil sample will be collected every 40 feet along the 10-inch pipeline (where excavated) and along the 6-inch pipeline (where excavated). Sampling locations will incorporate piping features such as joints, elbows, and valves. However, because of accessibility problems, only six (6) samples (roughly between 31 and 108 feet apart) will be collected from underneath Building 2001 in the vicinity of where the 10-inch pipeline use to be.

All soil samples collected along known or suspected pipelines will be analyzed for both total petroleum hydrocarbons (TPH)-extractable and volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and metals in order to confirm there are no unacceptable levels of CERCLA contamination on site.

4.2 PIPELINE DIRECT PUSH SOIL BORING SAMPLING

In locations where pipeline removal is not feasible (i.e.-under existing buildings), slanted direct push soil borings will be performed. One soil sample will be collected from underneath the piping, where feasible, at the same frequency as described in Section 4.1. However, for the 75-foot section of pipe at the western end of Building 2001 only three samples are planned due to limited access. This is also dependent on the capabilities of the equipment utilized. Hand augering may also be used in this area.

All soil samples collected along known or suspected pipelines will be analyzed for both TPH-extractable and VOCs, SVOCs, pesticides, PCBs, and metals.

4.3 EXCAVATION CONFIRMATION SOIL SAMPLING

After removal of approximately 1,350 cubic yards of contaminated soil from four hotspots within former AST Site 636, confirmation soil samples will be collected. The confirmation regime will include a minimum of one sample from each sidewall (4), at a depth representing the highest observed concentrations based on past investigative findings, biased sampling through visual observations, or other field observations, and two soil samples from the base of each hotspot excavation. However, only one floor sample and three sidewall samples will be collected from the excavation area surrounding sample point IR23GB060. All soil samples will be analyzed for TPH-extractable. One soil sample from the bottom of each hotspot excavation (4) will be additionally analyzed for VOCs, SVOCs, pesticides, PCBs, and metals.

4.4 GROUNDWATER SAMPLING

Groundwater at the site is deeper than the proposed excavation areas and is not anticipated to be encountered. However, if encountered, a grab sample will be collected and analyzed for both petroleum and non-petroleum constituents.

4.5 INVESTIGATION DERIVED WASTE SAMPLING

The types of wastes generated during field activities will be as follows:

- Residual fuel oil from pipelines
- Soil cuttings from direct push sampling activities
- Stockpiles from the removal action of the pipelines and the soil at the former AST Site 636
- Decontamination water from the cleaning of the pipelines and equipment
- Personal protective equipment (PPE)

The residual fuel oil, soil cuttings, and decontamination water will be stored separately onsite in 55-gallon drums or other approved containers. The stockpiles will be managed in accordance with the Waste Management Plan in Section 6.0 of the Work Plan. Each type of waste will be sampled at a minimum of 1 sample per every 5 drums or 1 sample per every 100 cubic yards (per each stockpile) and analyzed for TPH-extractable. (If less than 10 drums are generated for 1 type of waste, 1 sample per every 2 drums will be collected.) Additional sampling and analysis, as required by the disposal facility, may be performed. Additional analysis may include VOCs, SVOCs, pesticides, PCBs, metals, total recoverable petroleum hydrocarbons (TRPH), and waste characterization tests such as reactivity, ignitability, pH, toxicity characteristic leaching procedure (TCLP), and soluble threshold limit concentration (STLC).

PPE will not be sampled for waste characterization but will be characterized based on knowledge of the process generating the waste. The results of the waste characterization may also be used to classify the PPE.

5.0 REQUEST FOR ANALYSIS

This section describes analytical methods, containers, and preservative requirements; and field and laboratory quality control (QC) samples.

5.1 ANALYTICAL METHODS

The following analytical methods will be used for this project in conjunction with *Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846* (EPA, 1994).

- TPH-extractable by EPA Method 8015B
- VOCs by EPA Method 8260B (EPA Method 5035/8260B for soil samples)
- SVOCs by EPA Method 8270C
- Pesticides by EPA Method 8081A
- PCBs by EPA Method 8082
- Metals by EPA Method 6010B/7000
- TRPH by EPA Method 418.1
- Reactivity by SW-846, 7.3.3/7.3.4
- Ignitability by EPA Method 1010/1020
- pH by EPA Method 9040B (EPA Method 9045 for soil samples)
- TCLP by EPA Method 1311
- STLC by California Waste Extraction Test (WET)

5.2 SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Table 5-1 lists the sample containers, preservatives, and holding time requirements for samples.

5.3 FIELD QUALITY CONTROL SAMPLES

Field QC samples will be collected and analyzed during the project to assess the consistency and performance of the sampling program. Field QC samples for this project may include trip blanks, field duplicates, and equipment rinsates. Field QC samples will not be applicable to the collection of investigation derived waste samples.

5.3.1 Trip Blanks

Trip blanks are hydrochloric acid (HCl) preserved organic-free water prepared by the laboratory in 40-milliliter (mL) volatile organic analysis (VOA) vials that will be carried into the field, stored with the sample, and returned to the laboratory for VOC analysis. Trip blanks will be used

to determine if samples have been cross-contaminated with VOCs during sample collection and transportation. Trip blanks will be provided and analyzed for each VOC sampling and shipping event.

5.3.2 Field Duplicates

Field duplicates consist of two samples (an original and a duplicate) of the same matrix collected at the same time and location, to the extent possible, and using the same sampling techniques. The purpose of field duplicate samples is to evaluate the precision of the overall sample collection and analysis process. Field duplicates will be collected at a frequency of 1 per every 10 samples per matrix and will be analyzed for the same analytes as the original sample. Field duplicates receive unique sample numbers; therefore, the identity of the duplicate samples is "blind" to the analytical laboratory. Exact locations of duplicate samples and their identifications will be recorded in the field logbook.

5.3.3 Equipment Rinsate Samples

Equipment rinsate samples will be collected only if nondisposable sample equipment is used. Rinsate samples consist of reagent-grade water collected from the final rinse of the decontamination process. Rinsate samples will be collected from the sample equipment, placed in appropriate pre-cleaned containers supplied by the analytical laboratory, and analyzed for the same analytes as the field samples. Equipment rinsate samples, collected at a frequency of one per day, will evaluate the effectiveness of the decontamination procedure and potential cross-contamination during sampling events. This project will use disposable sampling equipment, where possible, eliminating the need for equipment rinsate samples.

5.4 LABORATORY QUALITY CONTROL SAMPLES

The laboratory will analyze 1 matrix spike/matrix spike duplicate (MS/MSD) for every 20 project samples. In order for the laboratory to prepare a project-specific MS/MSD, field personnel will collect triple the sample volumes at a minimum of 1 per 20 samples collected per matrix. Field personnel will designate 1 sample in 20 for MS/MSD analysis on the Chain-of-Custody (COC) form.

6.0 FIELD METHODS AND SAMPLING PROCEDURES

The following sections present sampling procedures and sample handling procedures to be used for this project.

6.1 PIPELINE CONFIRMATION SOIL SAMPLING PROCEDURES

Confirmation soil samples will be collected as follows:

- Sampling personnel will don a new pair of disposable nitrile gloves before sampling each location.
- Sample locations will be determined as described in Section 4.1 and stakes or pinflags will be used to mark each sampling point.
- Three to six inches of the topsoil from each sample location will be removed prior to sampling.
- Each soil sample will be collected in a pre-cleaned 8-ounce glass jar (for additional analyses, two 8-ounce jars should be collected). If VOC analysis is requested, then EnCore® samplers, in addition to 8-ounce jars, will be collected as described in Section 6.1.1.
- The jar will be filled completely to avoid any headspace (samples may be collected from the bucket of a backhoe if the location is inaccessible).
- Each sample will be numbered, labeled, and packaged in accordance with Sections 6.6 through 6.8.
- Field documentation including field logbooks and COCs will be filled out in accordance with Section 6.9.

6.1.1 Soil VOC Sampling Procedures

If soil samples are being collected for VOCs, then EPA Method 5035 using EnCore® samplers will be used as follows:

- Four EnCore® samplers will be collected for each VOC sample (if more than one volatile analysis is being performed, then four EnCore® samplers will be collected for each VOC sample).
- Holding the coring body, the plunger rod will be pushed down until the small o-ring rests against the tabs. This will assure that the plunger will move easily.
- The locking lever on the EnCore® T-handle will be depressed. The coring body, with the plunger end first, will be placed into the open end of the T-handle, aligning the slots of the coring body with the locking pins in the T-handle. The coring body will be twisted clockwise to lock the pins in the slots. The sampler will be checked to ensure that it is locked in place. The sampler will now be ready for use.

- By holding the T-handle, the coring body will be pushed into the soil until the coring body is full. When full, the small o-ring will be centered in the T-handle viewing hole. The sampler will then be removed from the soil and any excess soil will be wiped from the coring body exterior.
- The coring body will be capped while it is still on the T-handle. The cap should be pushed over the flat area of the ridge. To lock the cap in place, the cap will be pushed and twisted so that it seals the sampler.
- The capped sampler will be removed by depressing the locking lever on the T-handle while twisting and pulling the sampler from the T-handle.
- The EnCore® sampler will be placed in its aluminum sealed bag. The sample label on the outside of the bag will be completed as described in Sections 6.6 and 6.7, clear tape will be placed over the label, and the bag will be placed on ice immediately.
- This procedure will be performed until the appropriate amount of EnCore® samplers are collected for each sample.

6.2 PIPELINE DIRECT PUSH SOIL BORING SAMPLING PROCEDURES

In locations where the pipelines are inaccessible, a slanted direct push boring will be performed to collect samples underneath those pipelines as follows:

- Sampling personnel will don a new pair of disposable nitrile gloves before sampling each location.
- Sample locations will be determined as described in Section 4.2.
- The borehole will be advanced by the direct push method until the top of the desired sampling interval is reached.
- The properly decontaminated sampler will be equipped with an acetate liner, which will be lowered into the borehole.
- The sampler will then be driven into the undisturbed formation by a pneumatic-operated hammer.
- Following sample acquisition, the sampler will be brought to ground surface and removed from the drill rods. The upper and lower fittings will be loosened and the sampler will be taken to the sample handling area. At the sample handling area, the fittings and the barrel of the sampler will be removed.
- The liner containing the soil samples should immediately be removed from the sampler. The acetate liner will then be cut into 6-inch sections, and the liner at the required depth shall be retained as the analytical laboratory sample. The ends of the sample liner to be retained as the analytical laboratory sample will be covered with Teflon® film and sealed with plastic caps.
- If VOC analysis is requested, then EnCore® samplers, in addition to the liner, will be collected as described in Section 6.1.1.
- Each sample will be numbered, labeled, and packaged in accordance with Sections 6.6 through 6.8.

- Field documentation, including field logbooks and COCs, will be filled out in accordance with Section 6.9.

6.3 EXCAVATION CONFIRMATION SOIL SAMPLING PROCEDURES

Confirmation soil samples will be collected as follows:

- Sampling personnel will don a new pair of disposable nitrile gloves before sampling each location.
- A random sample location (X and Y coordinates) will be generated for each sidewall and floor after excavation of the hotspots. Stakes or pinflags will be used to mark each sampling point.
- Three to six inches of the topsoil from each sample location will be removed prior to sampling.
- Each soil sample will be collected in a pre-cleaned 8-ounce glass jar (for additional analyses, two 8-ounce jars should be collected). If VOC analysis is requested, then EnCore® samplers, in addition to 8-ounce jars, will be collected as described in Section 6.1.1.
- The jar will be filled completely to avoid any headspace (samples may be collected from the bucket of a backhoe if the location is inaccessible).
- Each sample will be numbered, labeled, and packaged in accordance with Sections 6.6 through 6.8.
- Field documentation including field logbooks and COCs will be filled out in accordance with Section 6.9.

6.4 INVESTIGATION DERIVED WASTE SAMPLING PROCEDURES

Waste characterization samples will be collected as described in the following sections.

6.4.1 Drum Sampling

Residual fuel oil, soil cuttings, and decontamination water will be stored in 55-gallon drums or other approved containers. Collection of samples is as follows:

- Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting samples at each drum.
- At a minimum, 1 sample per every 5 drums will be collected for each type of waste (if less than 10 drums are generated for 1 type of waste, one sample per every 2 drums will be collected). If the waste is liquid and stored in a tank, 1 sample will be collected from the tank.
- The bung top of the drum or other approved container will be carefully opened and a measurement of the atmosphere inside will be taken using the photoionization detector (PID).
- If the PID reads zero, proceed with completely opening the drum or container. If there are indications that VOCs exist inside, the project health and safety person should be contacted for directions.

- Liquid samples will be collected using disposable Teflon® bailers. Samples will be transferred from the bailers to pre-preserved, pre-cleaned sample containers using a bottom-emptying device. Vials for VOC analysis will be filled according to Section 6.4.1.1.
- A disposable scoop may be used to collect soil in a pre-cleaned 8-ounce glass jar (for additional analyses, two 8-ounce jars should be collected). If VOC analysis is requested, then EnCore® samplers, in addition to 8-ounce jars, will be collected as described in Section 6.1.1.
- Each sample will be numbered, labeled, and packaged in accordance with Sections 6.6 through 6.8.
- Field documentation, including field logbooks and COCs, will be filled out in accordance with Section 6.9.

6.4.1.1 Water VOC Sampling Procedures

Water VOC samples will be collected as follows:

1. The water samples will be collected into three 40-mL VOA vials carefully to minimize aeration. One of the three vials collected will be used by the laboratory to evaluate sample preservation by measuring sample pH.
2. The vial will be filled up to the lid until a positive meniscus is formed.
3. The vial will be capped immediately but slowly.
4. The sample will be checked for the presence of air bubbles.
5. If an air bubble is present, the collected sample will be discarded and resampled using a new vial.
6. The previous steps will be repeated until an air bubble-free sample is collected.

6.4.2 Stockpile Sampling Procedures

Stockpile soil samples will be collected as follows:

- Measure and calculate the volume (in cubic yards) of the stockpiles using the following formulas:

$$V = A * H/27$$

Where: V = volume in cubic yards

A = area of the base in square feet calculated using one of the following formulas:

Rectangular = length * width
Square = length * width
Triangular = ½ base * height
Circular = 3.14 * radius * radius
Oval = 3.14 * long radius * short radius

H = average height of the stockpile in feet

27 = conversion factor for cubic feet to cubic yards

- At a minimum, 1 soil sample per every 100 cubic yards will be collected for each stockpile.
- A grid system, for sampling purposes, will be used for each stockpile. The number of grids will be based on the total number of samples to be collected for each stockpile.
- The sample location in each grid will be determined by using random number generation of X, Y, and Z coordinates. Locations will be marked with stacks or pinflags.
- A backhoe bucket or hand auger will be used to access each random sample point.
- Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting samples at each location.
- A disposable scoop may be used to collect soil in a pre-cleaned 8-ounce glass jar (for additional analyses, two 8-ounce jars should be collected). If VOC analysis is requested, then EnCore® samplers, in addition to 8-ounce jars, will be collected as described in Section 6.1.1.
- Each sample will be numbered, labeled, and packaged in accordance with Sections 6.6 through 6.8.
- Field documentation, including field logbooks and COCs, will be filled out in accordance with Section 6.9.

6.5 DECONTAMINATION PROCEDURES

Decontamination of nondisposable sampling equipment will be performed to prevent the introduction of extraneous material into samples and to prevent cross-contamination between samples. All sampling equipment will be decontaminated by steam cleaning or by washing with a nonphosphate detergent, such as Liquinox™, or equivalent.

The following steps will be followed for decontamination of nondisposable sample equipment:

- **Wash with nonphosphate detergent and water solution.** This step will remove all visible contamination from the equipment. Using a 5-gallon bucket approximately 75 percent full of solution and a long-handled brush is suggested for this step. Dilute nonphosphate detergent as directed by the manufacturer.
- **Rinse with potable water.** This step will rinse all the detergent solution away from equipment. Using a 5-gallon bucket approximately 75 percent full of water and a long-handled brush is suggested for this step. Periodic changing of this water is required.
- **Rinse with deionized/laboratory reagent-grade water.** This step will rinse any detergent solution and potable water residues. Rinsing is most effective when water is applied using a stainless steel Hudson-type sprayer or Nalgene® squeeze bottle while holding equipment over a 5-gallon bucket.
- **Rinse with deionized/laboratory reagent-grade water.** This step will be a final rinse to remove any contaminants. Rinsing is most effective when water is applied using a stainless steel Hudson-type sprayer or Nalgene® squeeze bottle while holding equipment over a 5-gallon bucket.

6.6 SAMPLE NUMBER

All samples submitted to an analytical laboratory will be uniquely numbered according to the following format:

0094-YYY

Where 0094 is the four-digit DO number and YYY is a sequential number for this project. The sample number will be recorded in the field logbook and on the COC form at the time of sample collection. A complete description of the sample and sampling circumstances will be recorded in the field logbook and referenced using the unique sample identification number.

6.7 SAMPLE LABELING

Sample labels will be filled out with indelible black ink and will be affixed to each sample container. Each sample label will be covered with clear tape. Each sample container will be labeled, at a minimum, with the following:

- Sample identification number
- Sample collection date (month/day/year)
- Time of collection (24-hour clock)
- Sampler's initials
- Analyses to be performed
- Preservation (if any)

6.8 SAMPLE PACKAGING AND SHIPMENT

Immediately after sample labeling, custody seals will be affixed to each sample container. Each sample will be placed in double resealable plastic bags to keep the sample container and label dry (for VOA containers, place the signed custody seal on the outside of the first resealable bag. Then place the container in another resealable bag. This will prevent any contact with the adhesive from the custody seal and the VOA containers). All glass sample containers will be protected with bubble wrap if transported by a commercial carrier.

Each cooler will be shipped with a temperature blank. A temperature blank is a sample container filled with tap water and stored in the cooler during sample collection and transportation. The temperature of the temperature blank will be recorded by the laboratory on the COC form immediately upon receipt of the samples.

Sample cooler drain spouts will be taped from the inside and outside of the cooler to prevent any leakage.

Samples transported by a laboratory assigned courier will be packed in a sample cooler with ice in sufficient quantity to keep the samples cooled. Two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. Clear tape will be applied to the custody seals to prevent accidental breakage during transport. The COC form will be completed and signed by the courier. The cooler and the top two copies (white and pink) of the COC form will then be released to the courier for transportation to the laboratory.

Samples to be shipped by commercial carrier will be packed in a sample cooler lined with a double plastic bag. Double-bagged ice will be added to the cooler in sufficient quantity to keep the samples cooled for the duration of the shipment to the laboratory. Saturday deliveries must be coordinated with the laboratory, and the airbill and cooler must be marked appropriately. The top two copies of the COC form will be sealed in a double resealable bag. The COC form will then be taped to the inside of the sample cooler lid. Two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. Clear tape will be applied to the custody seals to prevent accidental breakage during shipping. The cooler will be taped shut with strapping tape. The samples will then be shipped to the analytical laboratory. A copy of the courier airbill will be retained for documentation.

6.9 FIELD DOCUMENTATION

At a minimum, sampling information will be recorded on a COC form and in the field logbook. Both documents will be completed in the field at the time of sample collection. All entries will be legible and will be recorded in indelible black ink.

6.9.1 Chain-of-Custody

The following will be recorded on the COC form:

- Project name
- Project location
- Sampler name
- Project contact
- Purchase order number
- Project number (FWENC)
- Sampler signature
- Airbill number (if applicable)
- Sample ID
- Date (of sample collection)
- Time (of sample collection to the nearest minute, 24-hour clock)
- Number of sample containers

- Data package requirement (Level III or IV)
- Sample type (matrix)
- Turn-around-time
- Analyses required
- Laboratory name
- Comments
  - MS/MSD samples
  - Observations specific to sample
- Sample location codes:

  Examples:

pipeline samples:	SITE X-PIPELINE
direct push samples:	SITE X-SB-X
drum samples:	DRUM-#X
QC samples:	TRIP BLANK
	EQ RINSATE

- Sample depth in feet (start, end)
- QC type:

REG:	regular sample
TB:	trip blank
FD:	field duplicate
ER:	equipment rinsate sample

- Transfer signature (to relinquish samples)
  - The sampler will be the first person to relinquish sample possession
- Courier/laboratory representative signature (for commercial carrier, write carrier's name here)
- Date/time (of custody transfer)
- Laboratory instruction
- Composite description
- Sampling comments

6.9.2 Field Logbooks

A permanently bound field logbook with consecutively numbered pages, used for sampling activities only, will be assigned to this project. All entries will be recorded in indelible black ink. At the end of each workday, the logbook pages will be signed by the responsible sampler and any unused portions of logbook pages will be crossed out, signed, and dated.

If it is necessary to transfer the logbook to another person, the person relinquishing the logbook will sign and date the last page used and the person receiving the logbook will sign and date the next page to be used.

At a minimum, the logbook will contain the following information:

- Project name and location
- Date and time
- Personnel in attendance
- General weather information
- Work performed
- Field observations
- Sampling performed, including specifics such as location, type of sample, type of analyses, and sample identification
- Field analyses performed, including results, instrument checks, problems, and calibration records for field instruments
- Descriptions of deviations from the Sampling and Analysis Plan
- Problems encountered and corrective action taken
- Identification of field QC samples
- QC activities
- Verbal or written instructions
- Any other events that may affect the samples

6.9.3 Document Corrections

Changes or corrections on any project documentation will be made by crossing out the item with a single line, initialing (by the person performing the correction), and dating the correction. The original item, although erroneous, must remain legible beneath the cross-out. The new information should be written clearly above the crossed-out item.

6.10 FSP REVISION OR AMENDMENT

When circumstances arise that impact the original project sampling objectives, such as a significant change in work scope, the FSP document will be revised or amended. Refer to Project Contractor Quality Control Plan for description of change procedures. The modification process will be based on EPA Guidelines and in conjunction with Environmental Work Instruction #2 (SWDIV, 1999b).

7.0 REFERENCES

U.S. Environmental Protection Agency (EPA). 1994. *Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846,* Third Edition and Final Updates.

U.S Navy/Naval Facilities Engineering Command (NAVFAC), Southwest Division. 1999a. *Navy Installation Restoration Chemical Data Quality Manual.* September.

U.S Navy/Naval Facilities Engineering Service Center (NFESC), Southwest Division (SWDIV). 1999b. *Environmental Work Instruction (EWI) #2, 4EN.2, Review, Approval, Revision, and Amendment of Field Sampling Plans (FSPs) and Quality Assurance Project Plans (QAPPs).* October.

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SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIME REQUIREMENTS

SOIL SAMPLES				
Analysis	**Analytical Method**	**Container**	**Preservative**	**Holding Time**
TPH-extractable	EPA Method 8015B	One 8-ounce glass jar or 6-inch acetate sleeve	Cool, 4±2°C	14 days to extract; 40 days to analyze
VOCs	EPA Method 5035/8260B	Four EnCore® samplers	Cool, 4±2°C	48 hours to analyze or preserve; if preserved, 14 days to analyze
SVOCs	EPA Method 8270C	One 8-ounce glass jar or 6-inch acetate sleeve	Cool, 4±2°C	14 days to extract; 40 days to analyze
Pesticides	EPA Method 8081A	One 8-ounce glass jar or 6-inch acetate sleeve	Cool, 4±2°C	14 days to extract; 40 days to analyze
PCBs	EPA Method 8082	One 8-ounce glass jar or 6-inch acetate sleeve	Cool, 4±2°C	14 days to extract; 40 days to analyze
Metals	EPA Method 6010B/7000	One 8-ounce glass jar or 6-inch acetate sleeve	Cool, 4±2°C	6 months (except mercury which is 28 days)
TRPH	EPA Method 418.1	One 8-ounce glass jar or 6-inch acetate sleeve	Cool, 4±2°C	14 days
Reactivity	SW-846, 7.3.3/7.3.4	One 8-ounce glass jar or 6-inch acetate sleeve	Cool, 4±2°C	14 days
Ignitability	EPA Method 1010/1020	One 8-ounce glass jar or 6-inch acetate sleeve	Cool, 4±2°C	14 days
pH	EPA Method 9045	One 8-ounce glass jar or 6-inch acetate sleeve	Cool, 4±2°C	Analyze immediately upon laboratory receipt
TCLP	EPA Method 1311	One 8-ounce glass jar or 6-inch acetate sleeve	Cool, 4±2°C	For metals, 180 days to extract, 180 days to digest and analyze; except mercury which is 28 days to extract, 28 days to digest, and 24 hours to analyze
STLC	California WET	One 8-ounce glass jar or 6-inch acetate sleeve	Cool, 4±2°C	For metals, 180 days to extract, 180 days to digest and analyze; except mercury which is 28 days to extract, 28 days to digest, and 24 hours to analyze

TABLE 5-1

SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIME REQUIREMENTS

WATER SAMPLES				
Analysis	**Analytical Method**	**Container**	**Preservative**	**Holding Time**
TPH-extractable	EPA Method 8015B	One 1-liter glass amber	Cool, 4±2°C	7 days to extract; 40 days to analyze
VOCs	EPA Method 8260B	Three 40-mL VOA vials	pH ≤ 2 w/ HCl Cool, 4±2°C	14 days
SVOCs	EPA Method 8270C	One 1-liter glass amber	Cool, 4±2°C	7 days to extract; 40 days to analyze
Pesticides	EPA Method 8081A	One 1-liter glass amber	Cool, 4±2°C	7 days to extract; 40 days to analyze
PCBs	EPA Method 8082	One 1-liter glass amber	Cool, 4±2°C	7 days to extract; 40 days to analyze
Metals	EPA Method 6010B/7000	500-mL HDPE container	pH ≤ 2 w/ HNO_3	6 months (except mercury which is 28 days)
TRPH	EPA Method 418.1	One 1-liter glass amber	pH ≤ 2 w/ H_2SO_4 Cool, 4±2°C	14 days
Reactivity	SW-846, 7.3.3/7.3.4	1 liter HDPE container	Cool, 4±2°C	14 days
Ignitability	EPA Method 1010/1020	250-mL HDPE container	Cool, 4±2°C	14 days
pH	EPA Method 9040B	250-mL HDPE container	Cool, 4±2°C	Analyze immediately upon laboratory receipt

Notes:

°C – degrees Celsius
EPA – U.S. Environmental Protection Agency
HCl– hydrochloric acid
HDPE – high density polyethylene
HNO_3 – nitric acid
H_2SO_4 – hydrochloric acid
mL – milliliter
PCB – polychlorinated biphenyl
STLC – soluble threshold limit concentration
SVOC– semivolatile organic compounds
TCLP – toxicity characteristic leaching procedure
TPH – total petroleum hydrocarbon
TRPH – total recoverable petroleum hydrocarbons
VOA – volatile organic analysis
VOC – volatile organic compound
WET – waste extraction test

FIGURES

N00221_000685
MARE ISLAND

SENSITIVE RECORD

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

FIGURE 1 – SITE MAP

FOR ADDITIONAL INFORMATION, CONTACT:

DIANE C. SILVA, COMMAND RECORDS MANAGER, CODE EV33
NAVAL FACILITIES ENGINEERING COMMAND, SOUTHWEST
1220 PACIFIC HIGHWAY (NBSD BLDG. 3519)
SAN DIEGO, CA 92132

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

SENSITIVE

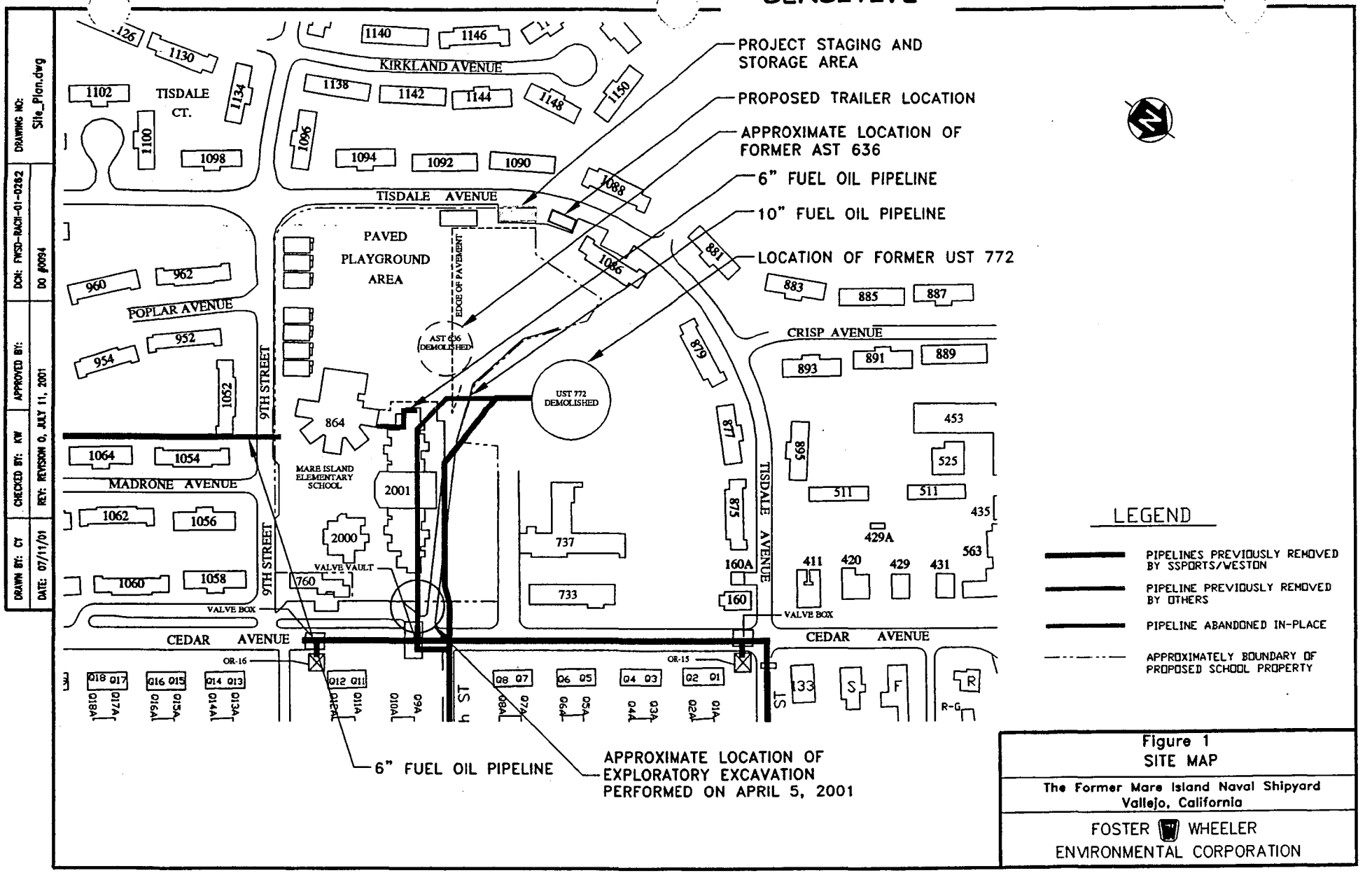

Figure 1
SITE MAP

The Former Mare Island Naval Shipyard
Vallejo, California

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

SENSITIVE

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Building 127, Room 112
San Diego, California 92132-5190

CONTRACT NO. N44255-95-D-6030
DO NO. 0094

APPENDIX B

FINAL

QUALITY ASSURANCE PROJECT PLAN

Revision 0
July 11, 2001

UNDERGROUND FUEL OIL PIPING AND TPH CONTAMINATED SOIL REMOVAL

MARE ISLAND ELEMENTARY SCHOOL AT THE FORMER MARE ISLAND NAVAL SHIPYARD VALLEJO, CALIFORNIA

DCN: FWSD-RACII-01-0262

FOSTER WHEELER ENVIRONMENTAL CORPORATION
1230 Columbia Street, Suite 640
San Diego, CA 92101

Mary Schneider — 7/6/01
Mary Schneider, Program QC Manager — Date

Narciso A. Ancog — 7/10/01
Narciso A. Ancog, SWDIV Quality Assurance Officer — Date

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ABBREVIATIONS AND ACRONYMS

AST	aboveground storage tank
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain-of-Custody
°C	degree Celsius
DIPE	di-isopropyl ether
DO	Delivery Order
DQO	data quality objectives
DTSC	Department of Toxic Substance Control
EDD	electronic data deliverable
EFANW	Engineering Field Activities Northwest
EPA	U.S. Environmental Protection Agency
ETBE	ethyl tertiary butyl ether
EWI	Environmental Work Instruction
FWENC	Foster Wheeler Environmental Corporation
FSP	Field Sampling Plan
GC/MS	gas chromatograph/mass spectrometer
ICAL	initial calibration
ICAP	inductively coupled argon plasma
LCS	laboratory control sample
MEK	methyl ethyl ketone
MIBK	methyl isobutyl ketone
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	micrograms per liter
MINS	Mare Island Naval Shipyard
MS/MSD	matrix spike/matrix spike duplicate
MTBE	methyl tertiary butyl ether
NA	not applicable

ABBREVIATIONS AND ACRONYMS
(Continued)

NFESC	Naval Facilities Engineering Service Center
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
%R	percent recovery
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RAC	Remedial Action Contract
RL	reporting limit
ROICC	Resident Officer in Charge of Construction
RPD	relative percent difference
RWQCB	Regional Water Quality Control Board
SOP	standard operating procedure
STLC	soluble threshold limit concentration
SVOC	semivolatile organic compound
SWDIV	Southwest Division Naval Facilities Engineering Command
TAME	tertiary amyl methyl ether
TBA	tertiary butyl alcohol
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbon
TRPH	total recoverable petroleum hydrocarbon
UST	underground storage tank
VOC	volatile organic compound
WET	waste extraction test

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) was prepared by Foster Wheeler Environmental Corporation (FWENC) to support sampling activities in and around Building 2001 (Elementary School) at the former Mare Island Naval Shipyard (MINS) in Vallejo, California. The plan was prepared on behalf of the United States Department of the Navy, Southwest Division Naval Facilities Engineering Command (SWDIV) under Delivery Order (DO) No. 0094, issued under Engineering Field Activities Northwest Remedial Action Contract (EFANW RAC II) No. N44255-95-D-6030. This QAPP and the Field Sampling Plan (FSP) complete the project-specific Sampling and Analysis Plan required for this project.

1.1 OBJECTIVE

This QAPP was prepared to ensure that the data collected during the sampling activities are precise, accurate, representative, complete, and comparable to meet their intended use. This document describes quality assurance (QA) objectives and quality control (QC) requirements for this project. The QC requirements associated with the sampling activities are presented in the FSP.

This work is being performed as a Non-Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal action. The San Francisco Bay Area Regional Water Quality Control Board (RWQCB) and the Department of Toxic Substances Control (DTSC) will be included in project oversight.

1.2 BACKGROUND

Information on site location and background is presented in Section 4.1 of the Work Plan. Information presented in the Work Plan will not be duplicated in this QAPP.

2.0 PROJECT ORGANIZATION

This section identifies the individuals from the Navy, regulatory agencies, and FWENC who are responsible for the oversight and/or implementation of the proposed work. The Project Organization Chart is shown in Figure 1-1. The responsibilities of the team members associated with the sampling activities are presented in Table 2-1.

2.1 LIST OF POINTS OF CONTACT

The following is a list of the key contacts for the project:

Agency	Contact	Title
Southwest Division Naval Facilities Engineering Command 1220 Pacific Highway San Diego, CA 92132-5190	Duane Rollefson (619) 532-4343	Remedial Project Manager
Southwest Division Naval Facilities Engineering Command 1220 Pacific Highway San Diego, CA 92132-5190	Tillmon Thornton (619) 532-0943	Contract Specialist
Southwest Division Naval Facilities Engineering Command 1220 Pacific Highway San Diego, CA 92132-5190	Narciso A. Ancog (619) 532-2540	Quality Assurance Officer
Naval Facilities Engineering Command San Francisco Bay Area Resident Officer in Charge of Construction (ROICC) Office 2450 Saratoga Street, Suite 200 Alameda, CA 94501	Izzat Ahmadiyya (510) 749-5947	ROICC
Foster Wheeler Environmental Corporation 1230 Columbia Street, Suite 640 San Diego, CA 92101	Kent Weingardt (619) 471-3532	Project Manager
Foster Wheeler Environmental Corporation 1230 Columbia Street, Suite 640 San Diego, CA 92101	Roger Margotto (619) 234-8696 ext. 203	Project Environmental Health and Safety Manager
Foster Wheeler Environmental Corporation c/o Naval Weapons Station Gardners Road and Industrial Road 800 Seal Beach Boulevard Seal Beach, CA 90740	Mary Schneider (562) 598-6150 ext. 5881	Program Quality Control Manager
	Lisa Bienkowski (562) 598-6150 ext. 5889	Project Chemist

3.0 QUALITY ASSURANCE OBJECTIVES

The overall quality assurance objectives of this QAPP are to outline procedures for the collection and assessment of data that are within acceptable ranges of precision, accuracy, representativeness, completeness, and comparability (PARCC) to meet the project data quality objectives (DQOs). The data quality associated with environmental data is a function of the sampling plan rationale and the procedures used to collect the samples, as well as the analytical methods and instrumentation used. However, uncertainty cannot be eliminated entirely from environmental data.

3.1 DATA QUALITY OBJECTIVES

The DQO process is a series of planning steps based on scientific methods that are designed to ensure that the type, quantity, and quality of environmental data used for decision making are appropriate for the intended application. The DQO process, as defined by the EPA, consists of the following seven steps that are designed to provide a systematic approach to resolving issues that pertain to the remediation (EPA, 2000):

- Stating the Problem
- Identifying the Decisions
- Identifying Input to the Decisions
- Defining the Boundaries
- Developing a Decision Rule
- Specifying Limits on Decision Error
- Optimizing Sampling Design

Table 3-1 provides a step-by-step summary of the DQO process.

3.2 ANALYTICAL DATA QUALITY OBJECTIVES

Analytical data will be obtained using standard methods in a State of California-certified and Navy evaluated laboratory. Analytical DQOs will be assessed through measures of PARCC parameters. The QC criteria are defined in this section. The analytical methods used, project required reporting limits, and project QC criteria are also described.

3.2.1 Quality Control Criteria

QC criteria definitions are as follows:

- **Precision**—A measure of the reproducibility of a set of replicate results or the agreement among repeat observations made under the same conditions. Analytical precision is the measurement of the variability associated with duplicate or replicate analyses. For this project, a laboratory control sample (LCS) will be used to determine the precision of the analytical method. Total precision is the measurement of the variability associated with the entire sampling and analysis process. It is determined by analysis of duplicate field samples and measures variability introduced by both the laboratory and field operations. Field duplicate and matrix spike duplicate samples will be used to assess field and analytical precision, and the precision measurement will be determined using the relative percent difference (RPD) between the duplicate sample results. The formula for calculating the RPD is as follows:

  RPD = 100 x 2 x (result - duplicate result)/(result + duplicate result)

- **Accuracy**—The nearness of a result or the mean of a set of results to the true or accepted value. Analytical accuracy is measured by comparing the percent recovery of analytes spiked into a LCS against a control limit. Surrogate compound recoveries are also used to assess accuracy and method performance for each sample analyzed. The formula for calculating accuracy uses the following equation to determine percent recovery (%R) of specific analytes.

  %R = 100 x (spiked sample result - unspiked sample result)/amount of spike added

- **Representativeness**—The degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter mostly concerned with the proper design of the sampling program.

- **Completeness**—The percentage of measurements made that are judged to be valid measurements. The completeness goal is to generate a sufficient amount of valid data to meet project needs. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results are all results not qualified with a rejected ("R") flag. The requirement of completeness is 95 percent for aqueous samples and 90 percent for soil samples, and is determined using the following equation:

  % completeness = 100 x (number of valid analyte results/number of possible results)

- **Comparability**—A qualitative parameter expressing the confidence with which one data set can be compared with another. Sample data should be comparable with other measurements for similar samples and sample conditions. The objective for the QA/QC program is to produce data with the greatest possible degree of comparability. The number of matrices that are sampled and the range of field conditions encountered are considered in determining comparability. Comparability is achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions, and using standard and comprehensive reporting formats.

3.2.2 Analytical Methods

The following methods will be used during this project:

- Total petroleum hydrocarbons (TPH)-extractable by EPA Method 8015B
- Volatile organic compounds (VOCs) by EPA Method 8260B (EPA Method 5035/8260B for soil samples)
- Semivolatile organic compounds (SVOCs) by EPA Method 8270C
- Pesticides by EPA Method 8081A
- Polychlorinated biphenyls (PCBs) by EPA Method 8082
- Metals by EPA Method 6010B/7000
- Total recoverable petroleum hydrocarbons (TRPH) by EPA Method 418.1
- Reactivity by SW-846, 7.3.3/7.3.4
- Ignitability by EPA Method 1010/1020
- pH by EPA Method 9040B (EPA Method 9045 for soil samples)
- Toxicity characteristic leaching procedure (TCLP) by EPA Method 1311
- Soluble threshold limit concentration (STLC) by California Waste Extraction Test (WET)

The reporting limits established for this project are presented in Table 3-2.

3.2.2.1 Project Quality Control Limits

The precision and accuracy QC limits for each method are identified in Table 4.

4.0 SAMPLING COLLECTION

4.1 SAMPLING LOCATIONS

Sample locations and the number of samples to be collected are described in Section 4.0 of the FSP and are not duplicated here.

4.2 SAMPLE COLLECTION

Sample collection procedures are described in Section 6.0 of the FSP and are not duplicated here.

4.3 SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Sample containers, preservatives, and holding times are described in Table 5-1 of the FSP and are not duplicated here.

4.4 SAMPLE PACKAGING AND SHIPMENT

Sample packaging and shipment procedures are described in Section 6.8 of the FSP and are not duplicated here.

5.0 SAMPLE CUSTODY AND DOCUMENTATION

The integrity and traceability of samples from the time they are collected through the time data are reported are essential in any sampling and analysis program. The handling of the samples and transfer of custody must be well documented given the evidentiary nature of the data. A sample is considered to be in one's custody if it meets any of the following criteria:

1. In actual possession or in view of the person who collected the sample.
2. Locked in a secure area.
3. Placed in an area restricted to authorized personnel.

5.1 FIELD SAMPLE CUSTODY AND DOCUMENTATION

In order to maintain the integrity and traceability of samples, all information pertinent to field sampling will be recorded in a field logbook. All samples will be properly labeled and custody sealed prior to being transported to the laboratory and will be accompanied by completed Chain-of-Custody (COC) documentation. All documentation will be recorded in a field logbook in black indelible ink.

5.1.1 Field Logbook

Detailed information on the field logbook is presented in Section 6.9.2 of the FSP.

5.1.2 Sample Labeling

Sample labels are necessary to prevent misidentification of samples. Labels will be filled out and affixed to sample containers at the time of sample collection. Detailed information on sample labeling is presented in Section 6.7 of the FSP.

5.1.3 Custody Seals

Sample custody seals are used to detect unauthorized tampering of samples from the time of sample collection to the time of analysis. The seals will be signed and dated by the sampler. The seals will be placed on the sample containers and shipping containers in such a way that they must be broken in order to open the containers. Seals will be affixed to containers before the samples leave the custody of sampling personnel.

5.1.4 Chain-of-Custody Records

To establish the documentation necessary to trace sample possession from the time of collection, a COC record will be completely filled out and will accompany every sample. At a minimum, the information presented in Section 6.9.1 of the FSP must be included on the COC record.

Samples will be delivered to the laboratory for analysis as soon as practicable. A COC record will accompany all samples.

5.2 LABORATORY SAMPLE CUSTODY AND DOCUMENTATION

The samples will be delivered to the person in the laboratory authorized to receive samples (referred to as the sample custodian). Upon receipt of a sample, the sample custodian will inspect the condition of the sample (including the temperature of the cooler) and the custody seal, reconcile the information on the sample label against that on the COC record, assign a laboratory number, log the sample in the laboratory logbook, and store it in a secured sample storage room.

The FWENC Project Chemist will be informed immediately of any inconsistencies between the COC form and the sample containers received. Any deviations from accepted sample handling procedures will be documented, and the FWENC Project Chemist will be informed.

5.3 CORRECTIONS TO CUSTODY DOCUMENTATION

Changes or corrections on any project documentation will be made by crossing out the item with a single line and initialing (by the person performing the correction) and dating the correction. The original item, although erroneous, must remain legible beneath the cross-out. The new information will be written above the crossed-out item. Corrections must be written clearly and legibly with indelible black ink.

6.0 ANALYTICAL QUALITY CONTROL PROCEDURES

This section describes analytical QC procedures, including laboratory qualification and QA program and QC procedures associated with analytical methods.

6.1 LABORATORY QUALIFICATION

The analytical laboratories selected to analyze samples for this project will be certified by the California Department of Health Services through the Environmental Laboratory Accreditation Program for all of the analytical methods required for the project. In addition, the laboratory must successfully complete the Naval Facilities Engineering Service Center (NFESC) Laboratory Evaluation Program prior to sampling activities and maintain that status throughout the project.

Laboratories selected for the project will be capable of providing the required turnaround times, project QC, and data deliverables required by this QAPP and the FSP.

6.2 LABORATORY QUALITY CONTROL PROCEDURES

The analytical laboratory must have written standard operating procedures (SOPs) defining the instrumentation, instrumentation maintenance, tuning, calibration, method detection limits, QC acceptance criteria, blank requirements, and stepwise procedures for each analytical method. The SOPs must be available to the analysts in the laboratory. The SOPs must meet or exceed the requirements of the methods cited in Section 3.2.2 of this QAPP. The laboratory must maintain logs of all activities that have an impact on the quality of the laboratory results.

Any portion of the method that is subcontracted by the laboratory to another laboratory or sent to another facility of the same network of laboratories must have the prior approval of the FWENC Project Chemist.

The laboratory must maintain the instruments required by the methods specified for the analyses. Sufficient redundancy in equipment must be available in the laboratory to handle downtime situations.

Method substitution because of instrumental failure will not be permitted without specific approval from the FWENC Project Chemist.

6.3 LABORATORY QUALITY CONTROL SAMPLES

6.3.1 Calibration

All instruments and equipment must be calibrated in accordance with the specified methods unless different instructions are included in this document.

Initial calibrations are performed when the method is first used and again whenever the continuing calibrations fail to meet their respective acceptance criteria. In addition, if the instrument undergoes significant maintenance, the initial calibration must be repeated.

Continuing calibrations are used to verify that the instrument performance has remained within the limits set at the time of the initial calibration. The frequency of continuing calibrations is method-dependent.

6.3.2 Instrument Blanks

Instrument blanks are run to ensure that analytes from previous runs are out of the system and do not contaminate succeeding runs. Instrument blanks must be run following calibration runs, before sample analyses are performed, and after samples containing high concentrations of potentially interfering materials.

Target analytes must not appear in the instrument blanks at concentrations greater than the required quantitation limits. If the laboratory consistently observes contaminants in the instrument blanks, the laboratory must investigate the source of the contamination and eliminate it, if possible.

6.3.3 Method Blanks

Method blanks are prepared in the same manner as the samples, using the same reagents and glassware used for samples. The purpose of the method blank is to assure that the equipment and reagents used in preparing the samples are free of contaminants that could interfere with the analysis.

The method blank must exhibit no analytes at concentrations greater than the required quantitation limits. If contaminants are found that either contribute to the apparent concentration of a particular target analyte or interfere with the analysis, the analysis sequence must be stopped, the source of contamination identified and corrected, and the analysis repeated. Contamination in the method blank above reporting limits will require that the entire associated batch of extracts or digestates be reprepared. Hence, it is very important to make sure that no such contamination is present.

6.3.4 Laboratory Control Samples

LCSs are purchased samples containing known concentrations of specific target analytes. LCSs can also be prepared by spiking known amounts of target analytes into a well-characterized blank matrix. The matrix will be laboratory reagent water for water samples and clean sand for soil samples.

The LCS is prepared and run with the associated samples, using the same reagents. All analytes in the LCS must meet recovery criteria. If the criteria are not met, the entire batch of samples must be reprepared, together with a new LCS, and reanalyzed.

6.3.5 Matrix Spike and Matrix Spike Duplicate

The matrix spike/matrix spike duplicate (MS/MSD) serves to determine whether matrix effects are affecting recoveries. For inorganic analyses, only a single matrix spike is performed per batch. A MS/MSD is prepared by spiking a known amount of solution to two portions of a sample being run in a batch. Once the spike is added to the MS/MSD samples, these samples are carried through the complete sample preparation process along with the other samples in the batch. The recoveries for the MS/MSD samples are compared against each other and against the known amount of the spike. From this data, both accuracy and precision can be determined. The laboratory will perform a MS/MSD at a frequency of 1 per 20 project samples per matrix.

6.3.6 Duplicates

Two types of duplicates, field and laboratory, will be performed. Field duplicates are two samples that are duplicates of each other. Field duplicates for soil will be collected. However, due to the inhomogeneity of soil, results will be used to determine sampling variability rather than sampling precision. The field duplicate is treated the same as the other field samples and identification is withheld from the laboratory. Field duplicates will be collected at a frequency of 1 for every 10 samples per matrix. Field duplicates are not applicable to investigation-derived waste samples.

The laboratory duplicate is created by the laboratory, where two aliquots are intentionally taken from the same sample and analyzed in parallel. This analysis serves to measure the precision of laboratory operations. Duplicate analyses will be applied only for inorganic analyses.

6.4 PREVENTIVE MAINTENANCE

All instruments must be maintained in accordance with the manufacturers' recommended procedures. The laboratory must define in its QA plan the frequency and type of maintenance for each instrument. The laboratory must also record all maintenance activities in an instrument logbook.

In addition to preventive maintenance, the laboratory must keep a sufficient supply of replacement parts on hand for those parts known to require frequent changes due to wear and tear or due to contamination.

Whenever preventive or corrective maintenance is applied to an instrument, the laboratory must demonstrate the instrument's return to operating conditions and must recalibrate the instrument prior to resumption of sample analyses.

6.5 DATA REVIEW

All data reported by the laboratory must be reviewed in accordance with the SOPs. At a minimum, the written guidelines must meet the following requirements.

6.5.1 Analyst Review

Each analyst that generates a data set is responsible for ensuring that the data comply with the method and project-specific requirements, and that any deviations or failure to meet criteria are documented for the project file.

6.5.2 Peer Review

One hundred percent of all data sets must be reviewed by an independent peer analyst. Peer reviews must be performed by an analyst that is qualified to perform the subject analytical method. The peer review must be comprehensive and include the following:

- Check 100 percent of manual entries for transcription errors
- Check 100 percent of manual calculations for accuracy
- Spot check computer calculations to verify program validity
- Check for compliance with method and project-specific QC requirements
- Check for completeness of raw data or supporting materials
- Confirm spectral assignments
- Check descriptions of deviations from method or requirements
- Check for appropriate use of significant figures and rounding
- Check reported values for dilutions
- Evaluate reasonableness of results

6.5.3 Technical Reviews

Technical reviews by the responsible supervisor or designated alternate must be performed on 100 percent of reported data. The same individual may not perform peer and technical reviews on the same data set. The technical review must include the following:

- Check for compliance with method and project-specific requirements
- Check the completeness of the reported information
- Check the information in the report narrative
- Evaluate the reasonableness of the results

If the responsible supervisor is the only qualified peer reviewer for a method, the requirement for the technical review is waived.

6.5.4 Management Review

One hundred percent of all data must receive management approval prior to release. The scope and content of management's review is at the laboratory's discretion. Authority to release data may be delegated to a technical supervisor or other party, if the term of the delegated authority is documented in the QA program file.

6.5.5 QA Review

QA reviews of data from each section of the laboratory must be conducted on a routine basis. Annually, at least 10 percent of data reports generated using each analytical method must be reviewed by a member of the QA staff. The QA reviews must include the following:

- Check for compliance with required QC practices
- Check for compliance with approved SOPs
- Check for compliance with method and project requirements

QA data reviews may be conducted after the subject data have been reported to FWENC.

6.6 DELIVERABLES

The following sections describe the deliverable documents that will be submitted to FWENC by the analytical laboratory.

6.6.1 Hard Copy Deliverables

Two copies of the hard copy data will be submitted to FWENC by the laboratory. The report pages will be numbered. The report will contain a table of contents referencing individual sections in the data package, the original white copy of the COC form, a copy of all corrective action reports, and a case narrative documenting the resolution of all corrective actions and noncompliance events. All FWENC samples will be clearly referenced to the associated QC samples. In order to perform validation, two types of data packages will be required. They will be referred to as EPA Level III or IV packages.

For this project, FWENC will request that 90 percent of the data be submitted in an EPA Level III-equivalent data package and 10 percent submitted in an EPA Level IV-equivalent data package. All data packages will be assembled in the following sequence:

- Cover page (with laboratory service identification number FWENC project name, and FWENC project number)
- Original COC form (including cooler temperature and sample condition)
- Sample receipt forms
- Cross-reference table

- Case narrative
- Organic raw data sequence (by test):
  - Sample result forms, including method blanks
  - (*)Sample raw data after each result form (EPA Level IV only)
  - Surrogate summaries (surrogate results may appear on the sample result forms)
  - QC summaries
  - Tune data [gas chromatograph/mass spectrometer (GC/MS) only]
  - Initial calibration (ICAL)
  - Daily calibration checks, including related continuing calibration verifications (CCVs)
  - Resolution check standards (GC/MS and pesticides)
  - QC raw data (EPA Level IV only)
  - Instrument run log
  - Sample preparation log

    (*) = For EPA Level III, include a copy of chromatogram of each field sample for all TPH analyses
- Inorganic raw data sequence:
  - Sample results forms, including method blanks
  - Sample raw data (EPA Level IV only)
  - QC summaries
  - ICAL
  - Daily calibration checks, including all related CCVs
  - Calibration blanks, including all related continuing calibration blanks
  - Interference check standards A and B for inductively coupled argon plasma (ICAP) only
  - Detection limit check standard (graphite furnace atomic absorption only)
  - QC raw data (EPA Level IV only)
  - Postdigestion spike results
  - Analytical spike results
  - Method of standard additions
  - ICAP serial dilutions
  - Instrument run log
  - Sample preparation log

6.6.2 Electronic Deliverables

The electronic data deliverable (EDD) will be in ASCII format. This will be compatible with the Navy Environmental Data Transfer Standard. The laboratory will certify that the EDD and the hard copy reports are identical. Both the EDD and the hard copy will present results to two or

three significant figures. For inorganic results, 2 significant figures will be used for results less than 10 and 3 significant figures will be used for results greater than 10. For organic results, 1 significant figure will be used for results less than 10 and 2 significant figures will be used for results greater than 10. The EDD for each sample delivery group is due at the same time as the hard copy, 21 working days after the last sample of the sample delivery group has been delivered to the laboratory.

7.0 DATA QUALITY MANAGEMENT

7.1 DATA MANAGEMENT

The following sections describe the requirements for the management of hard copy data and electronic data.

7.1.1 Hard Copy

All relevant raw data and documentation, including, but not limited to, logbooks, data sheets, electronic files, and final reports, will be maintained by the laboratory for at least 7 years. FWENC will be notified 30 days before disposal of any relevant laboratory records.

FWENC will maintain copies of all COC forms. Laboratory reports will be logged in upon receipt and filed in chronological order. The second copy of the report will be sent for third-party data validation.

7.1.2 Electronic Data

Field information (date and time collected, sample identification, etc.) will be entered directly into the main database from the COC form or uploaded from electronic files generated in the field.

Upon receipt by the FWENC Data Manager, electronic data will be uploaded into a Microsoft Access database. The uploaded data will also be processed to compare the fields against a list of required values. If any errors are returned by the program, the file will be manually edited or regenerated by the laboratory. The laboratory database will be merged with the field database, and reports will be generated from the merged database.

7.2 DATA VALIDATION

All samples, with the exception of investigation derived waste samples, will be validated. Data will be validated in accordance with SWDIV Environmental Work Instruction #1 (SWDIV, 1999a) at 90 percent EPA Level III and 10 percent EPA Level IV. Data validation will be performed by an independent data validation company. The validation will be in accordance with the *EPA Laboratory Data Validation Functional Guidelines for Evaluating Organic and Inorganic Analyses* (EPA, 1994) and the QC criteria specified in this document. Data not meeting method specification will be flagged as estimated ("J") or rejected ("R").

The data validation company will have the following qualifications:

1. A minimum of 5 years of experience in the environmental data validation business
2. Prior experience on Navy RAC or Comprehensive Long-Term Environmental Action projects
3. Navy data validation experience
4. Active peer review program

Personnel must have the following qualifications:

1. Data Reviewer:
   - Bachelor of Science degree or higher in chemistry or a physical science
   - Five years of combined experience with approximately 2 years in data validation and 3 years conducting laboratory analysis in an environmental laboratory using the EPA-approved methods being validated
2. Peer Reviewer:
   - Bachelor of Science degree or higher in chemistry or a physical science
   - Five years of combined experience with approximately 2 years in data validation and 3 years conducting laboratory analysis in an environmental laboratory using the EPA-approved methods being validated

7.3 DATA EVALUATION

After data validation, data will be further evaluated by the FWENC Project Chemist. In the process of evaluating the data, the Project Chemist will determine which of the advisory data qualifiers provided by the independent data validator will be retained or deleted. The evaluation of data will be based on the results of the QC samples, the level of contamination of samples indicated by the blanks analysis, and the overall indication of interference due to contamination. The following data qualifiers will be used in the report:

J - Result is estimated
U - Analyte is not detected at or above the stated reporting limit
R - Data is rejected
UJ - Analyte is not detected, but there is an uncertainty about the reporting limits

The flagging will be used to alert data users to uncertainties associated with the data. The evaluation flags will be entered into a special field in the electronic database. Thus, when data processing is complete, the data for each analyte will have the flag designated by the laboratory and the flag designated by the evaluator, as appropriate.

8.0 QUALITY ASSURANCE OVERSIGHT

QA oversight for this project will include system audits of field activities and of the laboratory subcontracted by the Navy to perform the analysis.

8.1 FIELD AUDITS

The FWENC and SWDIV QA Officers may schedule audits of field activities at any time to evaluate the execution of sample collection, identification, and control in the field. The audit will also include observations of COC procedures, field documentation, instrument calibrations, and field measurements.

Field documents and COC forms will be reviewed to ensure that all entries are printed or written in indelible black ink, dated, and signed.

Sampling operations will be reviewed and compared to the FSP, the QAPP, and other applicable SOPs. The auditor will verify that the proper sample containers are used, the preservatives are added or are already present in the container, and the documentation of the sampling operation is adequate.

Field measurements will be reviewed by random spot-checking to determine that the instrument is within calibration, that the calibration is done at the appropriate frequency, and that the sensitivity range of the instrument is appropriate for the project.

8.1.1 Corrective Action

Nonconformance identified during the field audit will be recorded on a Nonconformance Report. All nonconformance and corrective actions will be processed in accordance FWENC procedure QC-3. This procedure is presented in Attachment 5 of the Final Contractor Quality Control Plan (FWENC, 1999).

The Program Quality Control Manager will monitor corrective action documentation, verify implementation of corrective action, track and analyze corrective action, and closeout corrective action documentation upon completion of corrective action.

8.2 LABORATORY AUDITS

Laboratories selected to perform the analyses are required to have successful completion of NFESC laboratory evaluation process throughout the project. This process consists of laboratory QA plan review, performance evaluation samples, data package review, and onsite audit. Because of this requirement, FWENC will not perform an onsite audit or visit unless it is deemed necessary.

Laboratory oversight by FWENC will be through the review of the preliminary report and hard copy data packages. The information that may be obtained from the data packages consists of the following:

- Correctness of COC procedures
- Adherence to method or QAPP holding times
- Method detection limits and reporting limits
- Spiking levels, frequency, and recovery
- Accuracy of analytical operations through the LCS

8.2.1 Corrective Action

The laboratory will have a QA/QC and corrective action program that addresses all out-of-control situations. Following completion of analyses, laboratory personnel will verify compliance with the minimum QC requirements of the project and the laboratory QA/QC plan. If any of the parameters fall outside the control limits, corrective action will be implemented.

Initial corrective action is to verify that no obvious calculation errors have occurred. If appropriate, reanalysis will be performed. If the reanalysis confirms the initial out-of-control limits result, the chemist will notify the laboratory supervisor, who will initiate the corrective action process. Corrective actions may include, but are not limited to, the following:

- Verification of dilution factors
- Examination of sample for nonhomogeneity
- Verification of sample preparation
- Checking of standard preparation logbook
- Verification of instrument performance
- Checking of reagent water purity
- Monitoring chemist's method performance for procedure verification

Notification and prompt involvement of the FWENC Project Chemist in the corrective action process are absolutely necessary in determining an appropriate resolution. Corrective action records will document all steps taken in the corrective action process, beginning with a description of the problem and ending with a final resolution. A copy of the corrective action report will be sent to the FWENC Project Chemist immediately and will be maintained in the project files at FWENC office.

All corrective action reports will be maintained by the laboratory in a project file and delivered to FWENC as part of the hard copy deliverable.

8.3 QAPP REVISION OR AMENDMENT

When circumstances arise that impact the original project DQOs, such as a significant change in work scope, the QAPP document will be revised or amended. The modification process will be based on EPA Guidelines and in conjunction with Environmental Work Instruction #2 (SWDIV, 1999b).

9.0 REFERENCES

Foster Wheeler Environmental Corporation (FWENC). 1999. *Final Contractor Quality Control Plan.*

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

_____. 1994. EPA Contract Laboratory Program. *National Functional Guidelines for Organic Data Review; EPA-540/R-94-012.* February.

U.S Navy/Southwest Division Naval Facilities Engineering Command (SWDIV). 1999a. *Environmental Work Instruction (EWI) #1, 4EN.1,Chemical Data Validation.* October.

_____. 1999b. *Environmental Work Instruction (EWI) #2, 4EN.2, Review, Approval, Revision, and Amendment of Field Sampling Plans (FSP) and Quality Assurance Project Plans (QAPP).* October.

TABLES

TABLE 2-1

PERSONNEL AND RESPONSIBILITIES

Key Position	Responsibility
SWDIV Quality Assurance Officer	• Provides governmental oversight of FWENC QA Program • Provides quality related directives through Contracting Officer Representative • Provides technical and administrative oversight of FWENC surveillance audit activities • Point of contact for all matters concerning QA and the Navy's Laboratory QA Program • Prepares governmental budget estimates for all QA functions included in FWENC contracts • Coordinates training on matters pertaining to generation and maintenance of quality of data • Authority to suspend project execution if QA requirements are not adequately followed
Project Chemist	• Develops sampling and analysis plan and QA project plan • Selects qualified subcontract laboratories • Implements chemical data QC procedures and performs auditing of field performance • Reviews laboratory data prior to use • Coordinates data validation of laboratory data • Reviews data validation report • Prepares and supports report preparation
Field Chemist/ Technician	• Performs all sampling in accordance with approved FSP and QAPP • Ensures that field QA samples are collected as specified in the FSP • Completes sampling notes, forms, and sampling logs • Coordinates laboratory and field sampling activities • Implements corrective actions as required

TABLE 2-1

PERSONNEL AND RESPONSIBILITIES

Key Position	Responsibility
Remedial Project Manager	• Project management from client perspective • Fulfills scope of work • Oversees cost and schedule • Is lead interface with MINS
Project Manager	• Executes all phases of a specific project and efficiently applies the full resources of the FWENC RAC Team • Manages all technical, quality, financial, and administrative aspects of the project • Identifies and completes documents appropriate to work assignments • Approves and maintains qualification records for all project personnel • Ensures and verifies that the project team completes all work tasks and QA/QC requirements of planning documents • Logs all variances to planning documents and ensures timely follow-up and approval by the Navy
ROICC	• Oversees the technical and QC of the field activities

Notes:

FWENC – Foster Wheeler Environmental Corporation
FSP – Field Sampling Plan
MINS – Mare Island Naval Shipyard
Navy – U.S. Department of the Navy
QA – Quality Assurance
QAPP – Quality Assurance Project Plan
QC – Quality Control
RAC – Remedial Action Contract
ROICC – Resident Officer in Charge of Construction
SWDIV – Southwest Division Naval Facilities Engineering Command

TABLE 3-1

SUMMARY OF DATA QUALITY OBJECTIVES

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	STEP 7
Statement of Problem	**Decisions**	**Input to the Decisions**	**Boundaries of the Study**	**Decision Rules**	**Limits on Decision Errors**	**Optimize the Sampling Design**
TPH-impacted soils from former AST, UST, and associated piping.	Will the excavation of impacted soil remove the hydrocarbon contamination in the area of the former tanks and the associated piping below the clean-up goal of 400 mg/kg of TPH?	Previous investigation data collected by others. Results of soil analyses from this project.	Building 2001 is at the Elementary School at the Former Mare Island Naval Shipyard. It is located west of Cedar Avenue, between Tisdale Avenue and 9th Street. The site consists of former AST Site 636, former UST Site 772, and all associated piping.	If confirmation soil samples are below 400 mg/kg of TPH, then site closure will begin. If not, then the RWQCB and Navy will be notified.	Due to judgmental sampling design, decision errors will not be established.	Confirmation soil samples will be collected from pipeline trenches and excavation of TPH-impacted soil at AST Site 636 and UST Site 772. In locations where pipelines are inaccessible, direct push borings will be performed to collect soil samples underneath those pipelines.

Notes:

AST – aboveground storage tank
mg/kg – milligrams per kilogram
RWQCB – Regional Water Quality Control Board
TPH – total petroleum hydrocarbon
UST – underground storage tank

TABLE 3-2

PROJECT REPORTING LIMITS

Parameter	Method	Analyte	Soil		
			RL	Action Level	Unit
TPH-extractable	EPA Method 8015B	TPH-extractable (C10-C36)	10	400	mg/kg
VOCs	EPA Method 5035/8260B	1,1,1-Trichloroethane	5	NA	µg/kg
		1,1,2,2-Tetrachloroethane	5	NA	µg/kg
		1,1,2-Trichloroethane	5	NA	µg/kg
		1,1-Dichloroethane	5	NA	µg/kg
		1,1-Dichloroethene	5	NA	µg/kg
		1,2-Dichloroethane	5	NA	µg/kg
		1,2-Dichloropropane	5	NA	µg/kg
		2-Hexanone	50	NA	µg/kg
		Acetone	50	NA	µg/kg
		Benzene	5	NA	µg/kg
		Bromodichloromethane	5	NA	µg/kg
		Bromoform	5	NA	µg/kg
		Bromomethane	5	NA	µg/kg
		Carbon tetrachloride	5	NA	µg/kg
		Chlorobenzene	5	NA	µg/kg
		Chloroethane	5	NA	µg/kg
		Chloroform	5	NA	µg/kg
		Chloromethane	5	NA	µg/kg
		cis-1,2-Dichloroethene	5	NA	µg/kg
		cis-1,3-Dichloropropene	5	NA	µg/kg
		Dibromochloromethane	5	NA	µg/kg
		DIPE	5	NA	µg/kg
		Ethylbenzene	5	NA	µg/kg
		ETBE	5	NA	µg/kg
		MEK	50	NA	µg/kg
		MTBE	10	NA	µg/kg
		Methylene chloride	5	NA	µg/kg
		MIBK	50	NA	µg/kg
		Styrene	5	NA	µg/kg
		TAME	5	NA	µg/kg
		TBA	20	NA	µg/kg
		Tetrachloroethene	5	NA	µg/kg
		Toluene	5	NA	µg/kg
		trans-1,2-Dichloroethene	5	NA	µg/kg
		trans-1,3-Dichloropropene	5	NA	µg/kg
		Trichloroethene	5	NA	µg/kg
		Vinyl acetate	50	NA	µg/kg
		Vinyl chloride	5	NA	µg/kg
		Xylenes (Total)	15	NA	µg/kg

TABLE 3-2

PROJECT REPORTING LIMITS

Parameter	Method	Analyte	Soil		
			RL	Action Level	Unit
SVOCs	EPA Method 8270C	1,2,4-Trichlorobenzene	330	NA	µg/kg
		1,2-Dichlorobenzene	330	NA	µg/kg
		1,3-Dichlorobenzene	330	NA	µg/kg
		1,4-Dichlorobenzene	330	NA	µg/kg
		2,4-Dinitrotoluene	330	NA	µg/kg
		2,4,5-Trichlorophenol	1600	NA	µg/kg
		2,4,6-Trichlorophenol	330	NA	µg/kg
		2,4-Dichlorophenol	330	NA	µg/kg
		2,4-Dimethylphenol	330	NA	µg/kg
		2,4-Dinitrophenol	1600	NA	µg/kg
		2,6-Dinitrotoluene	330	NA	µg/kg
		2-Chloronaphthalene	330	NA	µg/kg
		2-Chlorophenol	330	NA	µg/kg
		2-Methylphenol	330	NA	µg/kg
		2-Nitroaniline	1600	NA	µg/kg
		2-Nitrophenol	330	NA	µg/kg
		3-Nitroaniline	1600	NA	µg/kg
		3,3'-Dichlorobenzidine	330	NA	µg/kg
		3/4-Methylphenol	330	NA	µg/kg
		4,6-Dinitro-2-methylphenol	1600	NA	µg/kg
		4-Chloro-3-methylphenol	330	NA	µg/kg
		4-Bromophenyl phenyl ether	330	NA	µg/kg
		4-Chloroaniline	330	NA	µg/kg
		4-Chlorophenyl phenyl ether	330	NA	µg/kg
		4-Nitroaniline	1600	NA	µg/kg
		4-Nitrophenol	1600	NA	µg/kg
		Acenaphthylene	330	NA	µg/kg
		Acenapthene	330	NA	µg/kg
		Anthracene	330	NA	µg/kg
		Benzo (a) anthracene	330	NA	µg/kg
		Benzo (a) pyrene	330	NA	µg/kg
		Benzo (b) fluoranthene	330	NA	µg/kg
		Benzo (k) fluoranthene	330	NA	µg/kg
		Benzo (g,h,i) perylene	330	NA	µg/kg
		Bis (2-chloroethoxy) methane	330	NA	µg/kg
		Bis (2-chloroethyl) ether	330	NA	µg/kg
		Bis (2-chloroisopropyl) ether	330	NA	µg/kg
		Bis (2-ethylhexyl) phthalate	330	NA	µg/kg

TABLE 3-2

PROJECT REPORTING LIMITS

Parameter	Method	Analyte	Soil		
			RL	Action Level	Unit
		Butyl benzylphthalate	330	NA	µg/kg
		Chrysene	330	NA	µg/kg
		Di-n-butylphthalate	330	NA	µg/kg
		Di-n-octylphthalate	330	NA	µg/kg
		Dibenz (a,h) anthracene	330	NA	µg/kg
		Dibenzofuran	330	NA	µg/kg
		Diethyl phthalate	330	NA	µg/kg
		Dimethyl phthalate	330	NA	µg/kg
		Fluoranthene	330	NA	µg/kg
		Fluorene	330	NA	µg/kg
		Hexachlorobenzene	330	NA	µg/kg
		Hexachlorobutadiene	330	NA	µg/kg
		Hexachlorocyclopentadiene	330	NA	µg/kg
		Hexachloroethane	330	NA	µg/kg
		Indeno (1,2,3-cd) pyrene	330	NA	µg/kg
		N-Nitrosodiphenylamine	330	NA	µg/kg
		N-Nitrosodi-n-propylamine	330	NA	µg/kg
		Naphthalene	330	NA	µg/kg
		Nitrobenzene	330	NA	µg/kg
		Pentachlorophenol	330	NA	µg/kg
		Phenanthrene	330	NA	µg/kg
		Phenol	330	NA	µg/kg
		Pyrene	330	NA	µg/kg
Pesticides	EPA Method 8081A	α-BHC	2	NA	µg/kg
		β-BHC	2	NA	µg/kg
		δ-BHC	2	NA	µg/kg
		γ-BHC (Lindane)	2	NA	µg/kg
		α-Chlordane	2	NA	µg/kg
		γ-Chlordane	2	NA	µg/kg
		4,4'-DDD	4	NA	µg/kg
		4,4'-DDE	4	NA	µg/kg
		4,4'-DDT	4	NA	µg/kg
		Aldrin	2	NA	µg/kg
		Dieldrin	4	NA	µg/kg
		Endosulfan I	2	NA	µg/kg
		Endosulfan II	4	NA	µg/kg
		Endosulfan Sulfate	4	NA	µg/kg
		Endrin	4	NA	µg/kg
		Endrin Aldehyde	4	NA	µg/kg
		Endrin ketone	4	NA	µg/kg

TABLE 3-2

PROJECT REPORTING LIMITS

Parameter	Method	Analyte	Soil		
			RL	Action Level	Unit
		Heptachlor	2	NA	µg/kg
		Heptachlor Epoxide	2	NA	µg/kg
		Methoxychlor	20	NA	µg/kg
		Toxaphene	40	NA	µg/kg
PCBs	EPA Method 8082	Aroclor-1016	40	NA	µg/kg
		Aroclor-1221	40	NA	µg/kg
		Aroclor-1232	40	NA	µg/kg
		Aroclor-1242	80	NA	µg/kg
		Aroclor-1248	40	NA	µg/kg
		Aroclor-1254	40	NA	µg/kg
		Aroclor-1260	40	NA	µg/kg
Metals	EPA Method 6010B/7000	Antimony	5	500	mg/kg
		Arsenic	0.3	500	mg/kg
		Barium	1	10000	mg/kg
		Beryllium	0.2	75	mg/kg
		Cadmium	0.2	100	mg/kg
		Chromium	0.5	2500	mg/kg
		Cobalt	0.5	8000	mg/kg
		Copper	0.5	2500	mg/kg
		Lead	0.3	1000	mg/kg
		Mercury	0.2	20	mg/kg
		Molybdenum	0.2	3500	mg/kg
		Nickel	0.3	2000	mg/kg
		Selenium	0.5	100	mg/kg
		Silver	0.5	500	mg/kg
		Thallium	0.5	700	mg/kg
		Vanadium	0.5	2400	mg/kg
		Zinc	0.5	5000	mg/kg
TRPH	EPA Method 418.1	TRPH	10	NA	mg/kg
Reactivity	SW-846, 7.3.3/7.3.4	Reactive Cyanide	20	>20	mg/kg
		Reactive Sulfide	20	>20	mg/kg
Ignitability	EPA Method 1010/1020	Ignitability	60	< 60	°C
pH	EPA Method 9045	pH	NA	≤ 2 & ≥12.5	pH
TCLP	EPA Method 1311	Antimony	10	NA	µg/L
		Arsenic	5	5000	µg/L
		Barium	10	100000	µg/L
		Beryllium	2	NA	µg/L
		Cadmium	2	1000	µg/L
		Chromium	5	5000	µg/L

TABLE 3-2

PROJECT REPORTING LIMITS

Parameter	Method	Analyte	Soil		
			RL	Action Level	Unit
		Cobalt	5	NA	µg/L
		Copper	10	NA	µg/L
		Lead	5	5000	µg/L
		Mercury	0.5	200	µg/L
		Molybdenum	5	NA	µg/L
		Nickel	5	NA	µg/L
		Selenium	10	1000	µg/L
		Silver	10	5000	µg/L
		Thallium	10	NA	µg/L
		Vanadium	10	NA	µg/L
		Zinc	10	NA	µg/L
STLC	California WET	Antimony	10	15000	µg/L
		Arsenic	5	5000	µg/L
		Barium	10	100000	µg/L
		Beryllium	2	750	µg/L
		Cadmium	2	1000	µg/L
		Chromium	5	5000	µg/L
		Cobalt	5	80000	µg/L
		Copper	10	25000	µg/L
		Lead	5	5000	µg/L
		Mercury	0.5	200	µg/L
		Molybdenum	5	350000	µg/L
		Nickel	5	20000	µg/L
		Selenium	10	1000	µg/L
		Silver	10	5000	µg/L
		Thallium	10	7000	µg/L
		Vanadium	10	24000	µg/L
		Zinc	10	250000	µg/L

TABLE 3-2

PROJECT REPORTING LIMITS

Parameter	Method	Analyte	Water		
			RL	Action Level	Unit
TPH-extractable	EPA Method 8015B	TPH-extractable (C10 – C36)	0.1	NA	mg/L
VOCs	EPA Method 8260B	1,1,1-Trichloroethane	5	NA	µg/L
		1,1,2,2-Tetrachloroethane	1	NA	µg/L
		1,1,2-Trichloroethane	5	NA	µg/L
		1,1-Dichloroethane	5	NA	µg/L
		1,1-Dichloroethene	5	NA	µg/L
		1,2-Dichloroethane	0.5	NA	µg/L
		1,2-Dichloropropane	5	NA	µg/L
		2-Hexanone	50	NA	µg/L
		Acetone	50	NA	µg/L
		Benzene	0.5	NA	µg/L
		Bromodichloromethane	5	NA	µg/L
		Bromoform	5	NA	µg/L
		Bromomethane	5	NA	µg/L
		Carbon tetrachloride	0.5	NA	µg/L
		Chlorobenzene	5	NA	µg/L
		Chloroethane	5	NA	µg/L
		Chloroform	5	NA	µg/L
		Chloromethane	5	NA	µg/L
		cis-1,2-Dichloroethene	5	NA	µg/L
		cis-1,3-Dichloropropene	0.5	NA	µg/L
		Dibromochloromethane	5	NA	µg/L
		DIPE	5	NA	µg/L
		Ethylbenzene	0.5	NA	µg/L
		ETBE	5	NA	µg/L
		MEK	50	NA	µg/L
		MTBE	1	NA	µg/L
		Methylene chloride	5	NA	µg/L
		MIBK	50	NA	µg/L
		Styrene	5	NA	µg/L
		TAME	5	NA	µg/L
		TBA	20	NA	µg/L
		Tetrachloroethene	5	NA	µg/L
		Toluene	0.5	NA	µg/L
		trans-1,2-Dichloroethene	5	NA	µg/L
		trans-1,3-Dichloropropene	0.5	NA	µg/L
		Trichloroethene	5	NA	µg/L

TABLE 3-2

PROJECT REPORTING LIMITS

Parameter	Method	Analyte	Water		
			RL	Action Level	Unit
		Vinyl acetate	50	NA	µg/L
		Vinyl chloride	0.5	NA	µg/L
		Xylenes (Total)	1.5	NA	µg/L
SVOCs	EPA Method 8270C	1,2,4-Trichlorobenzene	10	NA	µg/L
		1,2-Dichlorobenzene	10	NA	µg/L
		1,3-Dichlorobenzene	10	NA	µg/L
		1,4-Dichlorobenzene	10	NA	µg/L
		2,4-Dinitrotoluene	10	NA	µg/L
		2,4,5-Trichlorophenol	50	NA	µg/L
		2,4,6-Trichlorophenol	10	NA	µg/L
		2,4-Dichlorophenol	10	NA	µg/L
		2,4-Dimethylphenol	10	NA	µg/L
		2,4-Dinitrophenol	50	NA	µg/L
		2,6-Dinitrotoluene	10	NA	µg/L
		2-Chloronaphthalene	10	NA	µg/L
		2-Chlorophenol	10	NA	µg/L
		2-Methylphenol	10	NA	µg/L
		2-Nitroaniline	50	NA	µg/L
		2-Nitrophenol	10	NA	µg/L
		3-Nitroaniline	50	NA	µg/L
		3,3'-Dichlorobenzidine	10	NA	µg/L
		3/4-Methylphenol	10	NA	µg/L
		4,6-Dinitro-2-methylphenol	50	NA	µg/L
		4-Chloro-3-methylphenol	10	NA	µg/L
		4-Bromophenyl phenyl ether	10	NA	µg/L
		4-Chloroaniline	10	NA	µg/L
		4-Chlorophenyl phenyl ether	10	NA	µg/L
		4-Nitroaniline	50	NA	µg/L
		4-Nitrophenol	50	NA	µg/L
		Acenaphthylene	10	NA	µg/L
		Acenapthene	10	NA	µg/L
		Anthracene	10	NA	µg/L
		Benzo (a) anthracene	10	NA	µg/L
		Benzo (a) pyrene	10	NA	µg/L
		Benzo (b) fluoranthene	10	NA	µg/L
		Benzo (k) fluoranthene	10	NA	µg/L
		Benzo (g,h,i) perylene	10	NA	µg/L

TABLE 3-2

PROJECT REPORTING LIMITS

Parameter	Method	Analyte	Water		
			RL	Action Level	Unit
		Bis (2-chloroethoxy) methane	10	NA	µg/L
		Bis (2-chloroethyl) ether	10	NA	µg/L
		Bis (2-chloroisopropyl) ether	10	NA	µg/L
		Bis (2-ethylhexyl) phthalate	10	NA	µg/L
		Butyl benzylphthalate	10	NA	µg/L
		Chrysene	10	NA	µg/L
		Di-n-butylphthalate	10	NA	µg/L
		Di-n-octylphthalate	10	NA	µg/L
		Dibenz (a,h) anthracene	10	NA	µg/L
		Dibenzofuran	10	NA	µg/L
		Diethyl phthalate	10	NA	µg/L
		Dimethyl phthalate	10	NA	µg/L
		Fluoranthene	10	NA	µg/L
		Fluorene	10	NA	µg/L
		Hexachlorobenzene	10	NA	µg/L
		Hexachlorobutadiene	10	NA	µg/L
		Hexachlorocyclopentadiene	10	NA	µg/L
		Hexachloroethane	10	NA	µg/L
		Indeno (1,2,3-cd) pyrene	10	NA	µg/L
		N-Nitrosodiphenylamine	10	NA	µg/L
		N-Nitrosodi-n-propylamine	10	NA	µg/L
		Naphthalene	10	NA	µg/L
		Nitrobenzene	10	NA	µg/L
		Pentachlorophenol	10	NA	µg/L
		Phenanthrene	10	NA	µg/L
		Phenol	10	NA	µg/L
		Pyrene	10	NA	µg/L
Pesticides	EPA Method 8081A	α-BHC	0.1	NA	µg/L
		β-BHC	0.1	NA	µg/L
		δ-BHC	0.1	NA	µg/L
		γ-BHC (Lindane)	0.1	NA	µg/L
		α-Chlordane	0.1	NA	µg/L
		γ-Chlordane	0.1	NA	µg/L
		4,4'-DDD	0.2	NA	µg/L
		4,4'-DDE	0.2	NA	µg/L
		4,4'-DDT	0.2	NA	µg/L
		Aldrin	0.1	NA	µg/L

TABLE 3-2

PROJECT REPORTING LIMITS

Parameter	Method	Analyte	Water		
			RL	Action Level	Unit
		Dieldrin	0.2	NA	µg/L
		Endosulfan I	0.1	NA	µg/L
		Endosulfan II	0.2	NA	µg/L
		Endosulfan Sulfate	0.2	NA	µg/L
		Endrin	0.2	NA	µg/L
		Endrin Aldehyde	0.2	NA	µg/L
		Endrin ketone	0.2	NA	µg/L
		Heptachlor	0.1	NA	µg/L
		Heptachlor Epoxide	0.1	NA	µg/L
		Methoxychlor	1.0	NA	µg/L
		Toxaphene	2	NA	µg/L
PCBs	EPA Method 8082	Aroclor-1016	1	NA	µg/L
		Aroclor-1221	1	NA	µg/L
		Aroclor-1232	1	NA	µg/L
		Aroclor-1242	2	NA	µg/L
		Aroclor-1248	1	NA	µg/L
		Aroclor-1254	1	NA	µg/L
		Aroclor-1260	1	NA	µg/L
Metals	EPA Method 6010B/7000	Antimony	10	NA	µg/L
		Arsenic	5	NA	µg/L
		Barium	10	NA	µg/L
		Beryllium	2	NA	µg/L
		Cadmium	2	NA	µg/L
		Chromium	5	NA	µg/L
		Cobalt	5	NA	µg/L
		Copper	10	NA	µg/L
		Lead	5	NA	µg/L
		Mercury	0.5	NA	µg/L
		Molybdenum	5	NA	µg/L
		Nickel	5	NA	µg/L
		Selenium	10	NA	µg/L
		Silver	10	NA	µg/L
		Thallium	10	NA	µg/L
		Vanadium	10	NA	µg/L
		Zinc	10	NA	µg/L

TABLE 3-2

PROJECT REPORTING LIMITS

Parameter	Method	Analyte	Water		
			RL	Action Level	Unit
TRPH	EPA Method 418.1	TRPH	1	NA	mg/L
Reactivity	SW-846, 7.3.3/7.3.4	Reactive Cyanide Reactive Sulfide	0.1 1	> 0.1 >	mg/L mg/L
Ignitability	EPA Method 1010/1020	Ignitability	60	< 60	°C
pH	EPA Method 9040B	pH	NA	< 2 & >12.5	pH

Notes:

°C – degree Celsius
µg/kg – micrograms per kilogram
µg/L – micrograms per liter
DIPE – di-isopropyl ether
EPA – U.S. Environmental Protection Agency
ETBE – ethyl tertiary butyl ether
MEK – methyl ethyl ketone
MIBK – methyl isobutyl ketone
MTBE – methyl tertiary butyl ether
mg/kg – milligrams per kilogram
mg/L – milligrams per liter
NA – not applicable
PCB – polychlorinated biphenyl
RL – reporting limit
STLC – soluble threshold limit concentration
TAME – tertiary amyl methyl ether
TBA – tertiary butyl alcohol
TCLP – toxicity characteristic leaching procedure
TPH – total petroleum hydrocarbon
TRPH – total petroleum recoverable hydrocarbon
µg/L – micrograms per liter
VOC – volatile organic compound
WET – waste extraction test

TABLE 3-3

QUALITY CONTROL ACCEPTANCE CRITERIA

Parameter	Method	Analyte	Accuracy Soil (% R)	Precision Soil (RPD)
TPH-extractable	EPA Method 8015B	TPH-extractable (C10-C36)	55-145	≤ 30
		Surrogate:		
		Octacosane	65-135	NA
VOCs	EPA Method 5035/8260B	1,1-Dichloroethene	65-135	≤ 30
		Benzene	65-135	≤ 30
		Chlorobenzene	65-135	≤ 30
		Trichloroethene	61-135	≤ 30
		Toluene	64-135	≤ 30
		Surrogates:		
		Toluene-D8	65-135	NA
		4-Bromofluorobenzene	65-135	NA
		1,2-Dichloroethane-D4	52-149	NA
SVOCs	EPA Method 8270C	1,2,4-Trichlorobenzene	40-120	≤ 40
		1,4-Dichlorobenzene	40-120	≤ 40
		2,4-Dinitrotoluene	40-120	≤ 40
		Acenaphthene	40-120	≤ 40
		n-Nitrosodi-n-propylamine	40-130	≤ 50
		Pyrene	40-120	≤ 40
		2-Chlorophenol	30-120	≤ 45
		4-Chloro-3-Methyl Phenol	40-120	≤ 40
		4-Nitrophenol	20-150	≤ 65
		Pentachlorophenol	20-150	≤ 65
		Phenol	20-120	≤ 50
		Surrogates:		
		2,4,6-Tribromophenol	25-144	NA
		2-Fluorbiphenyl	34-135	NA
		2-Fluorophenol	25-135	NA
		Nitrobenzene-D5	25-135	NA
		Phenol-D5	25-135	NA
		Terphenyl-D14	32-136	NA
Pesticides	EPA Method 8081A	γ-BHC (lindane)	63-130	≤ 50
		4,4-DDT	25-153	≤ 50
		Aldrin	37-126	≤ 50
		Dieldrin	32-142	≤ 50
		Endrin	33-144	≤ 50
		Heptachlor	35-138	≤ 50

TABLE 3-3

QUALITY CONTROL ACCEPTANCE CRITERIA

Parameter	Method	Analyte	Accuracy Soil (% R)	Precision Soil (RPD)
		Surrogates:		
		Decachlorobiphenyl	25-143	NA
		Tetrachloro-m-xylene	35-135	NA
PCBs	EPA Method 8082	Aroclor-1016	44-127	≤ 50
		Aroclor-1260	31-136	≤ 50
		Surrogate:		
		Decachlorobiphenyl	25-143	NA
Metals	EPA Method 6010B/7000	Antimony	75-125	≤ 30
		Arsenic	75-125	≤ 30
		Barium	75-125	≤ 30
		Beryllium	75-125	≤ 30
		Cadmium	75-125	≤ 30
		Chromium	75-125	≤ 30
		Cobalt	75-125	≤ 30
		Copper	75-125	≤ 30
		Lead	75-125	≤ 30
		Manganese	75-125	≤ 30
		Molybdenum	75-125	≤ 30
		Nickel	75-125	≤ 30
		Selenium	75-125	≤ 30
		Silver	75-125	≤ 30
		Thallium	75-125	≤ 30
		Vanadium	75-125	≤ 30
		Zinc	75-125	≤ 30
TRPH	EPA Method 418.1	TRPH	80-120	≤ 20
Reactivity	SW-846, 7.3.3/7.3.4	Reactive cyanide	80-120	≤ 20
		Reactive sulfide	80-120	≤ 20
Ignitability	EPA Method 1010/1020	Ignitability	80-120	≤ 20
pH	EPA Method 9045	pH	NA	NA

TABLE 3-3

QUALITY CONTROL ACCEPTANCE CRITERIA

Parameter	Method	Analyte	Accuracy Water (% R)	Precision Water (RPD)
TPH-extractable	EPA Method 8015B	TPH-extractable (C10-C36)	65-135	≤ 30
		Surrogate:		
		octacosane	65-135	NA
VOCs	EPA Method 8260B	1,1-Dichloroethene	75–125	≤ 20
		Benzene	75–125	≤ 20
		Chlorobenzene	75–125	≤ 20
		Trichloroethene	71–125	≤ 20
		Toluene	74–125	≤ 20
		Surrogates:		
		Toluene-D8	75-125	NA
		4-Bromofluorobenzene	75-125	NA
		1,2-Dichloroethane-D4	62-139	NA
SVOCs	EPA Method 8270C	1,2,4-Trichlorobenzene	40-120	≤ 40
		1,4-Dichlorobenzene	40-120	≤ 40
		2,4-Dinitrotoluene	40-120	≤ 40
		Acenaphthene	40-120	≤ 40
		n-Nitrosodi-n-propylamine	40-120	≤ 40
		Pyrene	40-120	≤ 40
		2-Chlorophenol	40-120	≤ 40
		4-Chloro-3-Methyl Phenol	40-120	≤ 40
		4-Nitrophenol	15-145	≤ 65
		Pentachlorophenol	25-140	≤ 65
		Phenol	30-110	≤ 40
		Surrogates:		
		2,4,6-Tribromophenol	20-130	NA
		2-Fluorbiphenyl	40-130	NA
		2-Fluorophenol	20-130	NA
		Nitrobenzene-D5	40-130	NA
		Phenol-D5	10-110	NA
		Terphenyl-D14	40-140	NA
Pesticides	EPA Method 8081A	γ-BHC (Lindane)	73-125	≤ 30
		4,4-DDT	34-143	≤ 30
		Aldrin	47-125	≤ 30
		Dieldrin	42-132	≤ 30
		Endrin	43-134	≤ 30
		Heptachlor	45-128	≤ 30

TABLE 3-3

QUALITY CONTROL ACCEPTANCE CRITERIA

Parameter	Method	Analyte	Accuracy Water (% R)	Precision Water (RPD)
Pesticides (continued)	EPA Method 8081A	***Surrogates:***		
		Decachlorobiphenyl	34-133	NA
		Tetrachloro-m-xylene	45-125	NA
PCBs	EPA Method 8082	Aroclor-1016	54-125	≤ 30
		Aroclor-1260	41-126	≤ 30
		Surrogate:		
		Decachlorobiphenyl	34-133	NA
Metals	EPA Method 6010B/7000	Antimony	75-125	≤ 30
		Arsenic	75-125	≤ 30
		Barium	75-125	≤ 30
		Beryllium	75-125	≤ 30
		Cadmium	75-125	≤ 30
		Chromium	75-125	≤ 30
		Cobalt	75-125	≤ 30
		Copper	75-125	≤ 30
		Lead	75-125	≤ 30
		Manganese	75-125	≤ 30
		Molybdenum	75-125	≤ 30
		Nickel	75-125	≤ 30
		Selenium	75-125	≤ 30
		Silver	75-125	≤ 30
		Thallium	75-125	≤ 30
		Vanadium	75-125	≤ 30
		Zinc	75-125	≤ 30
TRPH	EPA Method 418.1	TRPH	80-120	≤ 20
Reactivity	SW-846, 7.3.3/7.3.4	Reactive cyanide	80-120	≤ 20
		Reactive sulfide	80-120	≤ 20
Ignitability	EPA Method 1010/1020	Ignitability	80-120	≤ 20
pH	EPA Method 9045	pH	NA	NA

Notes:

%R – percent recovery
EPA – U.S. Environmental Protection Agency
NA – not applicable
PCB – polychlorinated biphenyl
RPD – relative percent difference
SVOC – semivolatile organic compound
TPH – total petroleum hydrocarbon
TRPH – total recoverable petroleum hydrocarbon
VOC – volatile organic compound

FIGURES

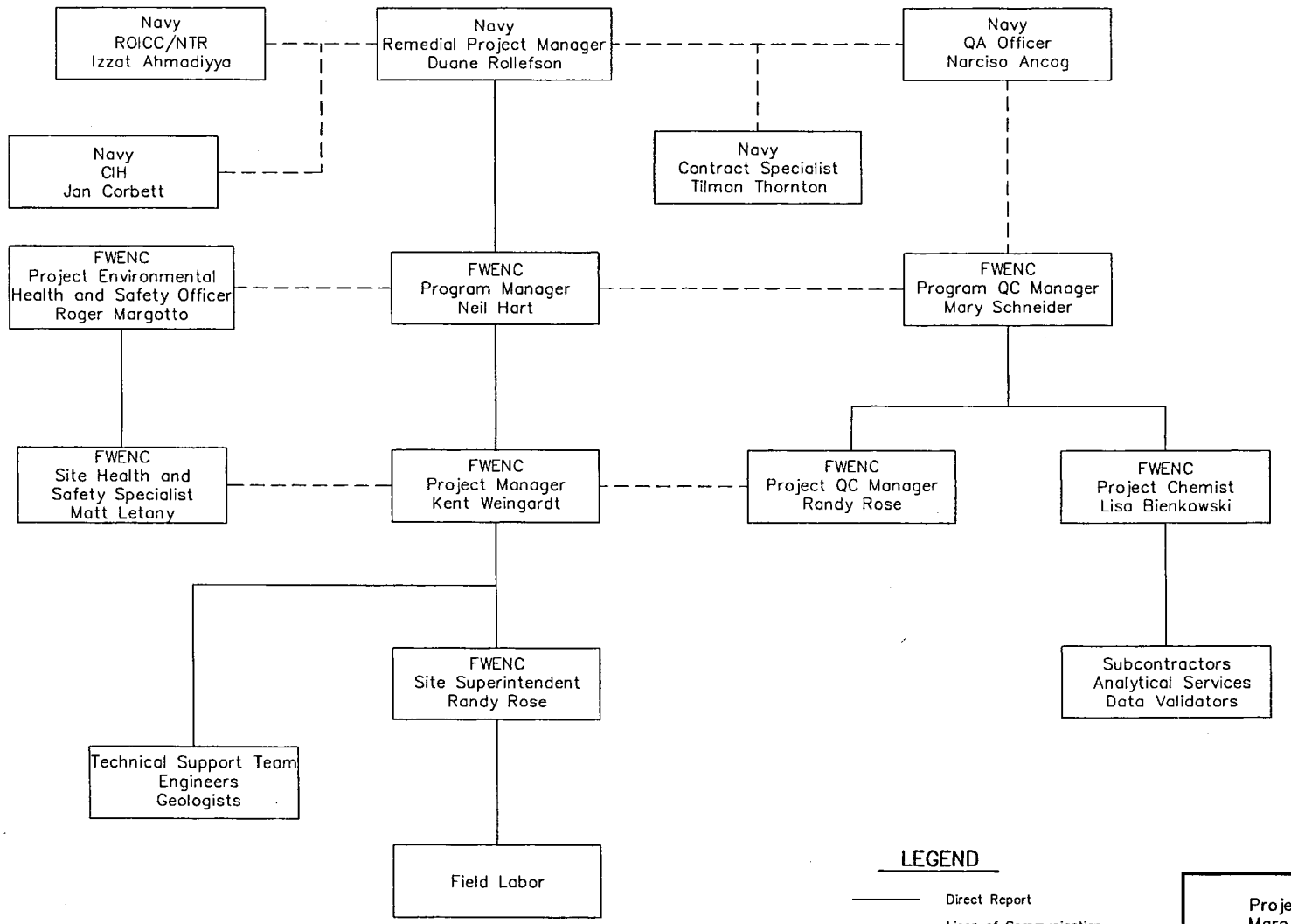

Figure 1–1
Project Organization Chart
Mare Island Naval Shipyard
DO #0094

FOSTER WHEELER
ENVIRONMENTAL CORPORATION

APPENDIX C

PROJECT CONTRACTOR QUALITY CONTROL (CQC) PLAN

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Building 127, Room 112
San Diego, California 92132-5190

CONTRACT NO. N44255-95-D-6030
DO NO. 0094

APPENDIX C

FINAL

PROJECT CONTRACTOR QUALITY CONTROL PLAN

Revision 0
July 11, 2001

UNDERGROUND FUEL OIL PIPING AND TPH CONTAMINATED SOIL REMOVAL

MARE ISLAND ELEMENTARY SCHOOL AT THE FORMER MARE ISLAND NAVAL SHIPYARD VALLEJO, CALIFORNIA

DCN: FWSD-RACII-01-0262

FOSTER WHEELER ENVIRONMENTAL CORPORATION
1230 Columbia Street, Suite 640
San Diego, CA 92101

Kent Weingardt, P.E.
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Mary Schneider
Program QC Manager

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ABBREVIATIONS AND ACRONYMS

BRAC	Base Realignment and Closure
CAD	computer-assisted drafting
CQC	Contractor Quality Control
CPR	cardiopulmonary resuscitation
CQCR	Contractor Quality Control Report
DFW	Definable Feature of Work
DO	Delivery Order
EFANW	Engineering Field Activities Northwest
FCR	Field Change Request
FWENC	Foster Wheeler Environmental Corporation
IRP	Installation Restoration Program
MINS	Mare Island Naval Shipyard
MSDS	Material Safety Data Sheet
NCR	Nonconformance Report
O&M	operations and maintenance
OHSA	Occupational Safety and Health Administration
PjM	Project Manager
PQCM	Project Quality Control Manager
QA	quality assurance
QC	quality control
RAC	Remedial Action Contract
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
SD	submittal description
SHSS	Site Health and Safety Specialist
SHSP	Site-Specific Safety and Health Plan
SS	Site Superintendent
SWDIV	Southwest Division Naval Facilities Engineering Command
WP	Work Plan

1.0 INTRODUCTION

This Project Contractor Quality Control (CQC) Plan establishes the procedures and methods to be implemented for the pipeline removal and excavation of petroleum impacted soil activities at Mare Island Elementary School located at the Former Mare Island Naval Shipyard (MINS) in Vallejo, California. The Project CQC Plan combines the Southwest Division Naval Facilities Engineering Command (SWDIV) Engineering Field Activities Northwest Remedial Action Contract (EFANW RAC II) No. N44255-95-D-6030 with the Foster Wheeler Environmental Corporation (FWENC) quality control system requirements.

This Project CQC Plan for Delivery Order (DO) No. 0094 is an addendum to the Final Contractor Quality Control Program Plan (FWENC, 1999).

1.1 PURPOSE

The purpose of this Project CQC Plan is to establish the specific procedures and methods for construction/remediation activities performed during pipeline removal and excavation activities at the Mare Island Elementary School under EFANW RAC II No. N44255-95-D-6030, DO No. 0094. The construction services will include removal and demolition of asphalt and concrete overlaying the fuel lines, pipeline removals, excavation of soils, backfill of excavations and site restoration.

The Project CQC Plan provides an effective quality control (QC) system to ensure the quality of all work performed by FWENC and its subcontractor personnel.

This Project CQC Plan complies with the requirements of the following documents:

- *Contractor's Guide* (SWDIV, 1996)
- *Guide Specification Section 1450* (Naval Facilities Engineering Command, 1999)
- *Guide Specification Section 1330* (Naval Facilities Engineering Command, 1999)

1.2 SCOPE

This Project CQC Plan is applicable to all construction operations and will be available (as part of the full set of project work plans) in the project field office. All work activities will be conducted in accordance with the Work Plan (WP).

The Project CQC Plan will be implemented for the following activities:

- Mobilization
- Demolition of asphalt and concrete
- Excavation and removal of soil and fuel lines

- Direct Push borings to collect soil samples
- Backfill of excavations
- Site restoration including placement of asphalt, concrete, and turf.

2.0 ORGANIZATION AND RESPONSIBILITIES

This section describes the organization and authority for project personnel performing construction operations, including subcontractors. The organizational structure, functional responsibilities, personnel qualifications, levels of authority, and lines of communication established within the organization to ensure high quality work are documented. The project organization chart and personnel assignments are included in Section 1.4 of the WP. All personnel assigned to this project will be qualified and experienced. The responsibilities and authorities of the key project personnel are described in the following paragraphs.

2.1 PROJECT MANAGER

The Project Manager (PjM) is responsible for the direction, execution, and successful completion of project tasks to achieve overall project goals. The PjM has responsibility for and the authority to perform the following quality-affecting activities related to the project:

- Coordinate work activities of subcontractors and FWENC personnel and ensuring all personnel adhere to the administrative and technical requirements of the project
- Monitor and report the progress of work and ensuring project deliverables are completed on time and within project budget
- Ensure adherence to the quality requirements of the contract, project scope of work, and the CQC Plans
- Ensure that all contract work will meet the requirements of the specifications and applicable codes
- Ensure that all work activities are conducted in a safe manner in accordance with the Site-Specific Safety and Health Plan (SHSP), US Army Corps of Engineers Safety and Health Manual (COE EM-385-1-1), and all applicable Occupational Safety and Health Administration (OSHA) regulations
- Serve as the primary contact between Navy personnel and FWENC for actions and information related to the work
- Ensure that all contract work will meet the requirements of the specifications and applicable codes
- Coordinate satisfactory resolution and completion of evaluation and acceptance report for Nonconformance Reports (NCRs)

2.2 SITE SUPERINTENDENT

The Site Superintendent (SS) reports to the PjM and is responsible for coordinating, directing, implementing, and supervising site construction activities. Specific duties of the SS include:

- Implement construction activities in accordance with the WP
- Direct field leaders, support personnel, and subcontractors
- Administer site access
- Maintain work site, vehicles, and equipment
- Coordinate and maintain logistics of all components of on-site tasks, including all personnel and equipment
- Prepare daily production reports and estimate future scheduling needs
- Coordinate, prepare, and complete all required field reports
- Ensure that all safety requirements are met, enforced, and documented
- Ensure compliance with applicable regulations, contractual, and health and safety requirements
- Maintain the current 2-week look-ahead schedule of field activities
- Recommend changes to improve project efficiency and effectiveness
- Verify field personnel are trained and qualified to complete assigned tasks
- Attend QC meetings
- Coordinate work efforts with the Project Quality Control Manager (PQCM) and Site Health and Safety Specialist (SHSS)
- Provide technical justification for change orders
- Maintain site security

2.3 PROJECT QUALITY CONTROL MANAGER

The PQCM is responsible for overall management of Project Quality Control and reports to the Program QC Manager. An appointment letter assigning the PQCM for implementation of the QC program is provided in Attachment 1 and will be issued to the NTR/ROICC as well as the Navy RPM prior to beginning fieldwork. The PQCM's resume is presented in Attachment 2. The PQCM will be on-site at all times during construction. The PQCM has the authority to stop work on site-related issues affecting the quality of work performed and directing the correction of all non-conforming work. In the event of her absence, a qualified individual will be appointed to serve as her replacement. The requirements for the alternate will be the same as for the designated PQCM.

The duties of the PQCM as they apply to this project include:

- Provide and maintain an effective QC system for all construction activities
- Monitor QC activities to ensure conformance with authorized policies, procedures, contract specifications, and sound practices

- Maintain sufficient staff to perform all QC activities to ensure QC for all work phases, work shifts, and work crews
- Prepare the Contractor Quality Control Report (CQCR)
- Perform and coordinate the three phases of inspection (preparatory, initial, and follow-up) and ensure they are implemented for all definable phases of construction
- Ensure all required tests and inspections are performed and results reported
- Conduct required QC meetings, including the coordination and mutual understanding, site survey visit, and other scheduled meetings
- Stop work that is not in compliance with the contract
- Responsible for issuance and enforcement of NCR
- Ensure that all on-site and off-site inspections, testing, and sampling are performed in accordance with the plans, specifications, and applicable codes
- Provide inspection and conduct or supervise testing and sampling
- Coordinate and maintain submittal register, photograph log sheet, request for information (RFI), and NCR log
- Review and maintain records of approved submittals, design change notices (DCNs) for construction activities, and Field Change Requests (FCRs)
- Inspect material delivery handling and storage in accordance with technical specifications
- Update As-built drawings for invoice certification
- Review and approve submittals and shop drawings and/or forward submittals as information only or approval
- Maintain testing and rework logs
- Issue compliance notice on material, equipment, work in place, and workmanship
- Review project plans and procedures for quality issues
- Identify the need for corrective action and initiating, recommending, and coordinating solutions for project quality problems
- Perform submittal reviews and approvals/certifications

2.4 FIELD ENGINEER

The Field Engineer is responsible for implementing, directing, and supervising engineering activities on-site. For this project, the Field Engineer will also carry the duties of the Site QC Representative. Field engineering includes survey control, inspection and testing, and implementation of the project technical specifications and contract drawings. The duties of the Field Engineer include:

- Ensure all engineering work activities are performed in accordance with the FWENC Corporate engineering procedures, technical specifications and contract drawings, WP, and applicable professional standards
- Provide oversight of engineering work activities performed by subcontractors
- Implement engineering design requirements
- Conduct field engineering inspections and tests required by the project technical specifications and contract drawings
- Ensure the quality of survey control data
- Inspect the work performed each day for compliance with the WP and technical specifications
- Prepare engineering documents in accordance with the technical specifications and drawings
- Issue and maintain Field Change Requests (FCRs) and Design Change Notices

2.5 SITE HEALTH AND SAFETY SPECIALIST

The SHSS ensures that all elements of the approved SHSP are implemented and enforced on site. The SHSS reports directly to the Program Health and Safety Officer, Roger Margotto, and will assist in implementing and enforcing the SHSP in the field. The SHSS has full authority to issue stop work orders or evacuation orders where work operations or noncompliance(s) may threaten the health and safety of site workers or the public.

Duties and responsibilities for the SHSS include the following:

- Ensure enforcement of the SHSP through daily site inspections
- Coordinate site health and safety requirements with the Project Superintendent and DO Manager
- Ensure maintenance of all health and safety monitoring and personal protective equipment and direct site monitoring activities
- Report all health and safety monitoring results to the Program Health and Safety Officer
- Coordinate daily field activities with the Project Superintendent
- Coordinate site safety and emergency response duties; verify site communications system with site personnel.
- Implement periodic safety equipment and supplies
- Perform inspection of safety equipment
- Coordinate with the Program Health and Safety Officer and Resident Officer in Charge of Construction (ROICC).
- Maintain recordkeeping and reporting systems

- Initiate necessary revisions or changes to the SHSP
- Maintain site control procedures
- Maintain current certification for first aid and cardiopulmonary resuscitation (CPR)

2.6 SUBCONTRACTORS AND VENDORS

Qualified subcontractors will be selected to provide construction services for this project. The subcontractor is required to provide labor, material, and equipment necessary to conduct construction activities as directed by the Site Superintendent. Subcontractors and vendors will be required to conform to the Project CQC Plan and the requirements of all approved procedures, technical specifications, contract provisions, and applicable codes and regulations.

The subcontractor's QC inspectors are responsible for field inspection of their construction and operating activities. FWENC will monitor, oversee, and make on-site observations and inspections of work in progress to determine if the subcontractor's work is proceeding in accordance with the Project CQC Plan.

Subcontractor personnel are responsible for maintaining a daily log of the project activities they perform and for providing information needed to complete the CQCR to PQCM. All inspection records, including inspection reports, deficiency reports, and re-inspections of corrective actions, will be documented by the PQCM.

3.0 SUBMITTALS

This section describes the review and approval process of submittals. In addition, PQCM will institute and maintain a submittal register (Attachment 3) to track submittals from issue to approval. A list of required submittals will be developed at the initiation of the project activities and revised as necessary. The submittal register will be kept current by FWENC at the job site. Updated copies of the submittal register will be provided to the government

Submittals will be scheduled, reviewed, certified, and managed in accordance with the Naval Facilities Engineering Command Guide Specification NFGS-01330F.

Required submittals may consist of the following types:

- ***Shop Drawings.*** Drawings, schedules, diagrams, and other data prepared specifically for this contract, by contractor or through contractor by way of subcontractor, manufacturer, supplier, distributor, or other lower tier contractor, to illustrate portion of work.
- ***Product Data.*** Preprinted material such as illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, catalog data, and other data to illustrate portion of work, but not prepared exclusively for this contract.
- ***Sample.*** Physical examples of products, materials, equipment, assemblies, or workmanship that are physically identical to portions of work, illustrating portion of work or establishing standards for evaluating appearance of finished work or both.
- ***Administrative Submittals.*** Data presented for reviews and approval to ensure that administrative requirements of projects are adequately met, but not to ensure directly that work is in accordance with design concept and in compliance with contract documents.

3.1 SUBMITTAL DESCRIPTIONS

Submittal descriptions (SD) are as follows:

- **SD-01 Preconstruction Submittals**
  - Certificates of insurance
  - Surety bonds
  - List of proposed subcontractors
  - List of proposed products
  - Construction progress schedule
  - Submittal schedule
  - Schedule of values
  - Health and safety plan

- Work plan
- Quality control plan
- Environmental protection plan

- **SD-02 Shop Drawings**
  - Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.
  - Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the contractor for integrating the product or system into the project.
  - Drawings prepared by or for the contractor to show how multiple systems and interdisciplinary work will be coordinated.

- **SD-03 Product Data**
  - Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.
  - Samples of warranty language when the contract required extended product warranties.

- **SD-04 Samples**
  - Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.
  - Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.
  - Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

- **SD-05 Design Data**
  - Calculations, mix designs, analyses, or other data pertaining to a part of work.

- **SD-06 Test Reports**
  - Report signed by authorized official of testing laboratory that a material, product, or system identical to the material, product, or system to be provided has been tested in accordance with specified requirements (testing must have been within three years of date of contract award for the project).
  - Report which includes findings of a test required to be performed by the contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

- Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.
- Investigation reports.
- Daily checklists.
- Final acceptance test and operational test procedure.

- **SD-07 Certificates**
  - Statements signed by responsible officials of manufacturer of product, system, or material attesting that product, system, or material meets specification requirements. Must be dated after award of project contract and clearly name the project.
  - Document required of Contractor, or of a supplier, installer, or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.
  - Confined space entry permits.

- **SD-08 Manufacturer's Instructions**
  - Preprinted material describing installation of a product, system or material, including special notices and MSDSs concerning impedances, hazards, and safety precautions.

- **SD-09 Manufacturer's Field Reports**
  - Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

- **SD-10 Operation and Maintenance Data**
  - Data intended to be incorporated in operations and maintenance manuals.

- **SD-11 Closeout Submittals**
  - Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.
  - As-built drawings.
  - Special warranties.
  - Posted operating instructions.
  - Training plan.

3.2 SUBMITTAL REQUIREMENTS

The following requirements apply to submittals:

- Units of weights and measures will match those used in the construction drawings
- Each submittal will be complete and in sufficient detail to allow determination of compliance with plans, specifications, and applicable codes
- Each submittal will be reviewed by the PQCM or an approved reviewer
- A transmittal form certifying compliance with all contract requirements will accompany each submittal
- Proposed deviation from the contract requirements will be clearly identified
- Submittals will include items such as applicable drawings, descriptive literature, test reports, samples, operations and maintenance (O&M) manuals, certifications, and warranties.
- All spatial data, including computer-assisted drafting (CAD) drawings, will conform to the Tri-Service Spatial Data Standard and be submitted as AutoCAD version 14 – or Microstation version 5.0 –, or later, compatible format
- GIS data will conform to the Tri-Service SDS, and be submitted as ARC Info Export Format or MGE Export format
- The State Plane Coordinate System, North American Datum 83 and Lambert Zones 1 through 6 will be used
- The vertical reference elevation is mean sea level, with the relevant control data provided
- Catalog Cut/Shop Drawing Transmittal and Approval (Attachment 6)

3.3 REVIEW OF SUBMITTALS

Submittals will be reviewed to ensure completeness, accuracy, and contract compliance. All items will be approved by the PQCM. Any submittals requiring modifications or changes will be returned to the originating organization for correction and then resubmitted for review and approval by the PQCM prior to acceptance. Approval of the submittal will be indicated by stamping, signing, or initialing, in addition to dating, the submittal form. The PQCM or designee will perform a check to ensure that all materials and equipment have been tested, submitted, and approved during the preparatory phase of the QC inspections; no construction activities will be performed prior to the required approval of applicable submittals.

3.4 SUBMITTAL PROCESS

The PQCM will provide all submittals to the ROICC/NTR and forward them to the required Navy personnel as an "information only" submittal. Each submittal will have a unique document control number. All possible attempts will be made to schedule submittals to allow for approval

time noted in the contract and project scope of work. However, certain submittals will require accelerated processing to maintain the construction schedule.

The PQCM will update the submittal register regularly. A transmittal form will accompany each submittal. Each transmittal and submittal register, except sample panel and sample installation, will be identified with the following information permanently adhered to or noted on each separate component.

- Contract number and DO number
- Project title and location
- Name, address, and phone number of subcontractor, supplier, manufacturer, and any other second tier contractor associated with submittal
- Date of submittal
- Description of item being submitted, including reference to specification section and SD number
- Approval of submitting organization indicating conformance to the requirements
- SD number of each component of submittal
- Product identification and location in project
- Submittals will be reviewed by the PQCM or an approved reviewer. The submittal will indicate that it either conforms to contract requirements or does not conform to contract requirements

Format of each submittal type is described in the following sections.

3.4.1 Format for Shop Drawings

Shop drawings will be formatted as follows:

- Shop drawings shall not be less than 8½ by 11 inches nor more than 30 x 42 inches
- Present 8½ by 11 inch-sized shop drawings as part of the bound volume for submittals required by section. Present larger drawings in sets
- Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information stated in Section 3.4
- Dimension drawings except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Identify materials and products for work shown

3.4.2 Format of Product Data

Product data submittal will be formatted as follows:

- Present product data submittals for each section as a complete, bound volume. Include table of contents, listing page, and catalog item numbers for product data

- Indicate, by prominent notation, each product which is being submitted; indicate specification section number and paragraph number to which it pertains
- Supplement product data with material prepared for project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for project

3.4.3 Format of Samples

Samples will be formatted as follows:

- Furnish samples in sizes below, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately same size as specified:
  (1) Sample of Equipment or Device: Full size
  (2) Sample of Materials Less Than 2 by 3 inches: Built up to 8½ by 11 inches
  (3) Sample of Materials Exceeding 8½ by 11 inches: Cut down to 8½ by 11 inches and adequate to indicate color, texture, and material variations
  (4) Sample of Linear Devices or Materials: 10-inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails
  (5) Sample of Non—Solid Materials: Paint. Examples of non-solid materials are sand and paint
  (6) Color Selection Samples: 2 by 4 inches
  (7) Sample Panel: 4 by 4 feet
  (8) Sample Installation: 100 square feet
- Samples Showing Range of Variation: Where variations are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range
- Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples shall be in undamaged condition at time of use
- Recording of Sample Installation: Note and preserve the notation of area constituting sample installation but remove notation at final clean up of project
- When color, texture, or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison

3.4.4 Format of Administrative Submittals

Administrative submittals will be formatted as follows:

- When submittal includes a document which is to be used in a project or become part of project record, other than as a submittal, do not apply contractor's approval stamp to document, but to a separate sheet accompanying document.
- Operation and Maintenance Manual Data: Submit in accordance with Section 01781.

3.5 REVIEW AND PROCESSING OF SUBMITTALS THAT DO NOT REQUIRE NAVY APPROVAL

Submittal will be reviewed by the PQCM or an approved reviewer. The submittal will indicate that it either conforms to established requirements or does not conform to established requirements. The PQCM will advise submitter of the results of the review. The submittal log will be updated to indicate status.

Conforming submittals will be certified by the PQCM for approval and forward to the required Navy personnel as an "information only" submittal.

Non-conforming submittals are returned to the submitter for correction, resolution of comments, and re-submittal.

3.6 REVIEW AND PROCESSING OF SUBMITTALS THAT REQUIRE NAVY APPROVAL

Submittal will be reviewed by the PQCM or approved reviewer. The submittal will indicate that it conforms to established requirements, or does not conform to contract requirements. Reviewed and certified submittals will be forwarded to the contracting officer utilizing transmittal and approval form (Attachment 4). Each form will indicate item transmitted, date and signature of PQCM and submittal reviewer (when applicable), and QC certifying statement. The QC certifying statement is as follows:

> "I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with Contract Number N44255-95-D-6030, is in compliance with the contract drawings and specifications, can be installed in the allocated spaces, and is submitted for Government approval."

Upon completion of review, the ROICC (or ROICC's Representative) may return the transmittal sheet to the PQCM for further action.

The PQCM will advise submitter of the results of the review in writing and include any comments. The submittal log will be updated to indicate status.

Non-conforming submittals may be returned to the submitter for correction, resolution of comments, and re-submittal if required. No work will begin until submittals for that work have been returned as "Approved" or "Approved as Noted".

3.7 REVISED SUBMITTALS

Revised submittals will be logged, reviewed, and processed in a manner identical with the initial submittal. When resubmitting disapproved transmittals or transmittal noted for resubmitttal, a copy of previously submitted transmittal including all reviewer comments for use by approving authority will be provided.

The submittal register used for the original submittal will be used for each resubmittal followed by a sequential alpha suffix to indicate resubmission.

4.0 TESTING (OTHER THAN CHEMICAL SAMPLING AND ANALYSIS)

The PQCM shall ensure the performance of all tests specified or required by the project specifications and drawings to verify control measures are adequate to provide a product conforming to contract specifications. General requirements for testing procedures to be implemented for this project are included in the project specifications and drawings. The type, number, and frequency of required tests are specified in the Testing Plan and Log (Table 4-1) and in the WP. These tests include both operational and acceptance testing, as appropriate. The PQCM is responsible for conducting or coordinating the required and timely test. For all testing activities, the PQCM shall:

- Verify testing procedures comply with contract requirements
- Verify that facilities and testing equipment are available and comply with testing standards
- Check test instrument calibration data against certified standards
- Verify that recording forms and the test identification control number system have been prepared

4.1 DOCUMENTATION

All test results, both passing and failing, will be recorded on the CQCR for the day the results are obtained. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test will be given. The actual test reports may be submitted later to the Navy Remedial Project Manager (RPM) and Resident Officer in Charge of Construction (ROICC). An information copy of tests performed by off-site facilities will be provided directly to the PjM or designee.

4.2 LABORATORY SERVICES

An independent testing laboratory will provide laboratory services as needed. The laboratory will be selected and qualified in accordance with applicable project requirements and accredited/certified as described below. Name of the laboratory and proof of accreditation will be submitted after procurement has been completed and prior to the field activities.

4.2.1 Accreditation for Non-Environmental Projects

Acceptable accreditation programs for non-environmental projects are the National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program, the American Association of State Highway and Transportation Officials Program, and the American Association for Laboratory Accreditation Program.

A copy of the certificate of accreditation, scope of accreditation, and latest directory of the accrediting organization for accredited laboratories will be submitted to the Contracting Officer or designated representative. The scope of the laboratory's accreditation shall include the test methods required by the project. Any deviation from the above requirements must be approved in writing by the ROICC.

4.2.2 Accreditation for Environmental Projects

Laboratories performing Installation Restoration Program (IRP) work funded by ER,N (formerly DERA) or Base Realignment and Closure (BRAC) (ER,N eligible in the absence of BRAC funding) must successfully complete the Navy Laboratory Evaluation Program. Unless otherwise specified, sampling and analysis shall be performed using current EPA procedures and quality control. Any deviation from the above requirements must be approved in writing by the SWDIV QA Officer.

On-site chemical analysis by mobile laboratories must be performed by laboratories certified by the California Department of Health Services through the Environmental Laboratory Accreditation Program.

5.0 INSPECTION PLAN

Project CQC Plan is the means by which FWENC ensures that all construction, including that of subcontractors and suppliers, complies with the requirements of the contract. The Definable Features of Work (DFW) is defined as an activity or task which is separate and distinct from other activities, and which requires separate control activities. In general, each work discipline or specification division would be considered a DFW. In addition, sub-activities or tasks within a work discipline or specification division could be considered a DFW if determined that separate and distinct control requirements exist for these activities or tasks.

The definable features of work establish the measures required to verify both the quality of work performed and compliance with specified requirements; and includes inspecting materials and workmanship before, during, and after each definable feature of work. The definable features for this project are:

- Mobilization
- Demolition of asphalt and concrete
- Excavation
- Backfill of excavations
- Direct push borings to collect soil samples
- Placement of asphalt
- Placement of concrete

Detailed descriptions of each definable feature of work are presented in Table 5-1.

The controls defined shall be adequate to cover in a coordination and mutual understanding meeting. The meeting will address all site operations and implement the following three phases of control for all aspects of the work:

- Preparatory phase
- Initial phase
- Follow-up phase

Attachment 4 contains inspection checklist forms for each phase.

5.1 COORDINATION AND MUTUAL UNDERSTANDING MEETING

Prior to start of site work, a Coordination and Mutual Understanding meeting with the ROICC will be held to discuss the QC program required by this contract. The purpose of this meeting is to develop a mutual understanding of the QC details, including forms to be used; administration of on-site and off-site work; coordination of the Contractor's management, production, and the PQCM duties with the ROICC. At a minimum, the Contractor's personnel required to attend will

include the DO Manager, Project Superintendent, and PQCM. Minutes of the meeting will be prepared by the PQCM and signed by both the Contractor and the Contracting Officer. This meeting may be held in conjunction with other meetings (i.e., preconstruction meeting).

5.2 QC MEETINGS

After the start of field activities, the PQCM will conduct QC meetings once every week or as required by the ROICC. The meetings will be held at the project site, and will be attended by the Project Superintendent. The PQCM will notify the ROICC at least 48 hours in advance of each meeting. One copy of the QC meeting minutes will be sent to all attendees within two calendar days of the meeting. The following will be accomplished at each meeting:

- Review the minutes of the previous meeting
- Review the schedule and the status of work
  - Work, inspection, or testing accomplished since last meeting
  - Rework items identified since last meeting
  - Rework items completed since last meeting
- Review the status of submittals
  - Submittals reviewed and approved since last meeting
  - Submittals required in the near future
- Review the work to be accomplished in the next 2 weeks and documentation required. Schedule the three phases of control and testing.
  - Establish completion date for rework items
  - Preparatory phases required
  - Initial phases required
  - Follow-up phases required
  - Testing required
  - Status of off-site work or testing
  - Documentation required
  - Discuss upcoming Activity Hazard Analyses
- Resolve QC and production problems
- Address items that may require revisions to the CQC Plans
  - Changes in QC Organization personnel
  - Changes in procedures

5.3 PREPARATORY PHASE INSPECTION

The PQCM will conduct preparatory phase inspections prior to starting the definable features of work listed in the technical specifications. These inspections shall include:

- A review of each paragraph of applicable specifications
- A review of the contract plans and drawings
- A check to ensure that all materials and/or equipment have been tested, submitted, and approved
- A check to ensure that provisions have been made to provide required control inspection and testing
- A check to ensure that all construction methods have been agreed with
- An examination of the work area to ensure that all required preliminary work has been completed and is in compliance with the contract
- A physical examination of required materials, equipment, and sample work to ensure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored
- A review of the appropriate activity hazard analysis to ensure safety requirements are met and the required Material Safety Data Sheets (MSDSs) are defined
- A discussion of procedures for constructing the work, including repetitive deficiencies
- Documentation of construction tolerance and workmanship standards for that phase of work
- A check to ensure that the portion of the Project CQC Plan for the work to be performed has been accepted by the Navy

The PjM and Navy RPM and ROICC shall be notified at least two (2) workdays in advance of preparatory phase activity. This phase shall include a meeting the PQCM conducts and that will be attended by other responsible construction personnel, as applicable, such as the Site Superintendent and SHSS.

The preparatory phase meetings will be documented and will be reported on the CQCR with the Preparatory Inspection Checklist included as an attachment. The PQCM will advise the Site Superintendent who will direct personnel performing work activities as to the acceptable level of workmanship required.

5.4 INITIAL PHASE INSPECTION

An initial inspection will be performed at the beginning of a definable feature of work and will include:

- A check of preliminary work to ensure that it is in compliance with contract requirements
- A review of the Inspection Checklist documenting results of the preparatory meeting

- Verification of full contract compliance, including required control inspection and testing is performed
- Establishment of the required level of workmanship, and verification to ensure work meets minimum acceptable standards
- Resolution of all differences
- A check of safety requirements to include compliance with and upgrading of the SSHP and activity hazard analysis
- A review of the activity analysis with project personnel.

The PjM and the Navy RPM and ROICC will be notified at least two (2) workdays in advance of any initial phase activity. The PQCM will document initial inspections for each item using the Initial Inspection Checklist and attach it to the CQCR. The exact location of the initial phase inspection will be indicated for future reference and comparison with follow-up inspections.

An initial phase inspection will be conducted each time a new crew arrives on-site or any time acceptable specified quality standards are not being met. No DFW can begin until the preparation and initial phases have been concluded.

5.5 ADDITIONAL PREPARATORY AND INITIAL PHASES

The PQCM may conduct additional preparatory and initial inspections on the same definable features of work under the following circumstances: (1) if the quality of ongoing work is unacceptable; (2) if there are changes in the staff, on-site supervision, or work crew; (3) if work on a definable feature is resumed after a substantial period of inactivity; or (4) if other problems develop.

5.6 FOLLOW-UP PHASE INSPECTION

During the completion of a particular work feature, follow-up inspections will be conducted to ensure continued compliance with contract requirements. The frequency of the follow-up inspections will depend on the extent of the work being performed on each particular feature. Each follow-up inspection will be documented on the Follow-Up Inspection Checklist, which will be attached to the CQCR. A final follow-up check will be conducted on any completed work phase prior to the commencement of a subsequent phase. Any deficiencies will be corrected prior to starting additional phases of work or will be identified on a list of items that do not conform to the specified requirements or are incomplete.

Follow-up inspections will include and be documented in the CQCR:

- Ensure that work is in compliance with specifications and contract requirements
- Maintain the quality of workmanship required

- Verify that required tests are performed and satisfactorily completed by an approved lab
- Verify that nonconforming conditions are identified and any rework is required

5.7 COMPLETION INSPECTION

Completion inspections will be performed as summarized in this section.

5.7.1 Construction Quality Control Completion Inspections

The PQCM or designated FWENC QC inspection personnel will conduct a detailed inspection prior to the pre-final inspection, when all of the work or an increment of work is deemed to be substantially complete. The PjM and Navy RPM and ROICC may also participate and will be notified in advance of the inspection date. The work will be inspected for conformance to plans, specifications, quality, workmanship, and completeness. The PQCM will prepare an itemized list of work not properly completed, inferior workmanship, or work that does not conform to plans and specifications. The list will also include any outstanding administrative items, such as record (as-built) drawings, O&M manuals, and spare parts. The list will be included in the QC documentation and submitted to the PJM or designee and the Navy ROICC and RPM within five (5) working days following the inspection and will specify an estimated date for correction of each deficiency. The completion inspection will be documented on the Completion Inspection Checklist, shown in Attachment 5, and attached to the CQCR.

5.7.2 Pre-final Inspection

The PQCM will conduct the pre-final inspection; the Navy ROICC, FWENC QC inspection personnel, or other primary management representative, as applicable, will attend. The PjM or designee will schedule the pre-final inspection in response to notification from the PQCM prior to the planned inspection date. The PQCM will ensure that all specific items previously identified on the Rework Items List as being unacceptable, along with all remaining project work, will be complete and acceptable by the date scheduled for the pre-final inspection. At this inspection, the PQCM will develop a specific list of incomplete and/or unacceptable work performed under the contract and will provide this list to the PjM.

5.7.3 Final Acceptance Inspection

The ROICC will schedule the final acceptance inspection based upon results of the pre-final inspection. The inspection will include the QC inspection personnel, PQCM, or other primary management personnel, the PjM, and the Navy RPM or ROICC. Notification will be given to the ROICC at least 14 days prior to the planned final acceptance inspection stating that all specific items previously identified as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection.

Completion Certification: Upon completion of work under a DO, the Project QC Manager will furnish a certificate to the ROICC attesting that the work has been completed, inspected, and tested, and is in compliance with the contract.

5.8 INSPECTION DOCUMENTATION

The PQCM is responsible for the maintenance of the inspection records. Inspection records will be legible and clearly provide all necessary information to verify that the items or activities inspected conform to the specified requirements or, in the case of nonconforming conditions, provide evidence that the conditions were brought into conformance or otherwise accepted by the PjM. All inspection records will be made available to the Navy.

6.0 DOCUMENTATION

Preparation, review, approval, and issuance of documents affecting quality will be controlled to the extent necessary to determine that the documents meet specified requirements.

6.1 CONTRACTOR QUALITY CONTROL REPORT

The PQCM is responsible for maintenance of current records of QC operation, activities, and tests performed, including the work of subcontractors and suppliers. The records will include factual evidence that required QC activities and tests were performed. A CQCR will be completed to document construction activities covered by the Project CQC Plan and will include:

- Record inspection and /or testing performed
- Identification and location of each DFW and its current phase (Preparatory, Initial, and Follow-up) of completion
- Results of inspections/testing
- Location and description of deficiencies
- Deficiencies corrected as of the date of the report
- Rework items
- Deviations from plans, difficulties, and resolution
- Test and/or control activities performed with results and references to specifications/plan requirements, including the control phase (Preparatory, Initial, Follow-up) and deficiencies (along with corrective action)
- Material received with statement as to its acceptability and storage
- Submittals reviewed, with contract reference, by whom, and action taken
- Off-site surveillance activities, including actions taken
- Contractor's verification statement
- Site visitors/purpose, deviations from plans, difficulties and resolution

The records will indicate a description of both conforming and nonconforming features will be covered with a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The CQCR attached to the Contractor Production Report will be furnished to the Navy ROICC on the first workday following the date covered by the report, except that reports need not be submitted for days during which no work is performed. At a minimum, one (1) report shall be prepared and submitted for every seven (7) days of no work and on the last day of a no-work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work will summarize

work for that day only. Reports will be signed and dated by the PQCM and other appropriate personnel, including subcontractors responsible for completion of activities. The report will include copies of test reports and copies of reports prepared by all subordinate QC personnel. The report will be provided to the ROICC for review by 10:00 a.m. on the working day following the day the work was performed or as agreed by the Navy ROICC.

6.2 CONTRACTOR PRODUCTION REPORT

The Contractor Production Report will be prepared for each day the work is performed and will be attached to the Daily CQCR prepared for the same day. The Contractor Production Report will be prepared, signed, and dated by the Project Superintendent and will contain the following information:

- Contractor and subcontractor and their area of responsibility
- Location and description of work performed
- Trades working on the project that day and number of personnel
- Operating equipment, with hours worked, idle, or down for repair
- Work performed that day giving location, description, weather conditions, and by whom work was done
- Any delays encountered
- Site visitors/purpose
- Job safety evaluations stating what was checked, results, and instructions or corrective actions
- A list of instructions given/received and conflicts in plans and/or specifications
- Contractor's verification statement

6.3 CONFERENCE NOTES AND CONFIRMATION NOTES

In addition to other required documentation, the PQCM is responsible for taking notes and preparing the reports of all conferences. Conference notes will be typed and the original report furnished to the Navy within five (5) days after the date of the conference for concurrence and subsequent distribution to all attendees. At a minimum, this report will include:

- Date and place the conference was held
- List of attendees, including name, organization, and telephone number
- Written comments presented by attendees attached to each report with the conference action noted: "A" for an approved comment, "D" for a disapproved comment, "W" for a comment that has been withdrawn, and "E" for a comment that has an exception noted

- Comments made during the conference and decisions affecting criteria changes
- Conference notes that augment the written comments

The PjM or his designee is also responsible for providing a record of all discussions, verbal directions, telephone conversations, etc. that FWENC personnel or their representatives participate in on matters relating to this contract and work. These records, entitled "Confirmation Notices," will be numbered sequentially and will fully identify participating personnel, subject discussed, and any conclusions reached. The PjM or his designee will forward a reproducible copy of the confirmation notices to the Navy RPM or designee and ROICC within five (5) workdays.

6.4 TESTING PLAN AND LOG

As tests are performed, the PQCM will record on the Testing Plan and Log (Table 4-1) the date the test was conducted, the date the test results were forwarded to the ROICC, remarks and acknowledgement that an accredited testing laboratory was used. The updated Testing Plan and Log will be attached to the last daily CQCR of each month.

6.5 REWORK ITEMS LIST

The PQCM will maintain a list of work that does not comply with the Contract, identifying what items need to be reworked, the date the item was originally discovered, the date the item will be corrected by, and the date the item was corrected. A rework item that is corrected the same day it is discovered will not be reported. The Rework Items List will be attached to the last daily CQCR of each month.

6.6 AS-BUILT DRAWINGS

The PQCM is responsible to ensure the as-built drawings are kept current on a daily basis and marked to show deviations, which have been made from the contract drawings. Each deviation will be identified with the appropriate modifying documentation. The QC Manager will initial each deviation and each revision. Upon completion of the work, the PQCM will provide a certificate attesting to the accuracy of the as-built drawings prior to submission to the ROICC.

7.0 NONCONFORMANCES

The PQCM documents any work or materials not conforming to the technical specifications or project/contract requirements on an NCR. The NCR will detail the nonconforming condition, the recommended corrective action(s), and the disposition of the corrective action(s). Qualified representatives from Engineering, quality assurance (QA), and Construction will review the NCR and either accept or reject the recommended corrective action or disposition. The NCR will remain open until the nonconforming condition has been satisfactorily resolved and verified by PQCM. Upon receipt of notification of detected nonconformance, NCRs for each item will be completed.

7.1 IDENTIFICATION OF NONCONFORMING ITEMS

Items identified as nonconforming will be documented on an NCR that will include the following information:

- Description of nonconforming item or activity indicating root causes of nonconformance to help prevent future occurrences
- Detailed description of nonconformance
- Referenced criteria
- Recommended disposition and corrective action to prevent recurrence (as applicable)
- Affected organization
- Anticipated completion date

Deficient conditions have been divided into three categories:

- In-process deficiencies
- Installed deficiencies
- Conditions that require Stop Work

7.1.1 In-Process Deficiencies

In-process deficiencies are those conditions discovered during the course of QC inspections that are intended to be corrected or brought into conformance with requirements. The PQCM will notify the SS of the problem or deficiency. Items not solved or corrected will be noted as in-process deficiencies and will be noted briefly on the daily CQCR and detailed on a NCR and added to the Rework Items List. Items on the punch list that cannot be corrected will be considered as installed deficiencies.

7.1.2 Installed Deficiencies

Installed deficiencies are those conditions discovered during the course of QC inspection of completed work that do not meet established acceptance criteria or requirements, and are not intended to or cannot be brought into conformance. These conditions will be noted on a Rework Items List in addition to a NCR for evaluation and disposition. The PQCM will issue the NCR summarizing discrepancies within 24 hours of discovery.

In the event an NCR is not resolved within seven (7) calendar days after issuance, a notice of non-response will be issued to the PjM. Each report will be consecutively numbered, logged, and updated by the PQCM. Resolution of installed deficient conditions will be approved by the PQCM. Copies of completed reports will be sent to the ROICC.

7.1.3 Condition Requiring Stop Work

If corrective actions are insufficient, resolution cannot be reached, or a notice of nonresponse or results of prior work are indeterminate, work may be stopped by PQCM. An immediate Stop Work Order can be issued by anyone for health and safety issues. The PQCM, DO Manager, or ROICC can issue a Stop Work Order in writing to the Project Superintendent who will direct site activities to stop.

The conditions of the Stop Work Order will be noted in the CQCR and described in detail on a NCR in addition to the Rework Items List to allow evaluation of the problem(s) and proper corrective action(s). Work will not continue until the Stop Work Order has been resolved by the PjM and documented.

7.1.4 NCR Log

The PQCM will maintain an NCR log (Attachment 6) which provides the NCR number, a brief description of the non-conforming condition, date of issue, point of contact to resolve, date of anticipated corrective action and date closed.

7.2 NONCONFORMING ITEMS

The nonconforming items will be controlled to prevent inadvertent use of material or workmanship quality. All items noted as nonconforming will be clearly identified and segregated from acceptable items when practical.

7.3 DISPOSITION

The disposition of NCRs will include the necessary actions required to bring the nonconforming condition to an acceptable condition and may include reworking, replacing, retesting, or reinspecting. Implementation of the disposition may be done in accordance with the original procedural requirements, a specific instruction, or a FCR.

7.3.1 Field Change Requests and Design Change Notices

The Field Engineer initiates FCRs to document a change to the approved plans, specifications, and drawings that occur in the field.

Changes will be qualified as follows:

- ***Major change***—one that affects the intent of the original design, including equipment, component, system, or structure that relates to function, operation, or safety of the designed product and/or personnel safety
- ***Minor change***—one that does not affect the intent of the original design or product, including equipment, component, system, or structure that relates to function, operation, or safety.

Where the FCR is marked "Minor Change," the Field Engineer may execute the change and, in parallel, obtain concurrence from the Project Manager that the change was indeed "minor."

Where the FCR is marked "Major Change," disposition must be sought before execution. An appropriately executed Design Change Notice (DCN) will be issued for approval by the PjM and ROICC. A DCN will not be issued for a "minor change" FCR. An example of a DCN is provided in Attachment 6.

7.4 CORRECTIVE ACTIONS

On detection of a nonconforming condition, the PQCM will immediately take corrective action. In addition to resolving identified nonconforming conditions, corrective action records will also address the initial cause of adverse conditions and establish methods and controls to prevent recurrence of the same or similar types of nonconformance. The PQCM will monitor the corrective actions to verify that they were properly implemented and accepted and that the NCR was closed out.

8.0 QUALITY MANAGEMENT

In addition to the required QC field inspections, the Foster Wheeler Environmental Corporation Quality Program requires a Quality Management overview of the site QA/QC Program implementation. The PQCM will perform regular internal quality control checks on the site implementation of the QA/QC Program. Reports of any deficiencies will be reported to the PjM for corrective action.

Inspection will be performed and check for the following:

- Possession and use of approved procedures, standards, and project specifications
- Conformance with appropriate procedures, standards, and instructions
- Thoroughness of performance
- Identification and completeness of documentation generated during performance
- Recommend changes to continually improve project efficiency and effectiveness
- Ensure personnel have been provided with instructions necessary to perform quality-related activities. A Training Program will be structured to emphasize correct performance of work and provide for the following:
  - Achievement of initial proficiency
  - Maintenance of proficiency
  - Adapting to changes in technology, methods, or job responsibilities

9.0 REFERENCES

Foster Wheeler Environmental Corporation (FWENC). 1999. *Field Contractor Quality Control Program Plan.* April 26.

Naval Facilities Engineering Command. 1999. *Guide Specification, NFGS-01450H.* September.

Naval Facilities Engineering Command. 1999. *Guide Specification, NFGS-01330F.* September.

Southwest Division Naval Facilities Engineering Command (SWDIV). 1996. *Contractor's Guide.* February.

TABLES

TABLE 4-1

TESTING PLAN AND LOG

CONTRACT NUMBER: N44255-95-D-6030, DO No. 0094 **PROJECT TITLE AND LOCATION:** The Former Mare Island Naval Shipyard, Vallejo, CA **CONTRACTOR:** Foster Wheeler Environmental Corporation

Specification Section and Paragraph Number	Item of Work	Test Required	Accredited/ Approved Lab		Sampled	Tested By	Location of Test		Frequency	Date Completed	Date Forwarded to Contractor Office	Remarks
			Yes	No			On Site	Off Site				
01500-1.2.4a		Backflow preventor test	X						One / Type			
02301-1.3.2d		Backfill tests	X						One / 1000 sq yds			
023301-3.10.1		Sub grade materials testing	X						50 lbs/1000 cu yds			
02722-3.6.1.1/3.6.1.2		Aggregate base materials testing	X						Per ASTM D75, ASTM C 136, ASTM C 117			
02722-3.6.2.2		Smoothness Test		X					At discretion			
02722-3.6.2.3		Field Density Test	X						1/500 sq yds			
02722-3.6.2.5		Thickness Test		X					1/500 sq yds			
02741-3.2.2.1		Asphalt Materials Test	X						2/day during paving ops			
02741-3.2.2.2a		Pavement Density	X						3/ 200 tons			
02741-3.2.2.2b		Pavement thickness		X					From density cores			
02741-3.2.2.2c		Straightedge test, pavement		X					Per discretion			

TABLE 5-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Mobilization	• Review station requirements for connecting to station utilities and verify that all permits and or notifications have been made. • Verify that SOWs provided to utility connection vendors meet the station requirements and all applicable regulations.		• Verify that permits and notifications have been submitted and that any inspections for utility hook up work have been arranged.		• Ensure that work has been completed in compliance with SOW, station requirements, and all applicable regulations. • Ensure that any documentation for the utility hook up work has been submitted.	
Demolition of Asphalt and Concrete	• Ensure that adequate equipment is on site and is in working order. • Ensure that work areas are properly marked and isolated. • Verify that PPE is available and meets requirements of Health and Safety Plan		• Verify that work performed is in compliance with the SOW.		• Make sure work is complete and meets requirements of scope of work. • Ensure that materials are demolished to adequate size for shipping and disposal.	
Excavation	• Verify that all excavation permit with CSO office is complete. • Verify that Bay Area Air Quality Management District notification has been placed. • Ensure that proposed excavation area has had geophysical survey work performed.		• Ensure that proper equipment is on site to perform work. • Verify with field personnel that they understand the presence of underground utilities, if any.		• Make sure work is complete and meets requirements of scope of work. • Measure and document quantities excavated and dimensions of excavation.	

TABLE 5-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Backfill of Excavations	• Confirm that excavation are approved for backfill (all analytical data has been collected and meets requirements for fill). • Review work plan and ensure that adequate material is available for fill. • Ensure that all materials testing (geotechnical) has been performed on fill materials and it meets specifications.		• Ensure that compaction equipment available is capable of performing compaction. • Verify that subcontractor for compaction verification is available to test during operations.		• Measure to verify that fill has been placed to the right elevations. • Ensure that results of compaction testing are complete and fill meets specification.	
Direct Push Borings for Collection of Soil Samples	• Review sections of work plan and permit requirements relevant to performing direct push borings. • Review results of geophysical survey and check against proposed boring locations.		• Check direct push boring equipment against permit requirements, work plan and vendor SOW to ensure that they are in compliance. • Verify that there is adequate equipment and materials to decontamination drilling equipment as necessary.		• Verify that work has been performed in compliance with the WP, vendor SOW and permit requirements.	
Placement of Asphalt for Road and Parking Lot	• Review Scope of Work, Drawings and Technical Specifications for this SOW. • Ensure that all samples of materials for proposed materials have been submitted and approved. • Ensure that testing services will be available for the testing of the asphalt during placement.		• Document that asphalt material being delivered is in compliance with SOW, drawings and technical specifications. • Verify thickness of pavement sections.		• Ensure that work has been completed in compliance with SOW, Drawings and Specifications. • Ensure that test data has been collected in compliance with the technical specifications.	

TABLE 5-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Placement of Concrete.	• Review scope of work and technical specifications for the task. • Ensure that proposed materials meet technical specifications.		• Ensure that testing subcontractor is available to perform monitoring of placement of concrete. • Ensure that adequate materials and labor are available to perform work.		• Verify that work is being performed in compliance with the scope of work and technical specifications. • Ensure that finish of concrete matches existing concrete.	

Notes:

CSO – Caretaker Site Office
PPE – personal protective equipment
SOW – Scope of Work

ATTACHMENTS

ATTACHMENT 1

DELEGATION OF AUTHORITY LETTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

June 3, 2001

Mr. Randy Rose
Foster Wheeler Environmental Corporation
1230 Columbia Street, Suite 640
San Diego, CA 92101

Subject: **Project Quality Control Manager**

Reference: Contract No. N44255-95-D-6030,
Naval Facilities Engineering Command, EFA Northwest
Environmental Remediation Contract, Delivery Order (DO) No. 0094,
Former Mare Island Naval Shipyard, California

Dear Mr. Rose,

In accordance with the terms of Foster Wheeler Environmental Corporation's (Foster Wheeler Environmental) Contract No. N44255-95-D-6030, this letter notifies you of your appointment as the Project Quality Control Manager for DO No. 0094 at the Former Mare Island Naval Shipyard, California.

As the designated Project Quality Control Manager, you will be responsible to manage the site-specific quality control requirements in accordance with project contractor quality control plan. You will be responsible for conducting quality control meetings, perform the three phases of control, and perform submittal review. You will be required to be present during all quality control testing to ensure that any testing is conducted in accordance with required specification. In addition, you will be required to prepare the necessary quality control certification and documentation.

You have the authority and responsibility for suspending work when conditions adverse to quality are identified and for directing the correction of all non-conforming work.

This letter is effective immediately until modified by the Program Quality Control Manager with concurrence of the Foster Wheeler Environmental DO Manager, the SWDIV Remedial Project Manager, and the Resident Officer in Charge of Construction.

Sincerely,

Foster Wheeler Environmental Corporation

Mary Schneider
Program Quality Control Manager

cc: Kent Weingardt, Project Manager

1230 COLUMBIA STREET, SUITE 640, SAN DIEGO, CA 92101
TEL: 619-234-8696 FAX: 619-234-8591

ATTACHMENT 2

RESUME

N00221_000685
MARE ISLAND

SENSITIVE RECORD

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

POTENTIAL PRIVACY ACT INFORMATION

FOR ADDITIONAL INFORMATION, CONTACT:

DIANE C. SILVA, COMMAND RECORDS MANAGER, CODE EV33
NAVAL FACILITIES ENGINEERING COMMAND, SOUTHWEST
1220 PACIFIC HIGHWAY (NBSD BLDG. 3519)
SAN DIEGO, CA 92132

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

Terri Ryland

Geoscientist

EXPERIENCE SUMMARY

Ms. Ryland has four years of geological and environmental consulting experience as well as five years of engineering and technical experience in the aerospace industry. Her areas of emphasis include sedimentology, engineering geology, and geophysics. She is currently assigned to the SWDIV Remedial Action Contract, where she is assisting in the management of the Groundwater Remediation System project at Naval Air Facility El Centro. From 1998 to 1999, she was assigned to the OII Landfill Project, where she was responsible for the evaluation of off-site soils for import, including drilling and collection of soil samples for analytical and geotechnical testing. Her responsibilities also included assisting with the installation, development, and abandonment of landfill gas extraction wells, installation of gas monitoring probes and tracking of field costs and materials.

REGISTRATIONS/CERTIFICATIONS

HAZWOPER - Hazardous Waste - CA, No. 98-02-844, Dates: 9/98 - 9/99

TRAINING

FWENC DOT Training – 12/1/99
FWENC Waste Management Training – 11/9/99
FWENC PM100 Project Management Training - 8/12/99
FWENC Environmental and Safety Supervisor Course - 6/24 through 6/29/99
8-Hour Refresher, OSHA Hazardous Waste Health and Safety Training – 5/17/00
4-Hour OSHA Hazardous Waste Health and Safety Supervisor Training - 6/29/99
40-Hour OSHA Hazardous Waste Health and Safety Training - 9/4/98

EDUCATION

MS / Geology / CSU Los Angeles/IP
BS / Physics / CSU Los Angeles / 1989

REPRESENTATIVE PROJECT EXPERIENCE

Naval Facilities Engineering Command, Southwest Division (SWDIV), Remedial Action Contract (RAC); San Diego, CA; Geoscientist (11/99 – Present)

NEX 28th Street Gas Station Plume Delineation Project, Naval Station San Diego. Site Lead and Site Quality Control Manager responsible for quality control oversight and documentation of drilling, soil sampling, well installation, and groundwater sampling activities.

Site 7, Naval Air Facility El Centro. Management tasks included assisting with personnel and equipment management, project procurement, budgeting, field activity planning, technical writing, and client relations. Field responsibilities included assisting with the installation, development, and abandonment of vapor extraction wells, and monitoring and reporting on the operational status of the Dual-Phase Vapor Extraction System.

Former Naval Training Center, San Diego. Site Lead and Site Quality Control Manager responsible for quality control oversight and documentation of drilling and well abandonment activities. Tasks included personnel and equipment management, project procurement, budgeting, field activity planning, and technical writing.

Marine Corps Air Station Miramar, San Diego. Site Quality Control Manager responsible for quality control oversight and documentation of underground storage tank (UST) removal and soil sampling activities. Tasks included equipment management, field activity planning, and health and safety monitoring.

New Cure, Inc., OII Landfill Project; Monterey Park, CA; Associate Geologist (9/1/98 – 11/99) - Responsible for monitoring and screening of imported soil for engineered monocover at OII. Offsite activities included drilling and collection of soil samples for analytical and geotechnical testing, evaluation of soils, conducting field monitoring of soils for potential contamination, and tracking field costs and materials. Onsite activities included assisting with the installation, development, and abandonment of landfill gas extraction wells, installation of probes, and monitoring the operational status of extraction wells and pumps.

PRIOR EXPERIENCE

Geodynamics Consultant Group
Dana Point, CA

Staff Geologist, 1995-1996 - Responsible for conducting hydrogeological research for litigation purposes. Evaluated historical hydrologic data, prepared surface hydrologic maps, and reviewed and interpreted aerial photographs.

CERES Associates (formerly CERES Environmental)
Concord, CA
(formerly in Santa Fe Springs, CA)

Environmental Geologist, 1992-1994 - Responsible for conducting Phase I and Phase II environmental investigations; performed soil and groundwater sampling, asbestos sampling, and radon testing; researched hydrogeological data, reviewed and interpreted aerial photographs, and assisted in geophysical investigations and UST removal.

LOCATION

Company: Foster Wheeler Environmental Corporation; 9/1/98 - Present
Years w/Other Firms: 7
Present Location: San Diego, CA
Daytime Phone: 619-234-8696 x219

TECHNICAL SPECIALTIES

Sedimentology
Boring & Wells - Soil Classification/logging
Environmental Geology

Terri Ryland
Geoscientist

SKILL SET

Biological Sciences

Fluvial Geomorphology
Mapping
Environmental Assessments
Environmental Geology
Geological Mapping
Groundwater Sampling
Hydrology
Geomorphology
Sedimentology
Soil/Sediment Quality
Soils

Chemical Sciences

Atomic Absorption Spectrometry
Groundwater/Surface Water Investigation/Feasibility Study
Preliminary Assessment/Site Investigation
Remedial Investigation
Scanning Electron Microscopy
Soil/Sediment Sampling
X-Ray Diffraction

Geoscience

Borings and Wells—Soil Classification/Logging
Borings and Wells - Monitoring Well Installation
Borings and Wells - Recovery Well/Production Installation
Geophysics—Gravity
Marine Geology—Coastal Geomorphology
Geophysics—Ground Penetrating Radar
Geophysics-Resistivity
Sampling—Soil
Geophysics—Electromagnetics
Hydrology—Runoff/Flooding
Sampling—Groundwater
Sampling—Water Level Measurements

Health Risk

Sampling and Analysis Planning

Regulatory Affairs

Asbestos
Phase I ASTM
Environmental Site Assessments
Phase II
Environmental Assessments for Property Transactions (Phase I & II)
USTs

DISCIPLINE(S) (Y = Primary Indicator; N = Secondary Indicator)

Geologists Y

PROFESSIONAL REFERENCES

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(619) 234-8696 x232

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San Diego, CA
(619) 234-8696 x204

***FWENC** Oil Landfill Project*
Vince Richards, Senior Geologist
Monterey Park, CA
(323) 278-6565

ATTACHMENT 3

SUBMITTAL REGISTER

SUBMITTAL REGISTER

TITLE AND LOCATION	CONTRACTOR	CONTRACT NO.
Former Mare Island Naval Shipyard, Vallejo, California	Foster Wheeler Environmental Corporation	N44255-95-D-6030 DO No. 0094

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	CLASSIFICATION	CONTRACTOR SCHEDULE DATES: SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CONTRACTOR ACTION: ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/DATE RCD FROM CONTR	APPROVING AUTHORITY: DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/DATE RCD FRM APPR AUTH	REMARKS
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)

ATTACHMENT 4

INSPECTION FORMS

PREPARATORY PHASE CHECKLIST

(CONTINUED ON SECOND PAGE)

CONTRACT NO	DEFINABLE FEATURE OF WORK	SPEC SECTION	DATE
N44255-95-D-6030		SCHEDULE ACT NO	INDEX #

PERSONNEL PRESENT

GOVERNMENT REP NOTIFIED ____ HOURS IN ADVANCE: YES ☐ NO ☐

NAME	POSITION	COMPANY/GOVERNMENT

SUBMITTALS

REVIEW SUBMITTALS AND/OR SUBMITTAL REGISTER HAVE ALL SUBMITTALS BEEN APPROVED? YES ☐ NO ☐

IF NO, WHAT ITEMS HAVE NOT BEEN SUBMITTED?

ARE ALL MATERIALS ON HAND? YES ☐ NO ☐

IF NO, WHAT ITEMS ARE MISSING?

CHECK APPROVED SUBMITTALS AGAINST DELIVERED MATERIAL. (THIS SHOULD BE DONE AS MATERIAL ARRIVES.)

COMMENTS:

MATERIAL STORAGE

ARE MATERIALS STORED PROPERLY? YES ☐ NO ☐

IF NO, WHAT ACTION IS TAKEN?

SPECIFICATIONS

REVIEW EACH PARAGRAPH OF SPECIFICATIONS.

DISCUSS PROCEDURE FOR ACCOMPLISHING THE WORK.

CLARIFY ANY DIFFERENCES

PRELIMINARY WORK & PERMITS

ENSURE PRELIMINARY WORK IS CORRECT AND PERMITS ARE ON FILE

IF NOT, WHAT ACTION IS TAKEN?

TESTING	IDENTIFY TEST TO BE PERFORMED. FREQUENCY, AND BY WHOM. WHEN REQUIRED? WHERE REQUIRED? REVIEW TESTING PLAN. HAS TEST FACILITIES BEEN APPROVED?
SAFETY	ACTIVITY HAZARD ANALYSIS APPROVED? YES ☐ NO ☐ REVIEW APPLICABLE PORTION OF EM 385-1-1.
MEETING COMMENTS	NAVY/ROICC COMMENTS DURING MEETING.
OTHER ITEMS OR REMARKS	OTHER ITEMS OR REMARKS:

QC MANAGER DATE

INITIAL PHASE CHECKLIST

SPEC SECTION	DATE

CONTRACT NO	DEFINABLE FEATURE OF WORK	SCHEDULE ACT NO	INDEX #
N44255-95-D-6030			

PERSONNEL PRESENT

GOVERNMENT REP NOTIFIED ____ HOURS IN ADVANCE: YES ☐ NO ☐

NAME	POSITION	COMPANY/GOVERNMENT

PROCEDURE COMPLIANCE

IDENTIFIY FULL COMPLIANCE WITH PROCEDURES IDENTIFIED AT PREPARATORY. COORDINATE PLANS. SPECIFICATIONS. AND SUBMITTALS.

COMMENTS:

PRELIMINARY WORK

ENSURE PRELIMINARY WORK IS COMPLETE AND CORRECT. IF NOT, WHAT ACTION IS TAKEN?

WORKMANSHIP

ESTABLISH LEVEL OF WORKMANSHIP.

WHERE IS WORK LOCATED?

IS SAMPLE PANEL REQUIRED? YES ☐ NO ☐

WILL THE INIITAL WORK BE CONSIDERED AS A SAMPLE? YES ☐ NO ☐

(IF YES, MAINTAIN IN PRESENT CONDITION AS LONG AS POSSIBLE AND DESCRIBE LOCATION OF SAMPLE)

RESOLUTION

RESOLVE ANY DIFFERENCES.

COMMENTS:

CHECK SAFETY

REVIEW JOB CONDITIONS USING EM 385-1-1 AND JOB HAZARD ANALYSIS

COMMENTS:

OTHER

OTHER ITEMS OR REMARKS

QC MANAGER DATE

SAMPLE PREPARATORY INSPECTION CHECKLIST FORM

CONTRACT NO.		REPORT NO.		
PROJECT NAME/NUMBER		DATE/SHIFT		
ITEM/ACTIVITY INSPECTED				
DRAWING REFERENCE	REV.	SPECIFICATION REFERENCE		REV.
PERMITS/LICENSES OBTAINED		YES/NO	REFERENCE NO.	
WORK PLAN WRITTEN		YES/NO	REFERENCE NO.	
QC INSPECTION PLAN WRITTEN		YES/NO	REFERENCE NO.	
REQUIRED SUBMITTALS APPROVED		YES/NO	REFERENCE NO.	
REQUESTS FOR INFORMATION ANSWERED		YES/NO	REFERENCE NO.	
FCRs/DCNs APPROVED/ISSUED		YES/NO	REFERENCE NO.	
NONCONFORMANCES DISPOSITIONED/CLOSED		YES/NO	REFERENCE NO.	
MATERIAL/EQUIPMENT AVAILABLE		QUANTITY	CONDITION	

SAMPLE PREPARATORY INSPECTION CHECKLIST FORM

PROJECT NAME & NO.	REPORT NO.
ITEM/ACTIVITY INSPECTED	DATE/SHIFT
PREPARATORY SITE CONDITIONS	
CONTRACT VARIANCE	
ACTIVITIES/ITEMS REQUIRING COMPLETION	
COMMENTS	
MEETING ADDRESS	

NAME SIGNATURE TITLE

SAMPLE INITIAL INSPECTION CHECKLIST FORM

CONTRACT NO.	REPORT NO.
PROJECT NAME/NUMBER	DATE/SHIFT
ITEM/ACTIVITY INSPECTED	

DRAWING REFERENCE	REV.	DRAWING REFERENCE	REV.

SITE CONDITIONS

INSPECTION ATTRIBUTE	SPECIFICATION REFERENCE	ACCEPTANCE CRITERIA	INSPECTION RESULT	ACCEPT/ REJECT

REQUESTS FOR INFORMATION ISSUED/SUBJECT	REFERENCE NO.

FCRs ISSUED/SUBJECT	REFERENCE NO.

NONCONFORMANCES ISSUED/SUBJECT	REFERENCE NO.

REINSPECTION REQUIRED	YES	NO	

SAMPLE INITIAL INSPECTION CHECKLIST FORM

PROJECT NAME & NO.	REPORT NO.
ITEM/ACTIVITY INSPECTED	DATE/SHIFT
COMMENTS	
CONTRACT VARIANCE	
ATTENDEES	

NAME SIGNATURE TITLE

CONTRACTOR QUALITY CONTROL REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE Enter (DD/MMM/YY)

REPORT NO Enter Rpt # Here

PHASE | CONTRACT NO N44255-95-D-6030, DO No. 0094 | CONTRACT TITLE EFD NW – Former Mare Island Naval Shipyard

PREPARATORY

WAS PREPARATORY PHASE WORK PREFORMED TODAY? YES ☐ NO ☐

IF YES, FILL OUT AND ATTACH SUPPLEMENTAL PREPARATORY PHASE CHECKLIST

Schedule Activity No.	Definable Feature of Work	Index #

INITIAL

WAS INITIAL PHASE WORK PREFORMED TODAY? YES ☐ NO ☐

IF YES, FILL OUT AND ATTACH SUPPLEMENTAL INITIAL PHASE CHECKLIST.

Schedule Activity No.	Definable Feature of Work	Index #

FOLLOW-UP

WORK COMPLIES WITH CONTRACT AS APPROVED DURING INITIAL PHASE? YES ☐ NO ☐

WORK COMPLIES WITH SAFETY REQUIREMENTS? YES ☐ NO ☐

Schedule Activity No.	Description of Work, Testing Performed & By Whom, Definable Feature of Work, Specification Section, Location and List of Personnel Present

REWORK ITEMS IDENTIFIED TODAY (NOT CORRECTED BY CLOSE OF BUSINESS)

Schedule Activity No.	Description

REWORK ITEMS CORRECTED TODAY (FROM REWORK ITEMS LIST)

Schedule Activity No	Description

REMARKS (Also Explain Any Follow-Up Phase Checklist Item From Above That Was Answered "NO"), Manuf Rep On-Site, etc.

Schedule Activity No.	Description

On behalf of FWENC, I certify that this report is complete and correct, and that equipment and material used and work performed during this reporting period are in compliance with the contract drawings and specifications, in the best of my knowledge, except as noted in this report

AUTHORIZED QC MANAGER AT SITE DATE

Government's NTR's/QA representative's remarks and/or exceptions to this report:

NTR/QA Representative DATE

NONCONFORMANCE REPORT LOG

PROJECT TITLE: _____

PROJECT LOCATION: _____

CONTRACTOR: _____

NCR NO.	HOLD TAG NO.	DESCRITION OF CONDITIONS/ ITEM AFFECTED	LOCATION	DATE					REMARKS
				VALIDATION	DISPOSITION/ APPROVAL	RE-INSPECTION	CLOSURE	HOLD TAG REMOVAL	

FOSTER WHEELER ENVIRONMENTAL CORPORATION

NONCONFORMANCE REPORT

REPORT NO _____

CONTRACT NO. AND TITLE		DRAWING NO/SPEC NO.
SUPPLIER, CONSTRUCTION QC OR CONTRACTOR	P. O. NO.	
DESCRIPTION OF COMPONENT, PART OR SYSTEM		

I. DESCRIPTION OF NONCONFORMANCE *(Items involved, Specifications, Code or Standard to Which Items Do Not Comply, Submit Sketch (If Applicable)*

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE	TITLE/COMPANY	DATE

II. RECOMMENDED DISPOSITION *(Submit Sketch If Applicable)*

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION	TITLE/COMPANY	DATE

III. EVALUATION OF DISPOSITION BY FOSTER WHEELER ENVIRONMENTAL. REASON OF DISPOSITION

IV. CORRECTIVE ACTION ☐ Required ☐ Not Required

V. ☐ ENGINEERING	☐ QUALITY ASSURANCE	☐ CONSTRUCTION	☐ OTHER
NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)
DATE	DATE	DATE	DATE
☐ ACCEPTED ☐ REJECTED	☐ ACCEPTED ☐ REJECTED	☐ ACCEPTED ☐ REJECTED	☐ ACCEPTED ☐ REJECTED
☐ ACCEPTED WITH COMMENTS	☐ ACCEPTED WITH COMMENTS	☐ ACCEPTED WITH COMMENTS	☐ ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION ☐ REQUIRED ☐ NOT REQUIRED

BY: SIGNATURE_____ TITLE _____ DATE _____

REWORK ITEMS LIST

Contract No. and Title: N44255-95-D-6030, DO No. 0094

Contractor: Foster Wheeler Environmental Corporation

NUMBER	DATE IDENTIFIED	DESCRIPTION	CONTRACT REQUIREMENT (Spec. Section and Par. No., Drawing No. and Detail No., etc.)	ACTION TAKEN BY QC MANAGER	RESOLUTION	DATE COMPLETED

INSTRUCTIONS

Enter submittal number.
Check applicable CQC clause.

CONSTRUCTION CONTRACTOR – PART I

From: Construction contractor's name and address.
To: Designer's name and address or ROICC/REICC as applicable.

Enter contract number.

Enter title of contract and location.

Describe item being transmitted. A separate form must be used for each set of catalog cuts or shop drawings. Include name of manufacturer, catalog sheets, drawing no., name of item, and number of copies forwarded.

Check submittal for record or approval purposes.

Type date and name.

Sign original and one.

Distribution (as applicable to CQC clause):

Send to designer: original and four transmittal forms with the seven copies of catalog cuts or shop drawings. When factory inspection is required, send eight copies.

Send to ROICC/REICC: one carbon copy of form.

Send to ROICC/REICC (CQC): Original and three copies of catalog cuts or shop design.

Retain one copy for your files.

DESIGNER (A&E CONTRACTOR, SOUTHWESTNAVFACENGCOM) OR OICC RESPONSIBLE FOR DESIGN – PART II

From: Designer's name and address.
To: ROICC/REICC and address.

Enter recommended action (i.e., approval recommended or disapproved, with appropriate comments).

Type date and name.

Sign original and one.

Distribution:

Send to ROICC/REICC: original and three copies with six (or seven when factor inspection is required) copies of catalog cuts or shop drawings.

Retain one copy of form and one copy of cuts or drawings for your files.

ROICC OR REICC – PART III

From: ROICC or REICC and address.
To: Construction contractor's name and address.

Enter action taken (i.e., approved subject to, etc.).

Type date and name.

Sign original and one.

Distribution:

Send to construction contractor: original with three copies of cuts or drawings

Send to OICC one carbon copy of form with one copy of cut or drawings.

Retain two copies of form and two copies of cuts or drawings: one for field use and one for ROICC/REICC file.

NOTE: When factory inspection is required, forward one approved copy of cuts or drawings to the OICC, Construction Division. Cover transmittal should state the information is forwarded for factory inspection.

CATALOG CUT/SHOP DRAWING TRANSMITTAL AND APPROVAL
SOUTHWESTNAVFACENGCOM 4355 / 2 (10-89)

No carbon paper is required to complete this form
No transmittal letter required

SUBMITTAL NO.

CQC CLAUSE ☐ IS APPLICABLE ☐ IS NOT APPLICABLE

REFERENCES TO USE WHEN CQC CLAUSE IS APPLICABLE

PART I – FOR CONTRACTOR USE

REFERENCES TO USE WHEN CQC CLAUSE IS NOT APPLICABLE

(A) ROICC/REICC

FROM (Contractor)
Foster Wheeler Environmental Corporation
1230 Columbia Street, Suite 640
San Diego, CA 92101

TO (A)

(A) DESIGNER

CONTRACT NO.
N44255-95-D-6030, DO No. 0094

CONTRACT TITLE

(B) *(Check one)*

☐ RECORD

☐ APPROVAL

THE FOLLOWING ITEM IS SUBMITTED FOR (B) PER SPECIFICATION SECTION NUMBER

(B) APPROVAL

CERTIFICATION (This form shall not be used to forward proposed substitutions)
IT IS HEREBY CERTIFIED THAT THE ☐ EQUIPMENT ☐ MATERIAL SHOWN AND MARKED IN THIS SUBMITTAL IS THAT PROPOSED TO BE INCORPORATED INTO CONTRACT N68711-98-D-5713, CTO 0011 IS IN COMPLIANCE WITH THE CONTRACT DRAWINGS AND SPECIFICATIONS AND CAN BE INSTALLED IN THE ALLOCATED SPACES.

(C) AUTHORIZED CONTRACTOR QUALITY CONTROL REPRESENTATIVE

CERTIFIED BY (C)

DATE

(C) PERSON DESIGNATED BY CONTRACTOR AS HAVING AUTHORITY TO SIGN CERTIFICATION

PART II – FOR DESIGNER USE

FROM (Designer)

TO (ROICC/REICC)

(D) CURSORY REVIEW REQUIRED ON RECORD COMES – REPLY TO ROICC ONLY IF APPROPRIATE. DETAILED REVIEW REQUIRED ON SUBMITTALS FOR GOVERNMENT APPROVAL

STAMP AND MARK EACH COPY AS APPROPRIATE.

THIS SUBMITTAL HAS BEEN REVIEWED (D). THE FOLLOWING RECOMMENDATION IS MADE:

(D) DETAILED REVIEW REQUIRED. STAMP AND MARK EACH COPY AS APPROPRIATE

SIGNATURE

DATE

PART III – FOR ROICC/REICC USE

(E) DESIGNER *(Copy to ROICC)*

FROM (ROICC/REICC)

TO (E)

(E) CONTRACTOR *(Copy to ROICC)*

ENCLOSURES ARE RETURNED WITH THE FOLLOWING COMMENTS:

SIGNATURE

DATE

CONTRACTOR PRODUCTION REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

CONTRACT NO N44255-95-D-6030	TITLE AND LOCATION Delivery Order #90 – Moffett Federal Airfield	DATE REPORT NO
CONTRACTOR FOSTER WHEELER ENVIRONMENTAL CORPORATION	SUPERINTENDENT	

AM WEATHER	PM WEATHER	MAX TEMP (F)	MIN TEMP (F)

WORK PERFORMED TODAY

WORK LOCATION AND DESCRIPTION	EMPLOYER	NUMBER	TRADE	HRS

JOB SAFETY					
	WAS A JOB SAFETY MEETING HELD THIS DATE? (If YES attach copy of the meeting minutes)	☐ YES	☐ NO	TOTAL WORK HOURS ON JOB SITE. THIS DATE, INCL CON'T SHEETS	
	WERE THERE ANY LOST TIME ACCIDENTS THIS DATE? (If YES attach copy of completed OSHA report)	☐ YES	☐ NO	CUMULATIVE TOTAL OF WORK HOURS FROM PREVIOUS REPORT	
	WAS CRANE/MANLIFT/TRENCHING/SCAFFOLD/HV ELEC/HIGH WORK/ HAZMAT WORK DONE? (If YES attach statement or checklist showing inspection performed.)	☐ YES	☐ NO	TOTAL WORK HOURS FROM START OF CONSTRUCTION	
	WAS HAZARDOUS MATERIAL/WASTE RELEASED INTO THE ENVIRONMENT? (If YES attach description of incident and proposed action.)	☐ YES	☐ NO		

LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED ☐ SAFETY REQUIREMENTS HAVE BEEN MET.

EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB (INDICATE SCHEDULE ACTIVITY NUMBER)

Submittal #	Description of Equipment/Material Received

CONSTRUCTION AND PLANT EQUIPMENT ON JOB SITE TODAY. INDICATE HOURS USED AND SCHEDULE ACTIVITY NUMBER.

Owner	Description of Construction Equipment Used Today (incl Make and Model)	Arrival	Off Rent Date	Actual Demob Date	Hours Idle	Hours Used	Reason for Idle

REMARKS

CONTRACTOR/SUPERINTENDENT _____ DATE _____

ATTACHMENT 5

COMPLETION INSPECTION CHECKLIST

SAMPLE FOLLOW-UP INSPECTION CHECKLIST FORM

CONTRACT NO.	REPORT NO.
PROJECT NAME/NUMBER	DATE/SHIFT
ITEM/ACTIVITY INSPECTED	

DRAWING REFERENCE	REV.	DRAWING REFERENCE	REV.

INSPECTION ATTRIBUTE	SPECIFICATION REFERENCE	ACCEPTANCE CRITERIA	INSPECTION RESULT	ACCEPT/ REJECT

REQUESTS FOR INFORMATION ISSUED/SUBJECT	REFERENCE NO.

FCRs ISSUED/SUBJECT	REFERENCE NO.

NONCONFORMANCES ISSUED/SUBJECT	REFERENCE NO.

REINSPECTION REQUIRED	YES	NO	

COMMENTS

NAME SIGNATURE TITLE

ATTACHMENT 6

MISCELLANEOUS QC FORMS

COMPLETION INSPECTION CHECKLIST

CONTRACT NO.: _____ DATE: _____

TITLE: _____

MAJOR DEFINABLE FEATURE OF WORK: _____

LOCATION.: _____ SPEC SECTION: _____

(Refer to Final Follow-Up Inspection Checklist)

A. OPEN PUNCHLIST ITEMS FROM FINAL FOLLOW-UP INSPECTION CHECKLIST:

	ITEM	DATE OF COMPLETION
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

B. NEW PUNCHLIST ITEMS NOTED:

	ITEM	DATE OF COMPLETION
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

C. ROICC NOTIFIED? Yes _____ No _____

On behalf of Foster Wheeler Environmental Corporation, I certify this activity is completely in accordance with the Contract Documents, based upon the information available to me.

_____

Project Quality Control Manager

APPENDIX D

TECHNICAL SPECIFICATIONS

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SECTION 02301

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09/98

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3.1.2.1 Drainage
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-- End of Section Table of Contents --

SECTION 02301

EARTHWORK FOR STRUCTURES AND PAVEMENTS
09/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 4	(1997) Clay Drain Tile
ASTM C 14M	(1995) Concrete Sewer, Storm Drain, and Culvert Pipe (Metric)
ASTM C 14	(1995) Concrete Sewer, Storm Drain, and Culvert Pipe
ASTM C 33	(1997) Concrete Aggregates
ASTM C 136	(1996; Rev. A) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 412M	(1994) Concrete Drain Tile (Metric)
ASTM C 412	(1994) Concrete Drain Tile
ASTM C 444M	(1995) Perforated Concrete Pipe (Metric)
ASTM C 444	(1995) Perforated Concrete Pipe
ASTM C 654M	(1995) Porous Concrete Pipe (Metric)
ASTM C 654	(1995) Porous Concrete Pipe
ASTM C 700	(1997) Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1140	(1997) Amount of Material in Soils Finer Than the No. 200 (75-Micrometer) Sieve
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft (2,700 kN-m/m))
ASTM D 1586	(1984; R 1992) Penetration Test and Split-Barrel Sampling of Soils

ASTM D 1883	(1994) CBR (California Bearing Ratio) of Laboratory-Compacted Soils
ASTM D 2434	(1968; R 1994) Permeability of Granular Soils (Constant Head)
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2855	(1996) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1996) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 3212	(1996; Rev. A) Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals
ASTM D 3786	(1987) Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Bursting Strength Tester Method
ASTM D 4253	(1993) Maximum Index Density of Soils Using a Vibratory Table
ASTM D 4254	(1991) Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D 4318	(1995; Rev. A) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 4355	(1992) Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
ASTM D 4491	(1996) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991; R 1996) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1995) Determining Apparent Opening Size of a Geotextile
ASTM D 4759	(1988; R 1996) Determining the Specification Conformance of Geosynthetics
ASTM D 4833	(1988; R 1996) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

ASTM F 402	(1993) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
ASTM F 758	(1995) Smooth-Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage

CORPS OF ENGINEERS (COE)

COE EM-385-1-1	(1992) Safety and Health Requirements Manual

1.2 DEFINITIONS

1.2.1 Backfill

A specified material used in refilling a cut, trench, or other excavation, placed at a specified degree of compaction.

1.2.2 Cohesive Materials

Cohesive materials include materials classified by ASTM D 2487 as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesive only when the fines have a plasticity index greater than zero.

1.2.3 Cohesionless Materials

Cohesionless materials include materials classified by ASTM D 2487as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.

1.2.4 Compaction

The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in or ASTM D 1557 for general soil types abbreviated in this specification as "percent ASTM D 1557 maximum density."

1.2.5 Embankment

A "fill" having a top that is higher than adjoining ground.

1.2.6 Excavation

The removal of soil, rock, or hard material to obtain a specified depth or elevation.

1.2.7 Fill

Specified material placed at a specified degree of compaction to obtain an indicated grade or elevation.

1.2.8 Hard Material

Weathered rock, dense consolidated deposits or conglomerate materials, (excluding manmade materials such as concrete) which are not included in the definition of "rock" but which usually require the use of heavy

excavation equipment with ripper teeth or the use of jack hammers for removal. [Material indicated in the soil boring logs as having a standard penetration resistance as determined by ASTM D 1586 between 60 and 600 blows per foot is arbitrarily defined herein as "Hard Material."]

1.2.9 In Situ Soil

Existing in place soil.

1.2.10 Lift

A layer (or course) of soil placed on top of a previously prepared or placed soil.

1.2.11 Rock

Solid, homogeneous, interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement, exceeding 1 cubic yard in volume. Material indicated in the soil boring logs as having a standard penetration resistance as determined by ASTM D 1586 greater than 600 blows per foot is arbitrarily defined herein as "Rock." Removal of "hard material" will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

1.2.12 Soil

The surface material of the earth's crust resulting from the chemical and mechanical weathering of rock and organic material.

1.2.13 Subgrade

The material in excavation (cuts) and fills (embankments) immediately below any subbase, base, pavement, or other improvement. Also, as a secondary definition, the level below which work above is referenced.

1.2.14 Topsoil

In natural or undisturbed soil formations, the fine-grained, weathered material on the surface or directly below any loose or partially decomposed organic matter. Topsoil may be a dark-colored, fine, silty, or sandy material with a high content of well decomposed organic matter, often containing traces of the parent rock material.

1.2.15 Unsatisfactory Material

Existing, in situ soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in fill or embankment without excessive consolidation or loss of stability. Materials classified as PT, OH, or OL by ASTM D 2487 are unsatisfactory. Unsatisfactory materials also include man-made fills, refuse, frozen material, uncompacted backfills from previous construction, unsound rock or soil lenses, or other deleterious or objectionable material.

1.2.16 Working Platform

A layer of compacted crushed rock or natural stone that replaces the in

situ soil to provide a stable, uniform bearing foundation for construction equipment to facilitate further site construction.

1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

1.3.1 SD-08 Statements

a. Shoring and sheeting plan

1.3.1.1 Shoring and Sheeting Plan

Describe materials or shoring system to be used. Indicate whether or not any components will remain after filling or backfilling. Provide plans, sketches, or details along with calculations by a registered professional engineer. Indicate sequence and method for installation and removal.

1.3.2 SD-12 Field Test Reports

a. Subsurface drains granular fill tests

b. Topsoil tests

c. Fill tests

d. Backfill tests

1.4 DELIVERY AND STORAGE

Deliver and store materials in a manner to prevent contamination or segregation. Store synthetic fiber filter cloth to prevent exposure to direct sunlight in accordance with the manufacturer's recommendations.

1.5 SITE CONDITIONS

1.5.1 Dewatering Plan

Base on site surface and subsurface conditions and available soils and hydrological data.

1.5.2 Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Perform work adjacent to privately owned utilities in accordance with procedures outlined by the utility company. Excavation made with power-driven equipment is not permitted within two feet of known Government-owned utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work as affected by the contract excavation until approval for backfill is granted by the Contracting Officer. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Granular Fill

2.1.1.1 Fill for Subsurface Drains

Provide clean sand, stone, or gravel fill meeting the following requirements:

a. Perforated or slotted wall pipe: Provide fill meeting requirements of Type I material as described in Table I below.

b. Open joint pipe: Provide fill consisting of both Type I and Type II material as described in Table I below.

c. Any type pipe used with filter fabric: Provide clean gravel or crushed stone or gravel conforming to ASTM C 33 coarse aggregate grading size 57, 67, or 7.

TABLE I

ASTM D 422 Sieve Size	Type I Percent Passing	Type II Percent Passing
1.5 inches	--	100
1 inch	--	90 - 100
3/8 inch	100	25 - 60
No. 4	95 - 100	5 - 40
No. 8	--	0 - 20
No. 16	45 - 80	--
No. 50	10 - 30	--
No. 100	0 - 10	--

2.1.2 Soil Materials

Provide materials free from debris, roots, wood, scrap materials, vegetable matter, refuse or frozen material. Maximum particle size permitted is3 inches. Use excavated material from the site for the work indicated when material falls within the requirements specified herein.

2.1.2.1 General Backfill Beside Structures

Soft, spongy, highly plastic, or otherwise unstable material is prohibited. Material shall be classified as GP, GM, GC, SP, SM, or by ASTM D 2487. If more material is required than is available from on-site excavation, then provide that material from approved sources.

2.1.2.2 General Site Fill, Backfill and Embankment Material

Provide a soil material from the borrow area that can be readily compacted to the specified densities. Materials shall be classified as GP, GM, GC, SP, SM, or SC by ASTM D 2487.

2.1.2.3 Working Platform

Material and thicknesses of working platform for support of construction equipment shall [be as indicated] [be at the discretion of the construction contractor]. The gradation and placement of such material shall not create large void spaces upon which overlying work is indicated to be placed.

2.1.2.4 Borrow

Provide materials meeting requirements for general site fill and general backfill. Obtain borrow materials in excess of those furnished from excavations described herein from borrow areas indicated.

2.2 FILTER FABRIC

Provide a pervious sheet of polyester, nylon, glass or polypropylene filaments woven, spun bonded, fused, or otherwise manufactured into a nonraveling fabric with uniform thickness and strength. The fabric shall have the following manufacturer certified minimum average roll properties as determined by ASTM D 4759:

	Class A	Class B
Grab tensile strength (ASTM D 4632) machine and transversed direction	min. 180	80 lbs
Grab elongation (ASTM D 4632) machine and transverse direction	min. 15	15 percent
Puncture resistance (ASTM D 4833)	min. 80	25 lbs
Mullen burst strength (ASTM D 3786)	min. 290	130 psi
Trapezoidal tear strength (ASTM D 4533)	min. 50	25 lbs

2.3 SUBSURFACE DRAIN PIPE

Type and size indicated conforming to the requirements specified below:

2.3.1 Clay Pipe and Perforated Clay Pipe

2.3.1.1 Clay Pipe

Standard or extra-strength as indicated and shall conform to ASTM C 700.

2.3.1.2 Perforated Clay Pipe

Standard or extra-strength and shall conform to ASTM C 700. Plain-end pipe conforming to the strength and perforation requirements of ASTM C 700 will also be acceptable if provided with spring wire clips of approved type to maintain a taut but elastic joint between the sections of pipe when laid. Clips shall be constructed of not smaller than No. 9 hard-drawn or oil-tempered steel wire conforming to ASTM A 227/A 227M or ASTM A 229/A 229M and shall be coated with an approved rust preventive coating. Wire clips shall withstand 25 cycles of alternate loading and unloading using a stressing force of 125 pounds. The permanent set resulting from this test shall be less than 5 percent, based on the original length of the fastener.

2.3.2 Concrete Pipe, Porous and Perforated Concrete Pipe

2.3.2.1 Concrete Pipe

Class 1, 2, or 3 as indicated and shall conform to ASTM C 14.

2.3.2.2 Porous Concrete Pipe

Conform to ASTM C 654, standard or extra strength as indicated.

2.3.2.3 Perforated Concrete Pipe

Conform to ASTM C 444, Type [I] [II] perforations and to ASTM C 14, Class 1, 2 or 3 as indicated.

2.3.3 Plastic Pipe

2.3.3.1 Polyvinyl Chloride (PVC) Solid Wall Pipe and Fittings

ASTM F 758, type PS 46, with solvent cement joints made in accordance with ASTM D 2855. ASTM F 402 for safe handling of solvent cement.

2.3.3.2 Polyvinyl Chloride (PVC) Perforated Pipe and Fittings

ASTM F 758 with 3/8 inch maximum diameter holes, 3 1/4 inches on center. Diameter of pipe shall be as shown on the drawings. Make solvent cement joints in accordance with ASTM D 2855. ASTM F 402 for safe handling of solvent cement.

2.3.4 Drain Tile

Clay drain tile shall conform to ASTM C 4 standard, extra-quality, or heavy-duty as indicated. Concrete drain tile shall conform to ASTM C 412 standard, extra, heavy-duty extra, or special quality as indicated.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Shoring and Sheeting

Provide shoring and sheeting where required. In addition to Section 25 A and B of COE EM-385-1-1, and other requirements of this contract meet the following:

a. Prevent undermining of pavements, foundations and slabs.

b. Slope banks where space permits.

c. Where shoring and sheeting materials remain in place in completed work to prevent settlements or damage to adjacent structures or as directed, backfill the excavation to 3 feet below the finished grade and remove the remaining exposed portion of the shoring before completing the backfill.

3.1.2 Drainage and Dewatering

Plan for and provide the structures, equipment, and construction for the collection and disposal of surface and subsurface water encountered in the course of construction.

3.1.2.1 Drainage

Dispose of surface water which may accumulate in open excavations,

unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces. Surface dewatering plan shall include rerouting of any storm water runoff or natural drainage if necessary and shall comply with requirements specified in Section 01575, "Temporary Environmental Controls." Collect and dispose of surface and subsurface water encountered in the course of construction.

3.1.2.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing or excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, he water level shall be maintained continuously, at least 0.6 1 foot below the working level.

3.1.3 Protection and Restoration of Surfaces

Protect newly graded areas from traffic, erosion, and settlements. Repair and reestablish damaged or eroded slopes, elevations or grades and restore surface construction prior to acceptance. Conduct work in accordance with requirements specified in Section 01575, "Temporary Environmental Controls."

3.1.3.1 Disposal of Excavated Material

Dispose of excavated material in such a manner that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of facilities, or be detrimental to the completed work.

3.2 EXCAVATION

Excavate to contours and dimensions indicated. Keep excavations free from water while construction is in progress. Notify the Contracting Officer immediately in writing in the event that it becomes necessary to remove rock, hard material, or other material defined as unsatisfactory to a depth greater than indicated and an adjustment in contract price will be considered in accordance with the Contract clause entitled "Differing Site Conditions." Refill excavations cut below the depths indicated with general backfill and compact as specified herein. Excavate soil disturbed or weakened by construction operations or soils soften from exposure to weather. Refill with general backfill and compact as specified herein.

3.2.1 Subsurface Drain Trenches

Excavate in accordance with lines, grades, and sections indicated.

3.2.2 Shoring and Sheeting

Shore and sheet excavations as described in the submitted plan, with various members sized and arranged to prevent injury to persons and damage to structures. Also arrange shoring and sheeting to preclude injurious caving during removal.

3.3 BORROW MATERIALS

Select borrow materials to meet requirements and conditions of the particular fill or backfill materials to be used. Perform necessary clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits as incidental operations to the borrow excavation. Obtain borrow materials from sources within the limits of Government property as indicated. No borrow shall be obtained within the limits of the project site.

3.3.1 Borrow Pits

Excavate borrow pits to afford adequate drainage. Overburden and other soil material shall be stockpiled for refilling the borrow area as required.

3.4 FILLING AND BACKFILLING

3.4.1 Subgrade Preparation

Scarify the underlying subgrade surface to a depth of 6 inches before the fill is started. Step, bench, or break up sloped surfaces steeper than one vertical to 4 horizontal so that the fill material will bond with or be securely keyed to the existing material. Scarify existing surface to a minimum depth of 6 inches if subgrade density is less than the degree of compaction specified and recompact. When the subgrade is part fill and part excavation or natural ground, scarify the excavated or natural ground portion to a depth of 6 inches and recompact as specified for the adjacent or overlying fill. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.

3.4.2 Fill and Backfill Beside Structures

Place required backfill material adjacent to structures and compact in a manner that prevents wedging action or eccentric loading upon or against the structures. Step or serrate slopes bounding or within areas to be backfilled to prevent sliding of the fill. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Do not place material on surfaces that are muddy, frozen, or contain frost. Do not use equipment for backfilling operations or for the formation of embankments against structures that will overload the structure. Backfilling against concrete will be done only after approval has been obtained from the Contracting Officer.

3.4.3 General Fill and General Backfill

Construct fill, backfill and embankment at the locations and to lines and grades indicated. Use only approved materials in constructing fill on the prepared subgrade. Place satisfactory material in horizontal lifts not exceeding 8 inches in loose depth. Do not place material on surfaces that are muddy, frozen, or contain frost. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Compact each lift as specified before placing the overlaying lift.

3.4.4 Final Backfill for Utilities

Construct backfill (final backfill) for storm drains, manholes, utility lines, and other utility appurtenances using the material and compaction requirements specified herein for the adjacent or overlying work. Bedding and initial backfill requirements are specified in Section 02302, "Excavation, Backfilling, and Compacting for Utilities." Backfilling against concrete will be done only after the concrete has attained its 28-day compressive strength.

3.4.5 Fill for Subsurface Drains

Install drain and construct filter of granular fill as indicated and as described below using materials specified herein. Place granular fill in 6 inch lifts and tamp or vibrate firmly. Place final backfill in trench in 6 inch lifts and compact as specified herein for adjacent or overlying work.

a. Perforated or Slotted Wall Pipe: Place granular material as the pipe is laid and extend it for a minimum of one pipe diameter on each side of and 18 inches above the top of the pipe.

b. Open-Joint Pipe: Place both types of granular material as the pipe is laid. Place Type I material so as to provide a total fill extending at least one pipe diameter on each side of and 18 inches above the top of the pipe. Place filter fabric on top of the granular fill before continuing with the backfill.

c. Subsurface Drain Fill Using Filter Fabric: Provide a layer of filter fabric around the perimeter of the drainage trench allowing sufficient fabric on top to provide an overlap of at least three pipe diameters. All fabric joints placed on the side of the drainage trench shall have the inside layer of filter fabric facing down. Wrap the perforated pipe with one layer of filter fabric overlapping 6 inches at the longitudinal fabric joint. Place filter fabric around the pipe so that at the overlap the outer layer of fabric is facing down and in direct contact with the inner layer of fabric and the pipe. Obtain approval of filter fabric installation before placing fill. Place fill in a manner to prevent fabric damage or displacement.

3.4.6 Weather Limitations

Fill and backfill shall not be constructed when weather conditions detrimentally affect the quality of the finished course. Place fill and backfill only if the atmospheric temperature is above freezing in the shade and is rising. Do not construct fill and backfill in the rain or on saturated subgrades. If weather conditions are windy, hot or arid, with high rate of evaporation, schedule the placement in cooler portions of the day and furnish equipment to add moisture to the fill or backfill during and after placement.

3.5 INSTALLATION OF PIPE FOR SUBSURFACE DRAINS

3.5.1 Pipelaying

Do not lay damaged or defective pipe. Laying of pipe shall proceed upgrade beginning at lower end of the pipeline. Pipe shall not be laid in water or when the trench conditions or weather is unsuitable for such work. Remove water from trenches by sump pumping or other approved methods. Lay pipe to the grades and alignment as indicated. Bed pipe to the established gradeline. Orient perforations on the bottom half of the pipe. Lay bell-and spigot or tongue-and-groove type pipe with the bell or groove end

upstream. Obtain approval for pipe in place before backfilling.

3.5.2 Jointing

3.5.2.1 Nonperforated Concrete and Clay Pipe

Lay pipe with 1/8 to 1/4 inch openings between ends of pipe, or as required by spacing lugs constructed in the pipe. Place mortar in the joint at three points and pressed firmly into place to hold the pipe securely in line. Mortar shall be the full depth of the bell or groove and approximately one inch in width, and shall be located at the third points around the joint with the top point at the center of the pipe. Inside of pipe shall be free of excess mortar.

3.5.2.2 Perforated Concrete and Clay Pipe

Lay pipe with closed joints with positive provision for centering each section of the pipe in the bell or groove of the previously placed section. Plain-end perforated clay pipe sections shall be securely fastened together with spring wire clips furnished by the pipe manufacturer.

3.5.2.3 Porous Concrete Pipe

Installed with mortar joints.

3.5.2.4 Poly(Vinyl Chloride) (PVC) Pipe

Joints shall be in accordance with the requirements of ASTM D 3212.

3.5.2.5 Drain Tile

Bed as provided for bell-and-spigot or tongue-and-groove types of pipe and lay with open joints of approximately 1/8 inch width but not over 1/4 inch width. Protect drain tile against the entrance of filter material into the line by the use of filter fabric, burlap, or a special graded granular filter material.

3.6 SUBGRADE FILTER FABRIC

Place synthetic fiber filter fabric as indicated directly on prepared subgrade free of vegetation, stumps, rocks larger than 2 inches diameter and other debris which may puncture or otherwise damage the fabric. Repair damaged fabric by placing an additional layer of fabric to cover the damaged area a minimum of 3 feet overlap in all directions. Overlap fabric at joints a minimum of 3 feet. Obtain approval of filter fabric installation before placing fill or backfill. Place fill or backfill on fabric in the direction of overlaps and compact as specified herein. Follow manufacturer's recommended installation procedures.

3.7 BORROW

Strip the top 12 inches of soil material from designated borrow area and stockpile. After removal of the borrow material and depositing of any approved waste soil material, regrade the borrow pit using stockpiled soil materials. Shape surface to contours which provide positive drainage and which will blend in with the adjacent topography. Maximum side slopes shall be two horizontal to one vertical.

3.8 COMPACTION

Compact each layer or lift of material specified so that the in-place density tested is not less than the percentage of maximum density specified in Table III.

TABLE III

	Percent ASTM D 1557 Maximum Density	
	Cohesive Material	Cohesionless Material
Fill, Embankment and Backfill		
General Fill and General Backfill under steps and parking lots	90	95
General Fill and General Backfill under sidewalks and grassed areas	85	90
General Backfill and General Fill beside structures	90	95
Subgrade (Top of fill, backfill or cut)		
Under building slabs, steps and parking lots, top 12 inches	93	98

3.9 FINISH OPERATIONS

3.9.1 Site Grading

Grade to finished grades indicated within 0.10 foot. Grade areas to drain water away from structures. Existing grades which are to remain but are disturbed by the Contractor's operations shall be restored.

3.9.2 Finishing Subgrades Under Structures and Pavements

Finish surface of top lift of fill or top of subgrade to the elevation and cross section indicated. Finished surface shall be smooth and of uniform texture. Lightly scarify or blade the finished surface to bring the finished surface to within 0.05 foot of the indicated grade and to eliminate imprints made by compaction and shaping equipment. Surface shall show no deviations in excess of 3/8 inch when tested with a 10 foot straightedge.

3.9.3 Borrow Areas

Excavation and backfilling of borrow pit shall ensure proper drainage. Maintain and restore borrow pits as specified in Section 01575, "Temporary Environmental Controls."

3.9.4 Disposition of Surplus Material

Surplus or other soil material not required or suitable for filling, backfilling, or embankment shall be wasted by disposition in the area directed by the Contracting Officer."

3.9.5 Protection of Surfaces

Protect newly graded areas from traffic, erosion, and settlements that may occur and as required in the Section 01575, "Temporary Environmental Controls" and as specified in the paragraph entitled "Protection and Restoration of Surfaces." Repair or reestablish damaged grades, elevations, or slopes prior to acceptance of work.

3.10 FIELD QUALITY CONTROL

3.10.1 Sampling

Furnish one 50 pound composite sample for each 1000 1000 cubic yards of subgrade being compacted and fill material being placed. Submit samples, in the number directed, whenever the source or character of the fill, backfill, or embankment material changes. Contain each sample in a clean container and fasten to prevent loss of material. Tag each sample for identification. Tag shall contain the following information:

Contract No. _____
Sample No. _____
Date of Sample _____
Sampler _____
Source _____
Intended Use _____

3.10.2 Tests

Test fill and backfill using ASTM C 136 for conformance to ASTM C 33, and ASTM D 2487 gradation limits. Test fill and backfill for material finer than the No. 200 sieve using ASTM D 1140. Test fill and backfill for liquid limit and plasticity index using ASTM D 4318. Test fill, backfill, and subgrade in cut materials for moisture density relations using ASTM D 1557. Test fill and backfill for permeability in accordance with ASTM D 2434. Perform one of each of the required tests for each material used when directed. Provide additional tests as specified above for each source change. Perform density tests in randomly selected locations using ASTM D 1556 as follows: one test per 18,000 square feet in each layer of lift 500 cubic yards placed 1,000 square yards subgrade in cut. Determine moisture content of soil material in place at every location where in-place density is tested. Where ASTM D 2922 and ASTM D 3017 are used to test field compaction densities, verify the results of the tests by performing at least one test per day using ASTM D 1556 at a location already tested by ASTM D 2922 and at least one additional test using ASTM D 1556 for every 10 tests performed with a nuclear device, also at locations already checked by ASTM D 2922.

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GRADED CRUSHED AGGREGATE BASE COURSE FOR FLEXIBLE PAVEMENT

03/98

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SECTION 02722

GRADED CRUSHED AGGREGATE BASE COURSE FOR FLEXIBLE PAVEMENT
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PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 29/C 29M	(1991; Rev. A) Unit Weight and Voids in Aggregate
ASTM C 117	(1995) Materials Finer than 75-Micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996; Rev. A) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft (2,700 kN-m/m))
ASTM D 1883	(1994) CBR (California Bearing Ratio) of Laboratory-Compacted Soils
ASTM D 2217	(1985; R 1993) Wet Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1996) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1995; Rev. A) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

1.2.1 SD-11 Factory Test Reports

a. Gradation

b. Bearing ratio

c. Liquid limit

d. Plasticity index

e. Percentage of wear

f. Density

1.2.2 SD-12 Field Test Reports

a. Gradation

b. Smoothness

c. Density

d. Thickness

1.3 DELIVERY AND STORAGE

Inspect materials delivered to site for damage and store as to prevent segregation and contamination.

1.4 WEATHER LIMITATIONS

Do not construct base course when atmospheric temperature is below 35 degrees F or when rainfall or other weather conditions detrimentally affect the quality of the finished course.

1.5 CONSTRUCTION EQUIPMENT

Equipment shall be dependable and adequate for the purpose intended. Maintain equipment in satisfactory and safe operating condition. Subject to approval, special equipment dictated by local conditions may be used. Calibrated equipment, such as scales, batching equipment, spreaders, and similar items, shall have been recalibrated by a State calibration laboratory within 12 months of commencing work.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aggregates

Consist of durable and sound crushed gravel, crushed stone, or crushed slag, free of lumps or balls of clay or other objectionable matter. Crushed stone and gravel shall be free from flat, elongated, soft, or disintegrated pieces. Crushed gravel retained on a No. 4 sieve shall have at least 90 percent by weight with at least two fractured faces and 100 percent by weight with at least one fractured face. Base course materials samples shall have a bearing ratio of at least 100 as determined by laboratory tests on a 4-day soaked specimen in accordance with ASTM D 1883; compact specimen in accordance with ASTM D 1557, Method D. Determine grain size in accordance with ASTM C 136 and amount of material finer than 200 mesh sieve

in accordance with ASTM C 117. Aggregate, other than slag, shall have a percentage of wear not exceeding 40 when tested in accordance with ASTM C 131, Grading A. Slag shall be an air-cooled, blast furnace product having a dry weight of not less than 65 pounds per cubic foot when tested in accordance with ASTM C 29/C 29M and shall consist of angular fragments uniform in density and quality, reasonably free from thin, elongated pieces, dirt, or other objectionable material. Soil binder material, that portion of material passing the No. 40 sieve, shall be of such composition that the composite material conforms to the requirements specified herein. The base course shall be of such nature that it can be compacted readily with watering and rolling to a firm, stable base and shall conform to one of the following sizes:

Percentage by Weight Passing
Square Mesh Laboratory Sieves

	Size Numbers		
Sieves	1	2	3
2 inch	100	-	-
1 1/2 inch	70-100	100	-
1 inch	45-80	60-100	100
1/2 inch	30-60	30-65	40-70
No. 4	20-50	20-50	20-50
No. 10	15-40	15-40	15-40
No. 40	5-25	5-25	5-25
No. 200	0-10	0-10	0-10

That portion of the material passing the No. 40sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than 5 as determined by ASTM D 4318. Prepare samples in accordance with ASTM D 2217, Procedure A.

PART 3 EXECUTION

3.1 BASE COURSE

Construct the graded aggregate base course on a prepared subgrade, as indicated. Provide line and grade stakes for control. Place grade stakes in lanes parallel to the centerline of areas to be paved and space for string lining or other control methods. The base course shall consist of aggregate processed, deposited, spread, and compacted on a prepared surface. The Contractor shall be responsible for protection of completed areas against detrimental effects. Recondition, reshape, and recompact areas damaged by freezing, rainfall, or other weather conditions.

3.2 MIXING OF MATERIALS

Mix aggregates in a stationary or traveling plant. Proportion aggregates by weight or volume in such quantities that specified gradation, liquid limit, and plasticity index requirements are met after the base course has been placed and compacted. Incorporate, during the mixing operation, water in quantities sufficient to provide the necessary moisture content for the specified compaction. Mixing operations shall produce satisfactory uniform blending and the method of discharging into trucks shall not produce segregation.

3.3 PLACING

Do not dump mixed materials in piles, but place on prepared subgrade or subbase in layers of uniform thickness with a spreader. When a compacted course 6 inches in thickness is required, place material in a single layer. When a compacted course in excess of 6 inches is required, place material in layers of equal thickness. Do not exceed 6 inches or have less than 3 inches in thickness for any compacted layer. Place layers so that when compacted, they will be true to grades or levels required with the least possible surface disturbance. Where the base course is constructed in more than one layer, clean previously constructed layers of loose and foreign matter. Maintain material water content during the placing period to obtain the compaction specified. Make adjustments in placing procedures or equipment to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to insure a satisfactory base course.

3.3.1 Stationary-Plant Method

Mix aggregates, binder material and water until a uniform homogeneous mixture is obtained. Do not dump materials in piles; place in layers of essentially uniform thickness, not to exceed 6 inches after compaction, by an approved spreader. Tail gate spreading will be acceptable only with permission, under conditions such as where space limitations prohibit use of the spreader.

3.3.2 Windrow Traveling-Plant Method

Place aggregates and binder materials in windrows of such cross section and proportions that, when picked up, mixed, and redeposited in windrows, the finished mixture shall conform to the specified requirements. Do not exceed the rated capacity of the traveling plant with the size of the windrow of the combined materials. Add water, in quantity sufficient to provide the necessary moisture content for compacting, to the aggregates at the time of mixing. Mix materials uniformly by the traveling plant, deposit in windrows of uniform cross section, and spread in a layer of uniform thickness to the required contour and grades.

3.4 COMPACTING AND FINISHING

Immediately following the placing, spread the finished mixture uniformly in a layer and bring to optimum moisture content. The loose thickness and the surface of the layer shall be such that the specified density and the required thickness shall be obtained after compaction. Compact the layer with steel-faced, vibrating or pneumatic-tired rollers, or other suitable compacting equipment or combinations thereof. Continue compacting until the layer is compacted through the full depth to a field density of at least 100 percent of the maximum density at optimum moisture content tested in accordance with ASTM D 1556 and/or ASTM D 2922 and ASTM D 3017. In areas not accessible to rollers or compactors, compact the mixture with mechanical hand tampers. If the mixture is excessively moistened by rain, aerate by blade graders, or other suitable equipment. Aerate until the moisture content of the material is that needed to obtain the required density. Finish the surface of the layer by a combination of rolling and blading. Final surface shall be smooth and free from waves, irregularities, and ruts or soft yielding spots.

3.5 FINISHING AT EDGES OF BASE COURSE

Place earth or other approved materials along the edges of the base course in such quantity that it will compact to the thickness of the course being constructed. When the course is being constructed in two or more layers,

place material to the thickness of each layer. In each operation, allow at least a one foot width of the shoulder to be rolled and compacted simultaneously with the rolling and compacting of each layer.

3.6 FIELD QUALITY CONTROL

Approve materials and material sources in advance of the use of such materials in the work. Replace base where samples are removed.

3.6.1 Sampling

3.6.1.1 Aggregates at the Source

Prior to production and delivery of aggregates, take at least one initial sample in accordance with ASTM D 75. Collect each sample by taking three incremental samples at random from the source material to make a composite sample of not less than 50 pounds. Repeat above sampling when source of material is changed or when unacceptable deficiencies or variations from specified grading of materials are found in testing.

3.6.1.2 During Construction

Take one random sample from each 1000 tons of completed course material, but not less than one random sample per day's run. Take samples in accordance with ASTM D 75.

3.6.1.3 Sample Identification

Place each sample in a clean container, securely fastened to prevent loss of material. Tag each sample for identification and with the following information:

Contract No._____
Sample No._____ Quality _____
Date of Sample_____
Sampler_____
Source_____
Intended Use_____
For Testing_____

3.6.2 Testing

3.6.2.1 Aggregates

Test each sample of base course material without delay. Make gradation tests from each sample in accordance with ASTM C 136. Make sieve analysis on material passing the No. 200 sieve in accordance with ASTM C 117.

3.6.2.2 Smoothness Tests

Test with a 10 foot straightedge, applied parallel with and at right angles to the center line of the paved area. Correct deviations in the surface in excess of 3/8 inch by loosening, adding or removing material, reshaping, watering, and compacting. The smoothness requirements specified herein apply only to the top layer when base course is constructed in more than one layer.

3.6.2.3 Field Density Tests

ASTM D 1556 or ASTM D 2922 and ASTM D 3017. Take one test for each 500

square yards of each layer of base course.

3.6.2.4 Laboratory Density Tests

In accordance with ASTM D 1557, Method D.

3.6.2.5 Thickness Tests

Measure thickness of base course at intervals such that there will be a depth measurement for at least each 500 square yards of complete base course. Make depth measurements by test holes, at least 3 inches in diameter, through the base course. Where base course deficiency is more than 1/2 inch, correct by scarifying, adding mixture of proper gradation, reblading, and recompacting. Where the measured thickness is more than 1/2 inch thicker than indicated, consider it as the indicated thickness plus 1/2 inch for determining the average. The average thickness is the average of the depth measurements and shall not underrun the thickness indicated.

3.7 MAINTENANCE

After construction is completed, maintain the base course throughout, except where portion of the succeeding course is under construction thereon. Maintenance includes drainage, rolling, shaping, and watering, as necessary, to maintain the course in proper condition. Correct deficiencies in thickness, composition, construction, smoothness, and density, which develop during the maintenance, to conform to the requirements specified herein. Maintain sufficient moisture by light sprinkling with water at the surface to prevent a dusty condition.

-- End of Section --

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SECTION 02741

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09/98

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-- End of Section Table of Contents --

SECTION 02741

BITUMINOUS CONCRETE PAVEMENT
09/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T30	(1993) Mechanical Analysis of Extracted of Aggregate
AASHTO T230	(1968; R 1993) Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1559	(1989) Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
ASTM D 2172	(1995) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D 2950	(1991) Density of Bituminous Concrete in Place by Nuclear Methods

STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, STANDARD SPECIFICATION

1.2 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

1.2.1 SD-08 Statements

a. Asphalt mix delivery record

b. Asphalt concrete and material sources

1.2.1.1 Mix Delivery Record Data

Record and submit the following information to each load of mix delivered to the job site. Submit within one day after delivery on Government-furnished forms:

a. Truck No:

b. Time In:

c. Time Out:

d. Tonnage and Discharge Temperature:

e. Mix Type:

f. Location:

g. Stations Placed:

1.2.1.2 Materials

Obtain approval of the Contracting Officer for materials and material sources 2 days prior to the use of such material in the work.

1.2.2 SD-11 Factory Test Reports

a. Trial batch reports

b. Mix design

1.2.2.1 Trial Batch

Submit current bituminous design reports for all mix types proposed for use on the project.

1.2.2.2 Mix Design

Submit results of laboratory tests performed on each mix design. Testing shall have been accomplished not more than one year prior to date of material placement.

1.2.3 SD-12 Field Test Reports

a. Asphalt concrete

b. Density

c. Thickness

d. Straightedge test

Submit reports for testing specified under paragraph entitled "Field Quality Control."

1.2.4 SD-13 Certificates

a. Asphalt concrete

Submit certificates, signed by the producer, that paving materials and incidental construction items conform to specification requirements.

1.2.5 SD-14 Samples

a. Uncompacted mix

b. Pavement cores

1.2.5.1 Uncompacted Mix

Submit 2 per day of each mix type. When two tests on uncompacted mix fail submit new trial batch for approval.

1.2.5.2 Pavement Cores

Submit 2 pavement cores when using the in-place nuclear density method.

1.3 QUALITY ASSURANCE

1.3.1 Regulatory Requirements

Provide work and materials in accordance with applicable requirements of State of California, Department of Transportation, Standard Specifications.

1.3.2 Modification of References

Where term "Engineer" is used in State of California, Department of Transportation, Standard Specifications it shall be construed to mean Contractor's Quality Control representative. Where term "state" is used, it shall mean "Federal Government".

PART 2 PRODUCTS

2.1 ASPHALT CONCRETE

Provide asphalt concrete in accordance with the applicable requirements of the State of California, Department of Transportation, Standard Specifications, except where specified otherwise. Asphalt concrete shall conform to Caltrans Type A, grade 3/4 inch maximum.

2.2 SUBBASE

Requirements for subbase is identified in Section 02301, "Earthwork for Structures and Pavements."

2.3 BASE COURSE

Requirements for Base Course is specified in Section 02722, "Graded Crushed Aggregate Base Course for Flexible Pavement."

PART 3 EXECUTION

3.1 CONSTRUCTION

Provide construction in accordance with the applicable requirements of the State of California, Department of Transportation, Standard Specifications, except where indicated or specified otherwise.

3.2 FIELD QUALITY CONTROL

Sample shall be taken by Contractor as specified herein. Contractor shall replace pavement where sample cores have been removed.

3.2.1 Sample and Core Identification

Place each sample and core in a container and securely seal to prevent loss of material. Tag each sample for identification. Tag shall contain the following information:

a. Contract No.

b. Sample No.

c. Quantity

d. Date of Sample

e. Sample Description

f. Source/Location/Stations Placed/depth below the finish grade

g. Intended Use

h. Thicknesses of various lifts placed

3.2.2 Testing

3.2.2.1 Bituminous Mix Testing

Take two samples per day per mix type at plant or from truck. Test uncompacted mix for extraction in accordance with ASTM D 2172 and sieve analysis in accordance with AASHTO T30. Test samples for stability and flow in accordance with ASTM D 1559. When two consecutive tests fail to meet requirements of specifications, cease placement operations and test a new trial batch prior to resumption of placement operations.

3.2.2.2 Testing of Pavement Course

a. Density: Determine density of pavement by testing cores obtained from the binder and wearing course in accordance with AASHTO T230. Take three cores at location designated by Contracting Officer for each200 tons, or fraction thereof, of asphalt placed. Deliver cores undisturbed and undamaged to laboratory and provide test results within 48 hours of each day placement of paving materials.

b. Thickness: Determine thickness of the binder and wearing course from cores taken for density test.

c. Straightedge Test: Test compacted surface of binder course and wearing course with a straightedge as work progresses. Apply straightedge parallel with and at right angles to center line after final rolling. Variations in the binder course surface shall not be more than 1/4 inches from the lower edge of the 10 foot straightedge; variations in wearing course surface shall not be more than 1/4 inch from the lower edge of the 10 foot straightedge. Pavement showing irregularities greater than that specified shall be corrected as directed by Contracting Officer.

3.2.2.3 Alternate Testing Method for Pavement Courses

At Contractor's option the following in-place testing method may be used to determine density and thickness in lieu of testing specified above. Frequency of testing shall be the same. When in-place nuclear method to determine density is used, take two pavement cores at locations designated by Contracting Officer and turn over to Government to verify pavement thickness.

a. Density: Determine density of pavement by in-place testing using Nuclear Method in accordance with ASTM D 2950.

b. Thickness: Determine thickness of finished pavement by use of following equation:

$$t = \frac{W}{0.75d}$$

Where t= pavement thickness, in inches.
W= average weight per square yard of mixture actually used in work.
d= compacted density as measured by nuclear density device.

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SECTION 03300

CAST-IN-PLACE CONCRETE

09/98

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SECTION 03300

CAST-IN-PLACE CONCRETE
09/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 301	(1996) Structural Concrete for Buildings

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 497	(1997) Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
ASTM A 615/A 615M	(1996; Rev. A) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 31/C 31M	(1996) Making and Curing Concrete Test Specimens in the Field
ASTM C 94	(1997) Ready-Mixed Concrete
ASTM C 143	(1990; Rev. A) Slump of Hydraulic Cement Concrete
ASTM C 172	(1997) Sampling Freshly Mixed Concrete
ASTM C 309	(1997) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 1107	(1997) Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

1.2 SUBMITTALS

Submit the following in accordance with section entitled "Submittal Procedures."

1.2.1 SD-06 Instructions

a. Liquid Membrane-Forming Compounds

1.2.2 SD-12 Field Test Reports

a. Compressive strength tests

1.2.3 SD-13 Certificates

a. Concrete

Provide the dry weight of cement, saturated surface-dry-weights of fine and coarse aggregate and quantities, type, and name of admixtures and of water (per cubic yard of concrete used in the manufacture of each batch of concrete. Certify the concrete is proportioned to provide concrete of quality and strength specified for its intended purpose.

1.3 DELIVERY

Do not deliver concrete until forms, reinforcement and embedded items are in place and ready for concrete placement.

PART 2 PRODUCTS

2.1 READY-MIXED CONCRETE

ASTM C 94, Option A. Concrete shall have a 28-day compressive strength of 3000 psi. Slump shall be between 2 and 4 inches. Provide aggregate Size No.67, , normal weight concrete.

2.2 REINFORCEMENT

2.2.1 Reinforcing Bars

ASTM A 615/A 615M, Grade.

2.2.2 Welded Wire Fabric

ASTM A 497, galvanized.

2.3 MATERIALS FOR CURING CONCRETE

2.3.1 Impervious Sheeting

Waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.

2.3.2 Liquid Membrane-Forming Compounds

ASTM C 309, white-pigmented, Type 2, free of paraffin or petroleum.

2.4 MOISTURE BARRIER

Polyethylene sheeting, minimum 6 mil thickness, vapor permeance rating not exceeding 0.5 perms.

2.5 NONSHRINK GROUT

ASTM C 1107.

2.6 FORM MATERIALS

Provide metal, plywood, or hardboard forms capable of producing the required surface without adverse effect on concrete. Do not use form coating that adversely affects concrete surfaces or impairs subsequent applications to the concrete. Provide metal form ties, factory-fabricated, removable or snap-off type that will leave holes less than 1/4 inch deep and not more than one inch in diameter.

PART 3 EXECUTION

3.1 FORMS

ACI 301.

3.2 PLACING REINFORCEMENT

ACI 301. Provide bars, wire fabric, including wire ties, supports, and other devices necessary to install and secure the reinforcement.

3.3 SETTING MISCELLANEOUS MATERIAL

Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

3.4 INSTALLATION OF MOISTURE BARRIER

Provide beneath the on-grade concrete floor slab. Lap 4 inches minimum, and seal laps and patches with pressure-sensitive adhesive or tape 2 inches wide, minimum.

3.5 CONCRETE PLACEMENT

Deliver concrete from mixer to forms continuously until approved unit of operation is completed. Provide scaffolding, ramps and walkways so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Deposit concrete as close as possible to its final position in the forms. When a vertical drop greater than 8 feet is authorized, provide equipment to prevent segregation. Regulate depositing of concrete so that it will be consolidated in horizontal layers not more than 12 inches thick. Place slabs in one layer. Screed concrete to provide levels and profiles indicated.

3.6 CONSOLIDATION

Immediately after placing, consolidate each layer of concrete by internal vibrators, except for slabs 4 inches or less. Use vibrators adequate in effectiveness and number to properly consolidate the concrete; keep a spare vibrator at the jobsite during placing operations.

3.7 WEATHER LIMITATIONS

Use special protection measures as approved by Contracting Officer, when freezing temperatures are anticipated before expiration of the specified curing period. Temperature of concrete placed during warm weather shall not exceed 85 degrees F except where an approved retarder is used.

3.8 CONSTRUCTION JOINTS

Locate where indicated or approved. Where concrete work is interrupted by weather, end of work shift or other type of delay, location and type of construction joint shall be subject to approval of the Contracting Officer.

3.9 SURFACE FINISHES

ACI 301 for repair and finish. Slope floors uniformly to drains where drains are provided.

3.9.1 Broomed Finished

Provide for exterior walks, platforms, patios, and ramps, unless otherwise indicated. Provide a floated finish, then finish with a flexible bristle broom. Permit surface to harden sufficiently to retain the scoring or ridges. Broom transverse to traffic or at right angles to the slope of the slab.

3.9.2 Pavement Finish

Screed the concrete with a template advanced with a combined longitudinal and crosswise motion. Maintain a slight surplus of concrete ahead of the template. After screeding, float the concrete longitudinally. Use a straight edge to check slope and flatness; correct and refloat as necessary. Obtain final finish by belting. Lay belt flat on the concrete surface and advance with a sawing motion; continue until a uniform but gritty nonslip surface is obtained. Round edges and joints with an edger having a radius of 1/8 inch.

3.10 CURING AND PROTECTION

ACI 301. Preserve moisture, protect from temperature extremes, wind and rain, and from mechanical injury.

3.11 SETTING BASE PLATES AND BEARING PLATES

Clean and dampen concrete surface before grouting. Set plate or equipment base to line and elevation. Provide grout at least 3/4 inches thick. Surfaces in contact with grout shall be free of oil and grease.

3.12 FIELD QUALITY CONTROL

3.12.1 Sampling

ASTM C 172. Collect samples of fresh concrete to perform tests specified. ASTM C 31/C 31M for making test specimens.

3.12.2 Testing

3.12.2.1 Slump Tests

ASTM C 143. Take concrete samples during concrete placement. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 20 cubic yards (maximum) of concrete.

3.12.2.2 Temperature Tests

Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

-- End of Section --

APPENDIX E

TRENCH AND EXCAVATION PERMIT/ ACTIVITY NOTIFICATION FORM

DEPARTMENT OF INDUSTRIAL RELATIONS
DIVISION OF OCCUPATIONAL SAFETY AND HEALTH

No: **2001-903457**

PERMIT

Permit Issued To
(Insert Employer's Name, Address and Telephone No.)

Foster Wheeler Environmental Corp
1940 E Deere Ave Ste 200
Santa Ana CA 92705-5718

(949) 756-7500

No.
Date 12/23/2000
Region 4
District 4
Tel. (626) 472-0046

Type of Permit T1-ANNUAL TRENCH/EXCAVATION

Pursuant to Labor Code Sections 6500 and 6502, this Permit is issued to the above-named employer for the projects described below.

State Contractor's License Number	692232	Permit Valid through	December 31, 2001	
Description of Project	Location Address	City and County	Anticipated Dates	
			Starting	Completion
Various	Statewide		1/1/2001 or issue date whichever is later.	12/31/2001

This Permit is issued upon the following conditions:

1. That the work is performed by the same employer. If this is an annual permit the appropriate District Office shall be notified, in writing, of dates and location of job site prior to commencement.

2. The employer will comply with all occupational safety and health standards or orders applicable to the above projects, and any other lawful orders of the Division.

3. That if any unforeseen condition causes deviation from the plans or statements contained in the Permit Application Form the employer will notify the Division immediately.

4. Any variation from the specification and assertions of the Permit Application Form or violation of safety orders may be cause to revoke the permit.

5. This permit shall be posted at or near each place of employment as provided in 8 CCR 341.4

Received From	Received By	
...ger Margotto	Permit Unit	
☐ Cash	Amount	Date
☒ Check 2360	$100.00	12/23/00

Investigated by _____ Safety Engineer Date

Approved by Robert E Law 2/13/2001
District Manager/Permit Unit Date

State of California
Department of Industrial Relations
Division of Occupatonal Safety & Health

ACTIVITY NOTIFICATION FORM FOR HOLDERS OF ANNUAL PERMITS

Scaffolding Falsework Trenches/Excavations

8 CCR 341.1(f) REQUIRES HOLDERS OF ANNUAL PERMITS TO PROVIDE NOTIFICATION TO THE DOSH OFFICE NEAREST THE PROJECT PRIOR TO COMMENCEMENT OF ANY WORK. THIS FORM IS PROVIDED FOR YOUR CONVENIENCE TO USE FOR SUCH NOTIFICATION.

THIS FORM MAY BE FAXED TO THE NEAREST DOSH OFFICE TO COMPLY WITH THE ABOVE. **PLEASE DO NOT MAIL DUPLICATE NOTIFICATION TO FOLLOW-UP FAX NOTIFICATION.**

FAX DATA: FAXED TO _____ DOSH DISTRICT OFFICE ON _____

DOSH FAX NO. ( ) _____ BY _____

Company Name: _____ Field Phone: _____

Annual Permit Number: _____ Office Phone: _____

Issuing Region: _____ Issuing District: _____

Specific Activity Location: _____ Number of Employees: _____

Nearest Major Cross Street: _____ Starting Date: _____

City: _____ Anticipated Completion Date: _____

County: _____ High Voltage Lines in Proximity? No _____ Yes _____

INSTRUCTIONS: The appropriate item(s) must be completed and signed by a person knowledgeable about the project for each activity covered by a permit. Please fill in or check off the blanks where appropriate.

Scaffolding: Height _____ Metal _____ Wood _____ Wood over 60 Feet _____ Metal over 125 Feet _____

Metal>125 Feet or Wood>60 Feet requires design by California Registered Civil Engineer & Plans at Site.(See 8 CCR 1644(c)(7))

Description: _____

Falsework/Vertical Shoring: Maximum Height _____ Maximum Span _____ Material _____

Description: _____

(See 8 CCR 1717)

Trenches/Excavations: Depth Range(Min/Max) * _____ Width Range(Min/Max) _____ Total Length _____

Ground Protection Method: Shoring _____ Sloping _____ Trench Shield _____ Professional Engineer _____

Underground Services Alert(USA) Number _____ (NORTH 1-800-642-2444/SOUTH 1-800-422-4133)

Soil Analysis to be done? Yes _____ No _____ If No, You **Must** Slope 1.5 to 1.

Competent Person: The holder of an Annual Permit who is notifying the Distrtict of the commencement of a Trench and/or Excavation project shall designate a **competent person** in accordance with the requirements of 8 CCR Section 1504, 1541, and 1541.1.

Description: _____

*Ground protection methods for excavations deeper than 20 feet must be designed by a Registered Professional Engineer. See 8 CCR 1541.1, Appendix F.

I hereby certify that to the best of my knowledge the above information and assertions are true and correct and that I/the applicant have knowledge of and will comply with the foregoing.

Signature: _____

Title: _____ Date: _____

Cal/OSHA District Offices

DISTRICT	ADDRESS	TELEPHONE NUMBER	FAX NUMBER
Anaheim	2100 East Katella Avenue, Suite 140, Anaheim 92806	(714) 939-0145	(714) 939-0815
Concord	1465 Enea Circle, Bldg. E, Suite 900, Concord 94520	(925) 602-6517	(925) 676-0227
Foster City	1065 East Hillsdale Blvd., Suite 110, Foster City 94404	(650) 573-3812	(650) 573-3817
Fresno	2550 Mariposa Street, Room 4000, Fresno 93721	(559) 445-5302	(559) 445-5786
Los Angeles	320 West 4th Street, Room 850, Los Angeles 90013	(213) 576-7451	(213) 576-7461
Oakland	1515 Clay Street, Suite 1301, Oakland 94612	(510) 622-2916	(510) 622-2908
Pico Rivera	9459 East Slauson Avenue, Pico Rivera 90660	(562) 949-7827	(562) 949-9860
Sacramento	2424 Arden Way, Suite 165, Sacramento 95825	(916) 263-2800	(916) 263-2798
San Bernardino	464 West 4th Street, Suite 332, San Bernardino 92401	(909) 383-4321	(909) 383-6789
San Diego	7807 Convoy Court, Suite 140, San Diego 92111	(858) 637-5534	(858) 279-4658
San Francisco	455 Golden Gate Avenue, Room 1524, San Francisco 94102	(415) 703-5210	(415) 703-5231
San Jose	2010 North First Street, Suite 401, San Jose 95131	(408) 452-7288	(408) 452-7287
Santa Rosa	1221 Farmers Lane, Suite 300, Santa Rosa 95405	(707) 576-2388	(707) 576-2598
Torrance	680 Knox Street, Suite 100, Torrance 90502	(310) 516-3734	(310) 516-4253
Van Nuys	6150 Van Nuys Boulevard, Suite 405, Van Nuys 91401	(818) 901-5403	(818) 901-5578
Ventura	1655 Mesa Verde, Room 150, Ventura 93003	(805) 654-4581	(805) 654-4852
West Covina	1906 W. Garvey Ave. South, Suite 200, West Covina 91790	(626) 472-0046	(626) 472-7708

Cal/OSHA Field Offices

[1]Chico	1367 East Lassen Avenue, Suite B-4, Chico 95973	(530) 895-4761	(530) 895-6941
[1]Eureka	619 Second Street, Room 109, Eureka 95501	(707) 445-6611	
[2]Modesto	1209 Woodrow, Suite C-4, Modesto 95350	(209) 576-6260	(209) 576-6191
[1]Redding	381 Hemsted Drive, Redding 96002	(530) 224-4743	(530) 224-4747

[1] Field office of Sacramento District.
[2] Field office of Concord District.

APPENDIX F

PRE-CONSTRUCTION INVESTIGATION FINDINGS

Southwest Division
Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Building 127, Room 112
San Diego, California 92132-5190

CONTRACT NO. N44255-95-D-6030
DO NO. 0094

APPENDIX F

FINAL

PRE-CONSTRUCTION INVESTIGATION FINDINGS

Revision 0
July 11, 2001

UNDERGROUND FUEL OIL PIPING AND TPH CONTAMINATED SOIL REMOVAL

MARE ISLAND ELEMENTARY SCHOOL AT THE FORMER MARE ISLAND NAVAL SHIPYARD VALLEJO, CALIFORNIA

DCN: FWSD-RACII-01-0262

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ABBREVIATIONS AND ACRONYMS

bgs	below ground surface
DECON	DECON Environmental Services
DO	Delivery Order
EFANW	Engineering Field Activities Northwest
FWENC	Foster Wheeler Environmental Corporation
KSR	Kister, Savio, & Rei
MINS	Mare Island Naval Shipyard
NORCAL	NORCAL Geophysical Consultants
PID	photoionization detector
RAC	Remedial Action Contract
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
SS	Site Superintendent
SWDIV	Southwest Division Naval Facilities Engineering Command
UST	underground storage tank

1.0 INTRODUCTION

This report describes the results of a geophysical survey, land survey, and exploratory excavation conducted on and adjacent to the Mare Island Elementary School at the former Mare Island Naval Shipyard (MINS), Vallejo, California on April 5, 6, and 10, 2001. The purpose of this investigation was to determine the locations of underground utilities and any remaining underground fuel oil pipelines that were abandoned in-place in the vicinity of the Mare Island Elementary School. The findings from these preliminary investigation activities will be incorporated in the development of the overall Work Plan for the removal of the abandoned pipelines and TPH contaminated soils. This report is included as Appendix F to the overall Work Plan for the subject project.

The geophysical survey was performed by NORCAL Geophysical Consultants (NORCAL), the land survey was performed by Kister, Savio, & Rei (KSR), and the exploratory excavation was performed by DECON Environmental Services (DECON). All of the subject work was performed under the direction and supervision of Foster Wheeler Environmental Corporation (FWENC), for the Southwest Division Naval Facilities Engineering Command (SWDIV), under Delivery Order (DO) No. 0094, issued under Engineering Field Activities Northwest Remedial Action Contract (EFANW RAC II) N44255-95-D-6030.

The Remedial Project Manager (RPM), Duane Rollefson, the Resident Officer in Charge of Construction (ROICC), Izzat Ahmadiyya, the Site Superintendent (SS), Sean Delaney, and representatives from the three subcontractors were all on-site for the commencement of the site activities.

1.1 OBJECTIVE

Site activities were completed in accordance with the Pre-Construction Work Plan titled *Geophysical Survey, Land Survey and Mapping, and Exploratory Excavation, Revision 0, March 20, 2001.*

The objective was to field locate the underground fuel lines that have been abandoned in-place as well as any underground utilities that could affect the site work. The presumed locations of the abandoned pipelines of concern are described in the Pre-Construction Work Plan as well as the main body of the overall Work Plan for this project. The project activities took place on or adjacent to the elementary school grounds.

Three main activities were conducted as part of this initial reconnaissance phase of the project:

- Geophysical Survey

  Objective: Utilizing non-intrusive techniques, field-locate, mark, and map the abandoned fuel lines and other utilities or obstructions that could interfere with intrusive site work.

- Land Survey

  Objective: Prepare a site map incorporating key topographic features as well as subsurface features from the geophysical survey.

- Exploratory Excavation

  Objective: Verify the existence and location of the 10-inch fuel line that appears to have run underneath Building 2001.

2.0 INVESTIGATION FINDINGS

2.1 GEOPHYSICAL SURVEY

The geophysical survey began on the morning of April 5, 2001. NORCAL first completed a survey of the sandbox area where the exploratory excavation was to be performed. The results showed no findings of underground utilities or fuel oil pipelines in this area. Once this was determined, NORCAL completed the geophysical survey for the remaining areas of the site that were described in the Work Plan.

The survey did not find evidence of the 10-inch fuel oil pipeline between the former underground storage tank (UST) 772 and Building 2001. This area is to the east and northeast of Building 2001.

The geophysical survey did not find evidence of fuel lines in the area between Buildings 864 and 2001. Other active utilities were also located in this area. The location of the utilities detected in this area were marked in the field and incorporated into the survey maps included in Attachments 1 and 2.

The geophysical survey did not detect the fuel line that appears to have been left in place under 9th Street in the suspect area. However, it did detect a utility line slightly to the east of the suspect location running beneath 9th Street. The results of the geophysical survey in this area were not conclusive. Other utilities were also detected in the subsurface in this area and are shown on the survey map. Further potholing should be conducted in this area during the construction phase to better define the location of this line.

The geophysical survey activities were completed on April 6, 2001. Site drawings illustrating the findings are included in Attachment 1. Site photographs have also been included in Attachment 3.

2.2 LAND SURVEY

The land survey was completed by KSR on April 10, 2001. The survey consisted of locating the applicable site features and underground utilities (marked out by geophysical surveyor). It also included preparing a map of site surface and applicable subsurface features. The Land Survey Map is included as Attachment 2.

2.3 EXPLORATORY EXCAVATION

Several historic drawings show that the 10-inch fuel line from UST 772 ran beneath Building 2001 (from west to east), and out towards Cedar Avenue. There is physical surface evidence of a vault near Cedar Avenue that the 10-inch line reportedly was connected to. The

location for the exploratory excavation was between the vault and Building 2001, intersecting the presumed path of the fuel line. This excavation location was in a fenced sandbox area just west of the building. Other contractors removed the 10-inch line beyond the vault (east under Cedar Avenue).

Once NORCAL had determined that no underground utilities existed in the area of the sandbox, DECON disassembled the fencing surrounded the sandbox in order to provide access for the backhoe. The top layer of sand was removed and placed on the western side of the excavation. The soils removed during excavation were placed on plastic located on the eastern side of the test pit. Photoionization detector (PID) readings were performed on the soil pile throughout the excavation. All of the PID readings were zero. The findings of the excavation are described below:

- The soil underlying the sandbox was reddish-brown silty sand with clay. The clay content increased with depth.
- Pieces of broken concrete were discovered at approximately 4.5 feet below ground surface (bgs).
- An organic odor was encountered at approximately 5-6 feet bgs. The excavated area and soils were screened with the PID, but the readings were zero.
- The soil was slightly moist from approximately 5 to 8 feet bgs.
- There were trace amounts of dark organic material from approximately 5.5 to 7 feet bgs.
- The final dimensions of the excavation were 10-feet long (north-south), 2.5-feet wide, and 8.5-feet deep.
- No underground utilities or underground fuel oil pipelines were discovered at this location.

Once the excavation was complete, it was backfilled and compacted in 10-inch lifts with the use of the backhoe bucket. The stockpiled soil and sand were reused to backfill the excavated area. The site was restored to original site conditions. This included restoring the sandbox and the surrounding fencing. Photographs of the excavation are included in Attachment 3.

3.0 SUMMARY AND RECOMMENDATIONS

A summary of the findings from this pre-construction investigation is as follows:

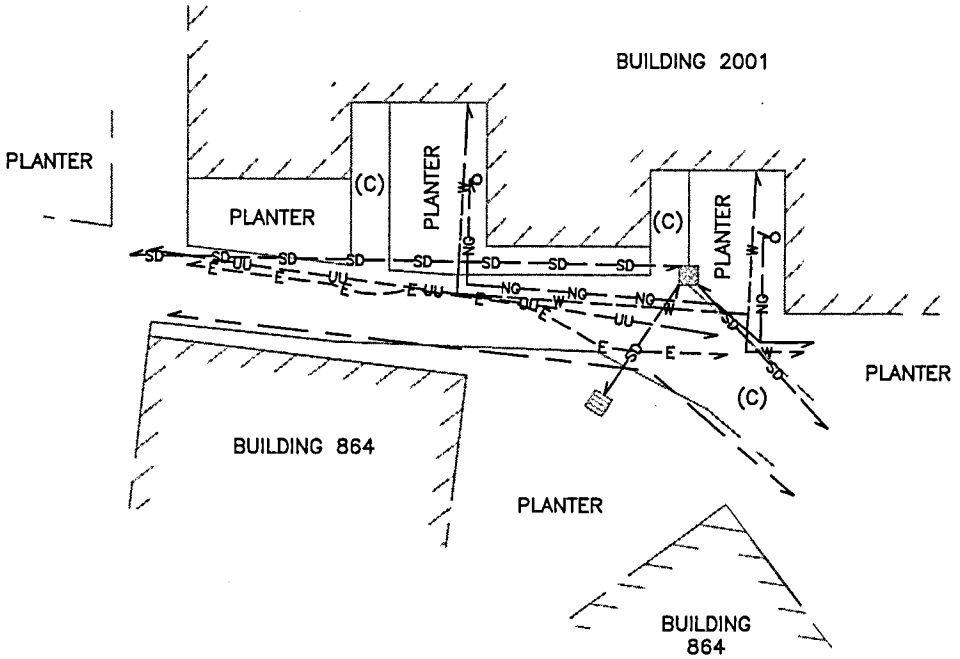
- Geophysical techniques did not find evidence of the 10-inch pipeline on the West Side of Building 2001, between the building and the former UST 772.
- The surface evidence of the vault at Cedar Avenue, the appearance of concrete debris in the exploratory excavation, and the historic drawings, provides good evidence that the 10-inch line did run underneath Building 2001 as shown on the historic drawings.
- The exploratory excavation confirmed that the 10-inch pipeline does not exist between Building 2001 and Cedar Avenue.
- The lack of evidence of the 10-inch line on the east and west ends of the building, coupled with As-Built drawings of Building 2001 construction stating that the line was removed, provide strong evidence that the pipeline is no longer in place.
- Geophysical techniques did not find evidence of a pipeline between Buildings 864 and 2001 that corresponds with historic drawings of the 6-inch fuel line. However, confirmation samples will be taken in the area where the line was suspected to be located, based on previous drawings and reports.
- Other utilities were located in the area between the buildings that should be avoided during sampling.
- Geophysical techniques did indicate some subsurface features just east of the location of the 6-inch pipeline that is presumed to run under 9th Street. However, the data was inconclusive.

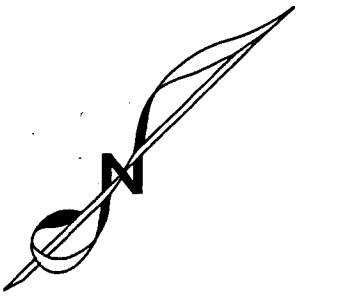
Recommendations based on these findings are as follows:

- No further work is required to locate the 10-inch fuel line on the East Side of Building 2001.
- Additional exploratory excavations will be performed, during the course of construction activities, to verify that the 10-inch fuel line is not still in place between Building 2001 and UST 772.
- Exploratory excavation should be performed to definitively locate the line presumed to run under 9th Street. This will be done as part of the overall construction phase.
- Information on the location of the 6-inch line in between the buildings shall be used to accurately identify accessible sampling locations.

ATTACHMENT 1

GEOPHYSICAL SURVEY MAPS





SCALE

0 10 20 40

(1 inch = 20 feet)

LEGEND	
—E— —	ELECTRIC LINE
— — —	SUSPECT NATURAL GAS LINE
—NG— —	NATURAL GAS LINE
—SD— —	STORM DRAIN
— —UU— —	UNDIFFERENTIATED UTILITY LINE
— — —W— —	WATER LINE
▩	UTILITY VAULT
▤	CATCH BASIN
(C)	CONCRETE

NOTE: NOT ALL NATURAL GAS LINES WERE DETECTABLE. STORM DRAIN LATERALS FROM BUILDINGS COULD NOT BE DETECTED.

NORCAL

	CENTRAL SURVEY AREA MARE ISLAND ELEMENTARY SCHOOL		
	LOCATION: VALLEJO, CALIFORNIA		
	CLIENT: FOSTER WHEELER		PLATE
JOB #: 01-273.20	NORCAL GEOPHYSICAL CONSULTANTS INC.		1
DATE: APR. 2001	DRAWN BY: G.RANDALL	APPROVED BY: DJK	

SENSITIVE RECORD

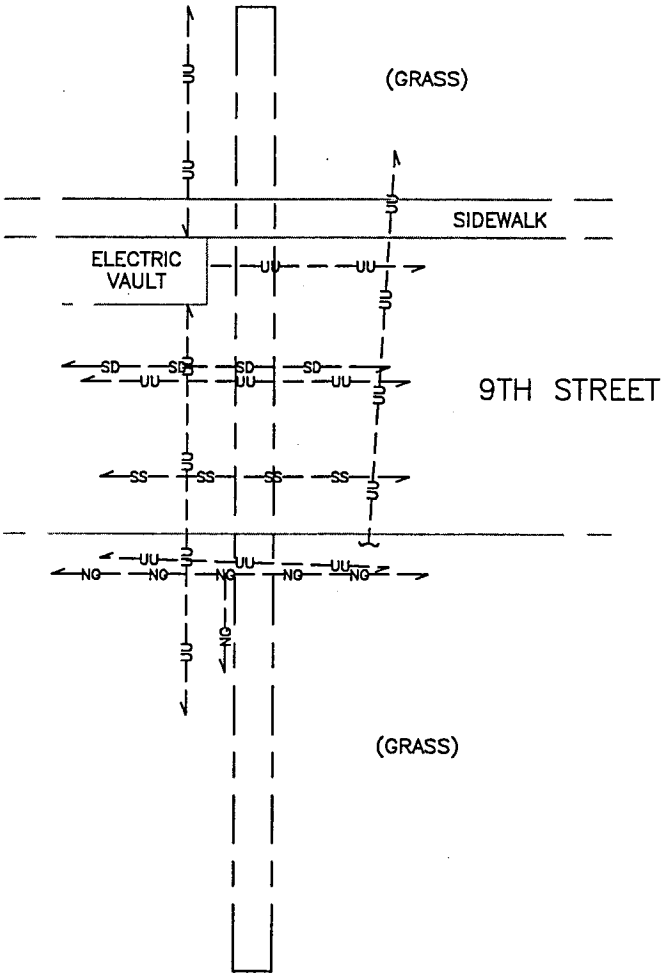
PORTIONS OF THIS RECORD ARE CONSIDERED SENSITIVE AND ARE NOT AVAILABLE FOR PUBLIC VIEWING

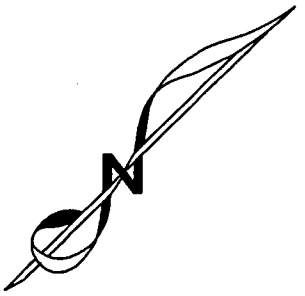
PLATE 2 – 9TH STREET SURVEY AREA
MARE ISLAND ELEMENTARY SCHOOL

FOR ADDITIONAL INFORMATION, CONTACT:

DIANE C. SILVA, COMMAND RECORDS MANAGER, CODE EV33
NAVAL FACILITIES ENGINEERING COMMAND, SOUTHWEST
1220 PACIFIC HIGHWAY (NBSD BLDG. 3519)
SAN DIEGO, CA 92132

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





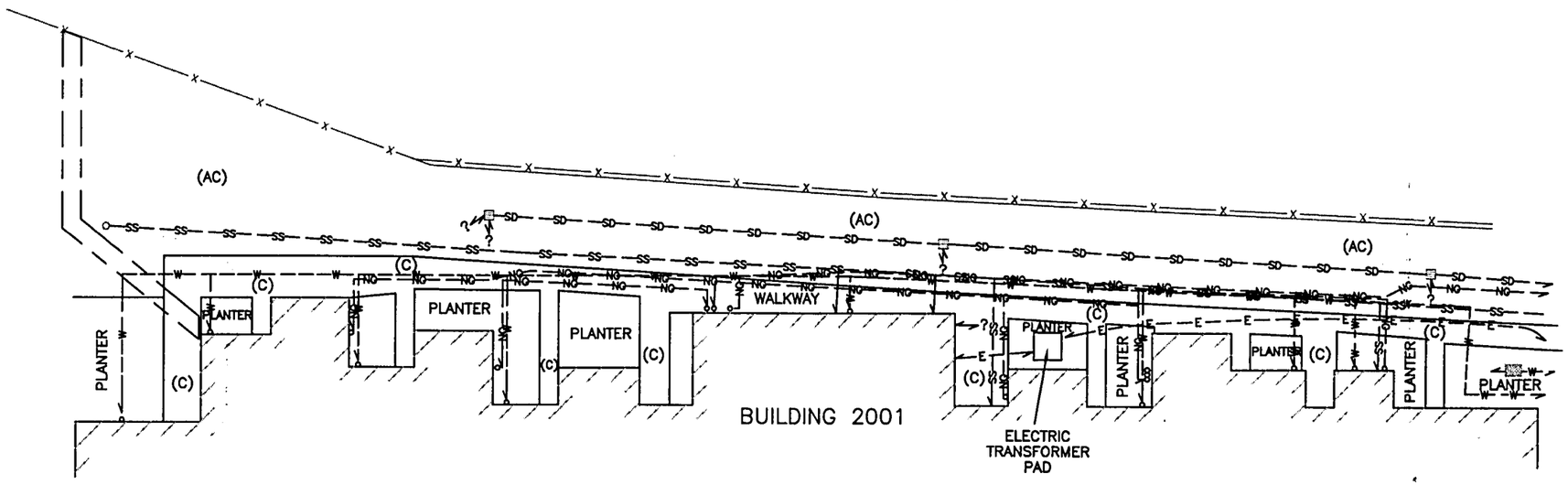
SCALE

0 10 20 40

(1 inch = 20 feet)

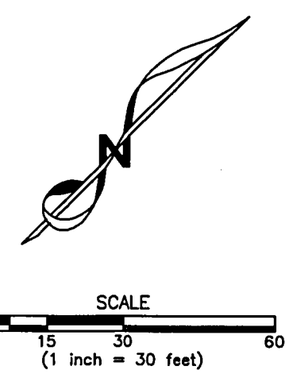
LEGEND	
— — —	SUSPECTED LOCATION OF FORMER FUEL LINE
—NG— —	NATURAL GAS LINE
—SS— —	SANITARY SEWER
—SD— —	STORM DRAIN
— —UU— —	UNDIFFERENTIATED UTILITY LINE

NORCAL	9TH STREET SURVEY AREA MARE ISLAND ELEMENTARY SCHOOL		
	LOCATION: VALLEJO, CALIFORNIA		
	CLIENT: FOSTER WHEELER		PLATE
JOB #: 01-273.20	NORCAL GEOPHYSICAL CONSULTANTS INC.		2
DATE: APR. 2001	DRAWN BY: G.RANDALL	APPROVED BY: DJK	



LEGEND	
— — —	SUSPECTED LOCATION OF FORMER FUEL LINE
—E— —	ELECTRIC LINE
—NG— —	NATURAL GAS LINE
—SS— —	SANITARY SEWER
—SD— —	STORM DRAIN
— — —W— —	WATER LINE
—x—	FENCE
▩	UTILITY VAULT
▤	CATCH BASIN
(AC)	ASPHALT
(C)	CONCRETE

NOTE: NOT ALL NATURAL GAS LINES WERE DETECTABLE. STORM DRAIN AND SANITARY SEWER LATERALS FROM BUILDING COULD NOT BE DETECTED.



NORCAL

NORTH SURVEY AREA
MARE ISLAND
ELEMENTARY SCHOOL

LOCATION: VALLEJO, CALIFORNIA

CLIENT: FOSTER WHEELER

JOB #: 01-273.20

NORCAL GEOPHYSICAL CONSULTANTS INC.

DATE: APR. 2001

DRAWN BY: G.RANDALL

APPROVED BY: DJK

PLATE 3

ATTACHMENT 2

LAND SURVEY MAP

N00221_000685
MARE ISLAND

SENSITIVE RECORD

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

ATTACHMENT 2 – LAND SURVEY MAP

FOR ADDITIONAL INFORMATION, CONTACT:

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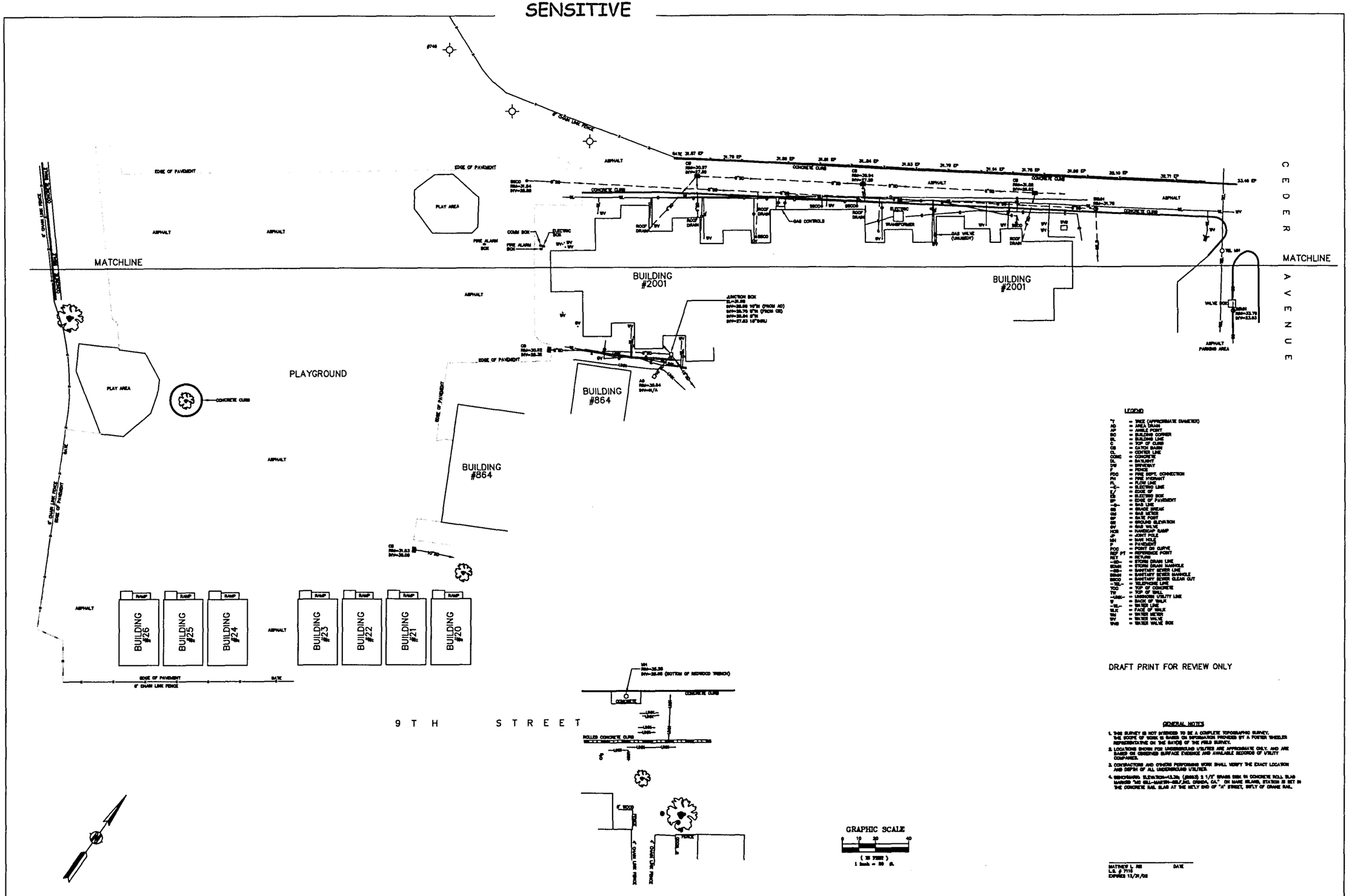
SENSITIVE



LEGEND

7"	= TREE (APPROXIMATE DIAMETER)
AD	= AREA DRAIN
AP	= ANGLE POINT
BC	= BUILDING CORNER
BL	= BUILDING LINE
C	= TOP OF CURB
CB	= CATCH BASIN
CL	= CENTER LINE
CONC	= CONCRETE
DL	= DAYLIGHT
DW	= DRIVEWAY
F	= FENCE
FDC	= FIRE DEPT. CONNECTION
FH	= FIRE HYDRANT
FL	= FLOW LINE
-E-	= ELECTRIC LINE
E/	= EDGE OF
EB	= ELECTRIC BOX
EP	= EDGE OF PAVEMENT
-G-	= GAS LINE
GB	= GRADE BREAK
GM	= GAS METER
GP	= GRADE POINT
GS	= GROUND ELEVATION
GV	= GAS VALVE
HCR	= HANDICAP RAMP
JP	= JOINT POLE
MH	= MAN HOLE
P	= PAVEMENT
POC	= POINT ON CURVE
REF PT	= REFERENCE POINT
RET	= RETURN
-SD-	= STORM DRAIN LINE
SDMH	= STORM DRAIN MANHOLE
-SS-	= SANITARY SEWER LINE
SSMH	= SANITARY SEWER MANHOLE
SSCO	= SANITARY SEWER CLEAN OUT
-TE-	= TELEPHONE LINE
TOC	= TOP OF CONCRETE
TW	= TOP OF WALL
-UNK-	= UNKNOWN UTILITY LINE
W	= BACK OF WALK
-W-	= WATER LINE
WLK	= FACE OF WALK
WM	= WATER METER
WV	= WATER VALVE
WVB	= WATER VALVE BOX

DRAFT PRINT FOR REVIEW ONLY

GENERAL NOTES

1. THIS SURVEY IS NOT INTENDED TO BE A COMPLETE TOPOGRAPHIC SURVEY. THE SCOPE OF WORK IS BASED ON INFORMATION PROVIDED BY A FOSTER WHEELER REPRESENTATIVE ON THE DAY(S) OF THE FIELD SURVEY.
2. LOCATIONS SHOWN FOR UNDERGROUND UTILITIES ARE APPROXIMATE ONLY, AND ARE BASED ON OBSERVED SURFACE EVIDENCE AND AVAILABLE RECORDS OF UTILITY COMPANIES.
3. CONTRACTORS AND OTHERS PERFORMING WORK SHALL VERIFY THE EXACT LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES.
4. BENCHMARK: ELEVATION=13.39, (DATUM) 3 1/2" BRASS DISK IN CONCRETE ROLL SLAB MARKED "MS BILL-MARTIN-SILT/SEL DRAGAL CA." ON MARE ISLAND, STATION IS SET IN THE CONCRETE RAIL SLAB AT THE WELY END OF "A" STREET, SWLY OF CRANE RAIL.

MATTHEW L. REI DATE
L.S. # 7116
EXPIRES 12/31/02

LEGEND	REFERENCES	REVISIONS	KISTER, SAVIO & REI, INC. LAND SURVEYORS – CIVIL ENGINEERS	DESCRIPTION
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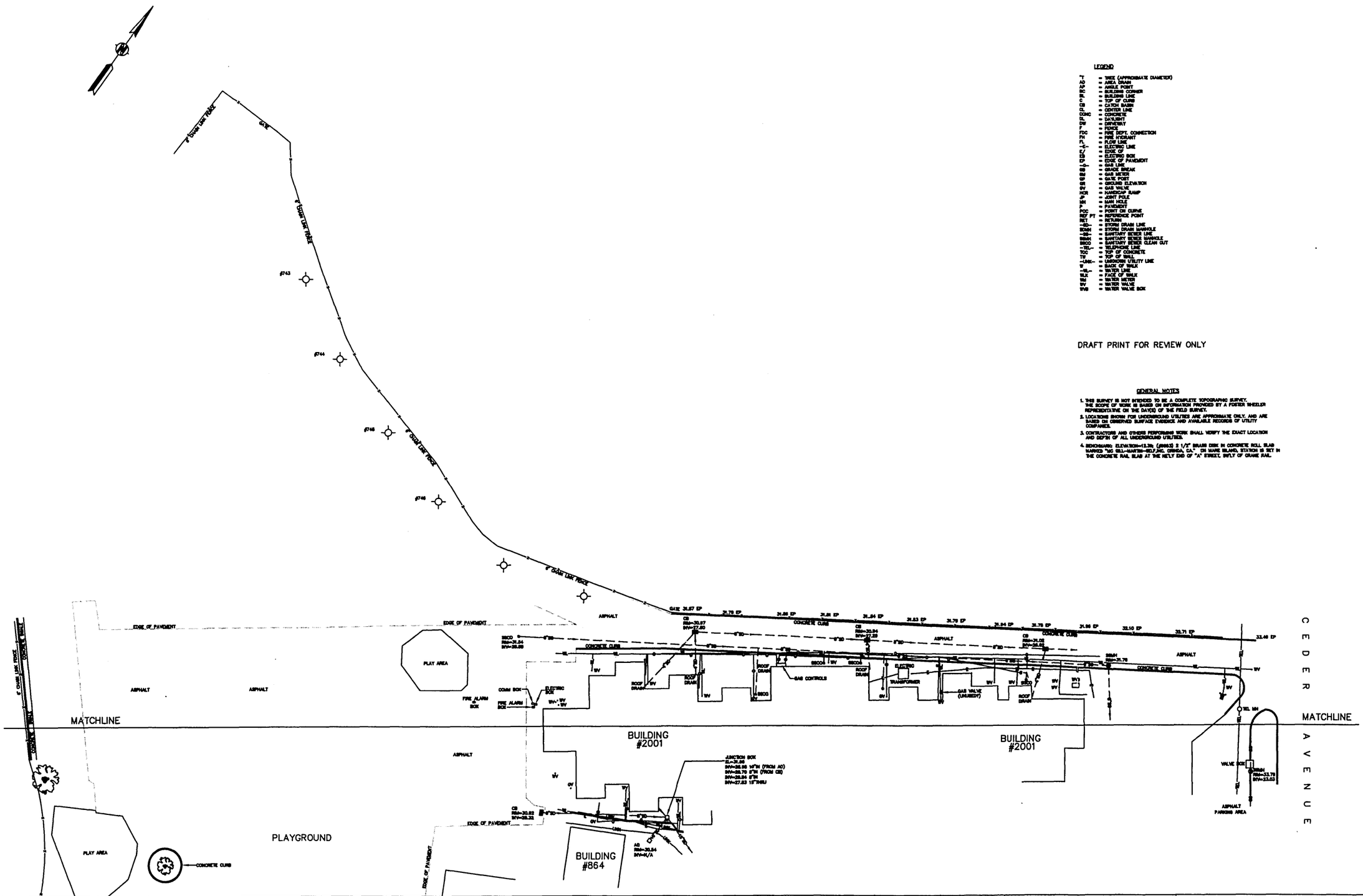
SENSITIVE

SENSITIVE



LEGEND

T	= TREE (APPROXIMATE DIAMETER)
AD	= AREA DRAIN
AP	= ANGLE POINT
BC	= BUILDING CORNER
BL	= BUILDING LINE
C	= TOP OF CURB
CB	= CATCH BASIN
CL	= CENTER LINE
CONC	= CONCRETE
DL	= DAYLIGHT
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LEGEND	REFERENCES	REVISIONS	KISTER, SAVIO & REI, INC. LAND SURVEYORS – CIVIL ENGINEERS	DESCRIPTION
	FIELD BOOK No. 17922.BOK/TOS FILE NAME TITLE CO. PRINT No. BASIS NAVD88 (NGS/CALTRANS) MON. REF: 9-8907		3085 RICHMOND PARKWAY, SUITE 214 RICHMOND, CALIFORNIA 94806 PHONE: (510) 223-4039 FAX: (510) 223-3716 E-MAIL: kreiinc@ix.net PRE FOSTER WHEELER ENVIRONMENTAL SCALE 1" = 20' JOB No. 17922 DATE 4-10-01 DWG No. O-840 SHEET #2	TOPOGRAPHIC SURVEY MARE ISLAND NAVEL SHIPYARD AREAS AROUND BUILDING 2001 VALLEJO, MARE ISLAND, CALIFORNIA

SENSITIVE

ATTACHMENT 3

PHOTOGRAPHS

MARE ISLAND

UNDERGROUND FUEL OIL PIPING AND TPH CONTAMINATED SOIL REMOVAL

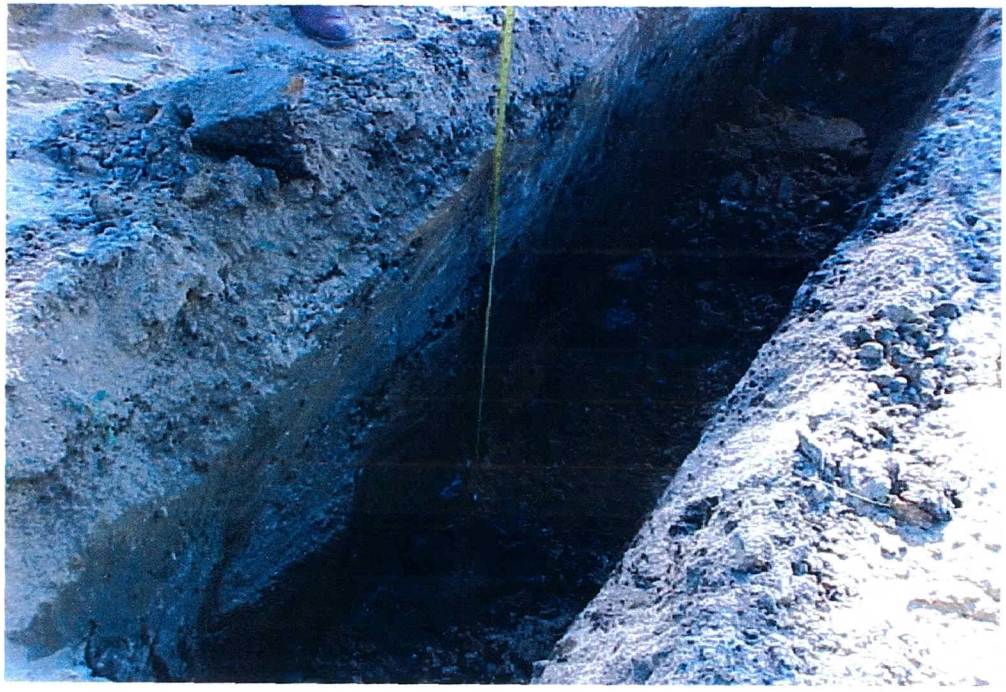
SITE VISIT 4/5/01

Set up for excavation at sand box area

MARE ISLAND

UNDERGROUND FUEL OIL PIPING AND TPH CONTAMINATED SOIL REMOVAL

SITE VISIT 4/5/01



Excavation, looking southeast, approximately 7 ft bgs

MARE ISLAND

UNDERGROUND FUEL OIL PIPING AND TPH CONTAMINATED SOIL REMOVAL

SITE VISIT 4/5/01

Excavation area after complete site restoration

MARE ISLAND

UNDERGROUND FUEL OIL PIPING AND TPH CONTAMINATED SOIL REMOVAL

SITE VISIT 4/5/01

Utility markout between 2001 and 864, looking west

MARE ISLAND

UNDERGROUND FUEL OIL PIPING AND TPH CONTAMINATED SOIL REMOVAL

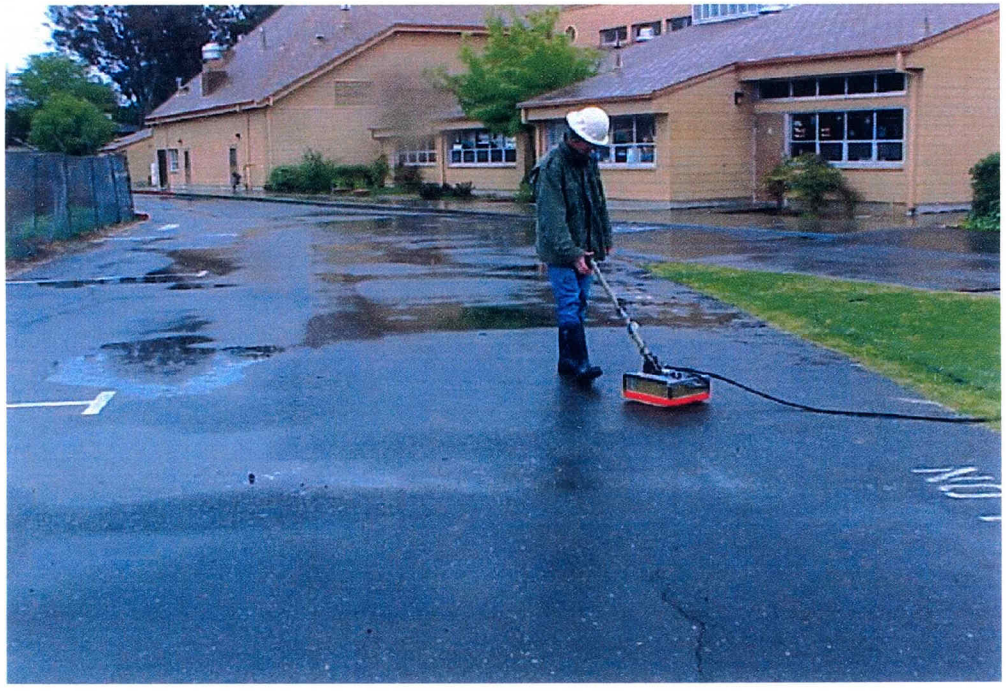
SITE VISIT 4/5/01

Geophysical survey near tank 772, looking north

MARE ISLAND

UNDERGROUND FUEL OIL PIPING AND TPH CONTAMINATED SOIL REMOVAL

SITE VISIT 4/5/01



Geophysical survey, north of building 2001, looking east