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NAS CORPUS CHRISTI
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WORK PLAN FOR DESIGN, INSTALL, TEST, START-UP, AND OPERATIONS AND MAINTENANCE AND TRAINING FREE PRODUCT RECIVERY COLLECTION AND TREATMENT SYSTEM NAS CORPUS CHRISTI TX

10/23/1996

MORRISON KNUDSEN CORPORATION

3

WORK PLAN

NAS CORPUS CHRISTI

DESIGN, INSTALL, TEST, START-UP, AND OPERATIONS AND MAINTENANCE AND TRAINING FREE PRODUCT RECOVERY, COLLECTION, AND TREATMENT SYSTEM

NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

CONTRACT N62467-93-D-1106
DELIVERY ORDER #0016
STATEMENT OF WORK #024

REVISION #0
OCTOBER 23, 1996

Prepared For:

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
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ADDENDUM #1
Work Plan
For
Design, Install, Test, Start-up and Operations and Maintenance and Training Free Product Recovery, Collection, and Treatment System

NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND

Contract #N62467-93-D-1106
Delivery Order #0016
Statement of Work #024

November 1997

Revision 0

ADDENDUM #1
WORK PLAN
FOR
DESIGN, INSTALL, TEST, START-UP, AND OPERATIONS AND MAINTENANCE AND TRAINING FREE PRODUCT RECOVERY, COLLECTION, AND TREATMENT SYSTEM

NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

Revision 0

November 17, 1997

CONTRACT N62467-93-D-1106
DELIVERY ORDER #0016
STATEMENT OF WORK #024

Prepared by:

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PREPARED/APPROVED BY:

Steve Travis
MK Project Engineer — Date: 11/19/97

APPROVALS:

Robert E. Hlavacek
MK Program Manager — Date: 21 Nov. 97

CLIENT ACCEPTANCE:

U.S. Navy Responsible Authority — Date: 11 DEC 97

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1.0
INTRODUCTION

1.1 BACKGROUND

This addendum to the *Work Plan, NAS Corpus Christi Design, Install, Test, Start-up, and Operations and Maintenance and Training Free Product Recovery, Collection, and Treatment System* [MK 1997] has been prepared to describe the installation of an automatic discharge system for discharging water from the multi-phase extraction system to the sewage treatment system. This Work Plan addendum has been prepared for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), under contract number N62467-93-D-1106 Delivery Order 0016, Statement of Work 024.

The multi-phase extraction system was started January 1997. Carbon adsorption was used to treat the off gas from the extraction system, however, due to higher than expected concentrations, the system operation was limited to remain in compliance with the air discharge limits. As a result of high carbon usage, a thermal oxidizer was added April 1997. The system was started for continuous operation 28 April, 1997. During system operation, the processed well water accumulates in the T-6 collection tank. When the tank nears its capacity, NAS personnel empty the tank and transport the water to the sewage treatment plant. The extraction system generates 3000-6000 gallons of water per week. Due to the quantity of water being generated and limited resources at the base to transport the water, the multi-phase extraction system has shut down on several occasions due to high level in the T-6 tank.

1.2 SCOPE AND OBJECTIVE

The multi-phase extraction system will be modified to include piping, a pump, valves, and associated fittings to discharge water from the T-6 tank to the sewage treatment system. The discharge pump will be controlled by level switches in the T-6 tank. A centrifugal pump will transfer the water to the sewage treatment system. The pump will be sized to deliver 15 gpm to the sewage treatment system. Schedule 80 PVC piping will be run aboveground within the fenced multi-phase extraction system. SDR-11 HDPE piping will run underground, buried to 12 inches, from the fenced area to the sewage treatment system. The buried piping will be run along the sea wall as it crosses the residential property. Installation will be done using a "Ditch-Witch" device. Installation will be done according to the previously approved Work Plan [MK 1997] including the Quality Control Plan, and Site Safety and Health Plan. The proposed Piping and Instrumentation Diagram (P&ID) is included as Figure 1.

Morrison Knudsen's Subcontractor, Applied Earth Sciences (AES), Inc., will provide the equipment, labor, and materials to procure, install, test, startup, the equipment at Fuel Farm 216 at NAS Corpus Christi, Texas.

2.0
ENVIRONMENTAL COMPLIANCE

2.1 REGULATORY COMPLIANCE

Work will be performed in accordance with all applicable codes and standards, including, but not limited to, the regulations listed in the Work Plan [MK 1997]. No additional or revised regulations are anticipated.

2.2 PERMITS, APPROVALS AND NOTIFICATIONS

NAS Corpus Christi Public Works Department will obtain approvals for discharge to the sewage treatment system. NAS Corpus Christi Public Works Department will issue excavation permits.

3.0
PROJECT ORGANIZATION

The Project Organization is presented in the Work Plan [MK, 1997].

4.0
WORK EXECUTION

4.1 DEFINABLE FEATURES OF WORK

As described in Section 1.3 of the Work Plan [MK, 1997], the work activities will be performed using definable features of work (DFOWs) and the Three Phases of Control to maintain quality control. The DFOWs for this project include the following:

- Trench, Pipe, and Equipment installation
- System Start-up

4.1.1 Trenching, Pipe and Equipment Installation

Approximately 1300 linear feet of two inch diameter polyethylene (SDR 11) tubing will be installed to connect the T-6 tank to the sewage treatment system. All tubing will be installed in grass areas. It will be buried at least 12 inches below surface grade. Excavated soil will be used for backfill unless it exhibits visual contamination. No contamination is expected. Excavated soil will remain adjacent to the trench until it is used as backfill or relocated to containers approved by Morrison Knudsen pending sampling and disposal (if required). Work will be done in accordance with the Work Plan [MK 1997] Section 3.0.

Equipment will be installed as shown on Figure 1, Piping and Instrumentation Diagram. Piping will follow the route shown on Figure 2, Piping Layout.

4.1.2 System Startup

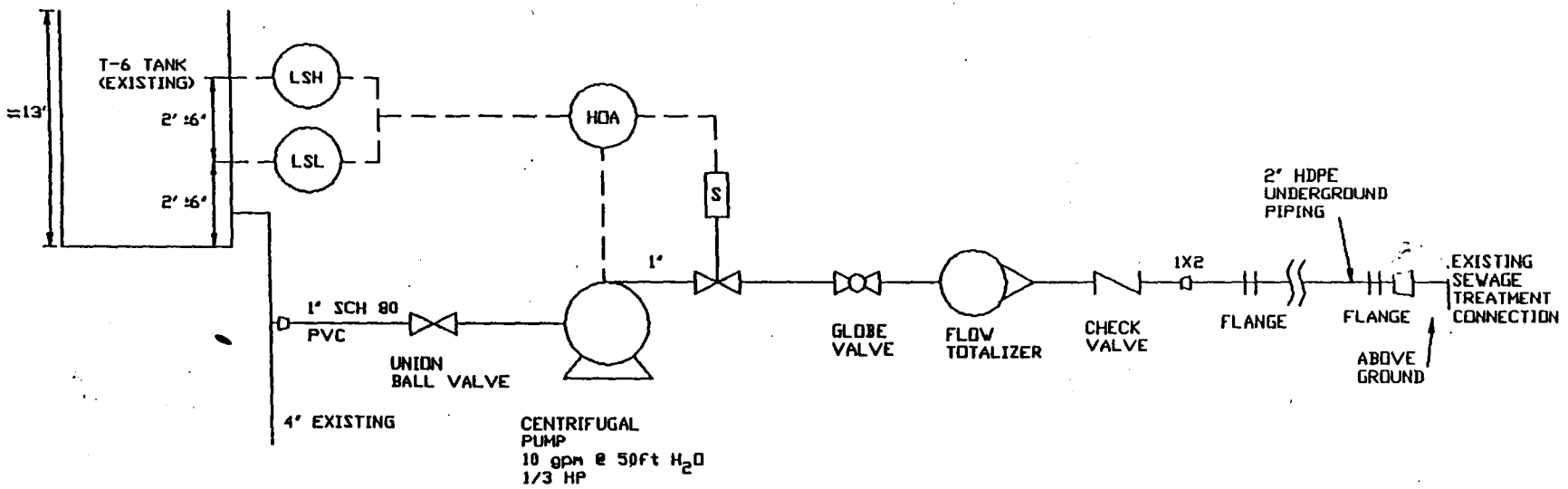
The equipment will be tested and started up following completion of installation. The operation of the system will be verified by testing the switches and pump for proper operation. Standard weekly maintenance inspections will be performed after start-up.

4.1.3 Reports

The Completion Report, as-built drawings and Operation and Maintenance manual will be updated upon completion of the discharge piping installation.

4.2 SAFETY AND HEALTH

The requirements of the SSHP included in Appendix A of the Work Plan [MK 1997] will be followed. The following Activity Hazard Analysis (AHA) sheets apply to the activities being performed under this Work Plan Addendum: 1.0, 4.0, 5.0, 8.0.



NAVIL AIR STATION
CORPUS CHRISTI
DISCHARGE PIPING

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES

FIGURE 1
PIPING & INSTRUMENTATION
DIAGRAM

DWG DATE: 1/07/97	DWG NAME:	REV #:

5.0
QUALITY CONTROL

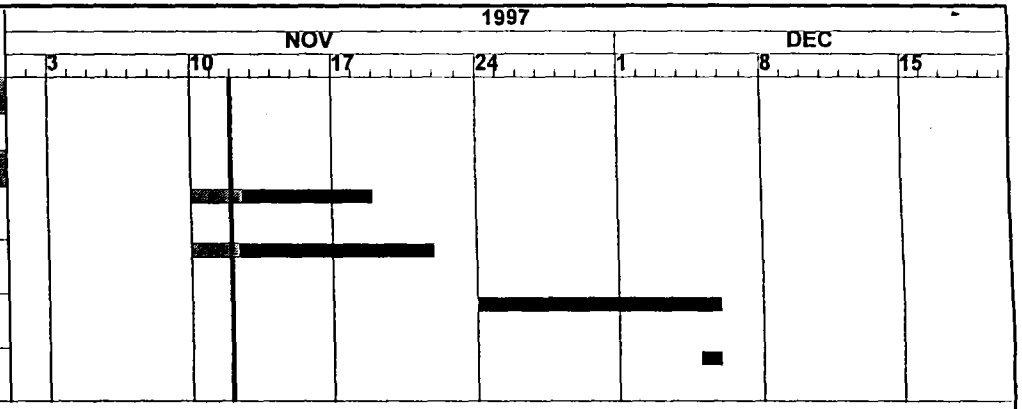
The quality control requirements specified in Section 5.0 of the Work Plan will be followed during work execution in conjunction with the requirements of this addendum. The following Quality Control Inspection checklists, are applicable for this work:

Piping Well Installation Underground Piping	PI-01
Mechanical Installation of Recovery System	ME-01
Electrical System Installation	EL-01

6.0
SCHEDULE

The installation will begin 24 November and will be completed 5 December. This schedule is contingent on availability of equipment. A bar schedule is attached.

Activity ID	Activity Description	Orig Dur	%	Early Start	Early Finish
DO#0016 NAS CORPUS CHRISTI, TEXAS					
SOW#024, Phase 30					
Phase 3 Additional Work Requested by Navy					
BT4110	T-6 - Discharge Piping System	7*	29	10NOV97A	18NOV97
BT4120	T-6 - Procure Equipment	10*	20	10NOV97A	21NOV97
BT4130	T-6 - Install Discharge Piping	8	0	24NOV97	05DEC97
BT4140	T-6 - System Startup & Testing	1	0	05DEC97	05DEC97



Project Start 01OCT97
Project Finish 05DEC97
Data Date 12NOV97
Plot Date 12NOV97

Early Bar
Progress Bar
Critical Activity

DAL2

Sheet 1 of 1

SOUTHDIV ERAC PROGRAM - WO# 4324
NAS CORPUS CHRISTI, TEXAS
T-6 DISCHARGE PIPING

MORRISON KNUDSEN CORPORATION

Date	Revision	Checked	Approved

7.0
REFERENCES

REFERENCES

1. MK, 1997, Work Plan NAS Corpus Christi Design, Install, Test, Start-up, and Operations and Maintenance and Training Free Product Recovery, Collection, and Treatment System, Morrison Knudsen, October 1997.

WORK PLAN

DESIGN, INSTALL, TEST, START-UP, AND OPERATIONS AND MAINTENANCE AND TRAINING FREE PRODUCT RECOVERY, COLLECTION, AND TREATMENT SYSTEM

NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

Revision #0
October 23, 1996

CONTRACT N62467-93-D-1106
DELIVERY ORDER #0016
STATEMENT OF WORK #024

Prepared by:

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PREPARED/APPROVED BY:

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MK Project Engineer — Date

APPROVALS:

William Piispanen — 10/24/96
MK Safety and Health Program Manager — Date

for — 24 Oct 96
MK Quality Program Manager — Date

24 Oct 96
MK Sr. Project Manager — Date

24 oct 96
MK Program Manager — Date

CLIENT ACCEPTANCE

30 Oct 96
U.S. Navy Responsible Authority — Date

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1.0
INTRODUCTION

1.1 SITE HISTORY

The underground storage tanks at Fuel Farm 216 were installed in the early 1940s. The fuel farm consists of thirty-six (36) 25,000 gallon tanks that used an aqua drive system to supply aviation fuel to the Naval Air Station. Two additional 10,000 gallon underground storage tanks (162-1 and 162-2) were also installed at the same time to store diesel fuel. Prior to 1979, twelve (12) of the 36 tanks were taken out of service without any known physical modifications. In the early 1980s, separate phase hydrocarbons were identified by NAS personnel in a well constructed of 55-gallon drums driven into the ground to a depth of fifteen (15) feet. In 1983, Geraghty and Miller, Inc., performed a hydrogeologic investigation and estimated that the volume of separate phase hydrocarbon in the subsurface was about 77,000 gallons, of which about 20,000 gallon is recoverable.

In January 1986, tanks 162-1 and 162-2 were taken out of service but remain in place. In November 1987, the closure of Fuel Farm 216 was completed with the tanks abandoned in place. All 36 tanks were filled with a mixture of sand and cement. Piping was cut to 2 feet below ground, plugged, and covered with soil. Recovery of separate phase hydrocarbon has been occurring since 1985 via pumping or bailing. In October 1991, tanks 162-1 and 162-2 were removed. During excavation, soil contamination was noted but no separate phase hydrocarbon was encountered.

During the operation of Fuel Farm 216, fuel was transported onto NAS using ship, railcar, and tanker truck. Two fuel loading/unloading stations were located to the east of the tanks.

1.2 SUMMARY OF WORK

Morrison Knudsen's Subcontractor, Applied Earth Sciences (AES), Inc., will provide the equipment, labor, and materials to procure, install, test, startup, and operate and maintain a product recovery and treatment system for two months at Fuel Farm 216 at Naval Air Station (NAS) Corpus Christi, Texas.

The recovery unit will consist of a liquid ring vacuum pump, a seal water tank, an air-water separator, a transfer pump, and associated motors and controls. Vapor treatment will consist of vapor phase activated carbon. Water will be treated using a gravity coalescing oil-water separator. Separated hydrocarbons (product) will be stored in a 500 gallon fiberglass storage tank and recovered water will be stored in a 5000 gallon polyethylene tank. A manifold will be installed to accommodate recovery from up to twelve (12) wells. AES will provide piping to five (5) wells as shown on the System Layout in Appendix C: MW-13, MW-20, MW-21, MW-26, and MW-29. The recovery and water treatment equipment will be ordered from a single supplier who will assemble

the liquid ring vacuum pump skid and provide the system control panel for installation at the site. A process flow diagram and treatment compound layout are included in Appendix C. Technical specifications and design drawings are provided as a separate document titled Specifications for Remediation System Multiphase Extraction.

Installation of the recovery and treatment system will include trenching and polyethylene tubing installation in grass and road areas, installation of tubing and cable ramps on areas paved with concrete, modification of monitor well completions to convert them to recovery wells, installation of a new concrete pad for the Remediation equipment and storage tanks, and fencing and lighting for the equipment compound.

Each major portion of work is described below. For each portion of work, the personnel, equipment, safety and health risk assessment, and preventative measures are addressed.

1.3 DEFINABLE FEATURES OF WORK

The definable features of work (DFOW) for this project include the following:

1.3.1 Mobilization/Demobilization - set up and removal of temporary trailer and utilities; site cleanup

1.3.2 Trench and Pipe Installation

1.3.3 Concrete Equipment Pad/Fence/Lighting

1.3.4 Installation of Remediation Equipment and Tanks

1.3.5 System Start-up

1.3.6 System Operations and Maintenance

1.3.7 Waste Management

1.4 QUALITY ASSURANCE/QUALITY CONTROL

The Quality Control Requirements specified in this section supplement and are to be used in conjunction with the requirements contained in the Delivery Order Execution Quality Control Plan previously approved by SOUTHDIV.

MK will use DFOWs and the three phases of control to ensure that system installation activities at NAS Corpus Christi achieve and maintain a consistently high level of quality. The DFOWs for NAS Corpus Christi are described in Section 1.3 of this work plan.

At each phase - Preparatory, Initial, and Follow-up - Quality Control verification activities may be supplemented by the performance of detailed inspections of a particular activity. In these cases, Field Inspection Checklists have been generated to assure a thorough verification of the work process. When utilized, the completed Field Inspection Checklist is attached to the combined *Contractor Production Report/Contractor Quality Control Report (form 01400-1)* completed on a daily basis.

Required Quality Control documentation that is to be completed to support the system installation activities at NAS Corpus Christi is provided in the form of inspection checklists. The inspection checklists will be completed when performing inspections on construction and system installation activities. Samples of these forms are included in Appendix B of this Work Plan.

2.0
MOBILIZATION/DEMOBILIZATION

2.1 DESCRIPTION OF WORK

AES will provide a single temporary office trailer for the use of both AES and Morrison Knudsen. The proposed location of the trailer is shown on the system layout in Appendix C. Minimum trailer size will be 10' x 42', with a private office at each end and a common area in the center. Built-in desks will be provided in the private offices, as well as file cabinets and chairs. A conference table, copy machine, and fax machine will be located in the common area for use by both AES and MK.

AES will provide temporary electrical and telephone connections for the trailer. Both of these temporary utilities will be run aboveground in polyethylene tubing from the nearest utility outlet. If the polyethylene tubing is required to cross a road, the tubing will be fastened down using C-clamps. One telephone line (or cellular telephone) will be provided to MK. A washing facility, drinking water, and two portable self-contained toilets will be provided for workers' use adjacent to the trailer. Temporary water will be accessed from the make-up water line AES will install to the Remediation compound. Until that water is available, sufficient water in containers or from the nearest fire hydrant will be provided on-site by AES to enable hand-washing, decontamination, and other needs.

Upon completion of the installation of the remediation system, AES will remove all temporary facilities, including the trailer and temporary utility connections. All waste and excess materials will be disposed of as described in Section 8.0 Waste Disposal. All equipment coming into contact with contaminated soil or groundwater will be decontaminated prior to removal from the site.

2.2 REFERENCES

Work performed by AES and lower tier subcontractors during this phase of work will be in accordance with Specification Section 01010 (Statement of Work), Section 01020 (Mobilization and Cleanup), and Section 01510 (Temporary Facilities) provided in the Morrison Knudsen Request for Proposal for this subcontract.

2.3 CREW SIZE AND MAKEUP

AES will have at least one person on-site during normal working hours for the duration of the remediation equipment installation. Mr. Bobby Hill is proposed as the on-site Project Manager, and Ms. Claire Meurer, P.E., will continue as Project Engineer. Resumes of these personnel are included in Appendix D.

An electrical subcontractor will be utilized to install the temporary power and telephone connections.

2.4 EQUIPMENT

Heavy equipment for loading and hauling may be used.

2.5 SAFETY AND HEALTH RISK ASSESSMENT

Expected subsurface contamination for this site includes high octane gasoline and JP-4 jet fuel. Constituents of concern include benzene, toluene, ethyl benzene, and xylene. Potential hazards include inhalation, ingestion, or dermal contact with these and other potentially harmful substances. The Activity Hazards Analysis (AHA) worksheet provided by Morrison Knudsen for this phase of work is included in Appendix E. This document will be reviewed by AES and the Morrison Knudsen representative prior to starting work to ensure the AHA adequately addresses the planned activity. All accidents and incidents will be promptly reported to Morrison Knudsen, and a written report will be provided within 24 hours of the incident. AES will maintain a first aid log sheet of all incidents requiring first aid treatment. A first aid kit will be supplied by AES at the site.

2.6 PREVENTATIVE MEASURES

All AES and lower tier subcontractor personnel will receive a site-specific briefing on safety concerns prior to entering the site or the commencement of work. Topics to be discussed include site and work overview, general safety rules and procedures, safety and health hazards present on site, decontamination procedures, and personal protection equipment (PPE) requirements. All AES and lower tier subcontractor personnel will wear leather steel-toe boots, full length slacks, and hard hat. In addition, personnel exposed to contaminated soil or groundwater will wear safety glasses with side shields and chemical resistant gloves.

2.7 SUBTIER CONTRACTORS

One of the following electrical subcontractors will be utilized to install the temporary power and telephone connections:

Scott Electric
Johnston Electric
Fairbairn Electric
Campbell Electric

3.0
TRENCHING AND PIPE INSTALLATION

3.1 DESCRIPTION OF WORK

Approximately 1000 linear feet of two inch diameter polyethylene (SDR 11) tubing will be installed to connect five (5) existing monitoring wells (MW-13, MW-20, MW-21, MW-26, and MW-29) to the liquid ring vacuum pump for use as recovery wells. The system layout is provided in Appendix C. Tubing installed in grass areas will be buried at least 12 inches below surface grade. Excavated soil will be used for backfill unless it exhibits contamination observed visually or using an FID to screen the headspace of representative soil samples. Excavated soil will remain adjacent to the trench until it is used as backfill or relocated to containers approved by Morrison Knudsen pending sampling and disposal (if required).

Tubing installed in concreted areas will be placed aboveground. In traffic areas, this tubing will be held in place with cable ramps. In non-traffic areas, the tubing will be anchored to the concrete using C-clamps. Tubing running to MW-26 will be installed via a road boring under First Street. A two inch polyethylene tube placed in the same road boring will be used to bring makeup water from the nearest water line running parallel to First Street into the treatment compound. If required, temporary water will be tapped from this makeup water line for use during construction.

Polyethylene tubing will be procured in coiled lengths to minimize connections. When connections are necessary, the polyethylene tubing will be fusion welded by qualified lower tier subcontractor personnel. Appropriate transition fittings will be used when connecting the polyethylene tubing to PVC or steel pipe.

If required, AES will provide a decontamination area for use by equipment and personnel following exposure to contaminated soil or groundwater. The location of the decontamination area will be clearly marked. All decontamination water will be stored in drums until properly disposed.

3.2 REFERENCES

Work performed by AES and lower tier subcontractors during this phase of work will be in accordance with Specification Section 01010 (Statement of Work), Section 11302 (Free-Product Recovery System), Section 01800 (Decontamination), and Section 15400 (Piping) provided in the Morrison Knudsen Request for Proposal for this subcontract. In addition, work will be performed in accordance with AES specifications Section 01011 (Scope of Work), Section 02221 (Excavation, Backfill, and Compaction), Section 05400 (Plumbing and Piping, Polyethylene), and Section 05500 (Peterson Cable Protectors).

3.3 CREW SIZE AND MAKEUP

AES will have at least one person on-site during normal working hours for the duration of the remediation equipment installation. Mr. Bobby Hill is proposed as the on-site Project Manager, and Ms. Claire Meurer, P.E., will continue as Project Engineer. Some of the pipe installation and related work will be performed by Luis Reyna. Resumes of these personnel are included in Appendix D.

A single subcontractor will be utilized to excavate and backfill trenches and install polyethylene tubing.

3.4 EQUIPMENT

A ditch witch or similar trenching machine will be used to excavate trenches. Heavy equipment for loading and hauling may also be used.

3.5 SAFETY AND HEALTH RISK ASSESSMENT

Expected subsurface contamination for this site includes high octane gasoline and JP-4 jet fuel. Constituents of concern include benzene, toluene, ethyl benzene, and xylene. Potential hazards include inhalation, ingestion, or dermal contact with these and other potentially harmful substances. The Activity Hazards Analysis (AHA) worksheet provided by Morrison Knudsen for this phase of work is included in Appendix E. This document will be reviewed by AES and the Morrison Knudsen representative prior to starting work to ensure the AHA adequately addresses the planned activity. All accidents and incidents will be promptly reported to Morrison Knudsen, and a written report will be provided within 24 hours of the incident. AES will maintain a first aid log sheet of all incidents requiring first aid treatment. A first aid kit will be supplied by AES at the site.

3.6 PREVENTATIVE MEASURES

All AES and lower tier subcontractor personnel will receive a site-specific briefing on safety concerns prior to entering the site or the commencement of work. Topics to be discussed include site and work overview, general safety rules and procedures, safety and health hazards present on site, decontamination procedures, and personal protection equipment (PPE) requirements. All AES and lower tier subcontractor personnel will wear leather steel-toe boots, full length slacks, and hard hat. In addition, personnel exposed to contaminated soil or groundwater will wear safety glasses with side shields and chemical resistant gloves.

Breathing air monitoring will be conducted during excavation activities using an FID and an LEL/Oxygen meter. AES will furnish a copy of the instruments' factory calibration and certifications, daily calibration checks, and monitoring results to Morrison Knudsen. All excavation and other equipment coming into contact with excavated soil or

groundwater will be decontaminated prior to removal from the site. All excavation equipment will be inspected prior to use to ensure adequate maintenance and safe operation.

An excavation permit will be requested from the NAS Corpus Christi Public Works Department. AES will request that underground electrical utilities in the area be marked by the Public Works Department prior to start of excavation.

AES will comply with the Accident Prevention Plan for Naval Facilities Engineering Command Southern Division prepared by Morrison Knudsen.

3.7 SUBTIER CONTRACTORS

One of the following subcontractors may be utilized to perform this phase of the work:

CCC Group, Inc.
CC Pump, Inc.
Garrett Construction, Inc.

4.0
CONSTRUCTION OF CONCRETE EQUIPMENT PAD/FENCE/LIGHTING

4.1 DESCRIPTION OF WORK

A new reinforced concrete equipment pad will be installed to support the remediation equipment. The concrete equipment pad will be laid out as shown in Appendix C. The pad will include an area (16' x 12') surrounded by a six (6) inch high berm to contain the remediation equipment, a raised platform area (4' x 12') for the vapor treatment equipment and control panel, and a containment area (15' x 15') for the 5,000 gallon water storage tank. The secondary containment for the water storage tank will include a concrete wall 30 inches in height. The compound includes a sump which is piped into the manifold vault and attached to the liquid ring vacuum pump. The manifold vault will house the manifold connecting the five recovery wells to the liquid ring vacuum pump extraction system.

The equipment pad will be provided with a six (6) foot high chain link fence. The fence will be constructed after installation of the remediation equipment skid onto the new concrete equipment pad. The equipment compound will also be provided with a high pressure sodium light for area lighting.

4.2 REFERENCES

Work performed by AES and lower tier subcontractors during this phase of work will be in accordance with Specification Section 01010 (Statement of Work), Section 11302 (Free-Product Recovery System), Section 01800 (Decontamination), Section 02830 (Chainlink Fence), Section 03302 (Cast in Place Concrete), and Section 15400 (Piping) provided in the Morrison Knudsen Request for Proposal for this subcontract. In addition, work will be performed in accordance with AES specifications Section 01011 (Scope of Work), Section 02221 (Excavation, Backfill, and Compaction), Section 02602 (Steel Manifold Vaults/Sumps), Section 02830 (Fencing - Chain Link), Section 03100 (Concrete Reinforcement), Section 03300 (Cast-in-Place concrete), Section 03301 (Concrete Equipment Pads), Section 04000 (Treatment Compound), and Section 06000 (Electrical).

4.3 CREW SIZE AND MAKEUP

AES will have at least one person on-site during normal working hours for the duration of the remediation equipment installation. Mr. Bobby Hill is proposed as the on-site Project Manager, and Ms. Claire Meurer, P.E., will continue as Project Engineer. Resumes of these personnel are included in Appendix D.

The trenching/pipe installation subcontractor will be utilized to install the equipment pad and tank containment. A qualified fencing subcontractor will be used to install the fencing. The electrical subcontractor will install the area lighting.

4.4 EQUIPMENT

A trenching machine or backhoe will be used to excavate concrete pad beams. Heavy equipment for loading and hauling may also be used.

4.5 SAFETY AND HEALTH RISK ASSESSMENT

Expected subsurface contamination for this site includes high octane gasoline and JP-4 jet fuel. Constituents of concern include benzene, toluene, ethyl benzene, and xylene. Potential hazards include inhalation, ingestion, or dermal contact with these and other potentially harmful substances. The Activity Hazards Analysis (AHA) worksheet provided by Morrison Knudsen for trench excavation will be used for this phase of work since the expected hazards are similar. This AHA worksheet is included in Appendix E. This document will be reviewed by AES and the Morrison Knudsen representative prior to starting work to ensure the AHA adequately addresses the planned activity. All accidents and incidents will be promptly reported to Morrison Knudsen, and a written report will be provided within 24 hours of the incident. AES will maintain a first aid log sheet of all incidents requiring first aid treatment. A first aid kit will be supplied by AES at the site.

4.6 PREVENTATIVE MEASURES

All AES and lower tier subcontractor personnel will receive a site-specific briefing on safety concerns prior to entering the site or the commencement of work. Topics to be discussed include site and work overview, general safety rules and procedures, safety and health hazards present on site, decontamination procedures, and personal protection equipment (PPE) requirements. All AES and lower tier subcontractor personnel will wear leather steel-toe boots, full length slacks, and hard hat. In addition, personnel exposed to contaminated soil or groundwater will wear safety glasses with side shields and chemical resistant gloves.

Breathing air monitoring will be conducted during excavation activities using an FID and an LEL/Oxygen meter. AES will furnish a copy of the instruments' factory calibration and certifications, daily calibration checks, and monitoring results to Morrison Knudsen. All excavation and other equipment coming into contact with excavated soil or groundwater will be decontaminated prior to removal from the site. All excavation and other heavy equipment will be inspected prior to use to ensure adequate maintenance and safe operation.

An excavation permit will be requested from the NAS Corpus Christi Public Works Department. AES will request that underground electrical utilities in the area be marked by the Public Works Department prior to start of excavation.

AES will comply with the Accident Prevention Plan for Naval Facilities Engineering Command Southern Division prepared by Morrison Knudsen.

4.7 SUBTIER CONTRACTORS

One of the following subcontractors may be utilized to perform the installation of the concrete equipment pad:

CCC Group, Inc.
CC Pump, Inc.
Garrett Construction, Inc.

The electrical subcontractor will be used to install the area lighting. A qualified fencing subcontractor will be used to install the fencing.

5.0
INSTALLATION OF REMEDIATION EQUIPMENT AND STORAGE TANKS

5.1 DESCRIPTION OF WORK

The remediation equipment, including the Atlantic Fluidics Model A75 liquid ring vacuum pump, motor, air-water separator, seal water tank, and transfer pumps will be mounted on a single skid to be fabricated and assembled by the equipment supplier (NEPCCO Environmental Systems). The oil-water separator will be mounted on a support structure above the 500 gallon steel product storage tank. The control panel will be mounted on the fence at the raised walkway area of the equipment pad. The vapor phase activated carbon 55-gallon drums will also be placed on the raised walkway. The 550 gallon polyethylene water transfer tank will be installed within the 6-inch bermed compound, and the 5,500 gallon polyethylene water storage tank will be installed within the adjacent 15' x 15' containment area.

The manifold into which the recovery wells are piped will be installed into the manifold vault/sump. Piping for five (5) recovery wells will be provided. Recovery of separate phase hydrocarbon, groundwater, and soil vapor will be from one recovery well at a time. A motorized ball valve for each well will be controlled by the remediation control system to rotate recovery from each of the wells. Each valve will be set to be open a predetermined amount of time.

5.2 REFERENCES

Work performed by AES and lower tier subcontractors during this phase of work will be in accordance with Specification Section 01010 (Statement of Work) and Section 11302 (Free-Product Recovery System) provided in the Morrison Knudsen Request for Proposal for this subcontract. In addition, work will be performed in accordance with AES specifications Section 01011 (Scope of Work), Section 05000 (Plumbing and Piping, General), Section 05410 (Liquid Ring Vacuum Pump Automated Manifold), Section 06000 (Electrical), Section 06010 (Control Panel), Section 11400 (Liquid Ring Vacuum Pump Skid Mounted System), Section 11503 (Polyethylene Storage Tanks), Section 11504 (Oil/Water Separator/Product Tank), and Section 11505 (Vapor Phase Carbon Canisters).

5.3 CREW SIZE AND MAKEUP

AES will have at least one person on-site during normal working hours for the duration of the remediation equipment installation. Mr. Bobby Hill is proposed as the on-site Project Manager, and Ms. Claire Meurer, P.E., will continue as Project Engineer. Mr. Luis Reyna and Mr. John Broadus, P.E., of AES will assist with equipment installation. Resumes of these personnel are included in Appendix D.

The electrical subcontractor will be used to install power to the remediation equipment.

5.4 EQUIPMENT

A crane or forklift will be used to place the skid, storage tanks, and other equipment into the treatment compound. Other heavy equipment may be used for loading and hauling. Power tools may be used during the installation of the equipment.

5.5 SAFETY AND HEALTH RISK ASSESSMENT

No excavation is anticipated during this phase of work. The Activity Hazards Analysis (AHA) worksheet provided by Morrison Knudsen for this phase of work is included in Appendix E. This document will be reviewed by AES and the Morrison Knudsen representative prior to starting work to ensure the AHA adequately addresses the planned activity. All accidents and incidents will be promptly reported to Morrison Knudsen, and a written report will be provided within 24 hours of the incident. AES will maintain a first aid log sheet of all incidents requiring first aid treatment. A first aid kit will be supplied by AES at the site.

5.6 PREVENTATIVE MEASURES

All AES and lower tier subcontractor personnel will receive a site-specific briefing on safety concerns prior to entering the site or the commencement of work. Topics to be discussed include site and work overview, general safety rules and procedures, safety and health hazards present on site, decontamination procedures, and personal protection equipment (PPE) requirements. All AES and lower tier subcontractor personnel will wear leather steel-toe boots, full length slacks, and hard hat.

All lifting and other heavy equipment will be inspected prior to use to ensure adequate maintenance and safe operation.

AES will comply with the Accident Prevention Plan for Naval Facilities Engineering Command Southern Division prepared by Morrison Knudsen.

5.7 SUBTIER CONTRACTORS

The electrical subcontractor will be used to install the electrical connections to the equipment.

6.0
SYSTEM STARTUP

6.1 DESCRIPTION OF WORK

The extraction and treatment equipment will be tested and started up following completion of the installation of the equipment. Initial startup will be in the automatic mode, with the unit cycling through the five monitor wells for the pre-determined periods of time using the automatic motor valves on the manifold to control operation. For the first four hours following initial start-up, vacuum pressure, temperature, vapor flow, liquid level, and vacuum influence data will be gathered every half hour. The vapor phase carbon will also be sampled to ensure breakthrough does not occur. One drum of vapor phase carbon will be stored on-site in the event that breakthrough occurs.

Monitoring of the unit operation will continue on an hourly basis after the first four hours until one complete cycle of well extraction has occurred. Monitoring will then continue as needed (as determined in the field by the MK and AES on-site representatives). If desired, the unit can be taken off the automatic mode and used to place each recovery well under vacuum for four to eight hours to analyze the response from each individual well. The operation of the unit and the recovery of product and vapor from the wells will be closely monitored during the initial two week startup period. Fluid levels in recovery wells and surrounding monitoring wells can also be monitored.

6.2 REFERENCES

Work performed by AES and lower tier subcontractors during this phase of work will be in accordance with Specification Section 01010 (Statement of Work) and Section 11302 (Free-Product Recovery System) provided in the Morrison Knudsen Request for Proposal for this subcontract. In addition, work will be performed in accordance with AES specifications Section 01011 (Scope of Work) and Section 01650 (Starting of Systems).

6.3 CREW SIZE AND MAKEUP

AES will have at least three persons on-site during the startup of the remediation system. Mr. Bobby Hill, Ms. Claire Meurer, P.E., and Mr. John Broadus, P.E., of AES will assist with startup. Resumes of these personnel are included in Appendix D.

6.4 EQUIPMENT

An LEL meter will be used to monitor the vapor phase activated carbon for breakthrough and the ambient air for explosive conditions.

6.5 SAFETY AND HEALTH RISK ASSESSMENT

The Activity Hazards Analysis (AHA) worksheet provided by Morrison Knudsen for this phase of work is included in Appendix E. This document will be reviewed by AES and the Morrison Knudsen representative prior to starting work to ensure the AHA adequately addresses the planned activity. All accidents and incidents will be promptly reported to Morrison Knudsen, and a written report will be provided within 24 hours of the incident. AES will maintain a first aid log sheet of all incidents requiring first aid treatment. A first aid kit will be supplied by AES at the site.

6.6 PREVENTATIVE MEASURES

All AES and lower tier subcontractor personnel will receive a site-specific briefing on safety concerns prior to entering the site or the commencement of work. Topics to be discussed include site and work overview, general safety rules and procedures, safety and health hazards present on site, decontamination procedures, and personal protection equipment (PPE) requirements. All AES and lower tier subcontractor personnel will wear leather steel-toe boots, full length slacks, safety glasses, and hard hat.

AES will comply with the Accident Prevention Plan for Naval Facilities Engineering Command Southern Division prepared by Morrison Knudsen.

6.7 SUBTIER CONTRACTORS

A representative from the equipment supplier (NEPCCO Environmental Systems) may be present for one day during the initial startup of the system

7.0
OPERATIONS, MAINTENANCE, AND TRAINING

7.1 DESCRIPTION OF WORK

AES will continue to operate and maintain the remediation system for a period of two months from initial startup of the unit. A weekly visit by the AES field technician will be scheduled to check operation of the system, perform preventative maintenance, and monitor fluid levels in the storage tanks. AES will arrange to have the recovered groundwater transported from Fuel Farm 216 to the Industrial Wastewater Treatment Plant on-base on a weekly or twice a week basis, as needed.

During this period of time, training will be provided to personnel designated by MK on the operation and maintenance of the system. Training will include a review of the O&M Manuals and system configuration, on-site demonstration of system operation, a review of required preventive maintenance, and information on trouble-shooting.

8.0
WASTE MANAGEMENT PLAN

8.1 DESCRIPTION OF WORK

All wastes generated during the installation and startup of the remediation system will be properly disposed. Wastes of concern include:

8.1.1 soil cuttings from boreholes, generated during the geoprobe investigation

8.1.2 soil excavated from trenching and pipe installation

8.1.3 soil excavated from under concrete equipment pad

8.1.4 discarded personal protection equipment

8.1.5 construction debris

8.1.6 decontamination water

8.1.7 sanitary wastes

8.1.8 spilled materials and spill cleanup waste

Soil cuttings from the geoprobe investigation are contained in three 55-gallon drums located in the bermed area by First Street.

Soil excavated from the trenching will remain adjacent to the trench and used as backfill if approved by the on-site MK representative. Trenching will be to a depth of only about 12 inches below ground surface and is not expected to exhibit contamination. Samples of the excavated soil will be screened using an FID to ensure no contamination is indicated.

Soil excavated in the vicinity of the new concrete equipment pad is not expected to exhibit contamination. The soil will be regularly monitored with an FID and visually to determine if contamination is indicated. Special care will be taken if excavating more than three feet below ground surface.

Discarded personal protection equipment will be collected in a 55-gallon drum and properly disposed of. Uncontaminated construction debris will be collected in a rolloff as necessary and properly disposed. Decontamination water will be collected in drums and taken to the Industrial Wastewater Treatment Plant on-base for disposal. Sanitary wastes will be contained within the portable toilets and removed from the site regularly.

Every effort will be made to prevent any spill of contaminated fluid. In the event that a spill occurs, absorptive pads or other absorptive materials will be used to contain and absorb spilled hydrocarbon. Spill cleanup materials will be placed in a 55-gallon drum and stored within the bermed area along First Street pending proper disposal.

Solid hazardous wastes (if generated) will be transported to the Texas Ecologists, Inc., landfill in Robstown for disposal. Hazardous waste is not expected based on previous sampling at the site. Non-hazardous wastes will be disposed of by NAS Corpus Christi. AES will perform all documentation as required for the proper disposal of these wastes and provide this documentation to MK.

8.2 REFERENCES

Work performed by AES during this phase of work will be in accordance with Specification Section 01010 (Statement of Work) and Section 01850 (Waste Transportation and Disposal) provided in the Morrison Knudsen Request for Proposal for this subcontract.

8.3 SAFETY AND HEALTH RISK ASSESSMENT

The primary hazards expected during this phase of work include possible contact with contaminated soils or injury involving the use of loading or other heavy equipment. AES and the Morrison Knudsen representative will review safety concerns prior to sampling or disposing of wastes. All accidents and incidents will be promptly reported to Morrison Knudsen, and a written report will be provided within 24 hours of the incident. AES will maintain a first aid log sheet of all incidents requiring first aid treatment. A first aid kit will be supplied by AES at the site.

8.4 PREVENTATIVE MEASURES

All AES and lower tier subcontractor personnel will receive a site-specific briefing on safety concerns prior to entering the site or the commencement of work. Topics to be discussed include site and work overview, general safety rules and procedures, safety and health hazards present on site, decontamination procedures, and personal protection equipment (PPE) requirements. All AES and lower tier subcontractor personnel will wear leather steel-toe boots, full length slacks, safety glasses, and hard hat.

AES will comply with the Accident Prevention Plan for Naval Facilities Engineering Command Southern Division prepared by Morrison Knudsen.

8.5 SUBTIER CONTRACTORS

Waste transporter companies may be hired to remove wastes from the site for disposal.

9.0
DOCUMENTATION

The following plans, reports, and documentation will be provided to Morrison Knudsen.

9.1 Site Characterization Report - detailing the procedures and results of the geoprobe investigation and liquid ring vacuum pump pilot test.

9.2 Site Specific Safety and Health Plan

9.3 QA/QC Plan

9.4 Pilot Study Report - detailing the results of the first two weeks of operation of the installed remediation equipment

9.5 Draft and Final O&M Manuals

9.6 Final As-Built Drawings

APPENDIX A
SITE SAFETY AND HEALTH PLAN

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SITE SAFETY AND HEALTH PLAN FOR REMEDIATION ACTIVITIES AT NAS CORPUS CHRISTI

1.0 SITE DESCRIPTION, CONTAMINANT CHARACTERIZATION AND REFERENCES

1.1 INTRODUCTION

This Site Safety and Health Plan (SSHP) describes safety and health requirements for remediation activities at NAS Corpus Christi, Free Product Removal Project. This SSHP is consistent with requirements of the Occupational Safety and Health Administration's (OSHA) Hazardous Waste Site Regulations, 29 CFR 1910.120 and 29 CFR 1926.65 along with the U.S. Army Corps of Engineers' (ACOE) *Safety and Health Requirements Manual* EM 385-1-1 dated October 1992. This SSHP is applicable to all personnel who enter into work areas described in this SSHP and who are under Morrison Knudsen Corporation (MK) or MK's Subcontractors' control.

1.2 SITE DESCRIPTION

NAS Corpus Christi is located on the Gulf of Mexico in south Texas adjacent to the City of Corpus Christi. Work will be conducted at the non operational Fuel Farm 216 located in the northwestern portion of the base. Fuel Farm 216 contains 36 25,000-gallon underground storage tanks (USTs) which stored jet fuel (JP-4) and aviation gasoline. The fuel farm was closed in 1987 and each UST was closed in place. An additional area adjacent to Fuel Farm 216 designated Tank Nest 162 contained two 10,000 UST's used to store diesel fuel. Both tanks were closed by removal in 1991. Figure 1 is included as the vicinity map and Figure 2 as the work site map.

The scope of the work include design and installation of a vacuum-assisted free-product recovery or bioslurp system to remove the free floating product. The Definable Features of Work (DFOW) include the following: 1) system design and fabrication; 2) mobilization/demobilization; 3) site investigation/soil and groundwater sampling; 4) equipment installation; 5) system startup and pre-operational testing; 6) pilot testing; 7) drilling, installation of additional wells, and system modification; 8) final test and construction reports; and 9) site restoration.

Equipment installation includes: 1) installation, testing and operation of bioslurp system; 2) modify existing recovery wells for bioslurp system and construct well surface closures; 3) construct conveyance system including excavation, piping, backfilling and capping; 4) construct area lighting, fencing, and a lockable gate at the system installation location; 5) construct effluent treatment system and holding tank on existing concrete slabs; 6) construct product recovery storage tank on existing concrete slabs; and 7) provide electrical power supply, controls, and instrumentation including conduit, wire, hardware and distribution equipment.

1.3 CONTAMINANT CHARACTERISTICS

Potential contaminants expected to be encountered during remedial construction include residuals of Jet Fuel (JP-4), aviation gasoline (AVGAS) and possibly diesel fuel present in the soil and/or groundwater. More specifically, the contaminants include benzene, toluene, ethylbenzene and xylene, referred to the BTEX constituents of petroleum products. In addition, polycyclic aromatic hydrocarbons (PAHs) have been detected in soil and ground waters around the site as reported in the EA&H Contamination Assessment Report (CAR). The PAHs of any significance include naphthalene, 2-methyl naphthalene and 1-methylnapthalene. Groundwater sample results indicate Total Petroleum Hydrocarbons (TPH), BTEX and semi volatiles, which include 2 methyl naphthalene; phenol; n-nitrosodi n-propylamine; and naphthalene.

Additional contaminants could be present. They include coal tar pitch volatiles. Cresols, manganese, N,N-dimethylformamide and octane are common constituents of aviation fuels, kerosene, diesel, and fuel oil. Tetraethyl lead was a common constituent of jet fuels and gasoline and may be present in residual product. Triorthocresylphosphate (TOCP) is a common constituent of gasoline and may be present in residual product.

Refer to Table 1 which is provided as a summary on each known potential contaminant. Its description, exposure limits, signs and symptoms of acute exposure and recommended first aid is listed. MSDS's or NIOSH Pocket Guides for each of the contaminants and other chemical substances used in remedial construction shall be organized into separate MSDS Binders by the MK SSHO to be located on site.

1.4 REFERENCES

1. *Draft Contamination Assessment Report (CAR), NAS Corpus Christi*, EnSafe/Allen and Hoshall (EA&H), June 9, 1995.
   Draft Remedial Action Plan (RAP), NAS Corpus Christi, EnSafe/Allen and Hoshall (EA&H), October 6, 1995.
   Niemi to Jackman, *Free Product Recovery System Design Naval Air Station Corpus Christi*, MK-Boise, September 27, 1995.
2. *Safety and Health Requirements Manual*, US Army Corps of Engineers (ACOE), EM 385-1-1, October 1992.
3. *Pocket Guide to Chemical Hazards*, National Institute for Occupational Safety and Health (NIOSH), Publication N. 94-116, June 1994.
4. *Limits for Air Contaminants*, Title 29 CFR Part 1910 Section 1000, Table Z-1, July 1, 1994 revision.
5. *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Indices*, American Conference of Governmental Industrial Hygienists (ACGIH), 1994 - 1995.

6. *Accident Prevention Plan For Naval Facilities Engineering Command Southern Division,* Prepared by Morrison Knudsen under contract N62467-93-D- 1 106, May 20, 1994, Revision 0.
7. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities,* NIOSH/OSHA/USCG/EPA, DHHS (NIOSH) Publication No. 85-115, October 1985.
8. Maslansky, Carol J. and Steven P., *Air Monitoring Instrumentation, A Manual for Emergency, Investigatory, and Emergency Responders*, Van Nostrand Reinhold, 1993.
9. *Industrial Hygiene Procedures Manual,* Morrison Knudsen Corporation EC&E Group, Rev.No 0, April 1994.
10. *Safety and Health Program Description for Hazardous Waste Operations,* Morrison Knudsen Corporation, Rev. 1, September 1994.
11. *Safety Procedures and Guidelines Manual,* Morrison Knudsen Corporation, October 1995.
12. The following MK SOUTHDIV NAVFAC Program Procedures:

PHSP 01.1, Hazardous Energy Control (Lockout/Tagout), 3/15/96.
PHSP 02.1, Emergency Response, 3/15/96.
PHSP 03.1, Spill Response, 3/15/96.
PHSP 04.1, Incident Reporting, 3/15/96.
PHSP 05.1, Excavations, 5/21/96.

2.0 SAFETY AND HEALTH HAZARDS SUMMARY

2.1 OVERVIEW

During removal activities, the potential risk of acute exposure to the chemical contaminants listed in Table 1 is considered low. Engineering controls, Administrative Controls and Personal Protective Equipment (PPE) requirements shall be strictly adhered to. The chemical agents posing the highest health risk are benzene and tetraethyl lead. An airborne concentration of benzene near the breathing zone of a worker is considered very unlikely. During drilling activities, organic vapor concentrations in borings could be high, especially when free product is contacted. Breathing zone concentrations are not expected to exceed any action levels. This assumption will be validated by an ongoing air monitoring program, and if necessary, an air sampling program.

Contaminants posing dermal absorption risks such as tetraethyl lead are not expected to be airborne threats. Based on our previous work experiences with similar contaminants reported in the parts per million (ppm) concentrations, direct contact poses more of an exposure threat then airborne. Therefore, Personal Protective Equipment (PPE)(mainly skin protection), decontamination and good hygiene practices are critical when working with the listed

contaminants, and will be emphasized throughout the work campaign. Remedial construction physical hazards are probably the greatest contributor to any risk on this job as discussed below.

2.2 ACTIVITY HAZARD ANALYSES (AHA)

AHA have been prepared for each anticipated task in accordance with EM 385-1-1, October 1992 (ACOE, 1992). These hazard analyses are in the form of worksheets contained in Appendix A of this SSHP. Each site activity shall be reviewed by field supervision, namely the MK SSHO, MK General Superintendent and Subcontractor Job Supervisors(s) prior to starting work to determine if the prepared AHA adequately addresses the planned activity. If the prepared AHA requires revision or a new task is identified, additional hazard analysis will be prepared as needed. A new AHA worksheet shall be field prepared by the Subcontractor Job Supervisor and the MK SSHO before the activity takes place. The Pre-Entry Briefing meeting is utilized to review the AHA and is conducted with all affected workers by the Subcontractor Job Supervisor.

2.3 CHEMICAL HAZARDS

The potential chemical contaminants considered most significant on this project are benzene by inhalation mode and tetraethyl lead by absorption mode. Table 1 for a summary on potential chemicals of concern.

2.4 BIOLOGICAL HAZARDS

None anticipated, however, use caution and assess work areas for specific insect and snake concerns along with biohazard plant life. The MK SSHO shall meet with base medical staff and discuss and potential concerns.

2.5 CONSTRUCTION SAFETY HAZARDS

2.5.1 Physical Hazards

The physical hazards associated with the project include the use of heavy equipment, power and handtools and special power equipment. Examples include backhoes and drill rigs, underground utilities and electrical lines and process lines. Other physical hazards include could include heat stress; adverse weather conditions, and noise. Other possible safety hazards include the potential for slipping, falling, head trauma, lifting heavy objects, struck by and struck against and pinch points. All these physical hazards could cause slips, trips, and falls, cuts, contusions, and lacerations, traffic accidents, electrical shock, fires and explosions, crunching, pinching, injury from falling objects and heat/cold stress related disorders. Hazards also arise from vehicular traffic in and around the parking areas during construction activities. An active run-way is located south and southwest of the work area. Elevated equipment such as drill rigs will be flagged when in elevated position in accordance with guidance from the Resident Officer In Charge of Construction (ROICC). Each Contractor shall take proactive measures to prevent foreign object

damage to aircraft from potential projectiles when work is being done in the near vicinity of the flight line and hangar areas.

2.5.2 Noise

Well construction operations may create noise levels that exceed the applicable limits. Hearing protection shall be provided for all field personnel, and its use is required when noise levels exceed 85 decibels A weighted network {dB(A)} steady state or 140 dB(A) impulse, regardless of the duration of exposure. A comprehensive Hearing Conservation Program shall be implemented by the Subcontractor to protect personnel when noise levels equal or exceed 85 dB(A) as an 8-hour time weighted average. Exposure assessments will be conducted by the MK SSHO throughout the work campaign.

2.5.3 Heat and Cold Stress

All employees are to be alert to the signs and symptoms of heat stress. Should any of the following symptoms occur: extreme fatigue, cramps, dizziness, headache, nausea, profuse sweating, rapid pulse, pale clammy skin, the employee is to immediately leave the work area, rest, cool off, and drink plenty of cool water. If the symptoms do not subside after a reasonable rest period, the employee shall notify their supervisor who in turn will notify the MK SSHO and seek medical assistance. The MK SSHO and the site supervisor will be alert to signs of heat stress in site personnel and increase the frequency of breaks and fluid consumption as necessary. Cold stress is not anticipated as an occupational risk.

2.5.4 Excavations

MK Project Procedure PHSP 05.1 shall be followed regarding excavation safety.
Positive identification of underground utilities and services is required at least 24 hours prior to any excavation or trenching. An Excavation and Trenching Permit as found in the referenced procedure shall be posted at the excavation site. The Mechanical and Electrical Subcontractor, and if necessary the Well Driller/Installer Subcontractor will provide and coordinate additional underground utility locator service with MK. See Section 2.5.6 that follows. Individuals shall be properly trained prior to initiating work activities. A competent person shall evaluate all excavations and trenches on a daily basis regardless of whether personnel will enter. The competent person must be present whenever water removal is taken place from an excavation.

2.5.5 Underground Utilities

Underground utilities will be located to the extent possible via historical information, as-built drawings, and through the use of metal detectors and/or other devices such as ground penetrating radar prior to initiating excavation. Positive identification of underground utilities and services is required. An Excavation and Trenching Permit system shall be used whenever excavation,

trenching or penetrations are planned. If energy control is anticipated for underground utilities, the requirements established in MK project procedure PHSP 01.1 shall be followed.

Utility identification will be coordinated by MK. For facilities related utility and process system locations, the MK Project Engineer will work with the NAS Corpus Christi Public Works Department (PWD) and prepare a site specific utility diagram for each work area. NAS Corpus Christie site drawings will be reviewed to identify locations of all electrical, gas, water, and storm drain lines and they will be located on a single site drawing. MK will notify the ROICC at least 5 working days in advance of excavating, trenching and penetration activities to verify underground installations. The Subcontractor shall use metal detectors prior to the excavation/penetration activity to locate underground anomalies or designated utility. A site walk shall be conducted after utilities have been identified as a final check to assure agreement between all parties involved. Personnel attending shall include PWD personnel, utility locate personnel, MK, and Subcontractor personnel.

2.5.6 Fire and Explosion

No hot work or open flames will be allowed in the work area without a "Hot Work Permit". The MK Hot Work Permit form will be available through the MK SSHO. When fire or explosion hazards exist, all tools shall be of the non-sparking variety and pumps/blowers will be bonded or grounded to minimize hazards associated with static discharge. Use of any tool that can be considered an ignition hazard where fire and explosion hazards may exist is strictly prohibited. Portable power tools shall be explosion proof in accordance with NFPA 70B and 70E, Class 1, Division 1, Group D or otherwise approved for use in potentially explosive atmospheres.

At least two 20 lb "ABC" multi purpose dry chemical fire extinguishers shall be maintained for fire response at the entrance to the Contamination Reduction Zone (CRZ). All mobile heavy equipment must be fitted with a minimum 10 lb "ABC" fire extinguisher. Any temporary trailers or structures must have fire extinguishers installed in accordance with NFPA 10. Depending on the fire loading, in most cases a 5 lb "ABC" is sufficient in each office trailer. This extinguisher must be mounted at least four feet from the floor next to a egress door.

2.5.7 Electrical Hazards, Control of Hazardous Energy (Lockout/Tagout)

When energy control is anticipated for any utility and/or mechanical and process equipments, the requirements established in MK project procedure PHSP 01.1 shall be followed. The Subcontractor shall have available a complete set of Lock and Tag Hardware available for use by their Authorized Personnel. The MK Site Superintendent shall be responsible for verifying adequacy of all lockout/tagout installations and notifying all Affected Personnel. The MK Site Superintendent and the Subcontractor Supervisor have the responsibility for implementing energy control measures. Energy control involving any Base utility or process equipment shall be coordinated through the Navy's Resident Officer In Charge of Construction (ROICC) by the MK Site Superintendent. The Subcontractor will initiate all energy control requests to MK three working days in advance of anticipated work commencement.

Ground Fault Circuit Interrupters (GFCIs) shall be installed on all portable electrical equipment and installations in accordance with EM 385-1-1 Section 11.C.05. All extension cords shall have GFCI protection and shall be inspected by the MK SSHO and determined to be free of cracks or frays.
In addition, energy controls apply to motorized heavy equipment and the following requirement applies. At a minimum, during service and maintenance of motorized equipment, the key shall be removed and in possession of the service or maintenance person and a "Do Not Operate" tag signed by this person shall be displayed near the start-up controls.

2.5.8 General Motor Vehicle, Hand and Power Equipment Safety

The following traffic rules will apply to all motorized vehicles and equipment while on site:

- Equipment carrying waste shall always have the right-of-way within the Work Zones.

- The speed limit is 10 mph, or as posted. Exceeding the speed limit is cause for disciplinary action, including removal from the site. Trucks used for hauling materials, equipment, debris and rubbish shall be equipped with and use tailgates. Loads shall be covered and measures be taken to ensure hauling routes do not have debris which has inadvertently fallen off trucks.

- Personnel shall not ride equipment that has not been specifically designed for the transport of personnel.

- Seatbelts shall be worn at all times when operating any motorized equipment or vehicle.

- All motor vehicles and equipment including hand and power tools shall be subject to an incoming safety inspection by the MK SSHO. The MK SSHO reserves the right to reject any subcontractor equipment. A "DO NOT USE" or "DEFECTIVE" tag will

be placed on the equipment and documented in the MK SSHO Logbook. Corrective action will be pursued with the Subcontractor Supervisor.

- Daily safety checklists shall be completed by Subcontractor heavy equipment operators, especially any type of overhead crane or lifting equipment including the drill rig, and delivered to the MK Site Project Office on a daily basis. The checklist should be based on the equipment manufacturers recommended guidelines for daily checks using a format established and prepared by the owner/operator/subcontractor and approved by the MK SSHO.

2.5.9 Traffic and Work Site Control Safety

Potential hazards from vehicular traffic around the work areas will be controlled by placing approved barricades and signs around the work area. Workers required to work in active traffic areas or roadways will be required to wear high visibility reflective vests. Suggested types of barricades along with placement and signs will follow the requirements of EM 385-1-1, Section 8 and 29 CFR 1926.201 and 202. Elevated equipment such as drill rigs will be flagged when in elevated position in accordance with guidance from the Resident Officer In Charge of Construction (ROICC). All road closures shall be scheduled ten days in advance with the PWD.

3.0 RESPONSIBILITIES AND AUTHORITIES SUMMARY

This section describes the roles and responsibilities of project personnel with regard to safety and health. Ultimately, responsibility for the safety and health lies with the individual. All personnel must be cognizant of the hazards and the methods of reducing the risk of injury and illness. All personnel will comply with the rules and procedures set forth in this plan and will make project management aware of any conditions which may jeopardize the welfare of project workers and/or the general public. The specific personnel names and telephone numbers of responsible persons are presented in Table 2 herein.

3.1 MK PROJECT MANAGER (PM)

The PM is responsible for the management of all aspects of the project, including safety and health. The PM is responsible for ensuring that all project tasks receive appropriate safety and health review before commencement of field activities and that the necessary equipment and facilities are available to implement the SSHP.

3.2 MK GENERAL SUPERINTENDENT AND SUBCONTRACTOR JOB SUPERVISORS

The MK General Superintendent and the Subcontractor Job Supervisor(s) are responsible for ensuring that the safety and health aspects for their particular task are addressed. They are responsible for the implementation of the SSHP in the field and for ensuring that all project

personnel comply with provisions of the plan. The MK General Superintendent and Subcontractor Job Supervisor(s) are also responsible for notifying the MK Site Safety and Health Officer (SSHO) of any changes in work conditions which may affect the safety and health aspects of the task. The MK General Superintendent is responsible for conducting Plan of the Day (POD) meetings. The Subcontractor Job Supervisor(s) are responsible for conducting Pre-Entry Briefings and Post Entry Briefings.

The Subcontractor Job Supervisor(s) must notify the MK SSHO and MK General Superintendent of all accidents and incidents as soon as possible. The Subcontractor Job Supervisor(s) shall conduct an accident investigation and record the results of the investigation on a Supervisor Accident Investigation Report form or equivalent form. The initial investigation report shall be formally transmitted to the MK Project Manager within four hours after critical management of the incident is complete. The MK Project Manager shall follow the reporting requirements described in Section 11.2 of this SSHP. Section 11.2 references the MK Project Procedure PHSP-04-1. The MK General Superintendent shall conduct a critique of the incident with selected MK and Subcontractor personnel as soon as possible after critical management of the incident is complete. Lessons learned will then be developed by the MK General Superintendent and Subcontractor Job Supervisor(s) and communicated to all affected personnel.

3.3 MK CERTIFIED INDUSTRIAL HYGIENIST (CIH)

The MK CIH who is the MK Project Management Office (PMO) Health and Safety Manager is responsible for preparation of the Site Safety and Health Plan (SSHP). The CIH is based out of the Boise, ID office. The CIH is responsible for making modifications to the plans and recommending changes to the work tasks if they affect safety and health. The CIH is responsible for ensuring that all required sampling/monitoring is performed and that all required safety and health documentation is maintained. The CIH may assign some tasks to the MK SSHO for implementation.

3.4 MK SITE SAFETY AND HEALTH OFFICER (SSHO)

The MK SSHO is responsible for the day-to-day implementation of the Site Safety and Health Plan (SSHP), and verification of compliance with the SSHP and all applicable occupational safety and health rules and regulations. The MK SSHO has the authority to suspend work at any time if there is an imminent threat to the health and safety of project workers or the general public. The MK SSHO shall assure the Navy's designated authority at the site is notified immediately of any accident including spills. The MK SSHO shall assist in the accident investigation effort and shall have final approval authority for accident reports. The MK Work Plan document describes in detail the role and responsibilities of the MK SSHO on this project.

3.5 SUBCONTRACTOR DESIGNATED COMPETENT SAFETY PERSON

The Well Driller and Mechanical/Electrical Subcontractor's shall designate a competent and qualified person, subject to the approval of the MK SSHO and the MK Site Project Engineer, responsible for the implementation of this SSHP and their Company's safety and health program. This designated person shall be referred to as the Subcontractor SSHO. The Subcontractor's SSHO shall be qualified to perform air monitoring to support the subcontractor's operation and be supplied with the appropriate monitoring equipment described in Section 7 of this plan. The Subcontractor SSHO shall provide the MK SSHO copies of all factory calibration certificates and the forms to be used to record daily field calibrations for each instrument. The Subcontractor SSHO shall provide a daily site safety report and shall coordinate his efforts with the MK SSHO.

3.6 SUBCONTRACTOR PERSONNEL

All subcontractors are required to have a qualified designated competent safety person who will assure and abide by the requirements of this SSHP as stated above. They are also required to comply with all applicable and appropriate federal, state, and local laws, standards, and regulations. Subcontractors must notify the MK SSHO and MK General Superintendent of all accidents as soon as possible. Subcontractors must maintain records of all first aid rendered and recordable, and lost time injuries. Subcontractors must notify the MK SSHO of any changes in work conditions which may affect the safety and health aspects of the task.

3.7 NEAREST EMERGENCY MEDICAL FACILITIES

Directions to Naval Hospital Corpus Christi

1. Located off of Avenue E just east of Lexington Blvd.
2. Travel distance is approximately one mile, travel time approximately five minutes.

Directions to Spohn Hospital

1. Ocean Drive west, turn left on Ayers Street.
2. Proceed two blocks and turn right on Third Street, the emergency room will be on the right.
3. Travel distance is approximately nine miles, travel time approximately twenty minutes.

A copy of the map to the hospital shall be posted at work sites for reference, refer to Figure 3 for a copy of this map plus Table 2 for phone numbers. **Note: a clean copy of this map shall be obtained by MK SSHO during mobilization.**

4.0 TRAINING AND SAFETY MEETING REQUIREMENTS SUMMARY

This Section lists all regulatory driven and project specific training required for this job. Table 3 provides a summary on training requirements. Safety related meetings required for this project

are described beginning in Section 4.10. A training and meeting requirements matrix is shown in Table 3.

4.1 HAZARDOUS WASTE OPERATIONS TRAINING

All personnel entering a contamination reduction zone or exclusion zone shall have completed the initial 40-Hour Hazardous Waste Operations Safety and Health Training and three days of supervised experience pursuant to 29 CFR 1910.120(e)(3). All personnel shall receive eight hours of refresher training annually, pursuant to 29 CFR 1910.120(e)(8), as necessary. All on-site supervisors and managers as well as subcontractor superintendents and foremen shall receive an additional eight hours of specialized training pursuant to 29 CFR 1910.120(e)(4).

4.2 SITE SPECIFIC TRAINING

All personnel shall receive site-specific training prior to entering the site or commencement of work. All site employees and subcontractors, including those working in the support zone, shall receive this training. The Subcontractor Job Supervisor(s) are responsible for identifying personnel requiring this training and coordinated with the MK SSHO regarding scheduling of this training. The MK SSHO or designated alternate will conduct the training. Site visitors shall receive site-specific training prior to entering an exclusion zone. An abbreviated version of this training will be given to site visitors not entering an exclusion zone but whose business will be conducted unescorted in the near vicinity of the Work Zones. The format and content will be left up to the discretion of the MK SSHO. This training will cover the SSHP, but not necessarily be limited to, the following topics.

- Names of site safety and health personnel.
- Safety and health hazards present on the site and anticipated during the work campaign.
- Hazard Communication.
- PPE requirements.
- Safe work practices.
- Engineering and Administrative controls .
- Medical surveillance requirements, including recognition or symptoms and signs which might indicate overexposure to hazards.
- Decontamination procedures.
- Emergency procedures.
- Spill containment plan.
- Energy Control.
- Requirements of this SSHP.

4.3 CONFINED SPACE ENTRY TRAINING

Not anticipated on this project.

4.4 RESPIRATORY PROTECTION TRAINING

All MK personnel and subcontractors required to use respiratory protection shall be trained in respirator use, care and maintenance pursuant to 29 CFR 1926.103 and 29 CFR 1910.134. Each individual shall be medically qualified to wear a respiratory device and have documented evidence of successfully completing respiratory training and fit testing.

4.5 HAZARD COMMUNICATION TRAINING

All personnel shall complete hazard communication training pursuant to 29 CFR 1910.1200 and 29 CFR 1926.59 regarding all potentially hazardous chemicals to which they may be exposed. In the event that the OSHA regulations regarding other contaminants or hazards become applicable, substance-specific training pursuant to the subject regulation will be performed for the affected project personnel.

Each subcontractor shall have a written Hazard Communication Program in accordance with OSHA's Hazard Communication Standard, 29 CFR 1910.1200 and applicable State Department of Health Regulations. Material Safety Data Sheets (MSDS) for all hazardous materials in the work area shall be readily available for employees to review. MSDSs and/or NIOSH Pocket Guides for the contaminants suspected to be in the various work sites will be placed in a site MSDS Right-To-Know Binder. Copies will be maintained at each work site or some location convenient for employees to review plus a copy will be kept at the MK Project Office and the Subcontractor(s) Project Office.

Hazard Communication training will be included as part of the Site-Specific Training required in Section 4.2. When new chemicals are brought onto the work site or new chemical contaminants are identified, an MSDS and/or NIOSH Pocket Guide will be added to the MSDS Right-To-Know Binder(s) with a corresponding review by the MK SSHO and Subcontractor Job Supervisor(s) and if necessary, training shall be conducted with affected individuals. The MK SSHO has overall responsibility for maintenance of the MSDS database. Subcontractors are responsible for notifying the MK SSHO of new chemicals or substances being used in the work place. Subcontractor Job Supervisor(s) are responsible for reviewing the MSDS, identifying training needs for affected workers and transmitting a copy of the MSDS to the MK SSHO.

4.6 CPR/FIRST AID AND BLOODBORNE PATHOGENS

At least two employees on each shift shall be qualified to administer first aid and CPR. At the minimum, the MK SSHO and each Subcontractor shall have at least one person First Aid/CPR qualified. These personnel are also required to be trained to 29 CFR 1910.1030 (Bloodborne Pathogens) as stated and in accordance with MK IH Procedure 11. Trained first aid CPR personnel shall be identified by hard hat stickers or other means of identification.

4.7 DEPARTMENT OF TRANSPORTATION (DOT) HAZARDOUS MATERIALS TRAINING

All personnel required to classify, mark, select packaging, inspect, load and transport hazardous materials must be trained to 49 CFR Part 172 Subpart H. This includes personnel responsible for packaging of samples to be sent to off site laboratories for analysis. Also included are personnel responsible for completing a hazardous waste or hazardous material manifest and insuring the hazardous waste/material is properly prepared for off site shipment.

4.8 SAFETY MEETINGS

Safety meetings for all MK employees and subcontractors personnel shall be conducted on a weekly basis. This group meeting by design will be intended to be a self assessment of safety performance and a chance to review any lessons learned as a group plus an opportunity to introduced specialized training topics. The meeting shall be chaired by the MK General Superintendent and Subcontractor Supervisor(s) with assistance by the MK SSHO and/or subcontractor designated competent safety person. This safety meeting can also be used to describe any changes in the Site Specific Training described in Section 4.4. Safety Meetings are documented using Figure 4 from this plan or equivalent. An additional Safety Meeting for all MK personnel and Subcontractor Job Supervisor(s) shall be conducted at least once per month. The monthly meeting is chaired by the MK Project Manager or General Superintendent with assistance from the MK SSHO. Its purpose is to review and rate safety performance and identify any areas requiring additional specialized training. This meeting shall be documented to include date, time, personnel in attendance, topics, and instructor. The Safety Meeting shall be documented using Figure 4 or equivalent.

4.9 PLAN OF THE DAY (POD) MEETINGS

Plan Of The Day (POD) Meetings shall be held at the beginning of each shift to review the planned work of the day as well as any safety and quality concerns. The meeting is chaired by the MK General Superintendent or MK PM. The attendees include the Subcontractor(s) Job Supervisor, the MK Quality Control representative, the MK SSHO and other selected personnel. The date, time, personnel attending and meeting minutes shall be documented using Figure 3 or equivalent.

4.10 PRE- AND POST-ENTRY BRIEFINGS (MEETING)

Pre-entry briefings shall be held for employees prior to their initiating any new or differing site activity in an exclusion zone and at such other times as necessary to ensure employees are knowledgeable of the work plan activity, the Activity Hazards Analysis, and that the plan and analyses are being followed. Pre Entry Briefs are the responsibility of the Subcontractor Job Supervisor. Attendance shall be documented using Figure 5 from this Plan. In addition, a sign-in

and sign-out sheet shall be made available at the CRZ for personnel to sign and record time in and out of the exclusion zone.

Post-entry briefings shall be held as needed to assure changes in conditions or work methods are promptly reported and addressed. In addition, all incidents will be promptly evaluated and the evaluation results will be communicated to personnel in post-entry briefings and other meetings. Lessons-learned from these evaluations shall be communicated to all affected personnel. Post Entry Briefs are the responsibility of the Subcontractor Job Supervisor. They are not required to be formally documented using Figure 5 from this plan, a logbook entry is sufficient.

4.11 QUALITY CONTROL PREPARATORY PHASE INSPECTION MEETING

The MK SSHO shall attend all Quality Control Preparatory Phase Inspection Meetings to discuss any safety and health concerns requiring special attention and to review anticipated safety requirements for a specific definable feature of work, and to review specific air monitoring required.

4.12 RECORDKEEPING

Written records of all required training and meetings shall be maintained on site by the MK SSHO. These records shall be made available to U.S. Navy personnel upon request. Subcontractors to MK shall provide copies of training certifications along with proof of medical surveillance physical and respirator certification to the MK Project Manager or MK SSHO prior to personnel working on site.

5.0 MEDICAL PROGRAM SURVEILLANCE PROGRAM REQUIREMENTS

5.1 SUMMARY

All project personnel who work within the exclusion zone for more than three days per month, or are required to use respiratory protection regardless of the time within the exclusion zone, will participate in a medical surveillance program in accordance with OSHA 1910.120 and 1926.65, Section 16 from the MK Safety and Health Program Description for Hazardous Waste Site Operations, and as described in this section. New construction activities will not require participation in the Medical Surveillance Program unless special tasks dictate as determined by the MK SSHO.

The medical surveillance program consists of a baseline or initial examination, an annual medical examination, a termination examination, and episodic medical examinations as necessary. Termination exams specify to this job have been determined to not be necessary unless specific criteria is met as discussed in the MK Safety and Health Program for Hazardous Waste Site Operations, Section 16. Assess the need for termination physicals for both MK and Subcontractor personnel.

At a minimum, the content of the initial, annual and termination examinations shall consist of the following medical tests and procedures (or as determined by the examining physician):

- Medical and occupation history.
- Complete physical examination.
- Pulmonary function test (FVC and FEV_1).
- Complete blood count, generally SMAC-22 or 24 biochemical profile.
- Audiometry.
- Complete urinalysis.
- Resting electrocardiogram.
- Vision screen.
- Chest X-ray (PA) (at the direction of the examining physician).

An episodic examination will be required if any worker develops signs or symptoms related to the possible overexposure to hazardous substances or other health hazards, or that the employee has been injured or exposed above the permissible exposure limits or published exposure levels in an emergency situation. The scope of any episodic examination will be left to the discretion of the examining physician.

A copy of the examining physician's written opinion about the employee's ability to perform work on this hazardous waste site and use respiratory protection, and a statement that the physician has informed the employee of the results of the examination shall be kept on site. Subcontractors must provide this information to the MK Project Manager or the MK SSHO prior to mobilization activities on site. These statements must not contain the specific results of medical examinations or tests.

5.2 DRUG ABUSE PREVENTION PROGRAM

Drug screening is required for work at this site. Results must be provided for all personnel to the MK Project Manager prior to beginning any work at this site. Morrison Knudsen Corporation is committed to the establishment and maintenance of a safe and efficient work environment for all employees free from the effects of alcohol, illegal drugs, other controlled substances, and prohibited items.

5.3 RECORDKEEPING

Arrangements shall be made with the examining physician(s) or others to assure long-term storage of medical records in accordance with 29 CFR 1910.120 and 1926.65. MK will manage medical surveillance records for MK employee's only. The statements by the examining physician(s) attesting to the medical qualification of individual workers shall be maintained at the project site for both MK and the Subcontractor and will remain a part of the project files. The subcontractor's are responsible for all medical records management for their direct hire employees in accordance with OSHA 1910.120 and 1926.65.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

6.1 GENERAL REQUIREMENTS

In addition to engineering controls and work practices, personal protective equipment (PPE) shall be used to protect personnel from exposure to contaminants which may be encountered during activities on site as warranted. The following guidelines will be followed:

- Respirators and other PPE necessary to protect the health of employees shall be provided by their employer.
- Only NIOSH/MSHA-approved respirators and cartridges shall be used.
- The respirator user's medical status shall be reviewed by the MK SSHO before work is performed requiring respirator use.
- MK IH Procedure 14.0 shall serve as the written standard operating procedure governing the use of respirators at the job site. Section 10 from MK Safety and Health Program Description for Hazardous Waste Operations shall serve as the written standard operating procedure governing the use of PPE at the job site.
- Respirators will be assigned to individual employees for their exclusive use and marked to indicate to whom it was assigned, for the duration of this scope of work.

Table 4 presents the basic levels (Level B, C, Modified D, and D) of PPE.

Table 5 lists the minimum PPE level required for each task or operation. If air sampling/monitoring indicates that modification to the levels of protection are warranted, the SSHO is empowered with the authority to authorize the modification based on the guidance provided in **Table 6**, Airborne Contaminant Response Criteria.

The PPE has been selected based on the site specific hazards. If conditions change, PPE selection and use shall be reviewed by the MK SSHO. Personnel will be trained if necessary on the use and limitations of specific pieces of PPE prior to initiation of work by their designated supervisors with assistance when necessary from the MK SSHO.

PPE will be maintained and stored in accordance with the manufacturer's recommendation and good industrial hygiene practices. Personnel will inspect PPE prior to each use to assure the PPE is clean and good working order. Training will be provided to personnel concerning PPE inspection criteria if determined to be necessary by the MK SSHO. Where needed, PPE donning and doffing procedures will be developed or reviewed and personnel will be trained on these procedures by the MK SSHO.

The MK SSHO shall conduct evaluations of effectiveness of PPE. Revisions in PPE selection and use will be made as warranted. The Subcontractor(s) Job Supervisor and/or Subcontractor designated competent safety person in coordination with the MK SSHO shall address medical considerations, including work limitations due to temperature extremes, when assigning or revising PPE requirements to personnel in accordance with MK Procedure on PPE.

7.0 AIR MONITORING AND SAMPLING

Air monitoring refers to direct real time reading of airborne concentrations and air sampling refers to time integrated air sampling either personal or area samples. The Well Driller/Installer and Mechanical/Electrical Subcontractors are responsible for supplying one photo ionizing detector (PID) with 10.2 or 10.6 eV lamp; a supply of colormetric indicator tubes and hand pump, and one combustible gas indicator (CGI)/ oxygen (O_2) meter as described in subsections 7.2.1 and 7.2.2. The MK SSHO will maintain an additional PID and CGI/O_2 meter, plus an assortment of colormetric indicator tubes and a sound level meter. Execution of real time air monitoring will be coordinated by the MK SSHO in accordance with the requirements for air monitoring depicted in Table 8. Time integrated air sampling, if necessary will be completed by the MK SSHO.

7.1 GENERAL

This section describes the air sampling and air monitoring program performed to evaluate project worker exposure to potentially hazardous airborne materials and to evaluate off-site impacts. The air sampling/monitoring results will be used to:

- Assess worker exposure to potentially hazardous materials with respect to the Permissible Exposure Limit (PEL) for Air Contaminants (Title 29 Code of Federal Regulations, Part 1910.1000) or other published exposure levels.
- Assess the adequacy of engineering controls and respiratory protection.
- Delineate areas where controls or respiratory protection is needed.
- Establish work control zones.

7.2 AIR MONITORING

7.2.1 Volatile Organic Compounds

A direct-reading, real-time photoionization detection (PID) with a 10.2 or 10.6 eV lamp capable of detecting volatile organic compounds (VOCs) will be used whenever excavation and penetration in potentially contaminated areas occurs. Depending on degree of soil contamination encountered, monitoring can be completed on a periodic basis at the discretion of the MK SSHO. Readings will be taken at locations that reflect approximate concentrations of organic vapors and gases in the

breathing zone of personnel in the work area. Results of the monitoring will be documented. If necessary, the level of PPE used by personnel in the exclusion zone work area will be modified. Table 6 lists the level of PPE used based on the concentration of organic vapors and gases in the breathing zone of project personnel. The direct-reading real-time organic vapor and gas monitoring equipment will be "response checked" according to the manufacturer's instructions prior to use each day, and calibrated by the manufacturer or other qualified personnel yearly. Records of the response check, maintenance and annual calibration will be maintained on site.

Colorimetric indicator tubes (e.g., Dräeger tubes) shall be used at the MK SSHO's discretion whenever the PID instrument measures breathing zone concentrations of organic gases or vapors exceeding 5 parts per million (ppm) PID equivalents greater than background concentrations for time period greater than five minutes. Colorimetric Tubes are used to further characterize the potential exposure. Generally, the frequency of sampling with indicator tubes is driven on the monitoring results of the PID. The following compounds shall be measured by colorimetric indicator tubes as determined by the MK SSHO: benzene, petroleum hydrocarbons (n-Octane), toluene, xylene, and ethylbenzene. If benzene is detected, or if any organic is detected at concentrations approaching it's action level, the level of PPE will be upgraded as specified in Table 6, or as determined by the MK SSHO. In the event of multiple organic exposures, it will be necessary for the MK SSHO to determine additive effects of the mixtures using the guidelines of the ACGIH "Additive Effects" method.

7.2.2 Combustible Gas and Oxygen Monitoring

A direct reading real time combination instrument capable of measuring % Lower Explosive Level (LEL) and percent of oxygen O_2 will be used whenever excavation and penetration in potentially contaminated areas occurs. Depending on degree of soil contamination if any, monitoring can be completed on a periodic basis at the discretion of the MK SSHO. Results of the measurements will be documented. If necessary, the level of PPE will be modified. Table 6 describes the level of PPE to be used based on the concentration of organic vapors and gases in the breathing zone of project personnel. The combination gas meter will be "response checked" according to the manufacturer's instructions prior to use each day, and calibrated by the manufacturer or other qualified personnel yearly. Records of the response check, maintenance and annual calibration will be maintained on site.

7.2.3 Noise Monitoring

Noise monitoring will be performed by the MK SSHO at the initiation of each task or operation presenting an excessive sound level risk. Sound levels will be determined at locations that best approximate the sound levels at the ear of potentially affected personnel. Noise monitoring equipment will be "response checked" according to the manufacturer's instructions prior to use each day, and calibrated by the manufacturer or other qualified personnel yearly. Records of the response check, maintenance and annual calibration will be maintained on site. Areas requiring hearing protection will be posted to alert workers to the requirement for hearing protection.

7.2.4 Heat Stress and Cold Stress Monitoring

When temperatures at the site are above 65°F, the wet bulb globe temperature (WBGT) may be used to monitor the potential for heat stress. Work/rest periods will be adjusted according to the guidelines stated in the current edition of *ACGIH Threshold Limit Values for Chemical Substances and Physical Agents*. When the clothing worn differs from the ACGIH standard ensemble such as in the case of workers wearing semipermeable or impermeable clothing, guidelines established in the NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, Section 8 should be consulted. The following is a summary from that document.

When employees are required to wear impermeable chemical protective clothing in temperatures exceeding 70°F, employees shall use the "buddy system" to monitor each other's pulse rate at the start of each rest period. If the pulse rate exceeds 110 beats per minute, the next work period shall be shortened by one-third without shortening the rest period. The pulse rate shall be monitored again at the beginning of the next rest period and if the pulse rate exceeds 110 beats per minute, the work period shall again be shortened by one-third. No employee shall be permitted to continue working in PPE if his or her pulse rate exceeds 110 beats per minute continuously. Table 7, reprinted from reference 8 can be used to establish work/rest periods and the frequency of monitoring pulse rates. Cold Stress monitoring is not anticipated as necessary for this job.

7.3 AIR SAMPLING

7.3.1 Organic Compounds

Time-integrated air sampling for aromatic hydrocarbons using personal air sampling pumps will be performed by the MK SSHO whenever the real-time monitoring measures concentrations in the personal breathing zone exceeding 5 ppm organic gases or vapors for more than five consecutive minutes and the MK SSHO has reason to believe benzene could be contributing significantly to the exposure threat or any other organic vapor contaminant is present in concentration levels greater than its PEL or TLV-TWA. Time-integrated air samples will be collected and analyzed at the MK SSHO's discretion for aromatic hydrocarbons. The air samples will be collected and analyzed in accordance with NIOSH Method 1501 or equivalent method for benzene; or collected using 50/100 charcoal/coconut sorbent tubes for other organics. The air sampling pump will be calibrated before and after sample collection. Passive dosimeters may be used in conjunction with air sampling pumps. Analysis of all air samples will be performed by an American Industrial Hygiene Association (AIHA) accredited laboratory.

7.4 RECORDKEEPING AND CHAIN OF CUSTODY

Written records of all monitoring will be maintained on site and affected employees will be notified of monitoring results representative of their exposure. For industrial hygiene sampling

requiring collection and shipment of a sample to an approved analytical laboratory, Chain-of-Custody forms will be properly completed and accompany all collected samples in accordance with MK Industrial Hygiene Procedures Manual, Procedure 7.0, titled Analytical Laboratory Procedures. The selected AIHA accredited industrial hygiene lab will be American Analytical Laboratories, Inc., Akron, Ohio (216-535-1300) or a local accredited laboratory when one is located and approved by MK. Turn-around time is estimated at 5-10 working days. Workers will be notified of time integrated sampling results via memo to the designated supervisor.

8.0 GENERAL SAFETY RULES AND PROCEDURES

8.1 GENERAL

Operations shall be conducted in a safe manner consistent with the policies and procedures outlined in this SSHP. The number of personnel shall be restricted to the minimum necessary to complete the required work as an administrative control to limit personnel exposures to potential site chemical, physical and biological hazards.

All project and subcontractor personnel assigned to this project are responsible for following this SSHP unless modified in the subcontracting special conditions document, for using safe practices, and for wearing the PPE specified by the MK SSHO. Project personnel shall report hazards and unsafe conditions and practices to the MK SSHO. All federal, state and local occupational health and safety regulations must be complied with by project personnel. Violations of project procedures may include disciplinary measures up to and including termination.

8.2 RULES AND PROCEDURES

- The Subcontractor shall have available two 20 lb. rated ABC multipurpose dry chemical fire extinguishers; first aid kit including CPR kit (Pocket Mask) and biohazards control kit; emergency eyewash; and spill response equipment available at every controlled work location. Also, the Subcontractor shall complete the Work Zone Map and post it at each work site including emergency phone numbers. Work zone signs shall be posted in accordance with the requirements of Section 9.1.4 of this SSHP.

- Avoid driving over dry grass that is higher than the ground clearance of the vehicle. Catalytic converters on the undercarriage of vehicles are sufficiently hot to ignite dry prairie grass. Never allow a vehicle with a warm undercarriage to sit in a stationary location over dry grass or other combustible materials.

- Do not eat, drink, smoke, take medications, chew gum or tobacco, or put objects in mouth while in the exclusion zone and contamination reduction zone or when handling samples.

- After handling samples, thoroughly wash hands and, if necessary, face, before eating or putting anything in mouth (i.e., avoid hand-to-mouth contamination).

- At a minimum, wear hard hats, safety glasses and steel-toed boots when inside the work boundaries.

- Remain a safe distance from the excavation equipment when not involved in operation or monitoring activities.

- Do not under any circumstances enter or ride in or on any backhoe/excavator bucket, materials hoist or any other device not specifically designed for carrying human passengers.

- Remain aware of your own and other's positions with regard to rotating equipment and be extremely careful when assembling, lifting and carrying items that may cause pinch point injuries and collisions.

- Be alert to the symptoms of fatigue, heat stress and cold stress and their effect on the normal caution and judgment of personnel.

- Use explosion proof sampling equipment and tools.

- Use ground fault circuit interrupters (GFCI) with all electrical tools and equipment.

- Stand clear of trenches during excavation. Always approach the excavation from upwind. Stand upwind, whenever possible, of excavations and other sites where the soil has been disturbed.

- Be alert to potentially changing exposure conditions as evidenced by perceptible odors, unusual appearance of excavated soils, oily sheen on water, or other evidence of possible contamination.

- Do not enter any excavation or trench greater than five feet in depth unless authorized by the MK SSHO.

- Keep hand tools off the ground and centrally located on a plastic cover or area of no contamination whenever possible to avoid tripping hazards and the spread of contamination.

- Use the buddy system at all times while working at the site in controlled work zones. No one is to work alone in the Exclusion Zone or Contamination Reduction Zone without permission from the MK SSHO and MK General Superintendent.

- Minimize truck tire disturbance of all stabilized sites and areas beyond the work area boundaries.

- Cease all work operations on the site at sunset unless the control zone is adequately illuminated with artificial lighting.

- Subcontractor Job Supervisors shall attend the POD meeting prior to the start of the work and conduct pre and post entry briefs with all affected workers. All personnel shall sign and record the time in and out of all Exclusion Zones.

- Avoid direct contact with contaminated materials unless necessary for sample collection or required observation. PPE shall be worn at all times, as required.

- Remove disposable clothing and follow decontamination procedures.

- Always use an appropriate level of personal protection as assigned in this SSHP. Lesser levels of protection can result in otherwise preventable exposure.

- Maintain a high level of awareness of the limitations in mobility, dexterity and visual impairment inherent in the use of Level B and Level C PPE.

- Establish prearranged hand signals or other means of emergency communication when wearing respiratory equipment, since this equipment impairs speech communication.

- Wear hearing protection if you have to shout to communicate at a distance of three feet in steady-state (continuous) noise or when you expect loud impact noise from certain activities. The MK SSHO will assess potential noise exposure and provide recommendation on correct hearing protection.

9.0 SITE CONTROL MEASURES

9.1 SITE WORK ZONES

Where a potential for worker exposure to potentially hazardous substances and physical hazards, work zones will be established and the flow of personnel and equipment will be controlled. The establishment of work zones will ensure that personnel are properly protected against hazards present in the work area, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in an emergency.

Prior to the commencement of field activities, Work Zones shall be established by the Excavation Subcontractor with the approval of the MK SSHO as necessary to meet operational and safety objectives. These work zones will be depicted on Work Zone Maps that are field prepared by the Well Driller/Installer and/or Mechanical/Electrical Subcontractor to be posted by the Subcontractor Job Supervisor near the entrance to the work area. In addition to the zones, these maps should show assembly points; evacuation routes; location of first aid equipment, fire extinguisher and eye wash; spill containment equipment; and emergency communications

equipment. One copy of the work zone maps and all revisions shall be delivered to the MK SSHO by the Subcontractor Job Supervisor to be retained by the MK SSHO in Appendix B of the field master copy SSHP. Posted with the Work Zone Map shall be the list of emergency phone numbers and route map to hospital. Each Subcontractor shall maintain a sign-in and sign-out log at the entrance to the Contamination Reduction Zone (CRZ) for personnel entering the Exclusion Zone (EZ).

9.1.1 Exclusion Zone

The exclusion zone (EZ) is the designated area where hazardous substances are present or expected to be encountered during remedial construction activities. Entry into this area is limited to personnel required to perform the work and who are wearing the specified PPE and have attended a Pre-Entry Briefing. Everyone entering the EZ shall have completed the required health and safety training and participate in the medical surveillance program. The boundary of the EZ will be determined for each activity and may change depending on activities and conditions.

An EZ will be established to encompass the excavation/penetration area. For this job, the EZ for each excavation/penetration area will consist of the immediate in process excavation/penetration area extending outward for approximately 20 feet if space allows or the size necessary to meet safety and health objectives . Additionally, any stockpiled excavated soil classified as potentially contaminated will be included in the EZ.

The EZ will be clearly delineated through the use of fences with appropriate signs, or other suitable means. Access control points into the contamination reduction zone will be established to regulate the flow of personnel and equipment in an out of the zone and to help verify that proper procedures for entry and exit are followed. PPE levels in the EZ are initially scoped as Modified Level D and C depending on the task to be completed (see Table 5 of this SSHP). Decontamination will follow guidelines established in Section 10 noting gross contamination of both personnel and equipment will be removed in the EZ followed by additional decontamination in the Contamination Reduction Zone (CRZ). The boundary line from the EZ to the CRZ will be based on the following criteria:

a) Approximately 20 feet outward from contaminated work area or as much as necessary to include the heavy equipment operating in the zone and the temporary staging of any materials.

b) Perimeter air monitoring for VOCs reads no increase in ppm-equivalents above background. Levels for background are those obtained from a Support Zone location not likely to be affected by any of activity ongoing in the EZ.

9.1.2 Contamination Reduction Zone (CRZ)

The CRZ is the transition area between the contaminated area, the EZ and the clean area, the Support Zone (SZ). While designed primarily to reduce the possibility of the support zone becoming contaminated or affected by EZ activities, the CRZ is also used for decontamination of personnel and equipment. No personnel or equipment will be allowed to exit the contamination reduction and exclusion zones without being properly decontaminated except in emergency situations. The immediate area around the EZ extending outward as much as necessary to accommodate the complete length of the longest piece of heavy equipment will be designated the CRZ. Used PPE will be removed and stored in properly marked plastic lined 55-gallon drums or other containers for later disposal. A sign-in and sign-out log sheet shall be maintained by the Subcontractor at the CRZ and all personnel entering the EZ must sign in and out. Copies of the completed log sheet shall be distributed to the MK SSHO by the Subcontractor Job Supervisor or Subcontractor SSHO on a weekly basis.

9.1.3 Support Zone (SZ)

The SZ consists of all areas outside the exclusion and contamination reduction zones. These areas are used for all site activities which are not limited to the EZ or CRZ equipment and material storage, offices, parking, etc. The SZ will also serve as the staging area for all activities to be conducted.

9.1.4 Work Zone Controls

Before site operations begin, the SZ MK site office and Subcontractor offices shall be identified with signs identifying as such. Each Subcontractor shall post signs at entrances to the CRZ and EZ stating the following or equivalent:

HAZARDOUS AREA KEEP OUT
DANGER
AUTHORIZED PERSONNEL ONLY
PERSONAL PROTECTIVE EQUIPMENT IS REQUIRED IN THIS AREA

The Subcontractor shall also post signs at the entrance to the CRZ before operations begin, stating:

NO SMOKING, DRINKING OR EATING BEYOND THIS POINT

10.0 PERSONNEL AND EQUIPMENT DECONTAMINATION AND HYGIENE PROCEDURES

10.1 GENERAL

All personnel, clothing and equipment leaving an exclusion zone (contaminated or potentially contaminated area) shall be inspected and, if necessary, decontaminated to remove any potentially

harmful substances that may have adhered to them. Some equipment/clothing may be disposed of rather than decontaminated. In this case, the used PPE and/or equipment (e.g. disposable sampling equipment) will be stored in properly marked, plastic lined 55-gallon drums in the CRZ. A decontamination facility and/or station shall be constructed for personnel decontamination and for equipment decontamination. This section gives guidelines regarding the decontamination procedures to be implemented. Final details will be described during the site-specific safety and health briefing prior to commencing field operations.

10.2 PERSONNEL DECONTAMINATION

Decontamination (decon) stations will be established in the contamination reduction zone. The decon stations will consist of the following, as appropriate:

- Equipment drop to include used respirator receptacle.
- Boot wash station with boot pick for cleaning initial mud cakes from boots (a tub of water and detergent (Alconox®) with brushes for cleaning and another tub of water for rinsing.
- Outer glove wash station (similar to boot wash station).
- Sampling equipment wash station (similar to boot wash station).
- Disposable clothing drop. All contaminated or potentially contaminated disposable clothing shall be placed into labeled 6-mil plastic bags within a 55-gallon drum for disposal.

10.3 EMERGENCY PERSONNEL DECONTAMINATION

Based on the type of emergency that is postulated, the following types of response actions are anticipated for personnel emergencies within the exclusion zone.

A. Critical Triage Condition (life threatening) - Emergency evacuation or extrication from the exclusion zone to contamination reduction zone where emergency medical treatment and stabilization will be attempted until arrival of first responding medical unit. Or, emergency medical treatment and stabilization will be completed in the exclusion zone till arrival of first responding medical unit. In either case, gross decontamination will be completed to the extent possible by removal PPE, wiping patient down to remove contamination and/or wrapping patient to prevent spread of contamination.

B. Marginal Triage Condition (non life threatening) - patient will be evacuated from exclusion zone and treated in the contamination reduction zone followed by decontamination and patient preparation for transport to emergency medical facility. Decontamination could occur first followed by medical treatment in selected scenarios.

10.4 EQUIPMENT DECONTAMINATION

All equipment/tools used in the exclusion zone will be inspected for contamination prior to removal from the site. Any equipment/tools with visible contamination will be cleaned prior to removal from the site. A water and detergent solution will be used for highly contaminated equipment, followed by a high-pressure water rinse if necessary. All water used during decontamination will be contained for disposal.

10.5 WASHING FACILITIES

A hand and face washing facility shall be made available in the CRZ or in the very near vicinity, consisting of water, towels and soap for personnel, as necessary.

10.6 DECONTAMINATION WASH WATER

Equipment and personnel decontamination areas will be designed to allow for collection of all wash/rinse waters into 55-gallon drums or a larger temporary storage container.

10.7 SANITATION AND PERSONAL HYGIENE

Personnel exiting the CRZ are required to thoroughly wash their hands and face prior to eating, drinking, smoking, or using toilet facilities. Adequate toilet, hand washing and lunchroom facilities free of contaminants shall be made available by the subcontractor in accordance with EM 385-1-1 Section 2.

11.0 ON-SITE FIRST AID AND EQUIPMENT

11.1 FIRST AID AND MEDICAL FACILITY REQUIREMENTS

At a minimum, 16-unit first aid kits shall be maintained by MK in their office trailer and each of the Subcontractors shall maintain a first aid kit at their office trailer and have sufficient supply of kits for each of the work sites. The location of the first aid kit shall be communicated to project personnel as part of the site-specific and pre-entry brief training. Included with the first aid kit shall be a CPR Pocket Mask and a biohazards control kit (used to clean up incidents involving body fluid's). The MK SSHO can require upgrades to the first aid equipment requirements as deemed necessary for this job.

An emergency eyewash kit, fire extinguisher and spill control kit shall be available at each controlled work area. The Subcontractor is responsible for furnishing their office trailers and each controlled work location with this equipment as stated in Section 8.2 of this SSHP. The emergency phone number list and route map to medical facilities shall be posted at each office trailer and at each controlled work zone as part of the Contractor prepared Work Zone Map.

11.2 REPORT OF FIRST AID CASES

All first aid cases, accidents and incidents shall be promptly reported to the MK SSHO. The MK SSHO shall immediately notify the Navy Technical Representative (NTR) or the Navy Resident Officer in Charge of Construction (ROICC) of all injuries even if preliminary information is available. The MK SSHO and MK PM shall follow the guidance presented in Program Procedure PHSP-04.1.

The MK Charleston Project Management Office (PMO) should be notified shortly after notification to the Navy's designated authority. If an on-site official cannot be reached, the MK Charleston PMO still should be promptly notified at (803) 554-0100. A written report of the injury must be provided to the ROICC and MK Charleston PMO within 24 hours of the incident via memo form. This report is to include as attachments:

a. Employer's First Report of Injury (Workman's Comp Insurance Form)
b. Supervisor's Accident Investigation Report (MK Form CAS 24/77)
c. Accident Data Report (MK Form 6783/91)
d. Any records provided by the Medical Service Provider such as 1) Hospital Emergency room Report, 2) Examining Physician's designation of work restriction, and 3) Examining Physician's Work Release.

12.0 EMERGENCY RESPONSE PLAN AND CONTINGENCY PROCEDURES

12.1 GENERAL

This section describes a contingency plan to be implemented in the event of injuries, illnesses, accidents, and fires. The contingency plan provides guidelines for the proper response to emergency situations, however the actual response will depend on the situation.

In the event of an emergency, the MK SSHO, MK General Superintendent and/or Subcontractor Job Supervisors will direct all personnel to take appropriate action which could include any or all of the following:

- Evacuate all personnel involved to a safe place of refuge.
- Notify emergency services using phone numbers identified in Table 2.
- Initiate emergency response action.

12.2 PRE-EMERGENCY PLANNING

During mobilization activities for this project, the MK Project Manager, MK General Superintendent and the MK SSHO shall review the Program Procedure PHSP 02.1 and execute the steps necessary to assure effective emergency response requirements and resources are established for this project.

In addition to the guidance provided in this document and the preconstruction meeting, all safety meetings and pre-entry briefs shall include emergency response preplanning specific to each task and work site as a topic area. This training will include:

- Assembly Points. If the work activity may result in a release of hazardous substances, more than one assembly point will be specified to ensure that at least one upwind assembly point is accessible. This also pertains to fires and sites subjected to adverse weather conditions. Information must be included on the Work Zone Maps to be completed by the MK Subcontractors.

- Emergency Response Coordinator. The MK SSHO, as the on-site emergency response coordinator, will contact the emergency response providers, account for individuals at the assembly point, and plan the appropriate response.

- Evacuation Routes. Routes will be specified as needed. Information must be included on the Work Zone Maps.

- Means of Evacuation. The number of personnel that may be evacuated from the work site by various routes will be evaluated by the MK SSHO.

- Means of Communication. This will include the means of alerting personnel to an emergency at all points in the work site and should consider the sound screening potential of hearing protection, distance and noisy equipment when specifying the use of alarms, horns and sirens. The means of communication with emergency response providers will be considered. Information must be included on the Work Zone Maps.

- Designation of a location for first aid services, fire extinguisher(s) and spill control equipment. Information must be included on the Work Zone Maps.

- Procedures to be followed by employees who remain to manage critical operations to insure safe shutdown.

12.3 RESPONSIBILITIES

The following is a description of personnel roles, lines of authority, and the emergency response communication/notification responsibilities for site personnel.

12.3.1 Project Personnel

It is the responsibility of all project personnel to recognize conditions that have the potential for resulting in a personal injury or damage to property, and to report the condition immediately to their supervisor or the MK SSHO.

12.3.2 MK Project Manager (PM)

The MK PM is responsible for assuring adherence to the administrative elements and implementation of the Emergency Response Plan, as referenced in this document. He will evaluate the site's preparedness for emergency responses and identify special conditions which may require additional preparations. He will ensure that necessary equipment and facilities are provided to support this plan.

12.3.3 MK Certified Industrial Hygienist (CIH)

The CIH is responsible for preparing the Emergency Response Plan (this section of the SSHP). The CIH will develop and review the Emergency Response Plan, evacuation plans, and oversee implementation at the site. The CIH will ensure that supervisors and employees meet the training requirements of the plan and approve the equipment used in the plan. The CIH may designate duties on site to the MK SSHO. The CIH is the designated Health and Safety Manager based in Boise, ID.

12.3.4 MK Site Safety and Health Officer (SSHO)

The MK SSHO is responsible for directing response actions to emergency situations. He will coordinate with project management to ensure the availability of response equipment and supplies, and initiate drills. Emergency response plans will be evaluated over the course of the project by the MK SSHO to keep them up-to-date and to ensure that they are applicable and relevant to emergency response organizations.

12.3.5 Subcontractors

All MK and Subcontractor personnel will comply with the provisions of this plan and participate in training as required to implement response procedures. All personnel will be cognizant of their work areas and notify their supervisors and the MK SSHO of hazards at the site.

12.4 EMERGENCY RECOGNITION AND PREVENTION

Site personnel shall be apprised of hazards and life-threatening emergency situations during site-specific training to include the project kickoff site specific training, safety meetings and briefs. Means to control hazards and mitigate emergency situations will be addressed at that time.

12.5 SAFETY ZONES

Suitable assembly points will be established at the start of the project for each work site. These assembly points will provide a safe point of refuge for site personnel. Additional information will be provided in the site briefing concerning other hazards that may arise at the site. Safety Zones or assembly points must be included on the Work Zone Map.

12.6 SITE SECURITY AND CONTROL

At all times, site personnel working in an area in the near vicinity of an emergency situation shall be apprised of the emergency as soon as possible. Only authorized personnel shall be allowed into the emergency area. As necessary, the emergency area may be cordoned off and access restricted by MK and the Subcontractors.

12.7 EVACUATION ROUTES

Evacuation routes will be established based on scope of work, location of work and atmospheric conditions. Evacuation routes shall be posted in various locations on the site if necessary and included on the Work Zone Map. All site personnel will be made aware of evacuation procedures during site-specific training especially pre entry briefings. Topography, layout and prevailing wind conditions shall be considered in establishing evacuations routes and assembly points.

12.8 EMERGENCY DECONTAMINATION

In the event an employee is injured or becomes ill and requires hospital treatment, the extent of decontamination to be performed will be assessed based on severity of the injury or illness and time delay that decontamination may cause. If the employee has any signs of contamination, the ambulance and hospital staff will be notified of this and the nature of the contamination. Reasonable effort will be expended to decontaminate the victim prior to removal from the site, refer to Section 10.3 for more information. The medical facilities shall be notified by the MK SSHO of the intended scope of work and the potential for contaminated personnel. The medical facilities will receive copies of all the Material Safety Data Sheets (MSDSs) and/or NIOSH Pocket Guides applicable to this project. The MK SSHO shall contact the medical facility to establish a contact person for the necessary information.

12.9 EMERGENCY MEDICAL TREATMENT AND FIRST AID

See Section 11.

12.10 COMMUNICATIONS

The MK SSHO, the MK General Superintendent and the Subcontractor Job Supervisor(s) at each work site area shall be equipped with two-way radios for communications on site as warranted. Additional communications with outside emergency services will be accomplished through the use of cellular telephones if necessary. Both two way radios and cellular phones are to be used for emergency's only. In the radios will be used for standard field construction communication, then the MK SSHO shall establish strict protocols for radio communication and insure all personnel who carry radios understand the protocols.

12.11 CRITIQUE OF RESPONSE AND FOLLOW-UP

All actual emergencies shall be critiqued and follow-up corrective actions shall be implemented as needed. Drills and exercises if completed shall also be critiqued. The critique will be conducted as part of a safety meeting first by supervisory personnel and second with all MK and Subcontractor personnel.

12.12 INITIAL REPORTING AND MANAGEMENT OF INCIDENTS

All emergencies will be promptly reported to the Emergency Response Number as follows: 1) AMBULANCE X-2424; 2) FIRE X-3333; 3) SECURITY X-2376 on site and to the MK SSHO. The MK SSHO will assure that the Navy designated authority is notified promptly and direct initial emergency response actions until the arrival of the NAS Corpus Christi designated authority. The designated authority can include the officer in charge of security, fire department and/or ambulance services.

The following contains the initial response actions to be taken by MK personnel and subcontractors at the work site for the type of incident incurred.

A. Incident Type: Accident involving vehicles and mobile equipment, process equipment and support structures.

Response Actions:

1. Notify the Fire Department at x3333, include the following information:

    A. Name and phone number of person calling;
    B. Location of incident;
    C. Type of incident;
    D. Is anyone injured or trapped and potential material release or spill conditions.

2. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s) designates one person to meet the emergency response units at the nearest road where the units will be approaching.

3. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s) assumes initial command of the situation and directs personnel to do one of the following either separately or concurrently:

    A. Emergency shutdown of process equipment or mobile equipment, evacuate the work zone or immediate area to a safe place of refuge and meet the incoming response units and provide all available information.

    B. If fire is present, initiate initial fire attack and knockdown using available fire extinguishing equipment followed by evacuating the work zone or immediate area.

B. Incident Type: Preparation for adverse weather condition to include high winds, tornados or hurricanes, heavy rains, severe lightning.

Response Actions:

1. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s) notify Security at X-2376, and include the following information:

    A. Name and phone number of person calling;
    B. Location of work site(s);

C. Preparation for adverse weather condition has begun;
D. Permanent structure location where personnel will be relocating to on Base.

2. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s) direct personnel to shutdown operations, secure loose materials, park and secure mobile equipment. Personnel shall be directed to a permanent building after completing decontamination procedures.

3. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s) complete accountability and await clearance from Base Security to resume operations or take other action.

4. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s) shall inspect all offices, trailers, mobile equipment, work sites for damage or downed power lines.

5. Designated excavation Competent Person shall inspect all excavations for faulting, flooding, or cave in potential prior to restart of any work in that area.

C. Incident Type: Medical and Rescue Emergencies.

Response Actions:

1. Notify the Ambulance at x2424, include the following information:

A. Name and phone number of person calling;
B. Location of incident;
C. Type of incident;
D. Person(s) injured or trapped and if exposure to hazardous material.

2. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s) designates one person to meet the emergency response units at the nearest road where the units will be approaching.

3. MK SSHO, MK General Superintendent or Subcontractor Job Supervisor(s) assumes initial command of the situation and completes or directs personnel to do one or both of the following:

A. Emergency shutdown of process equipment or mobile equipment and any other necessary action to mitigate or control the incident.

B. Initiate emergency first aid actions until arrival of emergency units.

13.0 LOGS, REPORTS, AND RECORDKEEPING

13.1 SAFETY AND HEALTH LOGBOOK

The MK SSHO shall maintain a Project Safety and Health Logbook for the duration of work activities at the site. Entries in the logbook shall be time sequenced. The entries must be written in ink and the bottom of each page must be signed. The logbook shall be hard bound. No pages will be removed from the log book. Corrections must be lined out and initialed. The logbook will contain specific information recorded on a daily basis utilizing the Form shown in Figure 6.

A separate file folder shall be maintained for Figure 6. Additional forms supporting Figure 4 shall be attached to Figure 6 and held in file folder. Separate file folders shall be established for this SSHP; calibration data sheets if not attached to Figure 6; safety and IH instrument serial numbers and shipping papers; field specific safety and health procedures; all safety and health related permits; and weekly safety inspections. Records of training and site orientations; briefings including pre entry briefs; Subcontractor prepared equipment inspection sheets and exclusion zone sign-in and sign-out logs shall also be maintained in file folders by the MK SSHO.

13.2 REPORTS

A weekly site safety and health inspection report shall be prepared by the SSHO. This report shall identify work activities, safety and health-related deficiencies, and corrective measures. As a minimum, the checklist shown in Figure 7 shall be completed by the MK SSHO. All near miss incidents and incidents that result in property damage, personnel injuries or illness will be investigated and notification/reporting requirements shall be followed in accordance with PHSP 004.1.

13.3 FIELD MASTER COPY OF SSHP

The MK SSHO shall maintain a field master copy of this SSHP document to include all redlines and the completed work zone maps. This copy shall be properly filed with project records at the completion of the project to be sent to MK PMO office in Charleston.

13.4 RECORDKEEPING

The MK SSHO shall maintain records of all injuries and illnesses for MK employees only incidental to the work in accordance with 29 CFR 1904, including copies of the Worker's Compensation First Report of Injury. Accidents and Incidents data reporting requirements shall be managed in accordance with MK NAVFAC SOUTHDIV Procedure PHSP-04.1 titled Incident Reporting dated 9/13/95 for both MK and Subcontractor personnel as stated in Section 11.3.

The MK SSHO shall receive copies of all records for injuries and illnesses of Subcontractor personnel incidental to the work, including copies of the Worker's Compensation First Report of

Injury. The Subcontractor shall record injury and illnesses on their OSHA 200 Log, a copy of which is delivered to the MK SSHO on a monthly basis. Reporting shall follow the guidance stated above. A record of all first aid treatments not otherwise recordable shall be maintained and furnished to the Navy's designated authority upon request. The MK SSHO shall maintain records of employee exposure to potentially harmful toxic materials, harmful physical agents and medical records, in accordance with 29 CFR 1910.120. Employee's will be notified of time integrated sampling results where applicable via memo to his/her employer.

13.5 SAFETY AND HEALTH PROJECT COMPLETION REPORT

The MK SSHO shall complete a safety and health project completion report at the conclusion of the field work. The purpose of the report is to a self assessment summarizing effectiveness of the safety and health program implemented in the field; lessons learned and suggestions for program improvement; accident and incidents; air monitoring and sampling results including ratings on instrument useability; and how well the original prepared Activity Hazards Analysis (AHA) worksheets reflected field conditions. The report shall be directed to the MK SouthDiv Program Health and Safety Manager within ten working days after project demobilization.

14.0 ON-SITE WORK PLANS

A Remedial Action Plan (RAP) was developed to define the work tasks and identify the work objectives. The means and personnel required to complete the task is identified along with consideration for methods, logistics, quality control/assurance and resources.

15.0 COMMUNICATION PROCEDURES

15.1 RADIO COMMUNICATION, TELEPHONE, ALARMS AND DRILLS/EXERCISES

Refer to Section 12.10 of this Plan. Cellular telephones shall be selected as a secondary choice of emergency communication. An emergency alarm, such as an air horn, shall be available if necessary at each major work site to warn personnel of an emergency. Personnel shall be trained on what actions they are to take if the alarm is sounded to include evacuation routes and assembly points. Drills and exercises shall be conducted to ensure that communication methods are adequate. The MK SSHO will test the two way communication for confirmation of emergency communication using NAS Corpus Christi protocols.

16.0 SPILL CONTAINMENT PLAN

16.1 GENERAL

Spill and release accident scenarios during remediation could occur and involve residue process material and reinstates from decontamination activities. The following information will be used by project personnel to respond to and mitigate any releases on the project site. In the event of a spill or release, the MK SSHO, MK General Superintendent and/or Subcontractor Job Supervisors will direct all personnel to take appropriate action which could include any one or all of the following:

- Initiate spill response action and notify emergency services.
- Notify the FIRE DEPARTMENT at X-3333.
- Evacuate the work zone to a safe place of refuge.

16.2 PREPLANNING FOR SPILL CONTROL

Remedial construction activities will be reviewed for release potential and the capability of on-site personnel to adequately respond. Base personnel will be contacted to determine their capability to respond to various releases. All aspects of the Emergency Response Plan as described in Section 12, will be reviewed by site personnel to ensure adequacy and that resources are available.

During mobilization activities for this project, the MK Project Manager, MK SSHO, and the MK General Superintendent shall review the Program Procedure PHSP 03.1 and execute the steps necessary to assure effective spill response planning requirements and resources are established for this project. MK will cooperate with the base; other site contractors; and federal, state and local directors of emergency preparedness and response to ensure a coordinated effort in preparing for a spill emergency, with response plans that are compatible and integrated. Prior to the start of work, MK will review any site specific requirements and meet with site representatives on spill control to assure the SSHP is consistent with site requirements for spill control. Specific roles and responsibilities will be reviewed for MK and Navy personnel. The Base Fire Department will be notified of any spills classified above incidental and will assist in spill containment. The Base Fire Department will provide overall command and control of the clean-up activity for spills classified above incidental until relieved by a higher authority.

16.3 SPILL AND FIRE CONTROL MATERIALS AND EQUIPMENT

When planning to move or handle drums (or other containers) containing hazardous or special waste materials, the following shall be kept available in areas where spills, leaks or ruptures may occur: 1) salvage drums and container overpacks (approved by the U.S. Department of Transportation); 2) suitable quantities of proper absorbent materials; 3) portable containing material; 4) neutralizing agents; 5) fire extinguisher(s); 6) emergency eyewash station; and 7) spill pallets or platforms for secondary containment.

Drums and containers used during a clean-up will be appropriate to the hazardous substances they are meant to contain, and will meet the regulations promulgated by DOT, 49 CFR Parts 171-179, OSHA 29 CFR 1910.120, and EPA 40 CFR 262. Drums and containers will be inspected for defects and their integrity assured prior to being filled with any non-solid hazardous or special waste substance.

A spill of material can be contained with porous or absorbent barriers. Absorbent materials can take several configurations (pillows, sheets, booms, loose chips, particle beads, and fibers) that may be set in place, or scattered by hand. Preferred sorbents are inert nonreactive clay minerals (neutralizing agents may be added), or specific formulations which provide automatic neutralization or vapor control.

16.4 SPILL CONTROL MEASURES

Stopping the leak or spill at its source may involve turning off pumps or closing valves. Returning a container to an upright position, transferring wastes to other containers, or moving containers to less dangerous locations may, in some circumstances, be possible, but should not be attempted if the identification of the substance is not known unless Level B Protection is worn and decontamination stations have been established. Similarly, the patching of an active leak is not advised until an initial "Size-Up" of the situation is made and guidance established in Section 16.6 has been followed.

16.5 DRUM, CONTAINER, AND TANK HANDLING AND MOVING PROCEDURES

Drums, containers, and/or tanks of hazardous or special waste substances will not be moved until the requirements for preparation have been completed (i.e., all required equipment and materials are at the work site ready for use, and the employees have been familiarized with their responsibilities, the emergency response procedures, and the potential hazards associated with the contents of the drums and containers).

Work site operations will be organized to minimize the amount of drum or container movement. Each drum or container will be inspected before it is moved to ensure that it can be handled without suffering a rupture or puncture, and relocated without having the contents spill or leak.

Unlabeled or unmarked drums and containers will be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled. Drums and containers under pressure, as evidenced by bulging or swelling, will not be moved until such time as the cause for excess pressure is determined and appropriate containment procedures have been implemented to protect employees from explosion.

Equipment used to handle the drums and containers will be selected, positioned, operated, and maintained to minimize any contact that could rupture, puncture, dent, or drop drums and

containers holding hazardous or special waste substances, and the potential for equipment ignition sources to ignite vapors released from ruptured drums or containers shall be controlled.

Drums and containers that cannot be moved without rupture, leakage or spillage will be transferred to a sound container using a device specified for the material being transferred. During liquid transfer of flammable or combustible liquids, bonding and grounding equipment shall be utilized.

16.6 INITIAL REPORTING AND MANAGEMENT OF INCIDENTS

All spill emergencies initially classified above an incidental release shall be promptly reported to the FIRE DEPARTMENT AT X-3333.

Incidental Release (defined) - a release of hazardous material where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel. In addition, the quantity of released material does not exceed EPA Reportable Quantities.

The MK SSHO and the MK General Superintendent shall be notified immediately. The MK SSHO will assure that the Navy's Technical Representative (NTR) or ROICC is notified promptly. The MK SSHO, the MK General Superintendent and the Subcontractor Job Supervisor(s) are responsible for directing initial emergency response actions until the arrival of the NAS Corpus Christi designated authority. The designated authority can include the officer in charge of security, fire department and/or ambulance services. The following contains the initial response actions to be taken by MK personnel and subcontractors at the work site for spill and release emergencies.

Response Actions:

1. Classify spill as Incidental or an Emergency.

2.If Incidental (as defined above): 1) notify immediate supervisor; 2) assess hazard potential, establish precautions and PPE requirements; 3) begin clean-up of spill.

3. If Emergency, initiate response action in accordance with the following steps:

A. Quickly assess probability of safely stopping spill. If physical, chemical, or biological health hazards exist, immediate evacuate the area to a safe distance upwind and upgrade from the spill.

B. Notify the **BASE FIRE DEPT** at X3333 and provide the following information:

1. Name and phone number of person calling;
2. Location of incident;
3. Type of incident;
4. If anyone is injured or trapped and the estimated volume of material released.

C. MK SSHO, MK PM or Subcontractor Job Supervisor(s) designates one person to meet the emergency response units at the nearest road where the units will be approaching.

D. MK SSHO, MK PM or Subcontractor Job Supervisor(s) assumes initial command of the situation and directs personnel to do one of the following:

1. Emergency shutdown of process equipment or mobile equipment, evacuate the work zone or immediate area to a safe place of refuge and meet the incoming response units and provide all available information.

2. Initiate initial spill response using available spill response equipment only for small emergency spill events where personnel are trained to mitigate. Evacuate the work zone or immediate area if there are any health threats or risks to personnel.

3. MK's PM or designee shall immediately notify the Navy's Designated Authority and the MK PMO. The Navy's Designated Authority is the ROICC assigned to this project.

17.0 CONFINED SPACES

Not anticipated on this project.

TABLES

Table 1. Potential Contaminants				
Potential Contaminants	Description	Exposure Limits	Signs and Symptoms	First Aid
Benzene	Colorless to light-yellow liquid with an aromatic odor. Class 1B Flammable liquid.	OSHA PEL 1 ppm as 8 Hr. TWA OSHA STEL 5 ppm in 15 minute period	Irritant to eyes, nose, and respiratory system. Giddiness, headache, nausea, and staggered gait. Fatigue, anorexia and lassitude. Dermatitis. Bone marrow depression.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
Cresols	Crystalline or white solid with a sweet, tarry odor.	OSHA PEL 5 ppm	Irritation to eyes, skin and mucous membranes; CNS depressant; respiratory failure; weakness; and dermatitis	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
Ethylbenzene	Colorless liquid with an aromatic odor. Class 1B Flammable Liquid.	OSHA PEL 100 ppm as 8 Hr. TWA	Irritant to eyes, nose and respiratory system. Headache, dermatitis and narcosis.	Irrigate eyes immediately with water. Soap wash skin. Provide respiratory support. Seek medical attention immediately.
Gasoline	Water white or pale yellow in color, may be dyed other colors, petroleum odor. Flammable, volatile liquid. Common components include benzene, toluene and xylene.	ACGIH TLV of 300 ppm as 8 hr TWA.	Irritant to eyes, nose and respiratory system. Headache and dizziness. May cause dermatitis or rash upon skin.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
Tetraethyl Lead (TEL)	Colorless liquid unless dyed red, orange, or blue with a pleasant, sweet odor. Class 3B Combustible liquid.	OSHA PEL 75 ug/m^3 as 8 Hr. TWA.	Insomnia, lassitude and anxiety by inhalation. Tremor, hyper-reflexia, spastic and bradycardia. Irritant to eyes.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.

Table 1. Potential Contaminants				
Potential Contaminants	Description	Exposure Limits	Signs and Symptoms	First Aid
Manganese	Metal: a lustrous brittle, silvery solid.	OSHA Ceiling 5 mg/m^3	Parkinson's; insomnia; dry throat, cough, tight chest, dyspnea, V, flue like fever, low back pain, vomiting and fatigued	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
Naphthalene	Colorless to brown solid with an odor of mothballs	PEL 10 ppm	Irritation to eyes; headache, confusion, excitement, malaise; nausea, vomiting, abdominal pain; irritation bladder; profuse sweating, jaundice, renal shutdown, dermatitis.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
Phenol	Colorless to light pink, crystalline solid with a sweet, acrid odor	PEL 5 ppm	Irritation to eyes, nose, throat, anorexia, weakness, muscle ache, pain; dark urine; cyanosis; liver, kidney damage; skin burns; dermatitis; tremor, convulsions, twitching.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
Octane	Colorless liquid with a gasoline like odor.	PEL 500 ppm	Irritant to eyes and nose; drowsiness; dermatitis; chemical pneumonia	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
Triorthocresyl phosphate (TOCP)	Colorless to pale yellow, odorless liquid or solid	OSHA PEL 0.1 mg/m^3	Cramps in calves, tingling in feet and hands, weak feet, wrist drop, paralysis and gastrointestinal disorder.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.

Table 1. Potential Contaminants				
Potential Contaminants	Description	Exposure Limits	Signs and Symptoms	First Aid
Toluene	Colorless liquid with a sweet, pungent, benzene like odor. Class 1B Flammable liquid.	OSHA PEL 200 ppm as 8 Hr. TWA OSHA Ceiling of 300 ppm. ACGIH TLV of 50 ppm as 8 Hr. TWA.	Fatigue and weakness. Confusion, euphoria, dizziness, and headache. Dilated pupils and water eyes.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
Xylene	Colorless liquid with aromatic odor.	OSHA PEL 100 ppm as 8 Hr. TWA OSHA STEL 150 ppm in a 15 minute period.	Dizziness, excitement, drowsiness, incoherence, and staggering gait. Irritant eyes, nose, and throat. Corneal vacuolization. Anorexia, nausea, vomiting, and abdominal pain. Dermatitis.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.

NOTE: In contrast to naphthalene, the only reported effects of methylated naphthalene in man are skin irritation and skin photosensitization. N-nitrosodi n-propylamine is from the class of chemicals classified as N-nitrosamines which are associated with numerous carcinogenic effects in laboratory animals. Human exposure data is limited. Since it levels reported in the ground water are extremely low, occupational exposure of any significance is considered highly unlikely.

Table 2 Personnel Names and Telephone Numbers

Contact	Person or Agency	Telephone
Fire Dept	**Base Fire Dept**	**X3333**
Ambulance	**Ambulance Service**	**X2424**
Law Enforcement	**Base Security**	**X2376**
Robert Hlavacek	MK Program Manager	(803) 554-9367
Scott Newman	MK Senior Project Manager	(803) 554-9369
Dan Fuller	Site Project Manager	Office: (612) xxx-xxxx
Scott Pitzer	MK Site Safety and Health Officer	Office:(612) xxx-xxxx
Tom Benson Scott Pitzer tbd	MK Project Engineer MK Quality Control onsite MK General Superintendent	Office:(216) 523-6697 Office:(612) xxx-xxxx
William Piispanen	MK Health and Safety Program Manager	(208) 386-5930
John Young	Public Works Department	tbd
Cmd R.A. Wall Jesse Duarte	ROICC REICC	tbd 512-939-8608
Gene Santos	SOUTHNAVFACENGCOM	(803) 820-5522
John Young	Public Works, Environmental	(512) 939-3776
Poison Control Center	National Poison Control Center	1 800 764-7661
CHEMTRAC	Chemical spill or leak emergencies	1 800 424-9300
National Response Center	National Response Center	1 800 424-8802
Regional USEPA	USEPA Region VI, USEPA	214 767-2600
RCRA Hotline	USEPA	1-800-424-9346
Hospital	(1) NAS Hospital (2) Spohn Hospital	(1) (512) 939-2994 (2) (512) 881-3000
Utility Locate Service	NAS CC Public Works	tbd

Table 3. Training Requirements

Identifier	Location	40 Hr. Haz. Waste	Haz. Waste Annual Ref.	Haz. Waste Supervisor	Safety Mtg.	Haz. Com.	CPR First Aid	Respiratory Protection	Site Specific	POD, Pre & Post Entry Brief	Other
Well Modification and Installation	Fuel Farm 216 Area	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Piping and Mechanical	Fuel Farm Area	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Transport and Disposal (Hazardous Material)	Fuel Farm 216 Area					Y			Y		Y[2]

Y = Yes, N = No

Notes:
1 - Training requirements for the operations and maintenance phase will be delineated in the safety and health section of the MK prepared Operations and Maintenance (O&M) Manual.
2 - 49 CFR Part 172 Subpart H for personnel required to classify, mark, select packaging, inspect, load and transport hazardous materials.

Table 4 Selection of Personal Protective Equipment

PPE	Level D	Modified Level D	Level C	Level B
Coveralls or other approved working apparel	Yes	Optional*	Optional	Optional
Chemical-resistant clothing (coveralls; hooded, one- or two-piece chemical-resistant coveralls)		Yes		
Chemical-resistant clothing (coveralls; hooded one- or two-piece chemical splash suit; chemical-resistant hood and apron; disposal chemical-resistant coveralls)			Yes	
Chemical-resistant clothing (coveralls and long-sleeved jacket; one- or two-piece chemical splash suit; disposal chemical-resistant one-piece suit)				Yes
Boots, leather or chemical resistant, steel protective toe (29 CFR 1926.28, 1910.136 and ANSI Z41-1991).	Yes			
Boots (inner), chemical resistant, steel protective (29 CFR 1926.28, 1910.136 and ANSI Z41-1991).		Yes	Yes	Yes
Boot covers (outer), chemical resistant (disposable)		Optional	Optional	Optional
Safety glasses or chemical splash goggles (29 CFR 1910.133, ANSI Z87.1-1989, and 1926.102)	Yes	Yes	Yes *1	
Face shield (29 CFR 1910.133, ANSI Z87.1-1989, and 1926.102)	Optional	Optional	Optional	Optional
Gloves (cotton/leather)	Optional			
Gloves (inner), chemical resistant or liners		Optional	Yes	Yes
Gloves (outer), chemical resistant		Yes	Yes	Yes
Long underwear		Optional	Optional	Optional
Hardhat (29CFR 1926.100, 1910.135, ANSI Z89.1-1969 and ANSI Z89.2-1971)	Yes	Yes	Yes	Yes
Positive pressure, full-facepiece with nose cup, self-contained breathing apparatus (SCBA) or positive pressure, supplied-air respirator with escape SCBA (MSHA or NIOSH approved) (Note: escape SCBA may not be required)				Yes
Air-purifying respirator, half-face or full face with suitable cartridge (MSHA or NIOSH approved)			Yes	

* Optional requirements to be determined by MK SSHO based on Activity Hazard Analysis (AHA).

*1 - not required with full face APR

Table 5 Minimum Personal Protective Equipment Requirements by Task

Site	Activity	PPE
Fuel Farm 216	1. Configure and set up work areas.	1. Level D, modify where necessary.
	2. Hydro punching using Geoprobe or equivalent.	2. Modified Level D, modify where necessary.
	3. Modify existing wells.	3. Modified Level D, modify where necessary.
	4. Install new recovery wells.	4. Modified Level D, modify where necessary.
	5. Excavate, install underground and aboveground process piping and utilities.	5. Modified Level D, modify where necessary.
	6. Install ancillary equipment on existing concrete pad. Install fence around equipment.	6. Level D, modify where necessary.
	7. Waste Management activities including any sampling activities.	7. Modified Level D, modify where necessary.
	8. Site Restoration	8. Level D, modify where necessary.
	9. Start-up and pilot operation of Bioslurp system.	9. Level D, modify where necessary.

Note: Additional analysis of PPE requirements for tasks associated with start up and operation of Bioslurp system will be completed prior to construction completion when the As-Built configuration is final and all vendor literature is available for review.

Table 6 Airborne Contaminant Response Criteria

Contaminant or Chemical	Level	PPE	Monitoring Frequency	Actions Taken
Volatile organic compounds	No more than 5 ppm above background, no benzene detected above 0.5 ppm (Action Level).	Level D or Modified Level D. See Table 5 for PPE requirements by task.	Prior to each shift and reentry following 30 minute vacancy or as described in Section 7 of this plan.	Continue periodic monitoring or maintain continuous monitoring dependent on task.
	Greater than 5 ppm above background but less than 10 ppm above background. No benzene detected above 0.5 ppm (Action Level).	Level D or Modified Level D. See Table 5 for PPE requirements by task.	At least once every hour, when change in operation occurs or as described in Section 7 of this plan.	Monitor for benzene and vinyl chloride, continue periodic monitoring or maintain continuous monitoring dependent on task.
	Greater than 10 ppm above background or benzene detected greater than 0.5 ppm or action level exceeded for any organic.	Level C or B PPE as specified by MK SSHO. See Table 5 for PPE requirements by task.	Continuous.	Stop work, evacuate exclusion zone and notify MK SSHO. Size up situation and re-evaluate re-entry requirements.

Table 6. Airborne Contaminant Response Criteria (continued)

Contaminant or Chemical	Level	PPE	Monitoring Frequency	Actions Taken
Oxygen	Less than 19.5% or greater than 22%	Level B per concurrence by MK SSHO.	Prior to each shift and reentry following 30 minute vacancy or as described in Section 7 of this plan.	Stop work, evacuate exclusion zone and notify MK SSHO. Size up situation and re-evaluate re-entry requirements.
% LEL	Equal to or greater than 10%.	Level B PPE per concurrence by MK SSHO.	Prior to each shift and reentry following 30 minute vacancy or as described in Section 7 of this plan.	Stop work, evacuate exclusion zone and notify MK SSHO. Size up situation and re-evaluate re-entry requirements.

Table 7 Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers

ADJUSTED TEMPERATURE[b]	IMPERMEABLE ENSEMBLE
90°F (32.2°C) or above	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 90 minutes of work
72.5°-77.5°F (22.5°-25.3°C)	After each 120 minutes of work

[a] For work levels of 250 kilocalories/hour.

[b] Calculate the adjusted air temperature (ta adj) by using this equation:
ta adj °F = ta°F + (13 x % sunshine).

Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow.

(100 percent sunshine = no cloud cover and a sharp, distinct shadow: 0 percent sunshine = no shadows.)

Table 8. Air Monitoring and Sampling Requirements

Site	Activity	Monitor					Sample
		VOC	Oxygen and, % LEL	Perimeter (VOCs)	Noise	Heat Stress	VOC
Fuel Farm 216 Facility	1. Configure and set up work areas.	1.0	1.N	1.N	1.N	1.0	1.N
	2. Hydro punching using Geoprobe.	2.O	2.O	2.O	2.O	2.O	2.O
	3. Modify existing wells.	3.Y	3.Y	3.Y	3.O	3.O	3.O
	4. Install new recovery wells.	4.Y	4.Y	4.Y	4.O	4.O	4.O
	5. Excavate and install underground process piping and utilities.	5.Y	5.Y	5.Y	5.O	5.O	5.O
	6. Construct utility building and install ancillary equipment.	6.N	6.N	6.N	6.N	6.O	6.N
	7. Waste Management activities including any sampling activities	7.O	7.N	7.N	7.N	7.O	7.N
	8. Site Restoration	8.N	8.N	8.N	8.N	8.O	8.O

Y = Yes; O = Optional at discretion of MK SSHO; N = Not required

FIGURES

Figure 1 NAS CORPUS CHRISTI VICINITY MAP

SEE ATTACHED FIGURE THAT FOLLOWS

Figure 2 NAS CORPUS CHRISTI SITE MAP

SEE ATTACHED FIGURE THAT FOLLOWS

Figure 3 HOSPITAL ROUTE MAP

SEE ATTACHED FIGURE THAT FOLLOWS

Figure 4 Safety Meeting Report

Type of Meeting:

Topic:

The following personnel were present for meeting conducted at _____ (time) on _____ (date) at _____ (location).

NAME	SIGNATURE	ORGANIZATION

Printed Name of Meeting Chairman Signature Date

Figure 5 Pre-Entry Briefing Signature Sheet

Work area(s) to be entered _____

The following personnel have had a pre-site entry briefing conducted at _____ __ (time) on _____ (date) at _____ (location), and are familiar with this plan's provisions, and are willing to meet the requirements of this plan.

NAME	SIGNATURE	ORGANIZATION

Printed Name of Supervisor Signature Date

Figure 6. SSHO Daily Logbook Report

Date _____ Report Number _____

'on(s) Work Activity and # Employees: _____

Weather: Wind speed _____ Wind direction _____

Temp. & Pressure _____ Precipitation _____

Amount sun _____

Monitoring conducted:

Location	Sampled for	Instrument used	Results	Sampled By/Time

Levels of Protection: _____

Problems or Unusual Situations: _____

Correspondence: _____

Other Comments: _____

MK SSHO Printed Name: _____ Signature _____ Date _____

Figure 7 SSHP Weekly Inspection Checklist **Surveillance No. _____**

SURVEILLANCE NO.:	ACTIVITY:		PROJECT NO.:
DATE:	LOCATION: SITE/AREA CONTACT:	RESPONSIBLE MANAGER	SURVEYED ORGANIZATION: PRIME: SUBTIER:

ITEM NO.	DESCRIPTION OF SURVEYED ITEMS	N/A SAT UNSAT	DESCRIPTION OF DISCREPANCY/ NON-COMPLIANCE	ACT OR COND	CAT	REQUIRED ABATEMENT DATE	CORRECTIVE ACTION TAKEN AND DATE ABATEMENT COMPLETED
	Section 1						
1	Scope of work and site contaminants accurately described?						
	Section 2						
2	Activity hazard analysis prepared for each major work phase? (EM 385-1-1, Section 01.A.09)						
3	All hazards including chemical and physical adequately described?						
	Section 3						
4	Roles and responsibilities described and personnel rooster up-to-date?						
	Section 4						
5	All site personnel completed required training?						
6	Training documented and records on site?						
	Section 5						
7	All site personnel completed initial medial qualification?						
	Section 6						
8	PPE available and in good condition?						
9	PPE work per SSHP and/or SSHO direction?						
10	Personnel trained in proper use, limitations, and inspection of PPE?						
11	PPE inspected per SSHP?						
12	PPE donning/doffing procedures in place?						
13	Written SOP available describing respirator selection and use?						
	Section 7						
14	Air monitoring conducted per SSHP?						

Figure 7 SSHP Weekly Inspection Checklist **Surveillance No. _____**

SURVEILLANCE NO.:		ACTIVITY:				PROJECT NO.:	
DATE:		LOCATION: SITE/AREA CONTACT:		RESPONSIBLE MANAGER		SURVEYED ORGANIZATION: PRIME: SUBTIER:	
15	Monitoring equipment properly maintained and calibrated?						
16	Employees notified of monitoring results?						
17	Chain of custody prepared and maintained for all samples?						
	Section 4 and 8						
18	Weekly safety meeting held?						
19	Pre entry briefs held? and signature sheet completed?						
20	Haz Com programs in place?						
21	Competent person evaluates excavation?						
22	Personnel responsible for work maintain control of area?						
	Section 9						
23	Work zone maps prepared and updated?						
24	Maps posted near work area and stored in field master copy of SSHP						
25	Traffic patterns established and rules observed?						
	Section 10						
26	Inspections performed of all personnel, clothing and equipment leaving exclusion zone?						
27	All materials decontaminated prior to existing contamination reduction zone?						
28	Decon stations properly established?						
29	Proper personal hygiene practices observed?						
30	Decon solutions collected and properly disposed of?						
	Section 4 and 11						
31	At least two employees on each shift trained in CPR and first aid and BLOOD BORNE pathogens?						
32	First aid kit, biohazards control kit and eyewash/drench at each work site?						
33	All first aid and medical cases promptly reported to MK SSHO?						

Figure 7 SSHP Weekly Inspection Checklist **Surveillance No. _____**

SURVEILLANCE NO.:	ACTIVITY:	PROJECT NO.:
DATE:	LOCATION: SITE/AREA CONTACT: RESPONSIBLE MANAGER	SURVEYED ORGANIZATION: PRIME: SUBTIER:

	Section 12						
34	All personnel trained on Emergency Response Plan and Contingency Procedures?						
35	Emergency pre-planning addressed in safety meeting?						
36	List of emergency services/contact is up to date and posted?						
37	Assembly points identified and communicated to employees?						
38	Evacuation routes established and communicated to employees?						
39	Communication methods are adequate						
40	All drills, exercises, and emergencies critiqued?						
41	All emergencies promptly reported to MK SSHO?						
	Section 13						
42	MK SSHO maintains project log book?						
43	Daily reports completed by SSHO?						
44	Daily inspections completed by SSHO?						
45	Weekly reports prepared by SSHO?						
46	Records of all injuries and illnesses maintained by SSHO?						
	Section 14						
47	Work plans available and up to date?						
48	SOPs developed as needed?						
	Section 15						
49	Two-way radios available per SSHP?						
50	Cellular telephone available as needed?						
51	Emergency alarms available and personnel trained on what actions to take?						
52	Drills and exercises conducted to test communication methods?						
	Section 16						

Figure 7 SSHP Weekly Inspection Checklist **Surveillance No. _____**

SURVEILLANCE NO.:		ACTIVITY:				PROJECT NO.:	
DATE:		LOCATION: SITE/AREA CONTACT:		RESPONSIBLE MANAGER		SURVEYED ORGANIZATION: PRIME: SUBTIER:	
53	Spill response measures reviewed with personnel?						
54	Suitable quantities of spill supplies available?						
55	Spills promptly reported to SSHO?						
56	Operations arranged to minimize spills?						
	Section 17						
57	Confined space requirements of 385-1-1, Section 06.0.01 followed? Personnel trained?						

Inspection Performed By: Date:

Abatement Accepted By: Date:

APPENDIX B
QUALITY CONTROL INSPECTION CHECKLISTS

MORRISON KNUDSEN CORPORATION
ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP

FIELD INSPECTION CHECKLIST

Checklist Title	Checklist No.	Revision	Checklist
SITE PREPARATORY WORK	SP-01	Rev. 2	Page 1 of 2

References: Specification 01020 - Mobilization; 02100 -Site Preparation; 01560 - Dust Control; 01561 - Surface Water and Erosion Control; 02210 - Excavation; 02960 - Site Restoration

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
	Preparatory Inspection			
1	Verify that the Navy has been notified, within ten days, of the area of planed excavation.			
2	Perform preparatory phase meeting prior to initiating work items for site clearing.			
3	Verify Work Zone is clearly delineated.			
4	Verify excavation permits have been obtained.			
5	Ensure that a Stockpiling Plan has been developed and approved by the Project Manager.			
6	Ensure that a Decontamination Plan has been developed and approved by the Project Manager.			
7	Ensure that a Storm Water Run-on and Run-off Control Plan has been developed and approved by the Project Manager.			
8	Ensure that a Spill Control Plan has been developed and approved by the Project Manager			
9	Verify completion of any initial surveys.			
10	Verify that a review of safety requirements is performed as part of the preparatory inspection. (Briefing by Site Safety & Health Officer).			
11	Ensure that a housekeeping and maintenance requirements are understood.			
	Initial Inspections			
1	Confirm work areas have been located within the limits of established stakes, lines or monuments.			
2	Conduct an examination of areas to be cleared and identify items to remain or existing features, including plant life, that is not to be disturbed. Resolve discrepancies prior to continuance of work.			

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP	FIELD INSPECTION CHECKLIST		
Klist Title SITE PREPARATORY WORK	Checklist No. SP-01	Revision Rev. 2	Checklist Page 2 of 2

References: Specification 01020 - Mobilization; 02100 -Site Preparation; 01560 - Dust Control; 01561 - Surface Water and Erosion Control; 02210 - Excavation; 02960 - Site Restoration

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
	Initial Inspections			
3	Verify that protection of items not to be removed or disturbed has been provided, as necessary.			
4	Ensure compliance with the plans identified in the Preparatory Phase.			
5	Verify that dust control measures are available and effective.			
6	Verify that storm water and erosion control measures have been implemented to control run-on, run-off.			
7	Verify that filter fence for surface water and erosion is in place.			
	Follow-Up Inspections			
1	Ensure removal of ground surface vegetation from the construction areas.			
2	Verify removal from the construction area of stumps, roots, debris and other deleterious materials not suitable for subsequent grading or reuse and compaction.			
3	Verify final removal and off-site disposal of cleared and grubbed wastes in an approved manner.			
4	Verify continuing compliance with the approved plans identified during the Preparatory Phase Inspection.			
5	Topsoil materials are stockpiled, shaped and managed according to the specifications to promote drainage and for measurement purposes.			
6	Verify that storm water and erosion control measures have been implemented to control run-on, run-off.			

Additional Notes or comments: Use Additional Sheets as necessary

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION
ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP

FIELD INSPECTION CHECKLIST

:klist Title	Checklist No.	Revision	Checklist
MOBILIZATION and DEMOBILIZATION	MD-01	Rev. 2	Page 1 of 2

References: Specification 01011 - Statement of Work; Specification 01020 - Mobilization and Cleanup

Item No.	Item Checked	Accept/Reject	Remarks	Verified By /Date
	Preparatory Inspection			
1	Schedule a pre-construction meeting prior to construction activities.			
2	Verify that a visual site inspection and evaluation of environmental conditions have been performed.			
3	Verify Subcontractor Work Plan submitted and approved.			
4	Verify that site security measures have been established.			
	Initial Inspections			
1	Verify that all equipment mobilized to the site has been steam cleaned and inspected prior to site entry.			
2	Verify that all equipment has been inspected upon arrival at site for general conditions to assure that all safety systems and alarms are functional and tested.			
3	Verify that equipment has been set up at designated area.			
4	Verify that work zones and access routes have been established and signs, barricades and tapes have been placed to limit access.			
5	Verify that the site has been cleaned upon completion of work. All equipment, unused materials, temporary facilities, and miscellaneous materials have been removed from the site.			
	Follow-Up Inspections			
1	Verify that all equipment mobilized to the site has been steam cleaned and inspected prior to site entry.			
2	Verify that all equipment has been inspected upon arrival at site for general conditions to assure that all safety systems and alarms are functional and tested.			

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist No.	Revision	Checklist
MOBILIZATION and DEMOBILIZATION	MD-01	Rev. 2	Page 2 of 2

References: Specification 01011 - Statement of Work; Specification 01020 - Mobilization and Cleanup

Item No.	Item Checked	Accept/Reject	Remarks	Verified By /Date
	Follow-Up Inspections			
3	Verify that equipment has been set up at designated area.			
4	Verify that work zones and access routes have been established and signs, barricades and tapes have been placed to limit access.			
5	Verify that the site has been cleaned upon completion of work. All equipment, unused materials, temporary facilities, and miscellaneous materials have been removed from the site.			

Additional Notes or comments: Use Additional Sheets as necessary

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP	FIELD INSPECTION CHECKLIST		
klist Title PIPING INSTALLATION	Checklist No. PI-01	Revision Rev. 1	Checklist Page 1 of 2

References:

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
	Preparatory Inspection			
1	Trench excavation meets minimum requirements and guidelines in standard practice ASTM-2321.			
2	Concrete, cement and other materials used in construction of pipe trench meets all applicable ASTM standards.			
3	Proper temperature maintained during curing. Concrete protected from weather through the expiration of the curing period.			
4	Check mechanical of finished ends for damage and pipe interior for dirt and foreign material, where accessible.			
5	Assure gaskets, lubricants, compounds, and other mechanical joint materials handled and stored in accordance with manufacturer's recommendations.			
6	Observe that pipe, fittings, and accessories are handled in such a manner as to avoid damage by impact, abrasions, or other causes.			
7	Assure all piping and fittings are schedule 80 wall thickness CPVC. Assure all miscellaneous components meet appropriate ASTM and ANSI specifications.			
	Initial Inspections			
1	Assure all piping is laid in straight lines to alignment shown on drawings and to uniform grades between elevations shown on drawings at terminal structures, change of direction, and other locations.			
2	Assure joints are in accordance with manufacturer's recommendations.			
3	Assure piping is placed correctly in trench.			
4	Assure end surfaces are clean when joints are made.			
5	Assure trenches are free of standing water.			
	Follow-up Inspections			
1	Assure all required inspections, tests, and/or NDE work for the piping has been performed.			
2	Assure all inspectors with jurisdictional authority of the applicable codes have witnessed the required inspections and tests, or have waived the witness/hold point.			
3	Backfill complete.			
4	Verify that all tests, inspections, and NDE have been documented and the reports filed.			

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist No.	Revision	Checklist
PIPING INSTALLATION	PI-01	Rev. 1	Page 2 of 2

References:

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
	Follow-up Inspections (Continued)			
5				
6				

Additional Notes or comments: Use Additional Sheets as necessary

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP			FIELD INSPECTION CHECKLIST
klist Title BACKFILL PLACEMENT	Checklist No. BF-01	Revision Rev. 1	Checklist Page 1 of 2

References:

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
	Preparatory Inspection			
1	Perform a preparatory phase meeting prior to initiating backfill operations to ensure that backfill placement requirements are understood by all parties.			
2	Ensure that the services of a material testing laboratory are available and the laboratory has been approved.			
3	Verify that compaction densities are identified and understood.			
4	Verify that backfill equipment is present and suitable for the effort, i.e. vibratory compaction equipment, smooth drum rollers, etc.			
5	Verify that proposed fill material complies with the technical specifications, including approved test results.			
6	Verify that shoring has been approved, as required, and that provisions have been made for safety barricades.			
7	Verify that required samples from excavation have been analyzed and the results are acceptable prior to backfill.			
	Initial Inspections			
1	Verify that excavation is performed in accordance with the Work Plan and within established bounds.			
2	Verify that sub-standard materials (tree roots, etc.) Are removed.			
3	Verify that subsoil irregularities such as soft spots are removed.			
4	Confirm that drainage, de-watering, etc., conform with design/specs.			
5	Ensure that materials, compaction, and work are performed, inspected, and tested in accordance with the Work Plan and specifications.			
6	Verify the performance of ASTM D698 Proctor Tests for each soil type. Ensure receipt of test report by MK.			

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist No.	Revision	Checklist
BACKFILL PLACEMENT	BF-01	Rev. 1	Page 2 of 2

References:

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
	Follow-Up Inspections			
1	Verify that backfill materials comply with specifications (moisture, density, gradation).			
2	Verify that backfill materials are compacted in lift thicknesses that do not exceed specification. Compaction testing of lifts shall also be confirmed.			
3	Verify performance of Field Density Tests and documentation of results.			
4	Ensure that final grade of the backfill is to previous subgrade material.			
5	See that corrective action measures have been performed where required, verified, and documented. Ensure clearance of items identified on the Rework Items List.			
6	Ensure that the required density testing is performed and test results are provided.			

Additional Notes or comments: Use Additional Sheets as necessary

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP	FIELD INSPECTION CHECKLIST		
Checklist Title MECHANICAL INSTALLATION of TREATMENT EQUIPMENT	Checklist No. ME-01	Revision Rev. 2	Checklist Page 1 of 1

References: Specification 11400 and 05410 - Statement of Work

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
	Preparatory Inspection			
1	Verify that installation location is correct prior to and after concrete placement.			
2	Verify that concrete surfaces are properly prepared (clean, roughened, as necessary).			
3	Process flow diagrams and instrumentation diagrams show all major pieces of process equipment with controls. Detail drawings show proposed layout and mounting and relationship to other parts of the work.			
4	Check that equipment is handled in accordance with manufacturer's instructions, including protection of mechanical equipment from the weather during storage.			
5	Lockout/tagout procedures have been implemented as required.			
	Initial Inspections			
1	Effluent sump alarm, pump lights and control valve in place.			
2	Equipment inspected for alignment and connections prior to startup.			
	Follow-Up Inspections			
1	Fence installed to enclose treatment system.			

Additional Notes or comments: Use Additional Sheets as necessary

Specific Item Identification or Location, as applicable:

MK Project	Delivery Order Number	Checklist Title	
NAS Corpus Christi	0016, 24	Mechanical Installation ME-01	Page 1 of 1

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP	FIELD INSPECTION CHECKLIST		
Checklist Title DECONTAMINATION	Checklist No. DE-01	Revision Rev. 2	Checklist Page 1 of 2

References: Specification 01011 - Statement of Work; Specification 01850 - Decontamination

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
	Preparatory Inspection			
1	Verify Subcontractor Decontamination Plan submitted and approved.			
2	Review the specification requirements regarding establishment of the Decontamination Facility.			
3	Review the requirement for daily visual inspection of the decontamination facility and documentation requirements.			
4	Review decontamination procedures for the external surfaces of pumps, piping, tanks, oil/water separator, and ancillary equipment and construction and field equipment as contained in the Work Plan/Technical Specifications			
5	Verify that container for storage of decontamination water is established and of adequate size.			
6	Verify Subcontractor has required supplies for decontamination activities.			
7	Review Site Safety & Health Plan requirements for the Personnel Decontamination Facility. (Briefing by the Site Safety & Health Officer).			
	Initial Inspections			
1	Verify that the decontamination facility is constructed in an area approved by the Project Manager.			
2	Verify that decontamination facilities are delineated with orange fencing and appropriate signs as part of the contamination reduction zone.			
3	Perform an initial inspection of the decontamination facility liner for the following attributes: evidence of tears and holes; evidence of seepage; that the sheeting is adequately fastened to the side walls; that the liner adequately covers the straw bales at the end sections and is secured by sandbags; that expected quantities of generated liquids can be contained until collected for disposal			

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP	FIELD INSPECTION CHECKLIST

Checklist Title	Checklist No.	Revision	Checklist
DECONTAMINATION	DE-01	Rev. 2	Page 2 of 2

References: Specification 01011 - Statement of Work; Specification 01850 - Decontamination

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
	Initial Inspections			
4	Verify that records are established that specify decontamination facility construction materials and methods, disposition of liquids, and any repairs and/or breaches of liner integrity.			
5	Verify decontamination activities are performed in accordance with the Work Plan and Technical Specifications.			
	Follow-Up Inspections			
1	Monitor on-going decontamination operations to verify compliance with the Work Plan/Technical Specifications.			
2	Verify that daily inspections of the decontamination facility are performed and documented.			
3	Verify that records of any breaches and/or repairs to the liner are documented.			
4	Verify decontamination wastes are characterized and disposed of properly.			
5	Verify upon dismantlement of the decontamination facility, that underlying material is not contaminated. Potentially contaminated soil will be sampled by MK and analyzed prior to removal and managed per the Chemical Data Acquisition Plan.			

Additional Notes or comments: Use Additional Sheets as necessary

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP	FIELD INSPECTION CHECKLIST		
Checklist Title ELECTRICAL EQUIPMENT INSTALLATION	Checklist No. EI-01	Revision Rev. 1	Checklist Page 1 of 2

References: Section 06000 and 06010 Statement of Work

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
	Preparatory Inspection			
1	Verify the electrical equipment is clean, in good condition and free from moisture.			
2	Verify all electrical equipment conforms to the requirements of Sections 06000 and 06010 of the Work Plan.			
3	Verify the equipment is installed in the correct location with the correct orientation.			
	Initial Inspections			
1	Verify correct equipment is installed (check nameplate) in accordance with manufacturer's instructions and that wiring devices are heavy duty.			
2	Verify the equipment is properly mounted and aligned and clearances are correct.			
3	Verify incoming conduit is properly supported, free of corrosion and rust, and coated with a conductive galvanizing material.			
4	Verify the electrical motors are of premium-efficiency and are installed properly.			
5	Verify that all sources and outlets are identified and that colors of nameplates and conductor tabs conform to color codes specified in Work Plan.			
6	Verify that protective devices are properly installed to provide enclosure integrity.			
7	Verify that ventilation openings are not obstructed.			
8	Verify internal connecting cable is of the correct type, that the wires are properly identified and the cable is terminated properly.			
9	Verify that proper grounding is accomplished.			
10	Verify that label plates and fuse rating nameplates are correct.			
11	Confirm that all materials installed out of doors are approved for outdoor use.			
	Follow-up Inspections			
1	Verify that hand operated switches, breakers and controls are functional.			
2	Verify that all systems and equipment are in satisfactory working order and ready for normal service.			

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP		FIELD INSPECTION CHECKLIST	
Checklist Title ELECTRICAL EQUIPMENT INSTALLATION	Checklist No. EI-01	Revision Rev. 1	Checklist Page 2 of 2

References: Section 06000 and 06010 Statement of Work

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
3	Confirm that installation complies with applicable rules, codes and standards.			
4	Verify that connections and all power wiring have been checked for tightness, and that other field tests have been performed according to O/M Manual requirements.			

Additional Notes or comments: Use Additional Sheets as necessary

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP	FIELD INSPECTION CHECKLIST		
:klist Title TOPSOIL PLACEMENT	Checklist No. TS-01	Revision Rev. 1	Checklist Page 1 of 2

References:

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
	Preparatory Inspection			
1	Schedule a preparatory phase meeting prior to initiating topsoil placement activities.			
2	Verify that all subgrade backfill placement is complete, testing is acceptable, and documented density tests are submitted to MK.			
3	Verify the suitability of topsoil selected for placement. (Topsoil will be fertile, agricultural soil, typical of the Corpus Christi area, and capable of sustaining vigorous plant growth.)			
4	Verify that tests have been performed and documented on topsoil, including analysis for pH and organic matter content for fertilization and to ensure topsoil is compatible with native grass seed.			
5	Review the schedule with Project Management to ensure that topsoil placement occurs in dry weather.			
	Initial Inspections			
1	Verify that topsoil is free of clay or debris, including roots, branches or stones in excess of one inch in diameter.			
2	Ensure that topsoil placement is performed in dry weather.			
3	Ensure that topsoil is placed to a minimum depth of 6 inches.			
	Follow-up Inspections			
1	Verify that topsoil placement continues in accordance with the Work Plan.			
2	Ensure that topsoil is finish graded to eliminate low areas and to maintain the profile and contour of the subgrade.			
3	Ensure that topsoil is seeded with grass seed mixture containing 50% blend of Bermuda and Centipede.			
4	Ensure that seed is raked into the topsoil approximately 1/4 inch below the surface.			

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP	FIELD INSPECTION CHECKLIST		
Checklist Title TOPSOIL PLACEMENT	Checklist No. TS-01	Revision Rev. 1	Checklist Page 2 of 2

References:

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
	Follow-up Inspections (Continued)			
5	Verify that seeded areas are marked by the subcontractor with stakes and string to indicate the boundaries of the seeded area.			
6	Monitor plant growth to ensure that vegetation is established.			

Additional Notes or comments: Use Additional Sheets as necessary

Specific Item Identification or Location, as applicable:

MORRISON KNUDSEN CORPORATION ENGINEERING, CONSTRUCTION, ENVIRONMENTAL GROUP	FIELD INSPECTION CHECKLIST		
ecklist Title SITE RESTORATION	Checklist No. SR-01	Revision Rev. 1	Checklist Page 1 of 1

References:

Item No.	Item Checked	Accept/ Reject	Remarks	Verified By /Date
	Preparatory Inspection			
1	Verify that the subcontractor provides a Site Restoration Plan (SRP) in accordance with the specifications. Ensure that the SRP is reviewed and approved by the PM.			
	Initial Inspections			
1	Verify inventory of existing conditions and surface features that will affect site restoration.			
	Follow-Up Inspections			
1	Verify that the site is restored in accordance to the specification and the SRP.			
2	Verify continued maintenance of grass and plant life. Replaced or replenish, if required.			
3	Perform final walk-through with the Navy Resident Officer in Charge of Construction to confirm final site restoration.			
4	Compile a punchlist of any items identified as deficient or incomplete, and submit to the subcontractor for resolution.			
5	Document final acceptance of the work site.			

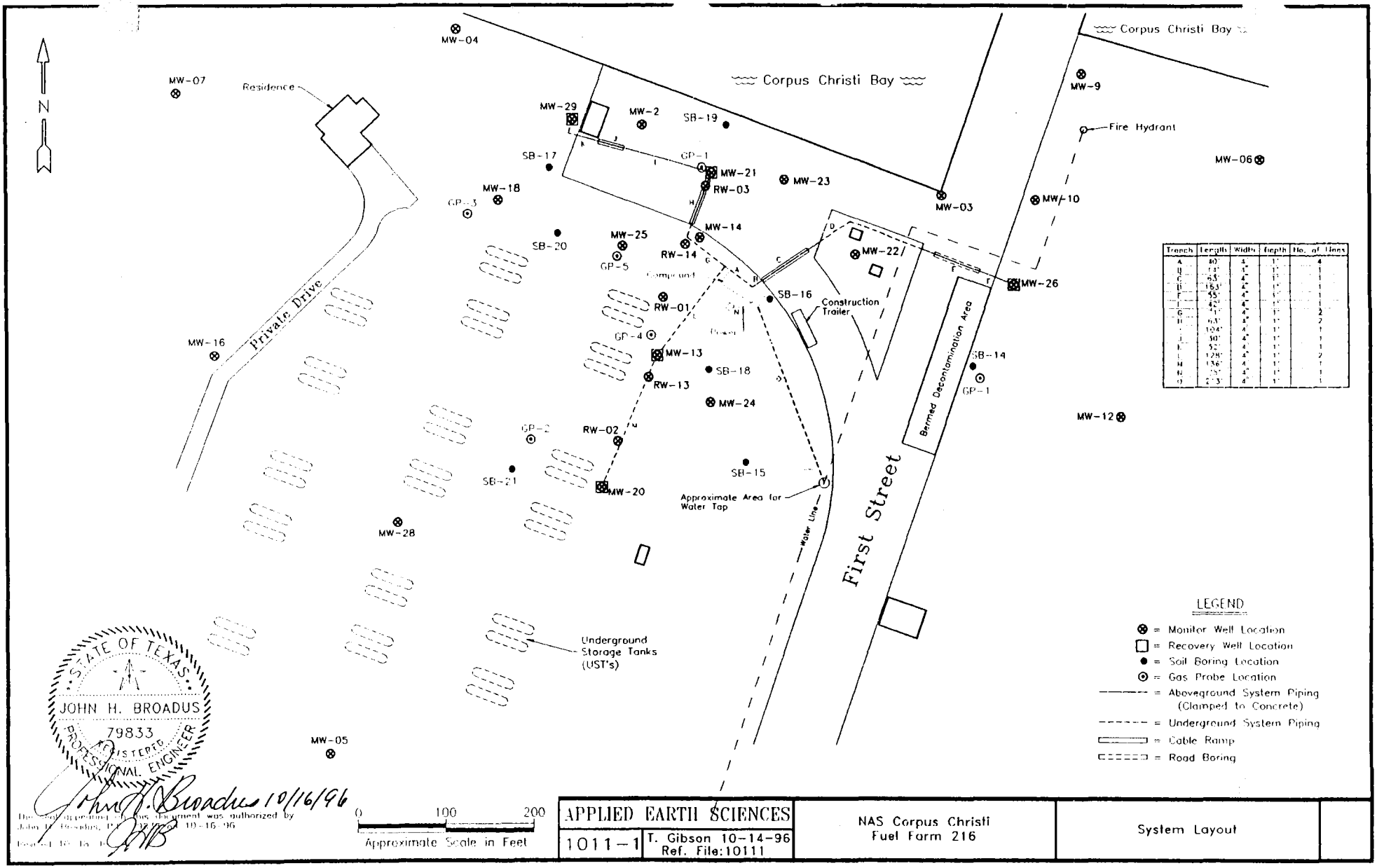
Additional Notes or comments: Use Additional Sheets as necessary

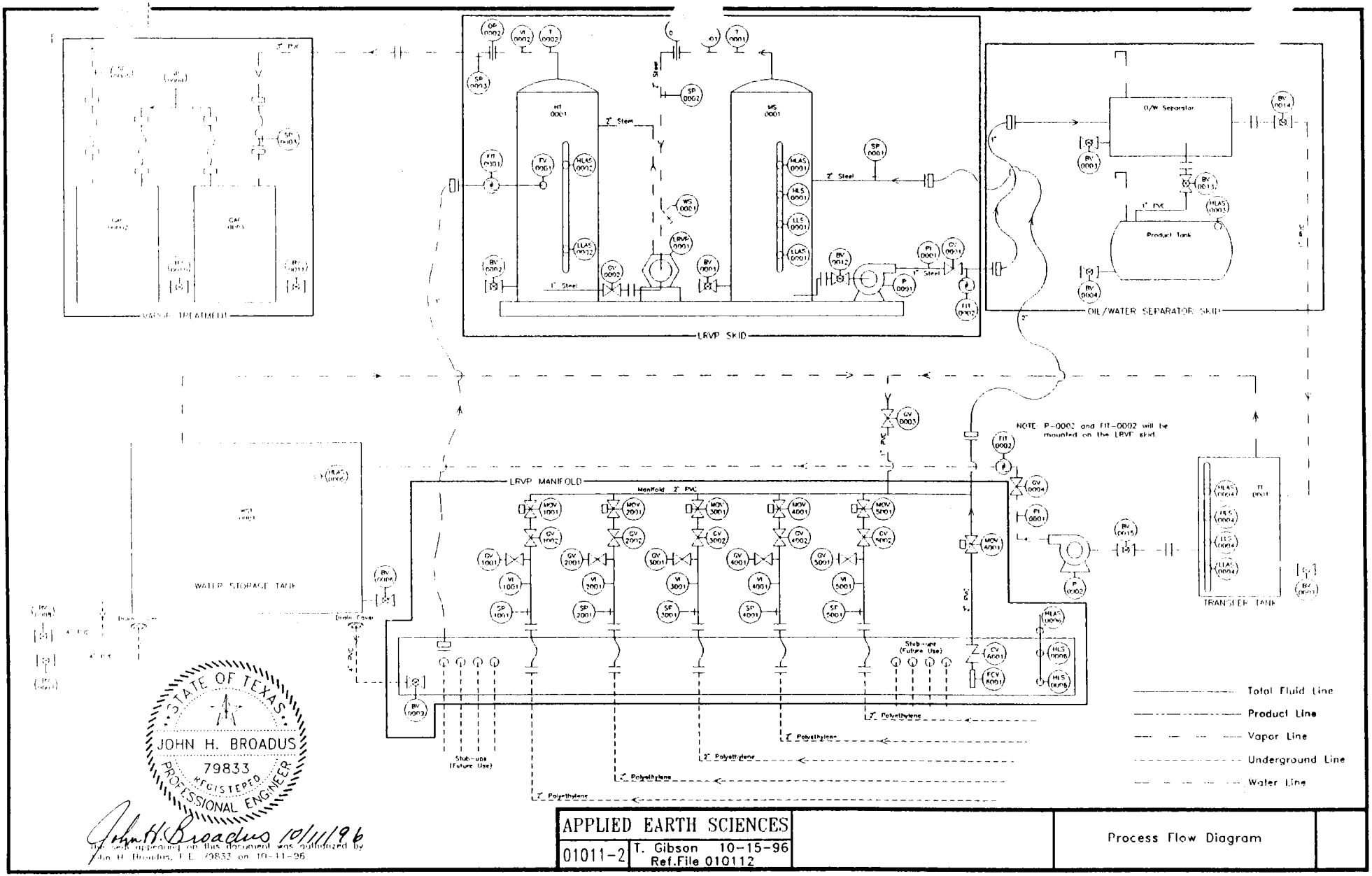
Specific Item Identification or Location, as applicable:

APPENDIX C
DRAWINGS

APPENDIX C
DRAWINGS

1011 - 1	System Layout
01011 - 2	Process Flow Diagram
04000 - 1	Treatment Compound Layout
03301 - 1	Concrete Equipment Pad


N
Corpus Christi Bay
Corpus Christi Bay
MW-04
MW-07
Residence
MW-29
MW-2
SB-19
MW-9
Fire Hydrant
SB-17
GP-1
MW-21
MW-23
MW-06
MW-18
RW-03
MW-03
MW-10
GP-3
MW-14
SB-20
MW-25
RW-14
GP-5
MW-22
MW-26
SB-16
Construction Trailer
Private Drive
RW-01
MW-16
GP-4
MW-13
SB-14
SB-18
GP-1
RW-13
MW-24
MW-12
Bermed Decontamination Area
GP-2
RW-02
SB-15
SB-21
MW-20
Approximate Area for Water Tap
Water Line
First Street
MW-28
Underground Storage Tanks (UST's)
MW-05
Trench
Length
Width
Depth
No. of Lines
LEGEND
= Monitor Well Location
= Recovery Well Location
= Soil Boring Location
= Gas Probe Location
= Aboveground System Piping (Clamped to Concrete)
= Underground System Piping
= Cable Ramp
= Road Boring
STATE OF TEXAS
JOHN H. BROADUS
79833
REGISTERED
PROFESSIONAL ENGINEER
John H. Broadus 10/16/96
0
100
200
Approximate Scale in Feet
APPLIED EARTH SCIENCES
1011-1
T. Gibson 10-14-96
Ref. File:10111
NAS Corpus Christi
Fuel Farm 216
System Layout



STATE OF TEXAS
JOHN H. BROADUS
79833
REGISTERED
PROFESSIONAL ENGINEER

John H. Broadus 10/11/96

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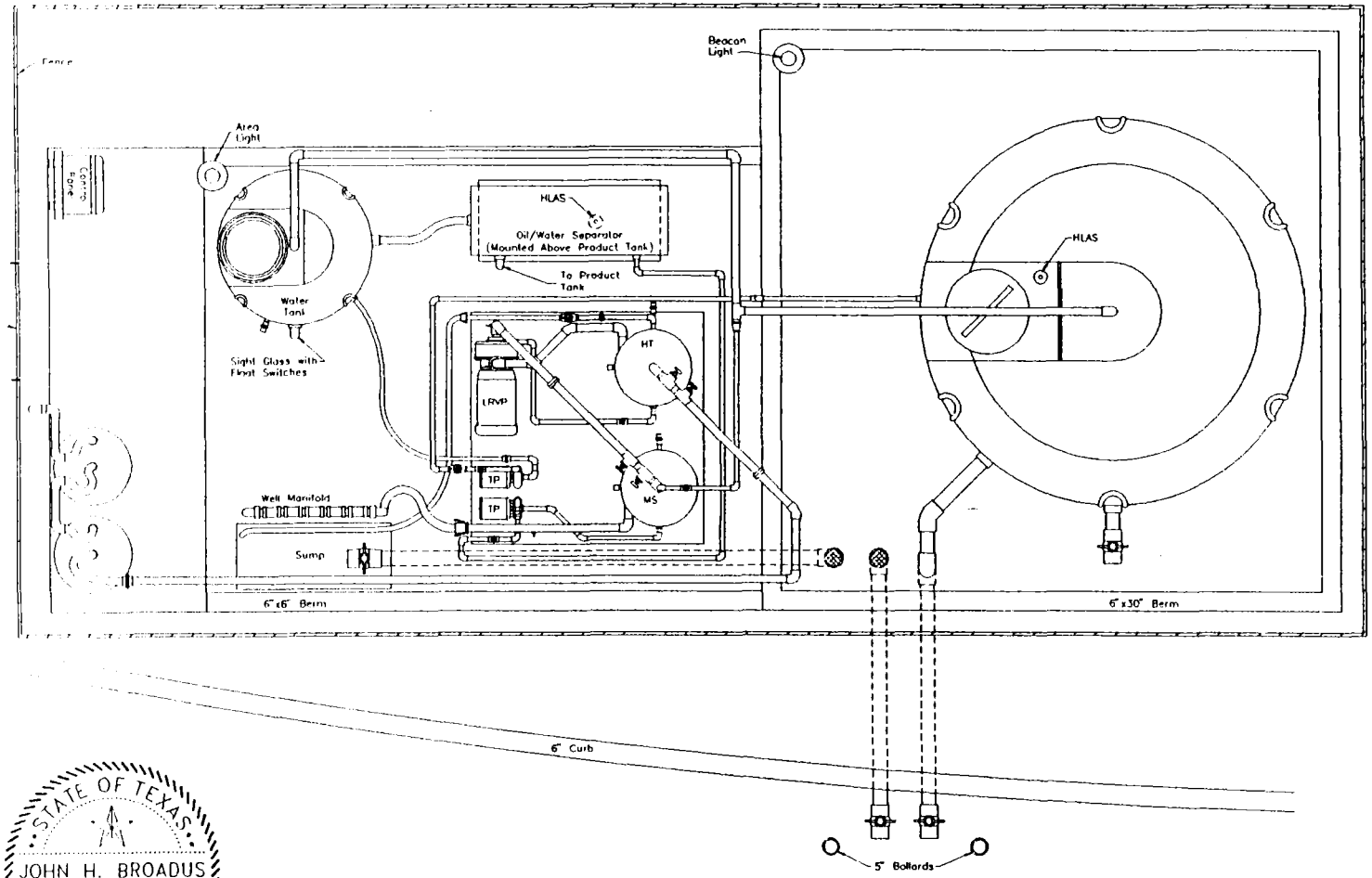
APPLIED EARTH SCIENCES		
01011-2	T. Gibson 10-15-96 Ref.File 010112	Process Flow Diagram



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PROFESSIONAL ENGINEER

John H. Broadus 10/10/96

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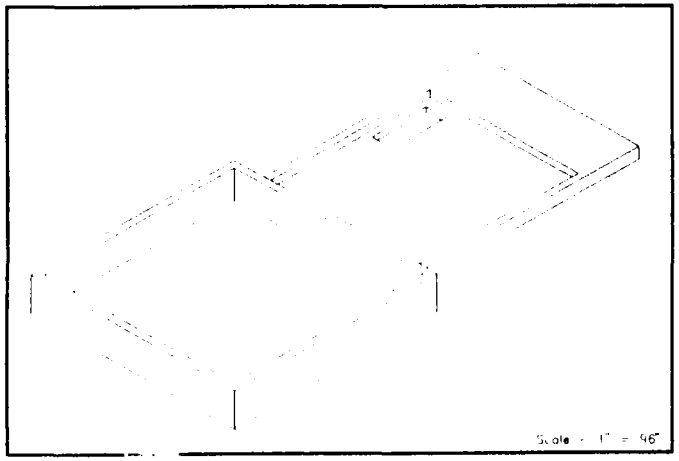
Scale - 1" = 36'
NOTE: For more detailed equipment descriptions, see LRV Skid drawing

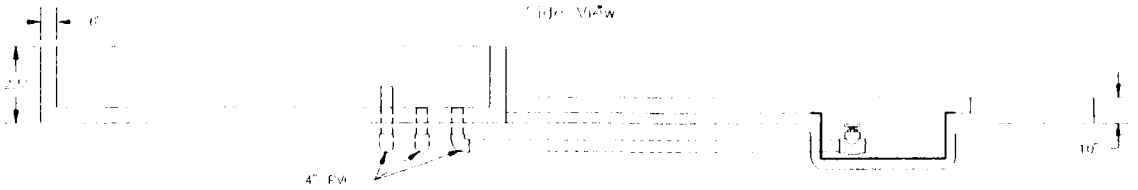
APPLIED EARTH SCIENCES	Revised 10-18-96	Treatment Compound Layout	
04000-1	T. Gibson 10-06-96 Ref.File 040001		

Isometric View
(Piping not Shown)

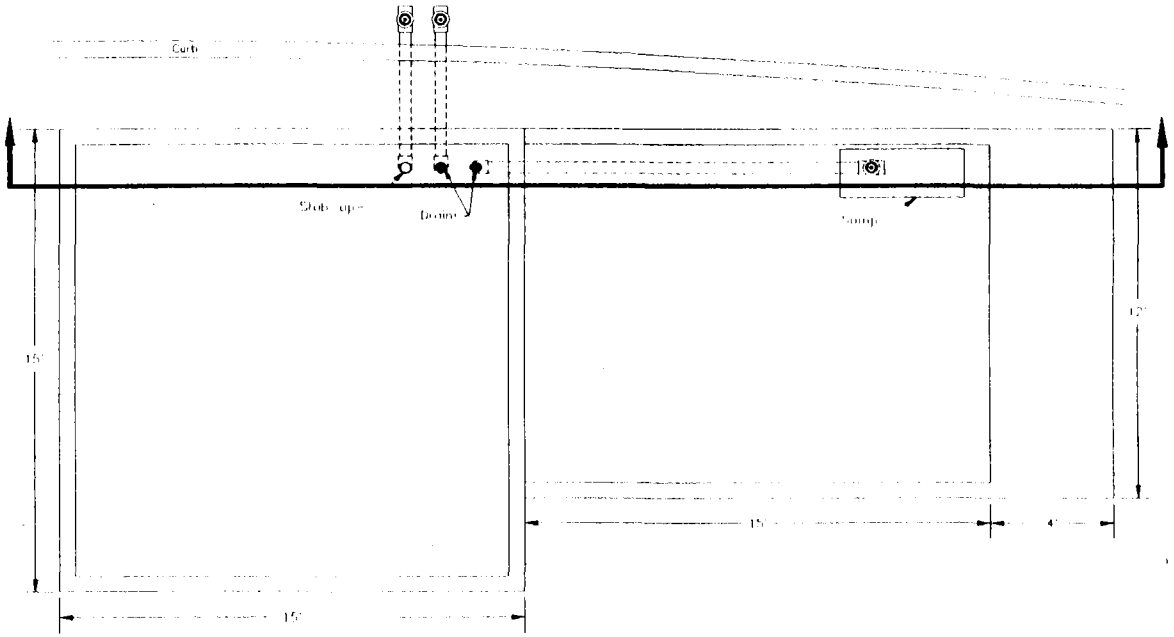


Scale - 1" = 96"

Side View



Plan View



Scale - 1" = 48"

STATE OF TEXAS
JOHN H. BROADUS
79833
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PROFESSIONAL ENGINEER

John H. Broadus 10/10/96

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APPLIED EARTH SCIENCES			
03301-1	T. Gibson 10-09-96 Ref.File 033011		Concrete Equipment Pad

APPENDIX D
RESUMES

John Broadus, P.E.

Bobby Hill

Claire Meurer, P.E.

Luis Reyna

John H. Broadus, P.E.
Environmental Engineer II

Mr. Broadus specializes in subsurface soil and groundwater investigation and the remediation of site soils and ground water. He has been actively involved in and responsible for all phases of site assessments including monitoring well installation, aquifer characterization tests, site hydrogeological mapping, concentration mapping, and remediation equipment design, purchase, and installation. His experience includes the generation of Spill Prevention, Containment, and Countermeasures Plans for over 900 sites in Texas, West Virginia, Arkansas, Kansas, Louisiana, and Oklahoma.

In addition to his environmental consulting experience, Mr. Broadus has twenty years of experience in oil and gas drilling and production operations. This includes emergency response to large crude oil spills from ruptured treatment vessels, storage tanks, and well blowouts. Emergency response included containment, recovery and clean up of crude oil and produced brine waters as well as equipment repair. Preventive methods included proper equipment design and proper operations procedures.

EDUCATION

1974 MS Biology/Chemistry; Eastern New Mexico University, Portales, New Mexico

1971 BS Biology/Chemistry; Eastern New Mexico University, Portales, New Mexico

EXPERIENCE

1992-Present	Applied Earth Sciences, Inc.
1991-1992	ATEC, Dallas, Texas
1989-1991	ATEC, Columbia, Maryland
1986-1989	Wentworth Operating Co., Oklahoma City, Oklahoma
1982-1985	Crown Central Petroleum Corp., Oklahoma City, Oklahoma
1978-1981	PetroLewis Corp., Oklahoma City, Oklahoma

EXPERIENCE (Continued)

1974-1978 Conoco, Inc., Oklahoma City, Oklahoma

RELATED ENVIRONMENTAL WORK

As the District Production Superintendent for a major oil company, Mr. Broadus generated Spill Prevention, Containment and Countermeasures (SPCC) plans for over 900 production sites in Texas, Arkansas, Kansas, West Virginia, Oklahoma, and Louisiana. As a direct result of these site specific SPCC plans, he implemented facility upgrades to comply with the regulations. These upgrades included the addition of berms, containment walls, sump pumps, replacement of leaking valves and addition of monitoring instruments. Reporting requirements were specified and a special file established for tracking the release and spill history for each site. These individual files became a part of ech SPCC site plan. The key requirements outlined in each site's SPCC plan was part of the routine OSHA-based Safety Training Program Mr. Broadus conducted for all site personnel.

Mr. Broadus designed and installed vapor recovery systems for bulk chemical storage tanks.

He installed remediation systems for gasoline service stations in Maryland, Virginia, California, and Texas.

Installed remediation systems and monitored operations for major Maryland Public Utility and large Maryland Hospital.

Designed and installed ground water interception trenches for a large stone quarry in Pennsylvania and an electronics manufacturing facility in Texas.

Supervised the removal of underground storage tanks from apartment buildings, hospitals, gasoline service stations, stone quarries, and industrial manufacturing facilities.

Performed aquifer tests at numerous sites (including industrial sites and gasoline service stations) to determine hydrogeologic characteristics both.

Supervised the installation and operation of ground water treatment systems including the removal and treatment of contaminated groundwater from recovery wells, interception trenches, and land farms.

Designed bioremediation systems for contaminated soils at large aircraft engine repair facilities. Operated remediation systems at U.S. Navy facilities in Maryland and California.

RELATED ENVIRONMENTAL WORK (Continued)

Performed computer ground water modeling simulations and ground water mapping for sites in Maryland and Texas. Clients included large department store warehouse facility, aircraft engine maintenance facilities, gasoline service stations, and stone quarries. Simulations include recovery wells, injection wells, interceptor trenches, and infiltration galleries.

Prepared quarterly monitoring and operating reports for USEPA, TWC, Maryland Department of the Environment, Pennsylvania Department of Environmental Resources, West Virginia Department of Natural Resources, and Washington D.C. Environmental Protection Agency.

Developed MathCad programs to determine system efficiencies and projections of concentration and mass values versus time for operating systems.

Assessed and/or remediated soil contaminated with gasoline, diesel, heating oil, jet fuel, tetrahydrofuran, trichloroethylene, tetrachloroethylene, dichloroethylene, and vinyl chloride or combined mixtures of referenced compounds.

Instructed courses in environmental chemistry (at local community college) for unemployed petroleum geologists and engineers who wish to enter the environmental consulting field.

Assisted in design and installation of large catalytic thermal oxidation system in major oil company bulk storage terminal in New Mexico.

Prepared Corrective Action Plans for sites in Texas, Tennessee, and Louisiana.

Performed construction oversight for five groundwater treatment systems on a superfund site in North Carolina.

PROFESSIONAL REGISTRATIONS

Professional Engineer, No. 16149; Oklahoma, 1991
Professional Engineer, No. 79833; Texas, 1994
UST Consultants, No. 260; Oklahoma, 1994
Corrective Action Project Manager (CAPM), No. 00132; Texas, 1994

PROFESSIONAL AFFILIATIONS

Society of Petroleum Engineers
American Petroleum Institute
National Water Well Association
Association of Groundwater Scientists and Engineers

SPECIALIZED TRAINING

1993	Bioremediation Engineering, General Physics, Inc., Columbia, Maryland
1991	Bioremediation of Contaminated Soils, Utah State University
1989	Graduate Studies in Hydrogeology, Oklahoma State University
1989	Certificate of Completion, Hydrogeology Metrotech, Oklahoma City, OK
1989	40 Hour SARA Operations Training, Oklahoma State University
1989	8 Hour SARA Supervisor Training, Oklahoma State University

Robert V. Hill
Environmental Scientist II

Mr. Hill is an environmental scientist specializing in soil and groundwater assessment and remediation. He is involved in projects including underground storage tanks (UST) installation and corrective actions, RCRA site investigations, and installation of hydrocarbon recovery systems.

EDUCATION

1993	MS, Environmental Science; Corpus Christi State University, Corpus Christi, TX
1987	BS, Environmental Science; Sam Houston State University, Huntsville, TX

EXPERIENCE

1995-Present	Applied Earth Sciences, Inc.
1993-1995	Foresight Environmental, Inc., Suntide Environmental Services Corpus Christi, TX

RELATED ENVIRONMENTAL WORK

Management of various UST projects involving removal, site assessment, regulatory reporting and ground water monitoring.

Preparation of RCRA Pre-Site Assessment and Site Assessment Plans for an industrial facility. These reports outlined sampling plans and recommendations for establishing background levels of various organic and inorganic contaminants of concern and for vertical and horizontal delineation of contamination.

Management of on site closure activities for two 10 acre Land Treatment Units (LTUs) at an industrial facility in accordance with a TNRCC approved closure plan. The scope of work included waste stabilization, installation of a capillary barrier, monitor wells and french drains, controlling runoff and establishing vegetative cover.

Design, installation and progress monitoring of soil bio-venting remediation system at an industrial facility.

Installation, operation and maintenance of hydrocarbon recovery systems.

Conducted treatability studies for bioremediation of hydrocarbon contaminated soils. Also monitored progress of bioremediation of hydrocarbon contaminated soils in treatment cells at a

TNRCC registered treatment and storage facility.

RELATED ENVIRONMENTAL WORK (Continued)

Designed and conducted a scientific study funded by the Texas General Land Office researching biological and ion exchange methods for remediation of hydrocarbon and brine contaminated soil at an oil and gas produced water deep well injection facility.

PROFESSIONAL AFFILIATIONS

Air and Waste Management Association

SPECIALIZED TRAINING

1995	OSHA 8-Hour HAZWOPER Refresher Course per 29 CFR 1910.120
1994	Corpus Christi Contractors' Safety Council General Course
1993	OSHA 40-Hour HAZWOPER Certification per CFR 1910.120

Claire P. Meurer, P.E.
Project Engineer II

Ms. Meurer has extensive engineering and construction management experience with direct expertise in municipal and toxic waste landfill development, landfill gas management, hazardous waste management, stormwater, groundwater, and wastewater systems, and air permitting.

EDUCATION

1993	MS, Environmental Engineering;University of Texas at Austin
1983	BS, Chemical Engineering;Texas A & M University, College Station, TX

EXPERIENCE

1995-Present	Applied Earth Sciences, Inc., Corpus Christi, TX
1994-1995	Naismith Engineering, Inc., Corpus Christi, TX
1993	Waid and Associates, Austin, TX
1991-1994	U.S. Navy Reserve Civil Engineer Corps, Austin, TX, and Gulfport, MS
1986-1990	U.S. Navy Civil Engineer Corps, Subic Bay, Philippines, and Jacksonville, FL
1983-1985	Celanese Chemical Company, Bishop, TX

RELATED ENVIRONMENTAL WORK

Designed and prepared plans and specifications for environmental and utilities projects including landfill gas monitoring probes, groundwater monitoring wells, new industrial wastewater manholes and piping, and automatic stormwater sampling equipment. Prepared specifications for removal and disposal of industrial wastewater treatment plant sludge, demolition and disposal of abandoned wastewater treatment facilities.

Performed soil gas and groundwater monitoring and sampling.

Completed the preliminary design of storage tanks and secondary containment systems and prepared numerous hazardous waste storage tank certifications in accordance with federal hazardous waste regulations.

RELATED ENVIRONMENTAL WORK (Continued)

Prepared environmental plans for hazardous waste management, spill prevention and control measures, landfill gas management, landfill gas assessment, hazardous and municipal solid waste landfill operations, landfill development, PCB waste management, solid waste management, and sludge and yard waste composting.

Prepared air permit applications and modifications, including emission calculations, process description and review of applicable regulations. Participated in staff engineer training program on air permitting and emissions calculations. Identified potentially impacted sensitive habitats for permit applications.

Administered fifteen federal government construction contracts valued at $5.6 million. Included constructibility review of plans and specifications, approval of submittals, negotiation of change orders, quality assurance, safety enforcement, and coordination with the designer, contractor, and customer activities.

Directed design and renovation of existing building into a child care center.

As the Facilities Engineer for Public Works Center, including utilities, maintenance shops, and warehouses, supervised engineering and project coordination staff. Developed Facilities Five Year Plan for maintenance, repair, and capital improvement projects and executed a $10 million annual facilities project budget.

Developed Scope of Work plans for projects and reviewed engineering designs for water treatment system expansion, power plant expansion, warehouses, and shop facilities. Served as primary point of contact during execution of projects for scope and cost changes, and for accepting completed projects.

Designed improvements to chemicals plant utilities systems and process units. She designed the flare for vent gases produced by formaldehyde unit.

Developed and implemented maintenance program to eliminate accumulation of biomass in anaerobic wastewater treatment system.

Designed an improved scheme for storage and pumping of different feeds to a multi-use process unit.

Performed numerous tank certifications including Liquid Hazardous Waste Storage Tank Farm Certification, Hazardous Waste Storage Tank Certification, Sludge Storage Tank Certification, Leachate Tank Certification, Hazardous Waste Storage Silo Certification, SPCC Plan Tank Inspections.

RELATED ENVIRONMENTAL WORK (Continued)

Prepared a hazardous waste stabilization unit preliminary design and certification (in accordance with 40 CFR 264, Subpart J - Tank Systems) and hazardous waste stabilization unit conceptual design and certification.

Performed drainage calculations, sized storm sewers and drainage ditches, and prepared grading plans.

PROFESSIONAL REGISTRATIONS

Registered Professional Engineer, State of Texas, #79648, 1994.
Registered Professional Engineer, State of Florida, #43357, 1990.

PROFESSIONAL AFFILIATIONS

National Society of Professional Engineers
Texas Society of Professional Engineers
Air and Waste Management Association

SPECIALIZED TRAINING

1996 40-hour OSHA Hazardous Waste Operations and Emergency Response, National Spill Control School, Corpus Christi, Texas

1996 Visible Emissions Training, Texas Natural Resource Conservation Commission, Austin, Texas

1995 Title V Air Operating Permit Seminar, Air and Waste Management Association, Corpus Christi, Texas

PROFESSIONAL PUBLICATIONS

Meurer, Claire P., "Selecting Between Physical / Chemical Processes for Removal of Synthetic Organics from Groundwater", Masters Thesis, University of Texas, Austin, August 1993.

Dvorak, Bruce I., Meurer, Claire P., *et al*, "Selection Among Aqueous and Off-Gas Treatemnt Technologies for Synthetic Organic Chemicals", as submitted to American Society of Civil Engineers Environmental Journal, 1996.

Luis Reyna
Senior Technician

Mr. Reyna is an environmental technician specializing in ground water sampling, effluent sampling, and operation and maintenance of numerous soil and ground water remediation systems. In addition, he is the asbestos inspector for Corpus Christi and San Antonio operation.

EDUCATION

1981	West Oso High School Corpus Christi, TX

EXPERIENCE

1992-Present	Applied Earth Sciences, Inc. Corpus Christi, TX
1990-1992	NOWCAM Services Corpus Christi, TX
1988-1990	Model Industrial Services, Inc. Corpus Christi, TX
1985-1988	G & R Automatic Transmissions Corpus Christi, TX
1981-1985	Tubular Inspections, Inc. Corpus Christi, TX

RELATED ENVIRONMENTAL WORK

Operated electric submersible ground water depression and recovery systems; systems include pneumatic phase-separate-hydrocarbon recovery pumps.

Operate and maintain fully pneumatic ground water depression and phase separate hydrocarbon recovery systems.

Operate and maintain fifteen (15) vapor extraction systems (VES) in Corpus Christi, Alice, the Rio Grande valley and San Antonio.

Operate and maintain five sparging/air injection vapor extraction systems (SVES).

Licensed asbestos inspector for south Texas operations.

RELATED ENVIRONMENTAL WORK (Continued)

Experienced with column and shallow tray air stripping systems.

Experienced with liquid phase carbon adsorption systems.

Obtained over 3,000 different soil and ground water samples as per EPA and TNRCC protocols.

SPECIALIZED TRAINING

1992	OSHA 40-hour Hazardous Waste Training National Spill Control School Corpus Christi, Texas
1993	Seven Habits of Highly Effective People
1994	State of Texas Licensed Asbestos Inspector No. 60-0732

APPENDIX E
ACTIVITY HAZARDS ANALYSIS (AHA) WORKSHEET

ACTIVITY HAZARD ANALYSIS (AHA)

Activity: Configure and set up work areas.	Analyzed By/Date: Frank J. Petrik 5/31/96	Reviewed By/Date:

1.0 Principal Steps	Potential Hazards	Recommended Controls
1.1 Walk area down, establish work zone and lay down areas.	1.1a. Struck by and struck against physical objects during loading and unloading operations and setup. 1.1b. Biological; weeds, snakes, spider's; other plant life. 1.1c. Contact by inhalation, direct contact or ingestion of chemical contaminants.	1.1a. Preplan work layout (Work Zone Map completed and posted by Subcontractor, also emergency numbers and hospital map). Backup alarms on all motorized heavy equipment. Use correct hand and power tools for job and inspect prior to use. Maintain good housekeeping and storage practices. 1.1b. MK SSHO to assess Work Zone for any specific biological hazards and communicate findings at POD and/or Pre Entry Briefs. 1.1c. Level D PPE anticipated. MK SSHO to visually inspect area for evidence of chemical contaminants and conduct general area scans for VOCs around existing equipment using PID.
1.3 Equipment to be Used	**Inspection Requirements**	**Training Requirements**
1.4 Heavy equipment for loading and hauling. Hand and power tools.	Daily, prior to use per manufacturers recommendation.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory, 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs and OSHA Hazard Communication.

ACTIVITY HAZARD ANALYSIS (AHA)			
Activity: Hydro punching using Geo Probe or equivalent.		Analyzed By/Date: Frank J. Petrik 5/31/96	Reviewed By/Date:
2.0 Principal Steps	**Potential Hazards**	**Recommended Controls**	
2.1. Establish locations and make penetrations. Manage any potentially contaminated soil or other waste.	Contact with underground utilities and/or process piping.	MK Excavation and Trenching permit required. Confirm location of underground utilities in penetration areas. Emergency procedures and equipment checked and in place prior to starting work.	
	Inhalation, direct contact or ingestion of chemical, biological and physical agents.	Modified Level D during initial penetrations, upgrade per MK SSHO direction. Review manufacturers recommendation for face shields on operators. MK SSHO and Subcontractor to conduct periodic air monitoring for VOCs, combustible gas and oxygen.	
	Struck by and struck against physical objects during penetrations.	Maintain clear area around Hydro punching equipment, barricade if necessary. Maintain good housekeeping and storage practices; load any potentially contaminated soil in approved, labeled containers and stage appropriately.	
2.4 Equipment to be Used	**Inspection Requirements**	**Training Requirements**	
2.5 Hydro punch using Geoprobe or equivalent, heavy equipment and handtools.	Daily, prior to use per manufacturers recommendation. Punch equipment checks to include structural damage; loose nuts and bolts; proper tension in drives; loose and/or missing guards and covers; fluid leaks; and damaged hoses, pressure gauge and/or relief valves. Check and test all safety devices including proper function of gauges, indicator lights and control levers.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory, 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, and OSHA Hazard Communication. Operators shall be trained and certified on hydro punch equipment.	

ACTIVITY HAZARD ANALYSIS (AHA)		
Activity: Modify existing wells by over drilling; drill and construct new recovery wells.	Analyzed By/Date: Frank J. Petrik 5/31/96	Reviewed By/Date:
3.0 Principal Steps	**Potential Hazards**	**Recommended Controls**
3.1 Establish locations, set up equipment and make penetrations. Construct new wells. Manage any potentially contaminated soil or other waste.	Contact with underground utilities and/or process piping. Inhalation, direct contact or ingestion of chemical, biological and physical agents. Struck by and struck against physical objects during penetrations.	MK Excavation and Trenching permit required. Confirm location of underground utilities in penetration areas. Emergency procedures and equipment checked and in place. Modified Level D during initial penetrations, upgrade per MK SSHO direction. Review manufacturer's recommendation for face shields on operators. MK SSHO and Subcontractor to conduct periodic air monitoring for VOCs and combustible gas and oxygen. Assess noise hazards, and airborne potential of nuisance mineral dusts such as silica sand and cement/bentonite mixtures. Maintain clear area around drill rig equipment, barricade if necessary. Install indicator flag(s) on elevated mast per base procedure. Level and stabilize unit per manufacturer's recommendation. Maintain good housekeeping and storage practices; load any potentially contaminated soil in approved containers and stage appropriately. Establish energy control program specific to drill rigs and new utility connections, and establish hoisting and rigging program for casing and pump installation.
3.3 Equipment to be Used	**Inspection Requirements**	**Training Requirements**
3.4 Drill rig, heavy equipment and hand tools.	Daily, prior to use per manufacturers recommendation. Drill rig inspection to include structural damage; loose nuts and bolts; proper tension in drives; loose and/or missing guards and covers; fluid leaks; and damages hoses, pressure gauge and/or relief valves. Check and test all safety devices including proper function of gauges, indicator lights and control levers.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory, 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs and OSHA Hazard Communication. Operators shall be trained and certified on drill rig equipment.

ACTIVITY HAZARD ANALYSIS (AHA)			
Activity: Excavate trenches, install underground and aboveground process piping and utilities.		Analyzed By/Date: Frank J. Petrik 5/31/96	Reviewed By/Date:
4.0 Principal Steps	**Potential Hazards**	**Recommended Controls**	
4.1. Establish locations and make trench penetrations. Install fluid recovery lines, air/vacuum lines and vaulted sumps. Manage any potentially contaminated soil or other waste. Process piping and utilities are aboveground except when crossing access roads.	Contact with underground utilities and/or process piping. Cave- in of trench under roads. Inhalation, direct contact or ingestion of chemical, biological and physical agents. Struck by and struck against physical objects during penetrations.	MK Excavation and Trenching permit required. Confirm location of underground utilities in penetration areas. Emergency procedures and equipment checked and in place. No personnel shall enter under road trenches unless safeguarded against collapse. Modified Level D during initial penetrations, modify per MK SSHO direction. MK SSHO and Subcontractor to conduct periodic air monitoring for VOCs and combustible gas and oxygen. Maintain clear area around trenches, barricade where necessary. Maintain good housekeeping and storage practices; load any potentially contaminated soil in approved containers and stage appropriately. MSDS(s) for any chemicals used in process equipment preparation shall be reviewed by Subcontractor Supervisors with personnel, one copy shall be delivered to MK SSHO for review.	
4.3 Equipment to be Used	**Inspection Requirements**	**Training Requirements**	
4.4 Heavy equipment and handtools. Pipe cutters and sealants.	Daily, prior to use per manufacturers recommendation.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, and OSHA Hazard Communication. Heavy Equipment operator(s) trained and certified.	

ACTIVITY HAZARD ANALYSIS (AHA)			
Activity: Install ancillary equipment on existing concrete pad. Install fence around equipment.		Analyzed By/Date: Frank J. Petrik 5/31/96	Reviewed By/Date:
5.0 Principal Steps	Potential Hazards	Recommended Controls	
5.1 Prepare foundation; install equipments and control hardware, make all process connections.	Struck by and struck against. Material handling, including ergonomic type injuries.	Sub Supervisors and MK SSHO shall review mechanical and material handling practices to insure use of approved equipment and practices. MK SSHO shall verify competent person assigned for hoisting and rigging.	
	Mechanical and electrical energies.	MK General Superintendent coordinates and verifies with Sub the energy control plan is in place for all utility and process subsystems. Permit required for any Hot Work, coordinated by MK SSHO.	
	Chemical agent exposure (from contaminants unlikely, from specialty support chemicals, more likely)	Sub Supervisors shall review MSDS(s) for support chemicals with workers, one copy shall be delivered to MK SSHO for review.	
5.2 Install fence around equipments.	Ergonomic injury from material handling and physical injury from puncture and flying objects (from cutting activities).	Inspect hand tools and cutting tools prior to use. Level D PPE anticipated, upgrade may include full face shield and cutting/burning goggles and clothing. Ensure good material handling practices for off loading and setting fence posts and fencing.	
5.3 Equipment to be Used	Inspection Requirements	Training Requirements	
5.4 Material handling equipment, handtools, power tools, excavating equipment, specialty chemicals such as glues and solvents (limited application).	Before use per manufacturers recommendation.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, and OSHA Hazard Communication.	

ACTIVITY HAZARD ANALYSIS (AHA)			
Activity: Site Restoration.		Analyzed By/Date: Frank J. Petrik 5/31/96	Reviewed By/Date:
6.0 Principal Steps	**Potential Hazards**	**Recommended Controls**	
6.1 Offload, spread, compact and reseed area (if required).	6.1a. Contact with airborne material, may present a biological hazard. 6.1b. Struck by and struck against physical objects during off-loading and spreading material.	6.1a. Dust Controls required to include wetting fill material. Level D PPE expected, upgrade if necessary. Dust controls and respirator (dust mask) may be necessary during spreading and covering with cover material (spray on straw or other material) 6.1b. Preplan work layout. Backup alarms on all motorized equipment. Keep clear area around heavy equipment.	
6.2 Equipment to be Used	**Inspection Requirements**	**Training Requirements**	
6.3 Heavy equipment, handtools, sodding equipment if applicable, and straw spreader.	Daily, prior to use per manufacturers recommendation.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, and OSHA Hazard Communication.	

ACTIVITY HAZARD ANALYSIS (AHA)			
Activity: Field Sampling Activities for Soil, Groundwater and Free Product.		Analyzed By/Date: Frank J. Petrik 5/31/96	Reviewed By/Date:
7.0. Principal Steps	Potential Hazards	Recommended Controls	
7.1. Hand auguring (in excavations and trenches)	7.1. Collapse of excavation or trench, entrance and egress, contaminated soil contact, contact with underground utility or piping/ mechanical system.	7.1. Modified Level D PPE expected, upgrade per MK SSHO assessment. Analyze for potential contact with any underground utility or mechanical service. Note: Excavation Permit must be valid. Review Field Sampling Kit MSDSs if applicable. Note: Sampler requires approval from competent person to enter excavation if deeper than 5 foot. Atmospheric conditions in excavation checked prior to and during sampling.	
7.2. Hand auguring (non excavated areas)	7.2. Contaminated soil contact, contact with utility or piping/ mechanical system.	7.2. Analyze for potential contact with any underground utilities or mechanical services. Modified Level D PPE expected, upgrade per SSHO review. Review Field Sampling Kit MSDSs if applicable.	
7.3. Containerized Liquids Sampling (known contents) including free product from wells or tanks.	7.3. Contaminated liquid contact.	7.3. Modified Level D PPE or as appropriate for contents hazards.	
7.4. Sampling Equipment Decontamination	7.4. Contact with contaminated material, also direct contact with decontamination solutions (weak nitric acid and acetone if used)	7.4. Modified Level D PPE with chemical goggles and gloves.	
7.5 Equipment to be Used	Inspection Requirements	Training Requirements	
7.6. Soil auger, stainless steel spoons, buckets, field sampling kits and decontamination solutions.	Per manufacturers recommendation. Core drilling equipment if used must be inspected daily. Preplan waste handling.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, and OSHA Hazard Communication. DOT 181 certification for person supervising the preparation of contaminated materials for offsite shipment.	

ACTIVITY HAZARD ANALYSIS (AHA)			
Activity: Start-up and Pilot Operations of Bioslurp System.		Analyzed By/Date: Frank J. Petrik 5/31/96	Reviewed By/Date:
8.0. Principal Steps	Potential Hazards	Recommended Controls	
O&M of system during pilot study.	Mechanical and electrical energy. Direct contact with free product or inhalation of vapors during O&M of oil/water separator and product storage tank. Fire/Explosion. Direct contact and inhalation of chemicals used in effluent treatment system. Spills.	Energy Control Plan required. Task analysis required on installed equipment to determine exposure risks and PPE requirements. Grounding and bonding on equipment, no smoking area, no flammable/combustible storage within or around process units Task analysis required on installed equipment to determine exposure risks and PPE requirements. Contingency planning for spills required prior to operations.	
8.1 Equipment to be Used	Inspection Requirements	Training Requirements	
8.2. TO BE DETERMINED	TO BE DETERMINED	OSHA 1910.120 24-Hour Training, 3 day OJT, 8 hour Refresher, Site Specific (Project Kickoff), POD, and OSHA Hazard Communication. DOT 181 certification for person supervising the preparation of contaminated materials for offsite shipment.	

APPENDIX F
GEOPROBE INVESTIGATION WORK PLAN

WORK PLAN

GEOPROBE INVESTIGATION

Prepared for Morrison Knudsen Corporation

Contract 4324-056

Design, Install, Test, Start-Up, and Provide Operations and Maintenance and Training, Free Product Recovery, Collection, and Treatment System NAS Corpus Christi, Texas

SEPTEMBER 9, 1996

Prepared by Applied Earth Sciences, Inc.
4455 South Padre Island Drive, Suite 28
Corpus Christi, Texas 78411

AES Project 243-05616-01

WORK PLAN
GEOPROBE INVESTIGATION
NAS CORPUS CHRISTI
September 1996

WORK PLAN FOR GEOPROBE INVESTIGATION

I. DESCRIPTION OF WORK

Applied Earth Sciences (AES), Inc., will provide the equipment, labor, and materials to perform a subsurface investigation to further delineate the extent of separate phase hydrocarbons at Fuel Farm 216 at Naval Air Station (NAS) Corpus Christi, Texas. The direct push method will be used to collect soil samples continuously from the surface to the groundwater interface at eight (8) borehole locations as shown in Attachment 1. Groundwater is expected to be encountered at approximately ten (10) to twenty (20) feet below ground surface.

Each soil sample will be visually inspected and logged, including soil color, approximate grain size, moisture content, and presence of odor. Each soil sample will also be screened using a FID. Following stabilization of the water level in the borehole, the depth to groundwater and thickness of separate phase hydrocarbon in each borehole and monitoring well will be measured. Each borehole will be abandoned in accordance with TNRCC guidelines. As agreed with Tom Benson of Morrison Knudsen, no soil samples will be collected for analysis by laboratory.

In addition, approximately four (4) soil samples will be collected from just above the water table for determination of porosity, permeability, and moisture content. These samples will be collected from a location immediately adjacent to the boreholes that display the greatest quantity of separate phase hydrocarbon.

All drilling equipment will be decontaminated using a steam cleaner or high pressure water washer before work starts, between boreholes (as needed), and at the end of the day. All sampling equipment will be decontaminated between samples using water and detergent, followed with a deionized water rinse. Boreholes left open overnight will be temporarily sealed using a temporary cap.

Information gathered during the subsurface investigation will be reported to Morrison Knudsen at the post-field work meeting and in the Site Characterization Report.

II. REFERENCES

Work performed by AES and lower tier subcontractors during the subsurface investigation will be in accordance with Specification Section 11302 (free Product Recovery System), Paragraph 1.5.B

(Site Characterization) and with Section 02260 (Sampling and On-Site Testing). Procedure 3.1 under Section 02260 will be followed for water level and product thickness measurements. Procedure 3.2 will be followed for soil boring logging and sample collection. Field data sheets provided in Section 02260 for water level and product thickness measurement, soil boring logs, and soil and water sampling field data will be used to document field activities. Copies of these procedures and forms are included in Attachment 2. The Standard Practice for Description and Identification of Soils (Visual - Manual Procedure) in ASTM D2488-90 will be used as the guideline for soil description during borehole logging.

III. CREW SIZE AND MAKEUP

Sample collection and coordination of subsurface investigation will be performed by AES personnel. At a minimum, AES will provide an environmental scientist to log the boreholes and to collect samples. An engineer or technician will also be provided to assist in sample collection and documentation and project coordination. Resumes of AES personnel slated to be involved with the subsurface investigation are included in Attachment 3. The technician or environmental scientist will be assigned to measure depth to water level and thickness of separate phase hydrocarbon in the direct push boreholes or existing monitoring wells.

The direct push drilling subcontractor will be Gemini Technical Services, Inc. (GTSI). GTSI will provide at least one driller certified to drill monitoring wells in Texas. The drillers' certifications are included in Attachment 4.

IV. EQUIPMENT

GTSI will provide a Mobiledrill B-61 direct push drill rig capable of sampling to a depth of at least 20 feet below ground surface. A two (2) foot long 2" diameter hardened steel split spoon will be used to collect soil samples for logging and screening with the FID. A 4" diameter hollow flight auger and Shelby tubes will be used to collect samples for determination of soil properties. A steam cleaner or high pressure washer and decontamination pad will be provided to properly decontaminate the drilling equipment before and after drilling. Fifty-five (55) gallon drums will be provided to contain solid and liquid wastes generated during the subsurface investigation. An FID will be used to screen soil samples for the presence of volatile organic compounds., Depth to groundwater and the thickness of separate phase hydrocarbons will be measured using a water level indicator and oil/water interface probe.

V. SAFETY AND HEALTH RISK ASSESSMENT

Expected subsurface contamination for this site includes high octane gasoline and JP-4 jet fuel. Constituents of concern include benzene, toluene, ethyl benzene, and xylene. Potential hazards

include inhalation, ingestion, or dermal contact with these and other potentially harmful substances. The Activity Hazards Analysis (AHA) worksheet provided by Morrison Knudsen for the subsurface investigation is included in Attachment 5. This document will be reviewed by AES and the Morrison Knudsen representative prior to starting work to ensure the AHA adequately addresses the planned activity. All accidents and incidents will be promptly reported to Morrison Knudsen, and a written report will be provided within 24 hours of the incident. AES will maintain a first aid log sheet of all incidents requiring first aid treatment. A first aid kit will be supplied by AES at the site.

VI. PREVENTATIVE MEASURES

All AES and GTSI personnel will receive a site-specific briefing on safety concerns prior to entering the site or the commencement of work. Topics to be discussed include site and work overview, general safety rules and procedures, safety and health hazards present on site, decontamination procedures, and personal protection equipment (PPE) requirements. All AES and GTSI personnel will wear leather or chemical resistant steel-toe boots, safety glasses with side shields, full length slacks, hard hat, and chemical resistant gloves.

Air monitoring will be conducted using an FID. AES will furnish a copy of the instrument's factory calibration and certification, daily calibration check, and monitoring results to Morrison Knudsen. All drilling, sampling, and air monitoring equipment coming into contact with excavated soil or groundwater will be decontaminated prior to removal from the site. All drilling equipment will be inspected prior to use to ensure adequate maintenance and safe operation.

An excavation permit has been requested from the NAS Corpus Christi Public Works Department. AES has reviewed an available utility map for the presence of underground utilities in the vicinity of the proposed borehole locations.

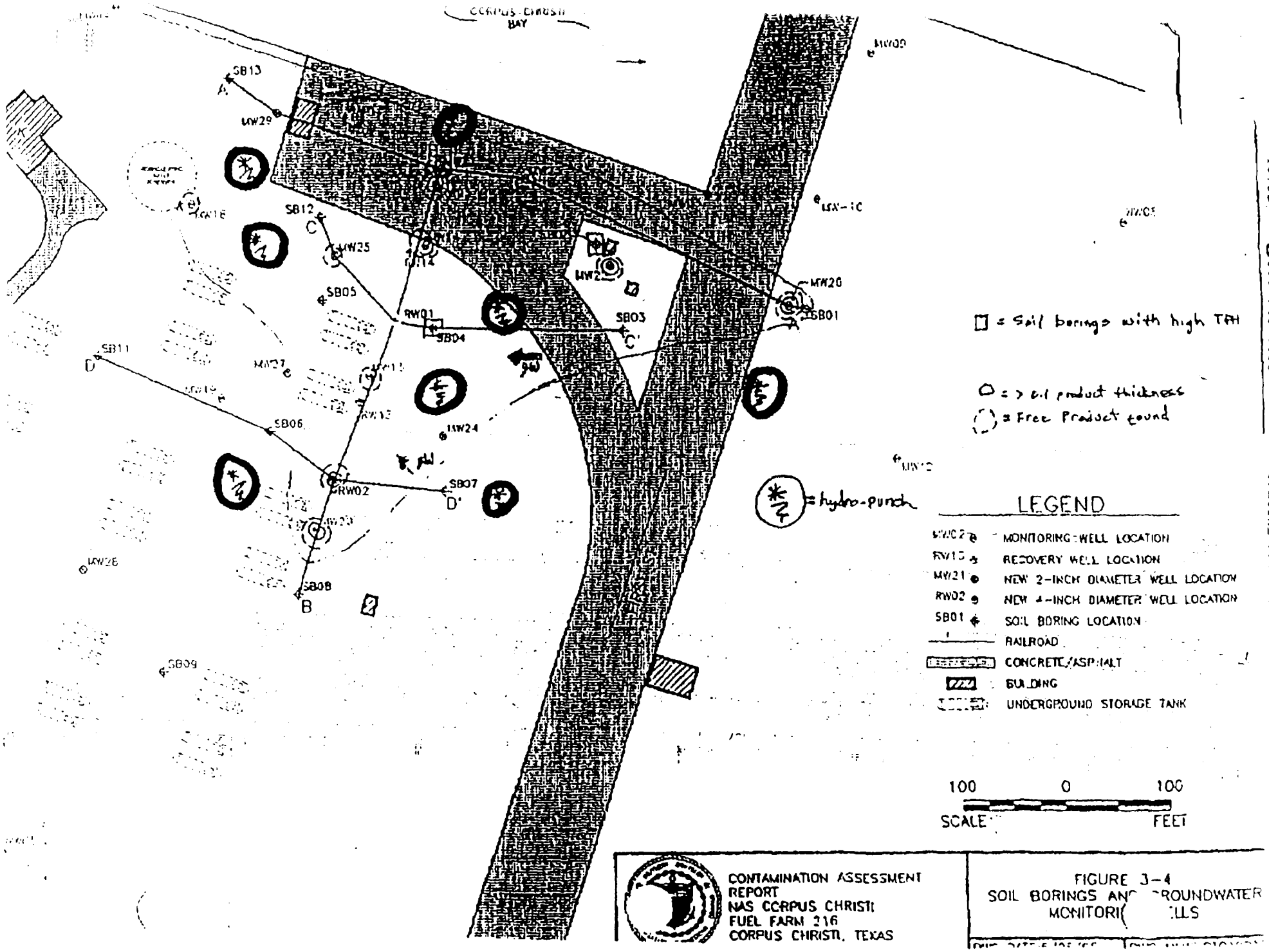
AES will comply with the Accident Prevention Plan for Naval Facilities Engineering Command Southern Division prepared by Morrison Knudsen.

VII. SUBTIER CONTRACTORS

The only lower tier subcontractor planned for use during the subsurface investigation is Gemini Technical Services, Inc. Samples for soil properties will be analyzed by Core Laboratories, Inc., or by Gulf Coast Testing Laboratory Inc.

WORK PLAN
GEOPROBE INVESTIGATION
NAS CORPUS CHRISTI
September 1996

ATTACHMENT 1



CONTAMINATION ASSESSMENT REPORT
NAS CORPUS CHRISTI
FUEL FARM 216
CORPUS CHRISTI, TEXAS

FIGURE 3-4
SOIL BORINGS AND GROUNDWATER MONITORING WELLS

WORK PLAN
GEOPROBE INVESTIGATION
NAS CORPUS CHRISTI
September 1996

ATTACHMENT 2

PROCEDURE 3.1: WATER LEVEL AND PRODUCT THICKNESS MEASUREMENTS

Objectives:

Jpdate the database for groundwater elevations and product thickness for wells at the site.
2. Provide baseline information for recovery system to be installed.

Equipment:

-fifty or 100-foot Solinst (or equivalent) electronic water level meter (on reel).
-fifty-foot oil/water interface probe (ORS 1068 or equivalent)
-decontamination supplies (distilled water, methanol rinse, reagent grade water rinse)

Method:

Review the manufacturer's specifications for calibration and operation of the oil/water interface probe.

1. Spray probes with distilled water, methanol solution and final reagent grade water rinse. Dry probes with a paper towel.
2. Lower the oil/water probe slowly down the well until the probe encounters oil or water. If oil is encountered (steady tone), record the depth below the top of the PVC well casing, on Field Data Sheet 1.
3. Continue to lower the probe until water is encountered (rapid beeping), and record the depth to the nearest 0.01 foot.
4. To confirm the depth to product, slowly withdraw the probe until the steady tone ceases.
5. If oil or product is not encountered, record the depth to water and confirm the measurement using the water level meter.
6. Repeat Step 1.
7. Repeat this procedure for geoprobe borings left open overnight. Note that following the measurements, the borings must be properly abandoned per TNRCC guidelines.

Documentation: Field Datasheet 1 (water levels, product thickness); field logbook

QA/QC: No equipment calibration required for the water level indicator. Follow manufacturer guidelines for calibration of the oil/water interface probe, if required.

PROCEDURE 3.2: GEOPROBE INVESTIGATION - SOIL BORING LOGGING AND SAMPLE COLLECTION

Objectives:

1. To define the extent of the free product plume in soil in the vicinity of the tank farm.
2. To characterize the grain size distribution of the water-bearing zone(s) at the site.

Equipment:

-Three two-foot samplers and geoprobe equipment (to be provided by driller)
-Large and small stainless steel spoons and bowl
-PID
-Sieve Test Assembly (Note that this test may be done at the lab - Confirm with the Contractor if this work will be done onsite.)
-decontamination supplies
-water level indicator
-oil/water interface probe

Method:

Steps 1-4 apply to each two-foot interval at each Geoprobe location. Locations will be labeled beginning with SB-14. Estimated total depth per location will be 15 feet below grade. Seventeen borings plus two borings for grain size samples only are anticipated. The locations, depth and total samples to be collected will be finalized in the field.

1. After sample is collected from a selected 2-foot interval, remove the sampler from the Geoprobe rod assembly.

2. Remove the drive shoe and the top assembly from the sampler. Open the tub by removing one-half of the split barrel.

3. Immediately screen the contents of the sampler with a PID. Crack the soil open with a decontaminated spoon or putty knife, divide the soil column and screen with a PID. Record the measurement.

4. Collect soil into an 8-ounce jar, if one or more of the following criteria are met:

   - PID reading greater than 100 ppm
   - strong hydrocarbon odor
   - petroleum discolored soil (oily, black)
   - interval is just above water table

   Remove all large roots, coarse gravel and cobbles from soil prior to placing in jar.

5. Do not collect more than two sets of samples per hole, unless directed by the Project Manager. One should be collected from just above the water table. The other will be collected from a shallower interval exhibiting the highest potential for hydrocarbon presence (use criteria above).

6. Using procedures in Attachment B (soil borehole logging procedures), describe the color, grain size, moisture content and presence of odor in the soil. Note changes in lithology or color. Note if trash or debris is present in the soil. Record information on Field Datasheet 2.

7. Once water is encountered, collect a representative soil sample for sieve analysis. from the water-bearing formation. If recovery of water-bearing zone samples is difficult, collect more than one sample until approximately 500 grams are collected.

8. Clean the exterior of the sample containers and ensure that the containers are tightly sealed prior to applying the sample container label. Complete sample bottle labels as described in Procedure 3.7. Document in the field logbook the date, time and sample identification numbers.

PROCEDURE 3.2: GEOPROBE INVESTIGATION - SOIL BORING LOGGING AND SAMPLE COLLECTION

Method (continued):

Conduct sieve analysis (per procedures provided as Attachment C) to confirm well design. This analysis may be done at an outside laboratory, if warranted by the Project Manager. Sieve data (Field Data Sheet 3) will be used for well construction, if required.

10. When sampling is completed, leave holes open overnight. Provide sufficient surface protection/covers. Measure depth to water and thickness of product, if present, the next day. Record data on the second page of Field Datasheet 1.

11. Abandon the hole per TNRCC guidelines.

Documentation:

Field Data Sheet 1: water levels and depth to oil/water interface, if present in soil borings
Field Data Sheet 2: soil boring log data
Field Data Sheet 3: sieve test results
Field Logbook: general field data, including sampling information

QA/QC:

1. Decontaminate all split spoons and sampling equipment per guidelines in Section 3.5.

2. Collect QA/QC samples as directed by the Contractor.

PROCEDURE 3.7 SAMPLE DOCUMENTATION, PACKAGING AND SHIPPING

Objective: The objective of this procedure is to establish a standard method for documenting sample shipment, maintaining chain-of-custody protocols and properly packaging samples to minimize or prevent breakage and maintain sample integrity in the field and the laboratory.

Equipment:

The Subcontractor shall provide the following:

- Cubed ice
- Ziploc™ bags
- Strapping tape (use clear tape if covering a custody seal; use more durable ribbed tape elsewhere)
- Over-night shipment airbill
- Bubble wrap

The Contractor-selected laboratory will provide the following, as needed:

- Temperature Blank
- Sample Bottles
- Coolers
- Blue ice
- Trip blanks
- Custody seal, sample labels, and Chain-of-Custody forms.

Notify the Contractor of needed supplies from the laboratory on a weekly basis.

Responsibilities:

Subcontractor: It is the responsibility of the Subcontractor to complete sample documentation, including labels, chain-of-custody (COC) forms, etc. and properly package sample containers for shipment to the laboratory. The Subcontractor field sampler shall assure that copies of all shipment documentation are made and properly filed with the project records. The Subcontractor field sampler shall sign the COC form showing transfer of custody from the field site to the laboratory.

Contractor: The Contractor shall inspect the coolers and Chain-of-Custody forms prior to sample shipment.

General:

Each of the procedures should be completed to ensure that sample information is properly recorded and containers are properly packed for shipment.

Sample Labels.

After a sample is collected, it shall be temporarily stored in the field in a cooler with 2-3 bags of ice. When sampling is completed, the cooler(s) shall be brought to the support zone. Any empty containers found in the cooler shall be discarded.

Full sample containers sent to the laboratory must be labeled. The labels must contain the following information:

- Site name
- Sample identification number
- Location of Sample
- Initials of sample collector
- Date and time of collection
- Preservative, if applicable
- Analytical method

If label is wet, pat dry and place a piece of clear label-protection tape over it.

Sample Logbook:

o filling out the chain-of-custody form, verify that all samples are accounted for and all volume requirements are met. Use the ıield logbook or field data sheets for cross-referencing. Begin or update a "sample logbook" (different from the field logbook described in Part 3.6 of this Specification) with each set of samples to be shipped that day. The logbook shall include the following data in a tabular format:

- Site location and identification number,
- Sample type,
- Sample identification,
- Sample depth, if applicable,
- Sample analyses and number of containers,
- Date and time collected,
- Shipment date, and
- Associated QA/QC samples.

Chain-of-Custody Form (COC).

Once the samples have been logged in, the chain-of-custody form shall be completed. The following are instructions for filling out the COC form (Attachment A):

ı. Fill out the reference nu nber provided by the Contractor. This may serve as the billing reference number for the laboratory.

b. Fill in the appropriate sample matrix (i.e. water, soil, oil, sludge).

c. Specify QC samples, when collected (i.e. field blank, rinsate blank and trip blank).

nsure the sample time on the COC is exactly the same as on the sample container label.

e. Unless a split sample is requested by a regulator, mark "no" under "split samples."

f. When specifying an analysis, write both the analysis and the method number.

g. Verify the turnaround time with the contractor for the samples (i.e. 7-day, 14-day, etc.). Include this in the remarks section.
h. The "relinquished time" should be roughly the time the cooler is sealed and given to over-night shipper.

I. Include the over-night shipment airbill number somewhere on the COC form. Record this number and the COC form number in the sample logbook. If the COC form does not have a number, consult with the Contractor to create a number series. Record the new number on the upper right hand corner of the COC form and in the sample logbook.

j. Include the trip blank with coolers containing volatile organic analyses samples. The trip blank is a regular sample and must be labeled and recorded as such. It shall be analyzed for volatile organics only.

k. Keep one copy of the COC form for site records and submit one copy to the Contractor. Seal the remaining copies in a gallon size ziploc™ bag and affix to the underside of the cooler lid using strapping tape. One COC form should be completed per cooler.

PROCEDURE 3.7 SAMPLE DOCUMENTATION, PACKAGING AND SHIPPING

Sample Preparation.

ubcontractor shall complete the following tasks, prior to sample packaging:

a. Ensure visible dirt or residue has been removed from the sample jars. Wipe excess moisture from the water sample containers.

b. Ensure containers are full and the lids are tight.

c. Place sample jars (glass) in protective bubble wrap and seal using adhesive strip on bubble wrap package.

Sample Packaging.

The Subcontractor shall package samples carefully to prevent breakage or movement of containers during shipment. The following guidelines shall be used for packaging:

a. Keep all volatile organic analyses samples together in the same cooler, if possible. If VOA samples are placed in several coolers, more trip blanks shall be required.

b. Initially line the base and sides of the cooler with bubble wrap. Pack the larger containers first, placing blue ice, double-bagged cubed ice or small containers between larger containers then follow with smaller containers. Distribute ice as evenly as possible, so all samples shall be chilled.

c. Don't overload the cooler with samples. Allow enough room for a layer of ice at the top, as well as a final layer of bubble wrap. Generally, one or more COC forms shall be filled out for a cooler of soil samples. Due to the large number of sample bottles for water samples, generally one COC is completed per cooler of water samples.

he samples and ice should be packed tight enough to prevent movement of containers during shipment.

e. Place custody seals. Use 2-3 custody seals (signed and dated) per cooler (small or large). Place seals on the front, side and back of each cooler where they shall be visible and easily ripped if the cooler is tampered with. Use a thin cover of strapping tape to protect the edges of the seal during shipment.

f. Seal the cooler with strapping tape.

Sample Shipping.

Notify the Contractor when samples are ready for shipping. All samples shall be shipped to the laboratory for next-day delivery. Ensure the air bills have been completely filled out and copied. Place one airbill into each envelope. Affix the envelope to the top of the cooler, if the lid is flat. If the lid is sliding, as with a "playmate" cooler, affix the envelope to the side of the cooler. Do not obstruct address labels provided by the laboratory (if present).

Document Control:

All field logbooks, records, and notes become permanent records of field activities. The Subcontractor shall keep these documents in a secured area at the end of each day. A copy of all project records shall be submitted to the Contractor at the conclusion of the site activities.

Field Datasheet 1 -- Water Level Measurement and Product Thickness
NAS Corpus Christi
(page 1 of 2)

Date:	
Weather Conditions:	
Field Crew initials:	

Well	Time	Depth to Water (feet below top of PVC)	Depth to Product (feet below top of PVC)	Product Thickness (inches)	Elevation of Top of PVC (ft MSL)	Groundwater Elevation (ft MSL)
MW-2						
MW-3						
MW-4						
MW-5						
MW-7						
MW-8						
MW-9						
MW-10						
MW-12						
MW-13						
MW-14						
MW-16						
MW-18						
MW-19						
MW-20						
MW-21						
MW-22						
MW-23						
MW-24						
MW-25						
MW-26						
MW-27						
MW-28						
MW-29						
RW-1						
RW-2						
RW-3						
RW-13						

Notes:

Field Datasheet 1 -- Water Level Measurement and Product Thickness
NAS Corpus Christi
(page 2 of 2)

Date:	
Weather Conditions:	
Field Crew initials:	

Boring	Time	Depth to Water (feet below ground surface)	Depth to Product (feet below ground surface)	Product Thickness (inches)	Estimated Ground Elevation (ft MSL)	Notes
SB-14						
SB-15						
SB-16						
SB-17						
SB-18						
SB-19						
SB-20						
SB-21						
SB-22						
SB-23						
SB-24						
SB-25						
SB-26						
SB-27						
SB-28						
SB-29						
SB-30						

Notes:

FIELD DATA SHEET 2
SOIL BORING LOG

Site:	Naval Air Station Corpus Christi				
Task:	Geoprobe Investigation				
Soil Boring No.		Drilling Contractor:			
Drill Make and Model:		Start Date:	Date Completed:		
Drilling Method:					
Ground Elevation (ft MSL):		Total Depth (ft):	Hole Diameter: ___ in		
Logged by:		Depth to Water (ft bgs):			

	SAMPLE				SOIL DESCRIPTION
Depth below surface (ft) 0	Sample Interval	Recovery (inches)	PID Result (ppm)	Sample I.D. (offsite analysis)	Description: Name, grain size distribution, color, moisture content, density, unusual observations (staining, odor, etc.)

General Notes:

FIELD DATA SHEET 4 - SOIL AND WATER SAMPLING FIELD DATA
NAVAL AIR STATION, CORPUS CHRISTI

'TE DESCRIPTION	WEATHER	SAMPLER INITIALS	DATE

SAMPLE NUMBER: _____

TIME COLLECTED: _____

PID (Headspace, PPM): _____

SAMPLE DESCRIPTION (moisture, odors, colors,etc.): _____

_____

_____

SAMPLE LOCATION: _____

_____

ANALYTICAL METHODS: _____

_____

SHIP DATE: _____ _____

CHAIN OF CUSTODY FORM _____

(SKETCH OF SAMPLE LOCATION)

COMMENTS:

SAMPLE NUMBER: _____

TIME COLLECTED: _____

PID (Headspace, PPM): _____

SAMPLE DESCRIPTION (moisture, odors, colors,etc.): _____

_____

_____

SAMPLE LOCATION _____

_____

ANALYTICAL METHODS _____

_____

SHIP DATE _____

CHAIN OF CUSTODY FORM _____

(SKETCH OF SAMPLE LOCATION)

C ENTS:

WORK PLAN
GEOPROBE INVESTIGATION
NAS CORPUS CHRISTI
September 1996

ATTACHMENT 3

Robert V. Hill
Environmental Scientist II

Mr. Hill is an environmental scientist specializing in soil and groundwater assessment and remediation. He is involved in projects including underground storage tanks (UST) installation and corrective actions, RCRA site investigations, and installation of hydrocarbon recovery systems.

EDUCATION

1993	MS, Environmental Science; Corpus Christi State University, Corpus Christi, TX
1987	BS, Environmental Science; Sam Houston State University, Huntsville, TX

EXPERIENCE

1995-Present	Applied Earth Sciences, Inc.
1993-1995	Foresight Environmental, Inc., Suntide Environmental Services Corpus Christi, TX

RELATED ENVIRONMENTAL WORK

Management of various UST projects involving removal, site assessment, regulatory reporting and ground water monitoring.

Preparation of RCRA Pre-Site Assessment and Site Assessment Plans for an industrial facility. These reports outlined sampling plans and recommendations for establishing background levels of various organic and inorganic contaminants of concern and for vertical and horizontal delineation of contamination.

Management of on site closure activities for two 10 acre Land Treatment Units (LTUs) at an industrial facility in accordance with a TNRCC approved closure plan. The scope of work included waste stabilization, installation of a capillary barrier, monitor wells and french drains, controlling runoff and establishing vegetative cover.

Design, installation and progress monitoring of soil bio-venting remediation system at an industrial facility.

RELATED ENVIRONMENTAL WORK (Continued)

Installation, operation and maintenance of hydrocarbon recovery systems.

Conducted treatability studies for bioremediation of hydrocarbon contaminated soils. Also monitored progress of bioremediation of hydrocarbon contaminated soils in treatment cells at a TNRCC registered treatment and storage facility.

Designed and conducted a scientific study funded by the Texas General Land Office researching biological and ion exchange methods for remediation of hydrocarbon and brine contaminated soil at an oil and gas produced water deep well injection facility.

PROFESSIONAL AFFILIATIONS

Air and Waste Management Association

SPECIALIZED TRAINING

1995	OSHA 8-Hour HAZWOPER Refresher Course per 29 CFR 1910.120
1994	Corpus Christi Contractors' Safety Council General Course
1993	OSHA 40-Hour HAZWOPER Certification per CFR 1910.120

Luis Reyna
Senior Technician

Mr. Reyna is an environmental technician specializing in ground water sampling, effluent sampling, and operation and maintenance of numerous soil and ground water remediation systems. In addition, he is the asbestos inspector for Corpus Christi and San Antonio operation.

EDUCATION

1981	West Oso High School Corpus Christi, TX

EXPERIENCE

1992-Present	Applied Earth Sciences, Inc. Corpus Christi, TX
1990-1992	NOWCAM Services Corpus Christi, TX
1988-1990	Model Industrial Services, Inc. Corpus Christi, TX
1985-1988	G & R Automatic Transmissions Corpus Christi, TX
1981-1985	Tubular Inspections, Inc. Corpus Christi, TX

RELATED ENVIRONMENTAL WORK

Operated electric submersible ground water depression and recovery systems; systems include pneumatic phase-separate-hydrocarbon recovery pumps.

Operate and maintain fully pneumatic ground water depression and phase separate hydrocarbon recovery systems.

Operate and maintain fifteen (15) vapor extraction systems (VES) in Corpus Christi, Alice, the Rio Grande valley and San Antonio.

Operate and maintain five sparging/air injection vapor extraction systems (SVES).

Licensed asbestos inspector for south Texas operations.

RELATED ENVIRONMENTAL WORK (Continued)

Experienced with column and shallow tray air stripping systems.

Experienced with liquid phase carbon adsorption systems.

Obtained over 3,000 different soil and ground water samples as per EPA and TNRCC protocols.

SPECIALIZED TRAINING

1992	OSHA 40-hour Hazardous Waste Training National Spill Control School Corpus Christi, Texas
1993	Seven Habits of Highly Effective People
1994	State of Texas Licensed Asbestos Inspector No. 60-0732

Claire P. Meurer, P.E.
Project Engineer II

Ms. Meurer has extensive engineering and construction management experience with direct expertise in municipal and toxic waste landfill development, landfill gas management, hazardous waste management, stormwater, groundwater, and wastewater systems, and air permitting.

EDUCATION

1993	MS, Environmental Engineering;University of Texas at Austin
1983	BS, Chemical Engineering;Texas A & M University, College Station, TX

EXPERIENCE

1995-Present	Applied Earth Sciences, Inc., Corpus Christi, TX
1994-1995	Naismith Engineering, Inc., Corpus Christi, TX
1993	Waid and Associates, Austin, TX
1991-1994	U.S. Navy Reserve Civil Engineer Corps, Austin, TX, and Gulfport, MS
1986-1990	U.S. Navy Civil Engineer Corps, Subic Bay, Philippines, and Jacksonville, FL
1983-1985	Celanese Chemical Company, Bishop, TX

RELATED ENVIRONMENTAL WORK

Designed and prepared plans and specifications for environmental and utilities projects including landfill gas monitoring probes, groundwater monitoring wells, new industrial wastewater manholes and piping, and automatic stormwater sampling equipment. Prepared specifications for removal and disposal of industrial wastewater treatment plant sludge, demolition and disposal of abandoned wastewater treatment facilities.

Performed soil gas and groundwater monitoring and sampling.

RELATED ENVIRONMENTAL WORK (Continued)

Completed the preliminary design of storage tanks and secondary containment systems and prepared numerous hazardous waste storage tank certifications in accordance with federal hazardous waste regulations.

Prepared environmental plans for hazardous waste management, spill prevention and control measures, landfill gas management, landfill gas assessment, hazardous and municipal solid waste landfill operations, landfill development, PCB waste management, solid waste management, and sludge and yard waste composting.

Prepared air permit applications and modifications, including emission calculations, process description and review of applicable regulations. Participated in staff engineer training program on air permitting and emissions calculations. Identified potentially impacted sensitive habitats for permit applications.

Administered fifteen federal government construction contracts valued at $5.6 million. Included constructibility review of plans and specifications, approval of submittals, negotiation of change orders, quality assurance, safety enforcement, and coordination with the designer, contractor, and customer activities.

Directed design and renovation of existing building into a child care center.

As the Facilities Engineer for Public Works Center, including utilities, maintenance shops, and warehouses, supervised engineering and project coordination staff. Developed Facilities Five Year Plan for maintenance, repair, and capital improvement projects and executed a $10 million annual facilities project budget.

Developed Scope of Work plans for projects and reviewed engineering designs for water treatment system expansion, power plant expansion, warehouses, and shop facilities. Served as primary point of contact during execution of projects for scope and cost changes, and for accepting completed projects.

Designed improvements to chemicals plant utilities systems and process units. She designed the flare for vent gases produced by formaldehyde unit.

Developed and implemented maintenance program to eliminate accumulation of biomass in anaerobic wastewater treatment system.

Designed an improved scheme for storage and pumping of different feeds to a multi-use process unit.

RELATED ENVIRONMENTAL WORK (Continued)

Performed numerous tank certifications including Liquid Hazardous Waste Storage Tank Farm Certification, Hazardous Waste Storage Tank Certification, Sludge Storage Tank Certification, Leachate Tank Certification, Hazardous Waste Storage Silo Certification, SPCC Plan Tank Inspections.

Prepared a hazardous waste stabilization unit preliminary design and certification (in accordance with 40 CFR 264, Subpart J - Tank Systems) and hazardous waste stabilization unit conceptual design and certification.

Performed drainage calculations, sized storm sewers and drainage ditches, and prepared grading plans.

PROFESSIONAL REGISTRATIONS

Registered Professional Engineer, State of Texas, #79648, 1994.
Registered Professional Engineer, State of Florida, #43357, 1990.

PROFESSIONAL AFFILIATIONS

National Society of Professional Engineers
Texas Society of Professional Engineers
Air and Waste Management Association

SPECIALIZED TRAINING

1996	40-hour OSHA Hazardous Waste Operations and Emergency Response, National Spill Control School, Corpus Christi, Texas
1996	Visible Emissions Training, Texas Natural Resource Conservation Commission, Austin, Texas
1995	Title V Air Operating Permit Seminar, Air and Waste Management Association, Corpus Christi, Texas

PROFESSIONAL PUBLICATIONS

Meurer, Claire P., "Selecting Between Physical / Chemical Processes for Removal of Synthetic Organics from Groundwater", Masters Thesis, University of Texas, Austin, August 1993.

Dvorak, Bruce I., Meurer, Claire P., *et al*, "Selection Among Aqueous and Off-Gas Treatemnt Technologies for Synthetic Organic Chemicals", as submitted to American Society of Civil Engineers Environmental Journal, 1996.

WORK PLAN
GEOPROBE INVESTIGATION
NAS CORPUS CHRISTI
September 1996

ATTACHMENT 4

THE STATE OF TEXAS

THIS IS TO CERTIFY THAT

MARK ALAN LEWIS

HAVING GIVEN SATISFACTORY EVIDENCE OF QUALIFICATIONS REQUIRED BY TITLE 2, TEXAS WATER CODE CHAPTER 32 - WATER WELL DRILLERS AND TITLE 2, TEXAS WATER CODE CHAPTER 33 - PUMP INSTALLERS, IS GRANTED THIS

LICENSE

AND IS HEREBY AUTHORIZED TO PRACTICE AS A

WELL DRILLER AND PUMP INSTALLER

SO LONG AS THIS LICENSE IS NOT REVOKED AND IS RENEWED ACCORDING TO LAW

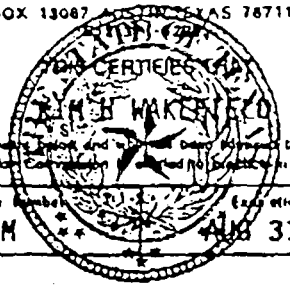
IN WITNESS WHEREOF,
THE TEXAS WATER COMMISSION HAS AFFIXED
ITS HAND AND SEAL OF THE STATE OF TEXAS
THIS 20th DAY OF APRIL 1993.

LICENSE NUMBER 4586MPL

BY _____
CHAIRMAN

TEXAS NATURAL RESOURCE
CONSERVATION COMMISSION

P.O. BOX 13087 [illegible] TEXAS 78711-3067



whose signature appears hereon and who has been licensed by the Texas Natural Resource Conservation Commission to practice in Texas as indicated.

Certificate Number	Expiration Date
3209M	AUG 31, 1996

Kim H. Wakefield
Signature of Licensee

CHAIRMAN

WORK PLAN
GEOPROBE INVESTIGATION
NAS CORPUS CHRISTI
September 1996

ATTACHMENT 5

ACTIVITY HAZARD ANALYSIS (AHA)			
Activity: Hydropunching using Geo Probe or equivalent.		Analyzed By/Date: Frank J. Petrik 5/31/96	Reviewed By/Date:
2.0 Principal Steps	Potential Hazards	Recommended Controls	
2.1. Establish locations and make penetrations. Manage any potentially contaminated soil or other waste.	Contact with underground utilities and/or process piping.	MK Excavation and Trenching permit required. Confirm location of underground utilities in penetration areas. Emergency procedures and equipment checked and in place prior to starting work.	
	Inhalation, direct contact or ingestion of chemical, biological and physical agents.	Modified Level D during initial penetrations, upgrade per MK SSHO direction. Review manufacturers recommendation for face shields on operators. MK SSHO and Subcontractor to conduct periodic air monitoring for VOCs, combustible gas and oxygen.	
	Struck by and struck against physical objects during penetrations.	Maintain clear area around hydropunching equipment, barricade if necessary. Maintain good housekeeping and storage practices; load any potentially contaminated soil in approved, labeled containers and stage appropriately.	
2.4 Equipment to be Used	Inspection Requirements	Training Requirements	
2.5 Hydro punch using Geoprobe or equivalent, heavy equipment and handtools.	Daily, prior to use per manufacturers recommendation. Punch equipment checks to include structural damage; loose nuts and bolts; proper tension in drives; loose and/or missing guards and covers; fluid leaks; and damaged hoses, pressure gauge and/or relief valves. Check and test all safety devices including proper function of gauges, indicator lights and control levers.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory, 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, and OSHA Hazard Communication. Operators shall be trained and certified on hydropunch equipment.	

WORK PLAN

LIQUID RING VACUUM PUMP PILOT TEST

Prepared for Morrison Knudsen Corporation

Contract 4324-056

**Design, Install, Test, Start-Up, and Provide Operations and Maintenance and Training,
Free Product Recovery, Collection, and Treatment System
NAS Corpus Christi, Texas**

SEPTEMBER 19, 1996

**Prepared by Applied Earth Sciences, Inc.
4455 South Padre Island Drive, Suite 28
Corpus Christi, Texas 78411**

AES Project 243-05616-01

APPENDIX G
LIQUID RING VACUUM PUMP PILOT TEST WORK PLAN

WORK PLAN
LRV PUMP PILOT TEST
NAS CORPUS CHRISTI
September 1996

WORK PLAN FOR LIQUID RING VACUUM PUMP PILOT TEST

I. DESCRIPTION OF WORK

Applied Earth Sciences (AES), Inc., will provide the equipment, labor, and materials to perform a liquid ring vacuum (LRV) pump pilot test to collect data required for the design and installation of properly sized liquid ring vacuum extraction equipment at Fuel Farm 216 at Naval Air Station (NAS) Corpus Christi, Texas.

The liquid ring vacuum pump is capable of generating vacuums as high as 30 inches of mercury. This is an order of magnitude greater than vacuums produced by regenerative blowers normally used for soil vapor extraction. The enhanced vacuum recovery of the liquid ring vacuum pump is particularly useful in soils exhibiting low hydraulic conductivities such as heavy clays. The liquid ring vacuum pump has the ability to recover liquids as well as vapors, making the unit more versatile than conventional soil vapor extraction.

The following information will be collected during the liquid ring vacuum pump pilot test:

- Flow Rates
- Induced Vacuum Pressures
- Radius of Influence
- Vapor Concentration Levels
- Product Recovery Rates
- Groundwater Recovery Rates
- Changes in Dissolved Oxygen Content in Vadose Zone & Groundwater
- Changes in Dissolved Carbon Dioxide in Vadose Zone & Groundwater

A. Procedures

The pilot test will be run on a selected test well located near the center of the separate phase hydrocarbon plume. MW-21 has been tentatively selected as the test well. Up to nine (9) monitoring wells have been selected as observation wells for the pilot test. Tentatively selected observation wells are MW-2, MW-13, MW-14, MW-20, MW-22, MW-23, MW-25, MW-26, and MW-29. See Attachment 1 for locations of monitoring wells.

WORK PLAN
LRV PUMP PILOT TEST
NAS CORPUS CHRISTI
September 1996

Prior to the pilot test, six (6) temporary soil vapor monitoring points will be installed. The direct push method will be used to place a vapor monitoring tube in the vadose zone at the six (6) locations shown in Attachment 1. Each vapor probe will consist of a plastic tube that extends up to the ground surface, allowing monitoring of soil gas before, during, and after the LRV pump pilot test. Each vapor probe tube will be plugged at the ground surface with a brass fitting and covered with a PVC cap.

The following parameters will be collected before the test begins:

- Distance of observation well from test well
- Vadose zone oxygen, carbon dioxide and hydrocarbon concentrations at temporary soil gas probes
- Depth to product in test and observation wells
- Depth to water in test and observation wells
- Saturated zone temperature, dissolved oxygen, dissolved carbon dioxide in test and observation wells

The vadose zone hydrocarbon concentration will be measured using a flame ionization detector (FID). The oxygen and carbon dioxide concentrations will be measured using a Landtech GA-90 landfill gas monitor.

Depth to product and depth to groundwater will be measured using an electronic oil/water interface probe.

Saturated zone dissolved oxygen will be measured with a YSI Model 57 dissolved oxygen meter. To measure dissolved carbon dioxide, a water sample will be collected in a 500 ml dedicated plastic bottle using a dedicated bailer. The water will be analyzed for dissolved carbon dioxide using a Hach field test kit.

The distance of each observation well from the test well will be measured using a pedometer or measuring tape.

A well cap will be installed on each observation well. A ¼" ball valve with a ¼" hose barb will be installed on each well cap. Vapor samples may be collected through the cap using an air sampling pump.

A sanitary well seal will be installed on the test well casing. It may be necessary to swage the 2" diameter well casing up to a piece of 4" pipe in order to install a 4" sanitary well seal. The well seal will have a hole for a 1" PVC drop pipe through the center, which can be extended to the desired

depth in the well. The cap will have a ¼" ball valve and hose barb for pressure measurement and vapor sample collection and a ½" or ¾" gate valve for regulating air flow through well.

The cap assembly will be installed on top of the selected well casing. The depth to product and groundwater from the top of the sanitary well seal will be measured using an interface probe. The corrected ground water depth will be calculated based on the measurements. The corrected depth will be marked on the 1" diameter drop pipe, and the pipe will be lowered through the well seal until the mark is at the top of the sanitary seal. The sanitary well seal will then be tightened.

Hoses will be installed on the test well and observation well caps. Magnahelic gauges will be connected to the hoses. Higher reading magnahelic gauges will be used on the observation wells closest to the test well. A 0-30"Hg vacuum gauge will be attached to the sanitary well seal on the test well.

The LRV pump requires water to create a seal in the pump. This water recirculates constantly through the LRV tank. The tank is equipped with a float switch and may be connected to a faucet or hydrant for make up water. AES is pursuing permission to use water from a fire hydrant located approximately 200 feet from the LRV unit. If permission is not obtained, it will be necessary to fill the tank before moving it to the site. Additional water will be available on site to keep the tank full, should the recovered groundwater not be sufficient to keep the tank full. Excess water will gravity flow out to a drum equipped with a pump and float switch to transfer the excess water to a storage tank. Vapors from the LRV unit will pass through vapor phase activated carbon prior to release to the atmosphere.

Following set-up, the unit will be started to ensure the system is working properly. After shutting the unit down, the water level in the tank will be recorded.

To start the pilot test, the well valve and the ambient air valve will be opened fully. The ambient air valve will slowly be closed until a vacuum is induced in the test well. Air velocities and pressures will be recorded. After about 15 minutes, the valve on top of the tank will be opened and color cut used to measure the product and water levels in the tank. **It may be necessary to shut the unit down to do so.** Any product collected during the test will collect in the tank. Unless a large amount of product is present, very little product will transfer out of the seal water tank. Most of the product collected will be during the initial phases of the test when the well is full of product. The initial surge of product is due to the amount of product stored in the well bore. In most cases the product may be slow to recover into the well bore.

An air sample will be collected from the sample port located at the top of the drop pipe to determine well vapor concentration. This sample will be sent to Core Laboratories in Houston for analysis for BTEX, total petroleum hydrocarbons (TPH), carbon dioxide, and oxygen. It is best to collect this

sample while the LRV unit is running, but the sample may be collected after the unit is shut down. The sample may also be collected after the tank but the air after the tank is diluted with ambient air and fluids transferred through the LRV are heated up to approximately 180 to 200°F. Gasoline and other hydrocarbons have a large number of components which will volatilize at these temperatures, giving an inaccurate well vapor concentration level.

The LRV unit will be run at the initial flow rate for a predetermined number of hours or until vacuum pressures in the observation wells stabilize. It is useful to graph these pressures in the field to observe developing trends. When the vacuum pressures level out the wells are stabilized. Data will be recorded frequently at first. Measurements may be stretched out later in the test as trends develop and projections may be made.

At the end of the initial run, the final vacuum and tank fluid level measurements will be recorded. If necessary, the unit will be shut down to get measurements. For the next run, the vacuum will be increased by slowly closing the ambient air valve until the vacuum pressure increases on the well inlet line. Each run at a different vacuum pressure will be conducted using the procedure described above. AES will attempt to get four different test vacuum and flow rate levels with corresponding vapor concentration levels and observation well vacuum levels. The four flow and vacuum rates may be used to project how different vacuums and flow rates would affect mass recovery.

After completing the four step pilot test, the caps will be removed from the observation wells and the LRV unit allowed to run overnight. This will allow the observation wells to act as a source for oxygen to the subsurface. Once the caps are removed, groundwater levels can be measured as the LRV unit continues to run.

After the LRV unit has run the desired length of time, it will be shut down and water levels and concentration levels of dissolved oxygen and carbon dioxide immediately measured as described previously for baseline measurements. These parameters will be measured periodically until they stabilize and are returned to base line levels.

B. Reporting

Information gathered during the subsurface investigation and pilot test will be reported to Morrison Knudsen at the September 26, 1996, post-field work meeting and in the Site Characterization Report. A draft of the information to be presented at the meeting will be provided to Morrison Knudsen before the end of business on September 23, 1996.

II. REFERENCES

Work performed by AES and lower tier subcontractors during the pilot test will be in accordance with Specification Section 11302 (Free Product Recovery System), Paragraph 1.5.C (System Design Parameters). Additional data required to properly size remediation equipment will be gathered as discussed in meetings with Tom Benson of Morrison Knudsen and as outlined in this work plan. Procedure 3.1 under Section 02260 will be followed for water level and product thickness measurements.

III. CREW SIZE AND MAKEUP

At least one engineer and one technician or environmental scientist from AES will be on-site during the active portions of the pilot test. Additional AES personnel may be provided during the startup of the LRV unit.

The direct push drilling subcontractor for installation of the temporary soil gas probes will be Transglobal Environmental GeoSampling (TEG). TEG will provide at least one driller certified to drill monitoring wells in Texas.

IV. EQUIPMENT

TEG will provide a direct push drill rig capable of sampling to a depth of at least 20 feet below ground surface. The LRV unit is an MPX-75 liquid ring vacuum extraction system supplied by Carbtrol Corporation. A schematic of the unit is included in Attachment 2. An FID calibrated to benzene will be used to measure soil vapor hydrocarbon concentrations. Depth to groundwater and the thickness of separate phase hydrocarbons will be measured using an electric oil/water interface probe. Vadose zone oxygen and carbon gas concentrations will be measured using a Landtech GA-90 landfill gas monitor. Dissolved oxygen will be measured using a YSI Model 57 dissolved oxygen meter. Dissolved carbon dioxide will be measured using a digital titration test kit from Hach.

V. SAFETY AND HEALTH RISK ASSESSMENT

Expected subsurface contamination for this site includes high octane gasoline and JP-4 jet fuel. Constituents of concern include benzene, toluene, ethyl benzene, and xylene. Potential hazards include inhalation, ingestion, or dermal contact with these and other potentially harmful substances. The Activity Hazards Analysis (AHA) worksheet provided by Morrison Knudsen for the field sampling activities and for startup and pilot operations of the vacuum extraction system are included in Attachment 3. This document will be reviewed by AES and the Morrison Knudsen representative prior to starting work to ensure the AHA adequately addresses the planned activity. All accidents and incidents will be promptly reported to Morrison Knudsen, and a written report will be provided

within 24 hours of the incident. AES will maintain a first aid log sheet of all incidents requiring first aid treatment. A first aid kit will be supplied by AES at the site.

VI. PREVENTATIVE MEASURES

All on-site AES and TEG personnel will receive a site-specific briefing on safety concerns prior to entering the site or the commencement of work. Topics to be discussed include site and work overview, general safety rules and procedures, safety and health hazards present on site, decontamination procedures, and personal protection equipment (PPE) requirements. All AES and TEG personnel will wear leather or chemical resistant steel-toe boots, safety glasses with side shields, full length slacks, hard hat, and chemical resistant gloves.

Air monitoring will be conducted using an FID. AES will furnish a copy of the instrument's factory calibration and certification, daily calibration check, and monitoring results to Morrison Knudsen. All drilling, sampling, and air monitoring equipment coming into contact with excavated soil or groundwater will be decontaminated prior to removal from the site. All drilling equipment will be inspected prior to use to ensure adequate maintenance and safe operation.

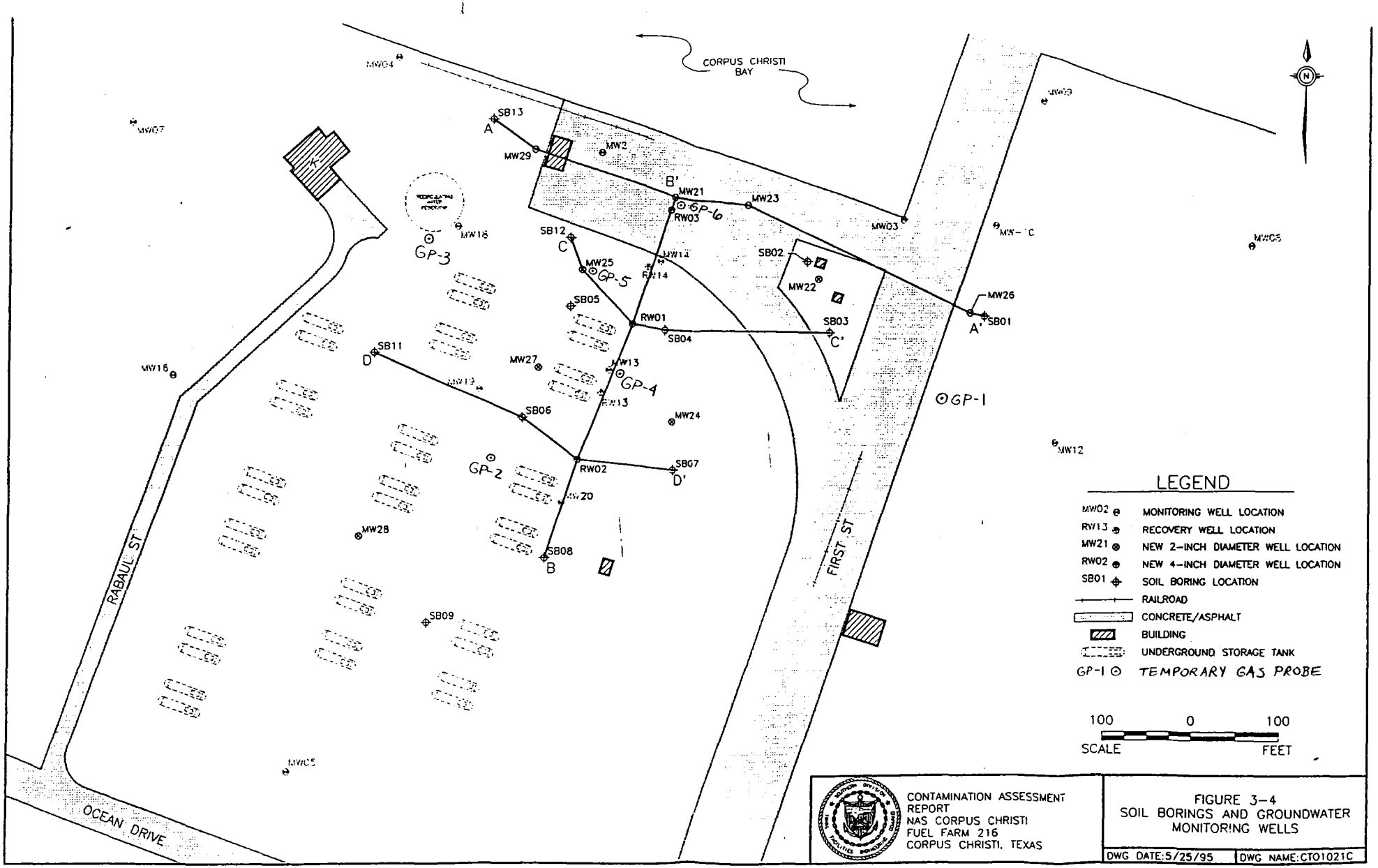
An excavation permit has been requested from the NAS Corpus Christi Public Works Department. AES has reviewed an available utility map for the presence of underground utilities in the vicinity of the proposed borehole locations.

AES will comply with the Accident Prevention Plan for Naval Facilities Engineering Command Southern Division prepared by Morrison Knudsen.

VII. SUBTIER CONTRACTORS

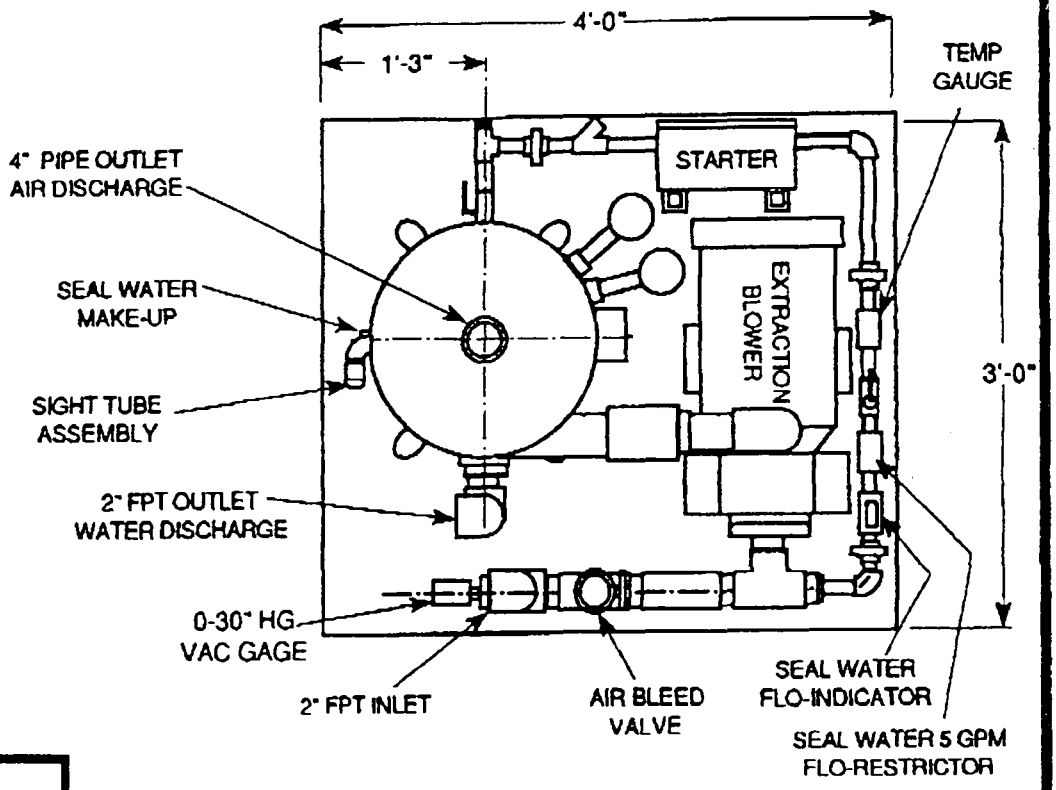
The only lower tier subcontractor planned for use during the subsurface investigation is Transglobal Environmental GeoSampling. Gas samples obtained from the test well during the pilot test will be analyzed by Core Laboratories, Inc., in Houston.

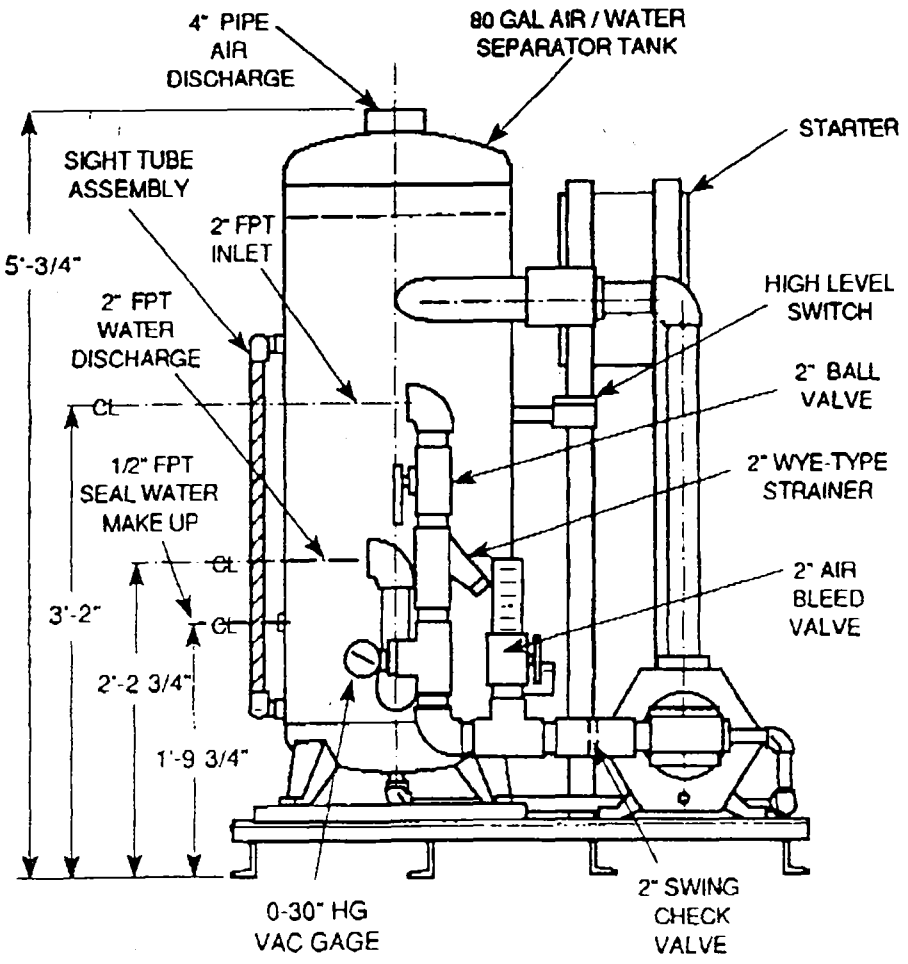
ATTACHMENT 1


CORPUS CHRISTI BAY
RABAUL ST
OCEAN DRIVE
FIRST ST
MW04
MW07
MW18
MW16
MW15
MW05
MW03
MW09
MW-C
MW12
MW2
MW29
MW21
MW23
RW03
GP-6
SB13
A
B'
SB12
C
MW25
GP-5
RW14
SB05
RW01
SB04
SB11
D
MW27
MW13
GP-4
RW13
SB06
MW24
GP-2
RW02
SB07
D'
MW20
MW28
SB08
B
SB09
GP-3
SB02
MW22
SB03
C'
MW26
SB01
A'
GP-1
LEGEND
MW02 MONITORING WELL LOCATION
RW13 RECOVERY WELL LOCATION
MW21 NEW 2-INCH DIAMETER WELL LOCATION
RW02 NEW 4-INCH DIAMETER WELL LOCATION
SB01 SOIL BORING LOCATION
RAILROAD
CONCRETE/ASPHALT
BUILDING
UNDERGROUND STORAGE TANK
GP-1 TEMPORARY GAS PROBE
100 0 100
SCALE FEET
CONTAMINATION ASSESSMENT REPORT
NAS CORPUS CHRISTI
FUEL FARM 216
CORPUS CHRISTI, TEXAS
FIGURE 3-4
SOIL BORINGS AND GROUNDWATER MONITORING WELLS
DWG DATE:5/25/95
DWG NAME:CTO1021C

3-17

ATTACHMENT 2





CARBTROL ®
CORPORATION

51 RIVERSIDE AVENUE
WESTPORT CONN. 06880
(203) 226-5642

SCALE —
DATE 9-5-96
Wah
BY DVB
REV

MULTI-PHASE EXTRACTION SYSTEM

MPX-75, PILOT UNIT NO.2, GRAVITY DISCHARGE

ARRANGEMENT

S
DWG 3058/0

ATTACHMENT 3

ACTIVITY HAZARD ANALYSIS (AHA)			
Activity: Field Sampling Activities for Soil, Groundwater and Free Product.		Analyzed By/Date: Frank J. Petrik 5/31/96	Reviewed By/Date:
7.0. Principal Steps	Potential Hazards	Recommended Controls	
7.1. Hand auguring (in excavations and trenches)	7.1. Collapse of excavation or trench, entrance and egress, contaminated soil contact, contact with underground utility or piping/ mechanical system.	7.1. Modified Level D PPE expected, upgrade per MK SSHO assessment. Analyze for potential contact with any underground utility or mechanical service. Note: Excavation Permit must be valid. Review Field Sampling Kit MSDSs if applicable. Note: Sampler requires approval from competent person to enter excavation if deeper than 5 foot. Atmospheric conditions in excavation checked prior to and during sampling.	
7.2. Hand auguring (non excavated areas)	7.2. Contaminated soil contact, contact with utility or piping/ mechanical system.	7.2. Analyze for potential contact with any underground utilities or mechanical services. Modified Level D PPE expected, upgrade per SSHO review. Review Field Sampling Kit MSDSs if applicable.	
7.3. Containerized Liquids Sampling (known contents) including free product from wells or tanks.	7.3. Contaminated liquid contact.	7.3. Modified Level D PPE or as appropriate for contents hazards.	
7.4. Sampling Equipment Decontamination	7.4. Contact with contaminated material, also direct contact with decontamination solutions (weak nitric acid and acetone if used)	7.4. Modified Level D PPE with chemical goggles and gloves.	
7.5 Equipment to be Used	Inspection Requirements	Training Requirements	
7.6. Soil auger, stainless steel spoons, buckets, field sampling kits and decontamination solutions.	Per manufacturers recommendation. Core drilling equipment if used must be inspected daily. Preplan waste handling.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, and OSHA Hazard Communication. DOT 181 certification for person supervising the preparation of contaminated materials for offsite shipment.	

ACTIVITY HAZARD ANALYSIS (AHA)			
Activity: Start-up and Pilot Operations of Bioslurp System.		Analyzed By/Date: Frank J. Petrik 5/31/96	Reviewed By/Date:
8.0. Principal Steps	Potential Hazards	Recommended Controls	
O&M of system during pilot study.	Mechanical and electrical energy. Direct contact with free product or inhalation of vapors during O&M of oil/water separator and product storgae tank. Fire/Explosion. Direct contact and inhalation of chemicals used in effluent treatment system. Spills.	Energy Control Plan required. Task analysis required on installed equipment to determine exposure risks and PPE requirements. Grounding and bonding on equipment, no smoking area, no flammable/combustible storage within or around process units Task analysis required on installed equipment to determine exposure risks and PPE requirements. Contengency planning for spills required prior to operrations.	
8.1 Equipment to be Used	Inspection Requirements	Training Requirements	
8.2. TO BE DETERMINED	TO BE DETERMINED	OSHA 1910.120 24-Hour Training, 3 day OJT, 8 hour Refresher, Site Specific (Project Kickoff), POD, and OSHA Hazard Communication. DOT 181 certification for person supervising the preparation of contaminated materials for offsite shipment.	

N

Corpus Christi Bay

Trickling Filter No. 1

Primary Clarifier No. 2

Trickling Filter No. 2

Primary Clarifier No. 1

Storage Tank

Spill Tank

Industrial Wastewater Equalization Tank

Industrial Wastewater Manhole

Lab/Office

Residence

Private Drive

MW-04

MW-07

MW-16

MW-19

MW-28

MW-29

MW-2

SB-19

SB-17

GP-6

MW-21

RW-03

MW-23

MW-18

GP-3

SB-20

MW-25

GP-5

MW-14

RW-14

Compound

MW-03

MW-9

Fire Hydrant

MW-10

MW-22

MW-26

SB-16

RW-01

GP-4

MW-27

MW-13

RW-13

SB-18

MW-24

Gas Line

Approximate Location of Natural Gas Tap

GP-2

RW-02

SB-21

MW-20

SB-15

Approximate Area for Water Tap

Water Line

Buried Decontamination Area

SB-14

GP-1

MW-12

First Street

Underground Storage Tanks (UST's)

A

B

C

D

E

F

G

H

I

Power

Gas Line

LEGEND

- ⊗ = Monitor Well Location
- ⊠ = Recovery Well Location
- ● = Soil Boring Location
- ⊙ = Gas Probe Location
- — — — = Aboveground System Piping (Clamped to Concrete)
- ------ = Existing Underground System Piping
- ------ = New Underground System Piping
- ⊏⊐⊏⊐⊏⊐ = Underground Road Crossing
- — — = Natural Gas Piping
- — · — = Water Distribution

Trench	Length	Pipe	Depth	No. of Lines
A	360'	2"	1'	1
B	132'	2"	1'	2
C	158'	2"	1'	1
D	210'	2"	1'	1
E	115'	2"	1'	2
F	187'	2"	1'	1
G	213'	2"	1'	1
H	128'	1"	1.5'	1
I	1315'	2"	1'	1

0 100 200

Approximate Scale in Feet

APPLIED EARTH SCIENCES

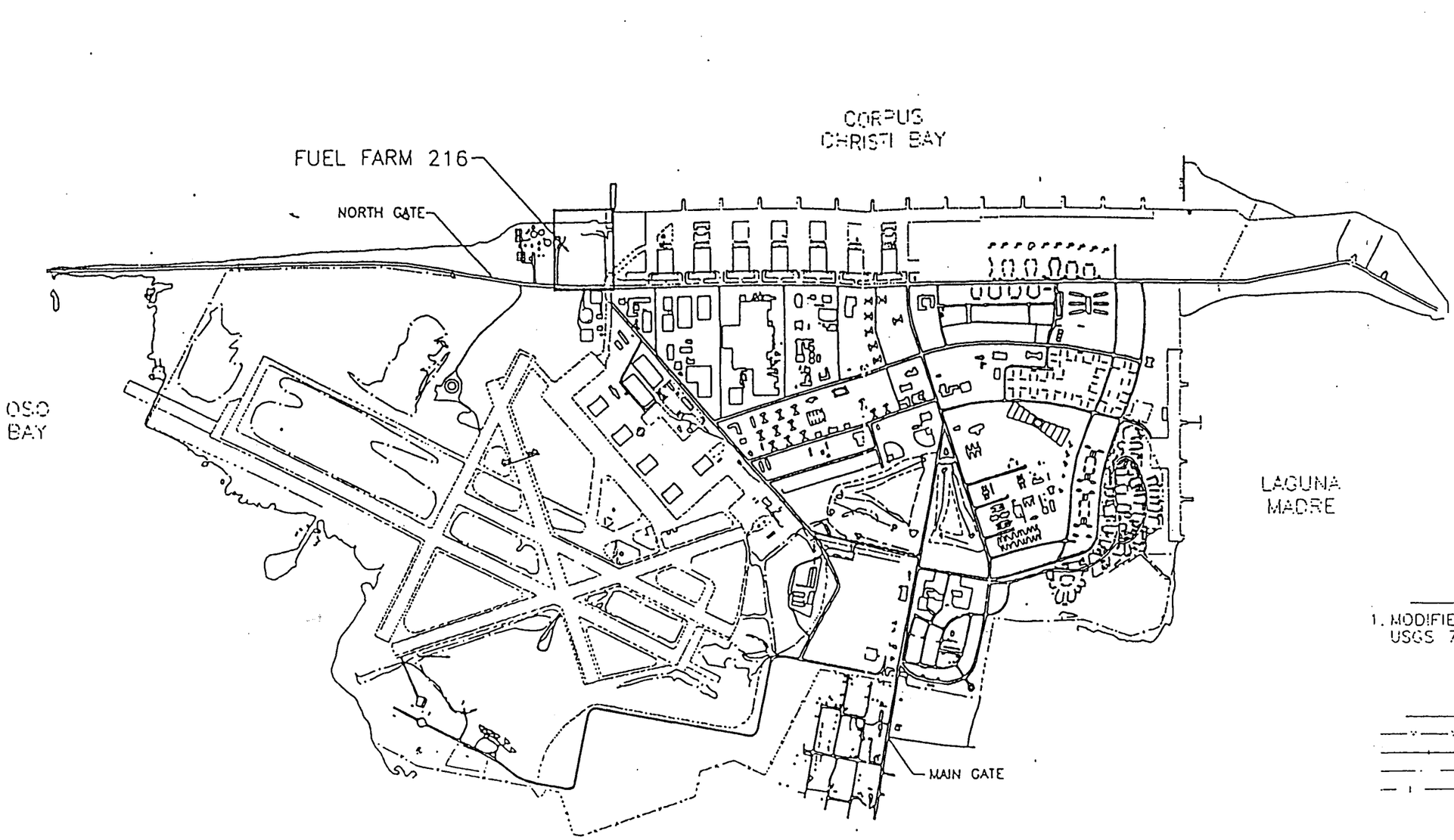
Drawn By:TG Date:11-12-97

Checked By:CM Pr:03616PL

NAS Corpus Christi
Fuel Farm 216

Piping Layout

2



NOTES

1. MODIFIED FROM OSO CREEK NE, TEX. USGS 7.5 MIN. QUADRANGLE MAP

LEGEND

- FENCE
- RAILROAD
- WATER FRONT
- WETLANDS

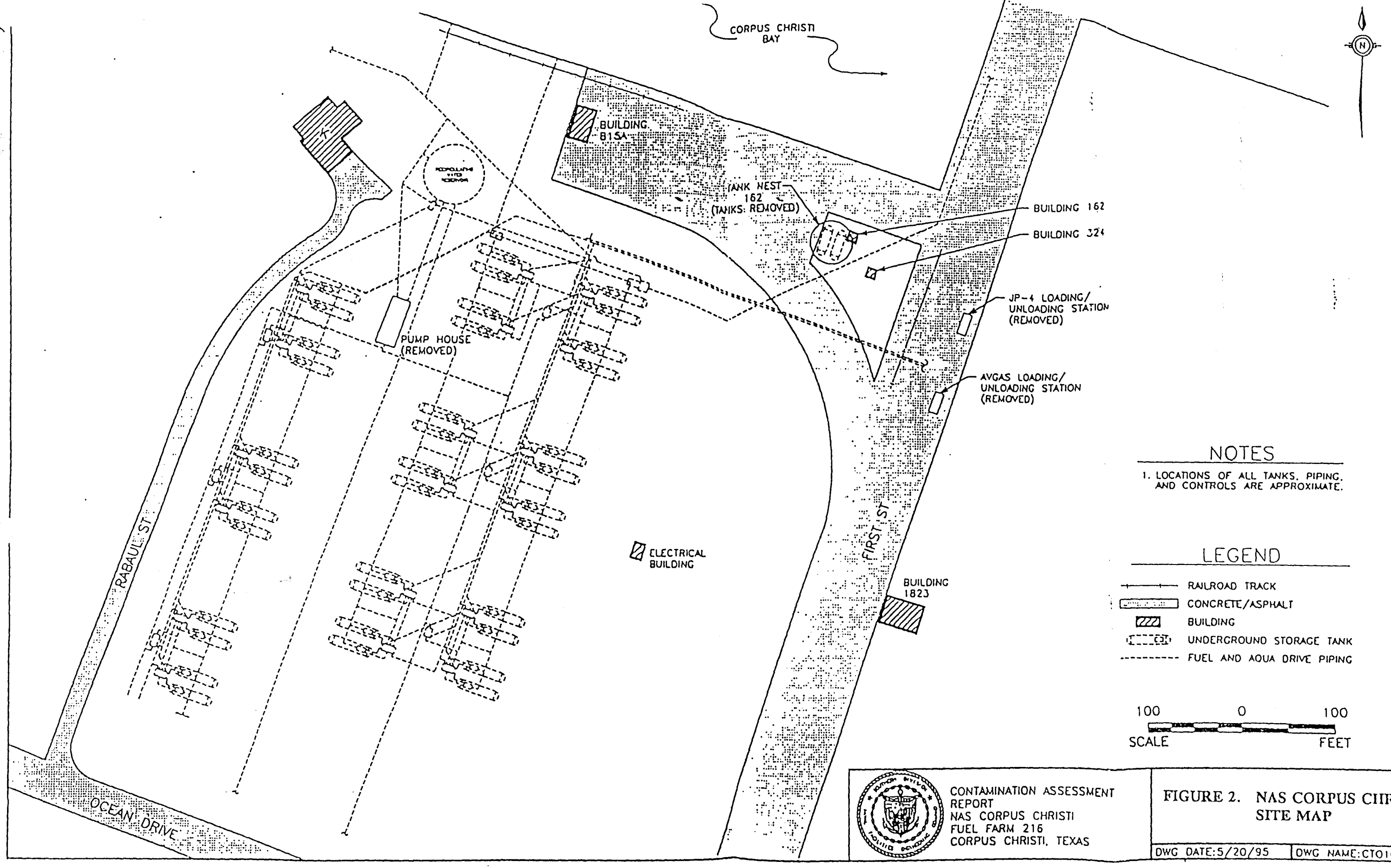
600 0 600

SCALE FEET

CONTAMINATION ASSESSMENT
REPORT
NAS CORPUS CHRISTI
FUEL FARM 216
CORPUS CHRISTI, TEXAS

FIGURE 1. NAS CORPUS CHRISTI VICINITY MAP

DWG DATE:5/20/95 | DWG NAME:CTO1021A



CONTAMINATION ASSESSMENT REPORT
NAS CORPUS CHRISTI
FUEL FARM 216
CORPUS CHRISTI, TEXAS

FIGURE 2. NAS CORPUS CHRISTI SITE MAP

DWG DATE:5/20/95 | DWG NAME:CTO10218

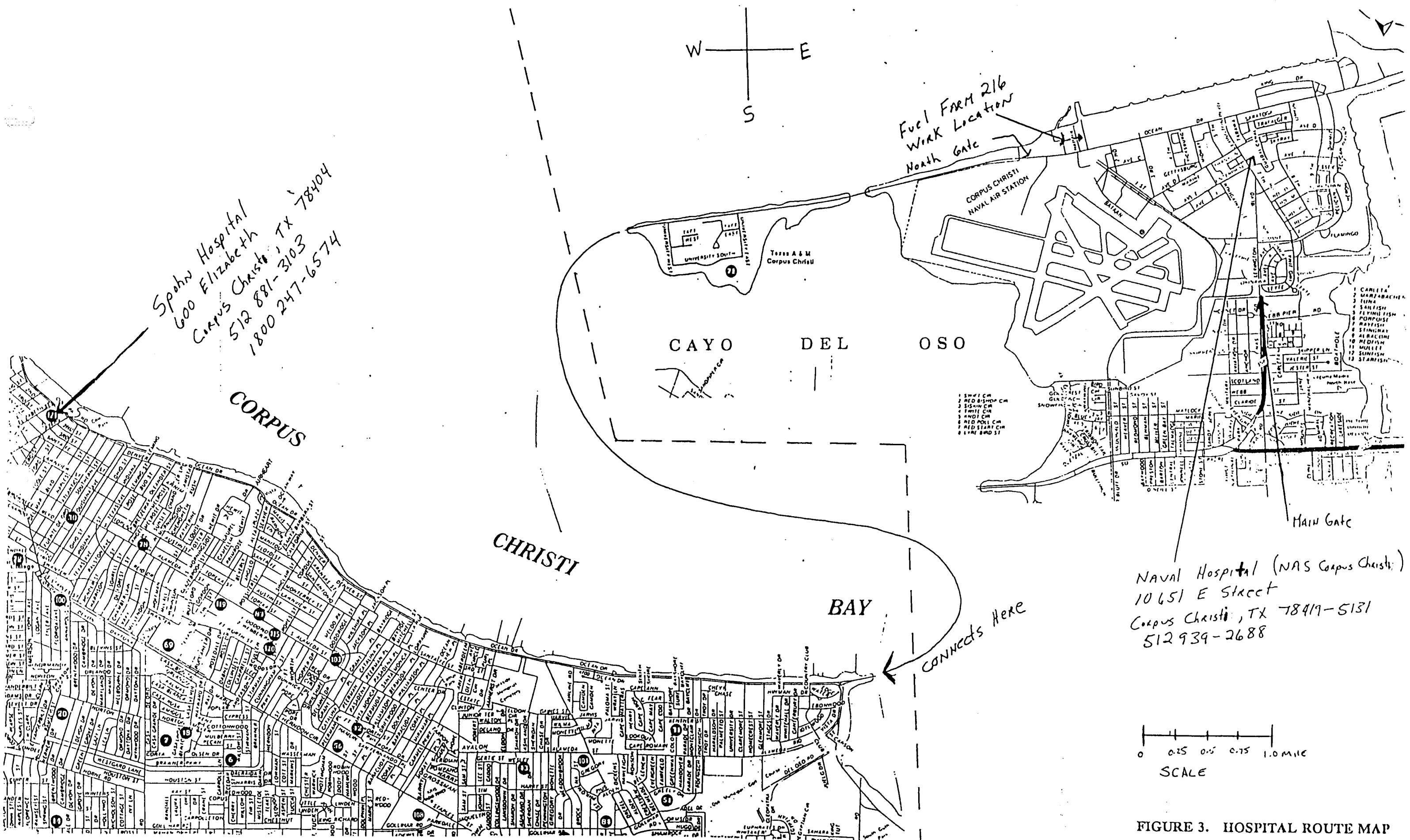


FIGURE 3. HOSPITAL ROUTE MAP