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REMEDIAL INVESTIGATION WORK PLAN FOR UNDERGROUND STORAGE TANK (UST)

NS GREAT LAKES IL
2/1/1993
HALIBURTON NUS

91

Remedial Investigation Work Plan for Underground Storage Tanks Naval Training Center Great Lakes, Illinois

Northern Division Naval Facilities Engineering Command

Contract No. N62472-90-D-1298
Contract Task Order 0049

February 1993

HALLIBURTON NUS
Environmental Corporation

CTO49/GRLKS/WPF/FEB93

REMEDIAL INVESTIGATION WORK PLAN
FOR
UNDERGROUND STORAGE TANKS
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) PROGRAM

Submitted to:
Department of the Navy
Southern Division
Naval Facilities Engineering Command
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A IEPA 20-DAY CERTIFICATION FORM

B IEPA 45-DAY CERTIFICATION FORM

C FIELD DOCUMENTATION FORMS

LIST OF ACRONYMS/ABBREVIATIONS

ASTM	American Society for Testing and Materials
BNA	Base/Neutral and Acid Extractable Compounds
BOA	Basic Ordering Agreement
BETX	Benzene, Ethylbenzene, Toluene and Xylene
CFR	Code of Federal Regulations
CHSM	Corporate Health and Safety Manager
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
COC	Chain of Custody
CTO	Contract Task Order
DOT	Department of Transportation
DQO	Data Quality Objective
DR	Duplicate Sample Result
FB	Field Blank
FD	Field Duplicate
FID	Flame Ionization Detector
FFS	Focused Feasibility Study
FSP	Field Sampling Plan
FTL	Field Team Leader
GL	Great Lakes
HASP	Health and Safety Plan
HSA	Hollow Stem Auger
ID	Inside Diameter or Identification
IDW	Investigative Derived Wastes
IEMA	Illinois Emergency Management Agency
IEPA	Illinois Environmental Protection Agency
MSL	Mean Sea Level
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NEESA	Naval Energy and Environment Support Activity
NTC	Naval Training Center
OSHA	Occupational Safety and Health Administration
OVA	Organic Vapor Analyzer
PARCC	Precision, Accuracy, Representativeness, Completeness, Comparability
PCBs	Polychlorinated Biphenyls
PID	Photoionization Detector
PNAs	Polynuclear Aromatic Hydrocarbons
PP	Priority Pollutant
PPE	Personal Protective Equipment

PWC	Public Works Center
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
R	Recovery
RB	Rinsate Blank
RI	Remedial Investigation
RPD	Relative Percent Difference
RPM	Remedial Project Manager
SA	Spike Amount
SR	Sample Results
SSO	Site Safety Officer
SSR	Spiked Sample Results
TB	Trip Blank
USCS	Unified Soil Classification System
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds

R/49WPF/AA0

1.0 INTRODUCTION

This project is being performed under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract No. N62472-90-D-1298, Contract Task Order (CTO) No. 0049. The activities under the CLEAN Contract are performed by a team of contractors comprised of HALLIBURTON NUS Environmental Corporation (HALLIBURTON NUS), the prime contractor, and SEC Donohue Inc. and ENSR Consulting and Engineering, both team subcontractors. SEC Donohue Inc. is the lead technical firm for this CTO.

Preparation of this Remedial Investigation (RI) Work Plan was accomplished pursuant to CTO No. 0049 for the Naval Training Center (NTC) in Great Lakes, Illinois, dated January 24, 1992. An Implementation Plan was submitted to the Navy on February 25, 1992. The Navy issued final approval of the Implementation Plan on March 31, 1992.

1.1 REMEDIAL INVESTIGATION OBJECTIVES

This Work Plan presents the HALLIBURTON NUS Team's technical scope of work for an RI at six underground storage tank (UST) sites at NTC. The objectives of the RI will be to:

1. Estimate the horizontal and vertical extent of soil contamination at each UST site.

2. Estimate the likelihood of groundwater contamination at each UST site.

3. Collect two soil samples to be tested for landfill disposal parameters.

4. Evaluate available UST remedial technologies.

5. For each UST site, select the best available contaminated soil remedial technology that is economically feasible.

Objectives 1, 2 and 3 will be accomplished through a drilling and subsurface soil sampling program and the preparation of an RI report. Objectives 4 and 5 will be accomplished by preparing a Focused Feasibility Study (FFS) report, which will be submitted as a separate document along with the RI report.

The installation of monitoring wells and groundwater sampling at the UST sites is considered premature during this UST RI project because it is unknown at this time whether any of the six USTs have released petroleum product. The RI report will present

an opinion on the likelihood of groundwater contamination at each UST site based on field screening, visual observations and laboratory analytical results. If it appears that groundwater at a particular UST site has likely been impacted from a release from the UST, this RI could be expanded into a second phase where the extent of groundwater contamination is determined.

1.2 REMEDIAL INVESTIGATION DELIVERABLES

Deliverables for this CTO include a draft and final Work Plan and a draft and final Health and Safety Plan (HASP). The Work Plan contains a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP).

Deliverables for the RI will include a draft and final RI report and a draft and final FFS report. The RI report will contain the items listed in Section 3.2.7. The FFS report will contain the items listed in Section 3.2.8.

1.3 REGULATORY OVERVIEW

The Illinois Environmental Protection Agency (IEPA) has issued regulations for USTs which contain petroleum products (35 Illinois Administrative Code, Subtitle G, Chapter I, Subchapter d, Part 731). These regulations contain requirements for registration of USTs with the State Fire Marshal, requirements for new UST design and installation, and requirements for existing UST release response and corrective action. The IEPA has also issued generic soil and groundwater cleanup objectives for USTs which have released petroleum products. IEPA regulatory requirements are further discussed in Section 3.2.10.

1.4 WORK PLAN ORGANIZATION

The organization of this Work Plan is as follows:

- Section 1.0 Introduction
- Section 2.0 Site Background
- Section 3.0 Remedial Investigation Objectives and Tasks
- Section 4.0 FSP
- Section 5.0 QAPP
- Section 6.0 References

A HASP is also part of the Work Plan, and has been submitted as a stand alone document.

The FSP, the QAPP, and the HASP contain the technical guidelines and procedures for conducting the field work and the laboratory analysis for the RI. These plans are described below.

The FSP includes: sampling objectives; sample location, frequency and parameters; sample identification system; sampling equipment and procedures; and sample handling and shipping procedures.

The QAPP includes: quality assurance (QA) objectives; chain of custody procedures; calibration procedures; analytical procedures; data reduction, validation, and reporting; data assessment procedures; internal quality control (QC); performance and system audits; preventive maintenance; corrective actions; and QA reports.

The HASP includes: site-specific safety information; a hazard assessment; monitoring procedures for site operations; and other requirements in accordance with U.S. Environmental Protection Agency (USEPA) protocols and Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120 and 29 CFR 1910.126.

1.5 REMEDIAL INVESTIGATION SCHEDULE

The estimated time duration for the completion of each of the tasks included in this UST RI are presented on Figure 1-1. The tasks included in this RI are discussed in Section 3.2.

FIGURE 1-1
UST RI PROJECT SCHEDULE
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY, 1993

Beginning of Week

Tasks	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Notice to Proceed	◆																					
Geophysical Survey		▬	◆																			
Field Work Mobilization		▬	▬	▬	▬	▬	▬	◆														
Field Work-Soil Borings and Soil Sampling							▬	▬	◆													
Laboratory Analysis							▬	▬	▬	▬	▬	▬	◆									
Data Validation and Data Entry												▬	▬	▬	◆							
Data Evaluation															▬	▬	◆					
Draft RI Report															▬	▬	▬	▬	▬	▬	▬	◆
Draft Focused FS Report															▬	▬	▬	▬	▬	▬	▬	◆
Draft RI Report Review																						
Final RI Report																						

◆ - Completion or Deliverable Date

2.0 SITE BACKGROUND

2.1 NAVAL TRAINING CENTER LOCATION

NTC is located in Shields Township, Lake County, Illinois, on the shore of Lake Michigan. It is bounded on the west by U.S. Route 41, on the east by Lake Michigan, on the north by the city of North Chicago, and on the south by the Veterans Administration Hospital and the Shoreacres Country Club (Figure 2-1).

2.2 NAVAL TRAINING CENTER DESCRIPTION

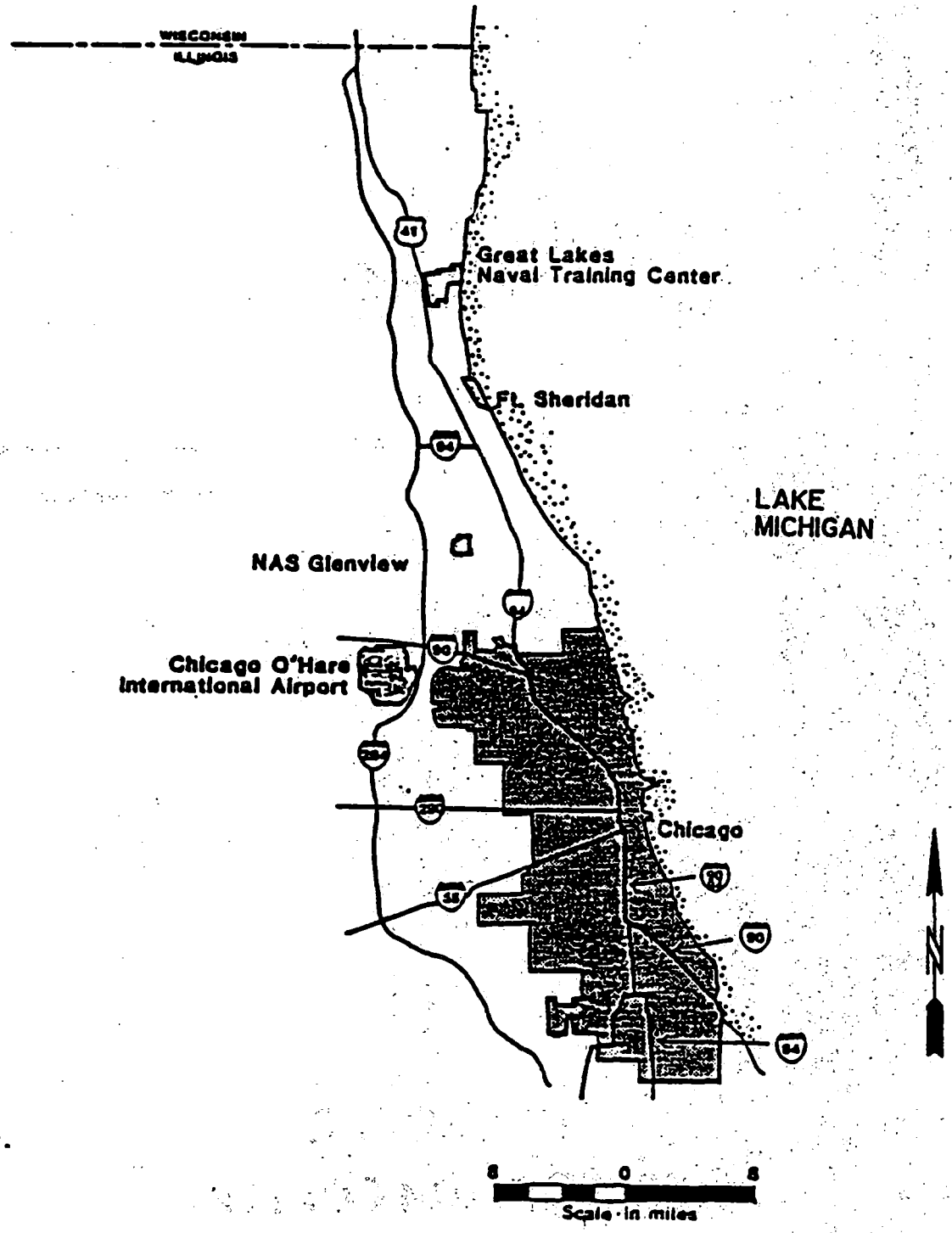
Construction of the original NTC was finished in 1911 and consisted of 39 buildings on 292 acres. Over the years, the NTC has expanded to its present size of approximately 1,133 buildings on 1,640 acres (NTC, 1986). NTC is divided into the following areas:

- Mainside
- Original Station
- Hospitalside
- Camp Moffet
- Camp Porter
- Nimitz Village
- Halsey Village
- Golf Course
- Forrestal Village

Figure 2-2 delineates the boundaries of each of these areas.

Currently, the land within NTC has the following uses:

- Recruit training.
- Housing and barracks.
- Public works (maintenance, engineering).
- Supply facilities (warehouses).
- Medical facilities (Naval Hospital, Dental Clinic).
- Administration.
- Recreation (Lake Michigan shoreline, golf course).
- Utilities (power plant, sewage treatment plant).
- Ammunition storage.



SOURCE:
INITIAL ASSESSMENT STUDY
ROGERS, GOLDEN, HALPERN, 1986

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FIGURE 2- 1
GENERAL LOCATION MAP

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NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS

DUNCAN-PARNELL, INC. CHARLOTTE, NC 800-768-7788

2.2.1 Topography

Most of the facilities at NTC are located on uplands adjacent to Lake Michigan. The upland areas are typically level to gently sloping, but are in places cut by steep walled ravines that contain Pettibone Creek and its tributaries which drain to Lake Michigan. Elevations range from approximately 580 feet above mean sea level (MSL) along the Lake Michigan shoreline to a maximum of approximately 730 feet above MSL near the golf course shown on Figure 2-2.

2.2.2 Geology

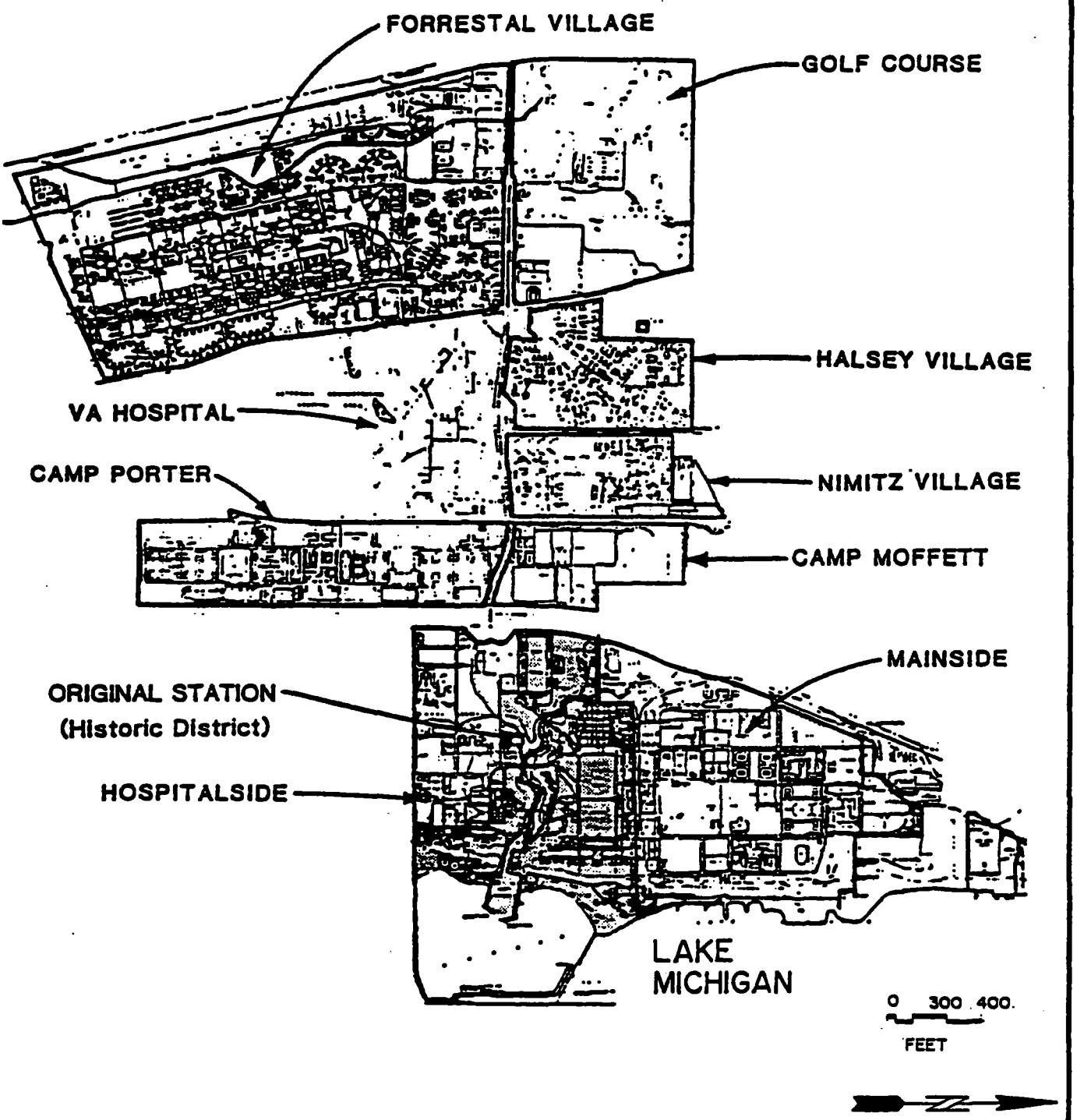
NTC is underlain by Silurian age bedrock consisting of Niagaran and Alexandrian Limestone. Above the bedrock is glacial till which ranges in thickness from approximately 170 to 210 feet. The predominant glacial deposit in the vicinity of NTC is Wadsworth till. This till is highly clayey with thin, irregular, discontinuous lenses of sand and silty sand (Dames & Moore, 1991).

2.2.3 Groundwater

Groundwater occurs throughout the till, but due to a low hydraulic conductivity of the clayey material, the till yields very little water. The discontinuous lenses of sand are potential sources of groundwater and have reportedly been used for limited water supplies in the NTC area. Two distinct zones of groundwater were encountered during a drilling investigation conducted in 1988 by Dames & Moore at the golf course shown on Figure 2-2. The first zone had a potentiometric surface of approximately 10 feet below ground surface, while the deeper zone had a potentiometric surface of between 15 and 30 feet below ground surface. No other water bearing zones were encountered to the maximum depth explored of 45 feet (Dames & Moore, 1991).

2.3 DESCRIPTION OF THE UNDERGROUND STORAGE TANK SITES

Table 2-1 provides information, including UST identification (ID), contents, construction, date installed and location for each of the six USTs included in this project. Tank 21-T-2 is located in the Original Station area of NTC. Tanks 21-T-6 and 23-T-11 are located Mainside. Tanks 21-T-12, 3224 and 3225 are located in Forrestal Village. Figures 2-3 and 2-4 show the locations of the USTs. Each UST is further discussed in the following sections.



SOURCE: GREAT LAKES NTC MASTER PLAN, 1986.

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FIGURE 2- 2
GREAT LAKES NTC MAP

CTO 0049
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NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS

DUNCAN-PARNELL, INC. CHARLOTTE, NC 800-768-7788

TABLE 2-1

UNDERGROUND STORAGE TANKS INCLUDED IN THIS REMEDIAL INVESTIGATION
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

UST ID	CONTENTS(1)	CAPACITY(3) (GALLONS)	CONSTRUCTION(3)	DATE INSTALLED(3)	LOCATION
21-T-2	Gasoline	500	Metal	1955	Northwest corner of Building 13
21-T-6	Waste Oil	600	Metal	1951	East side of Building 144
23-T-11	No. 2 Diesel Fuel	5,000	Metal	1973	Northeast corner of Building 238
21-T-12	Unleaded Gasoline	12,000	Metal	1970	North of Building 3216
3224	No. 2 Diesel Fuel	4,000	Metal	1949	North of Building 3216
3225	Unknown(2)	2,000	Metal	1949	North of Building 3216

(1) Except for 3224, the USTs have been emptied and taken out of service.

(2) Contents were reported as diesel fuel by a worker in Building 3216 during a conversation with the HALLIBURTON NUS Team conducting a site visit.

(3) Source: Engineering-Science, 1991.

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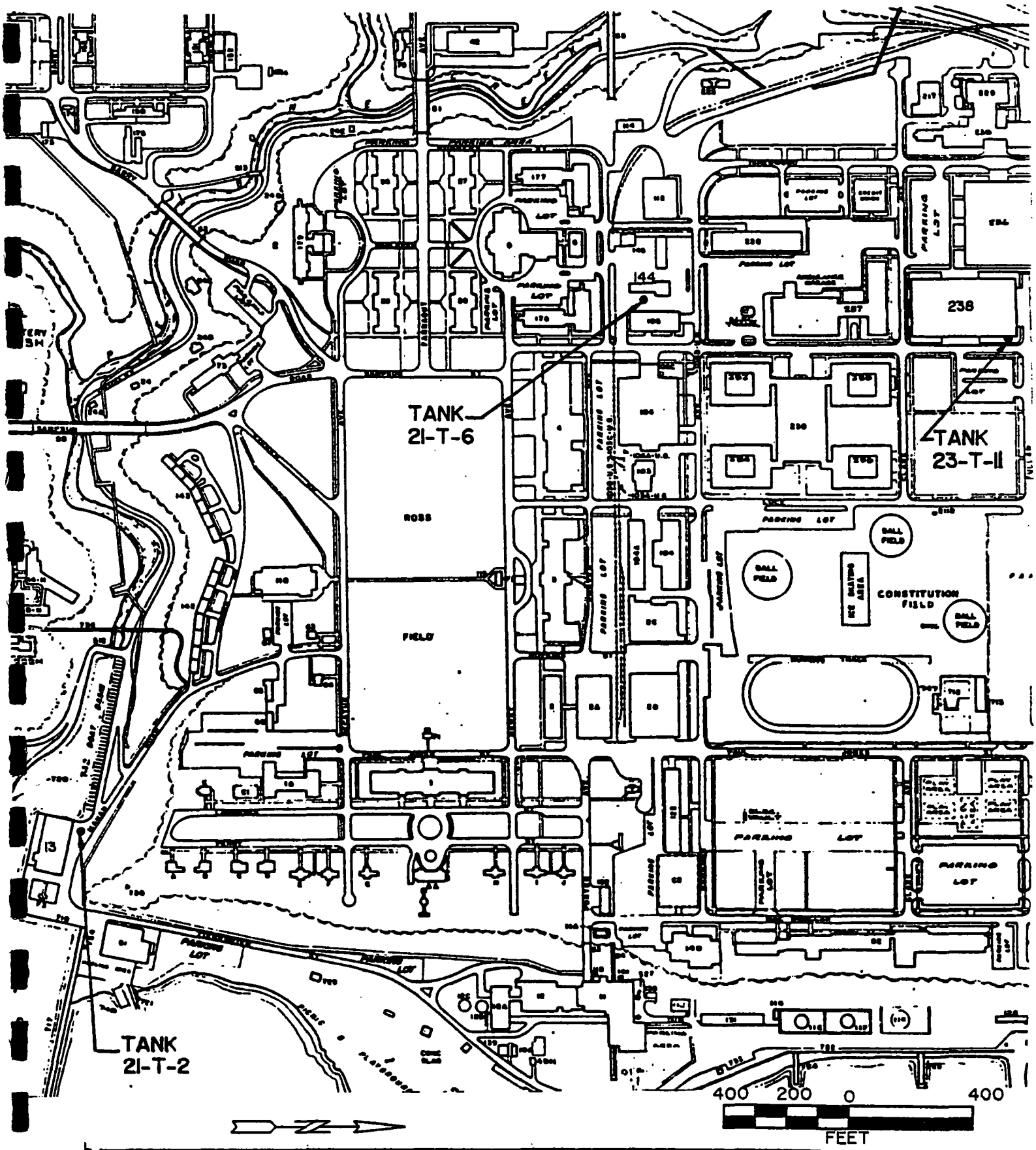

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FIGURE 2- 3
TANK #21- -T-2, #21- T-6
AND #23- T-11 LOCATION
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS

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20611

329965

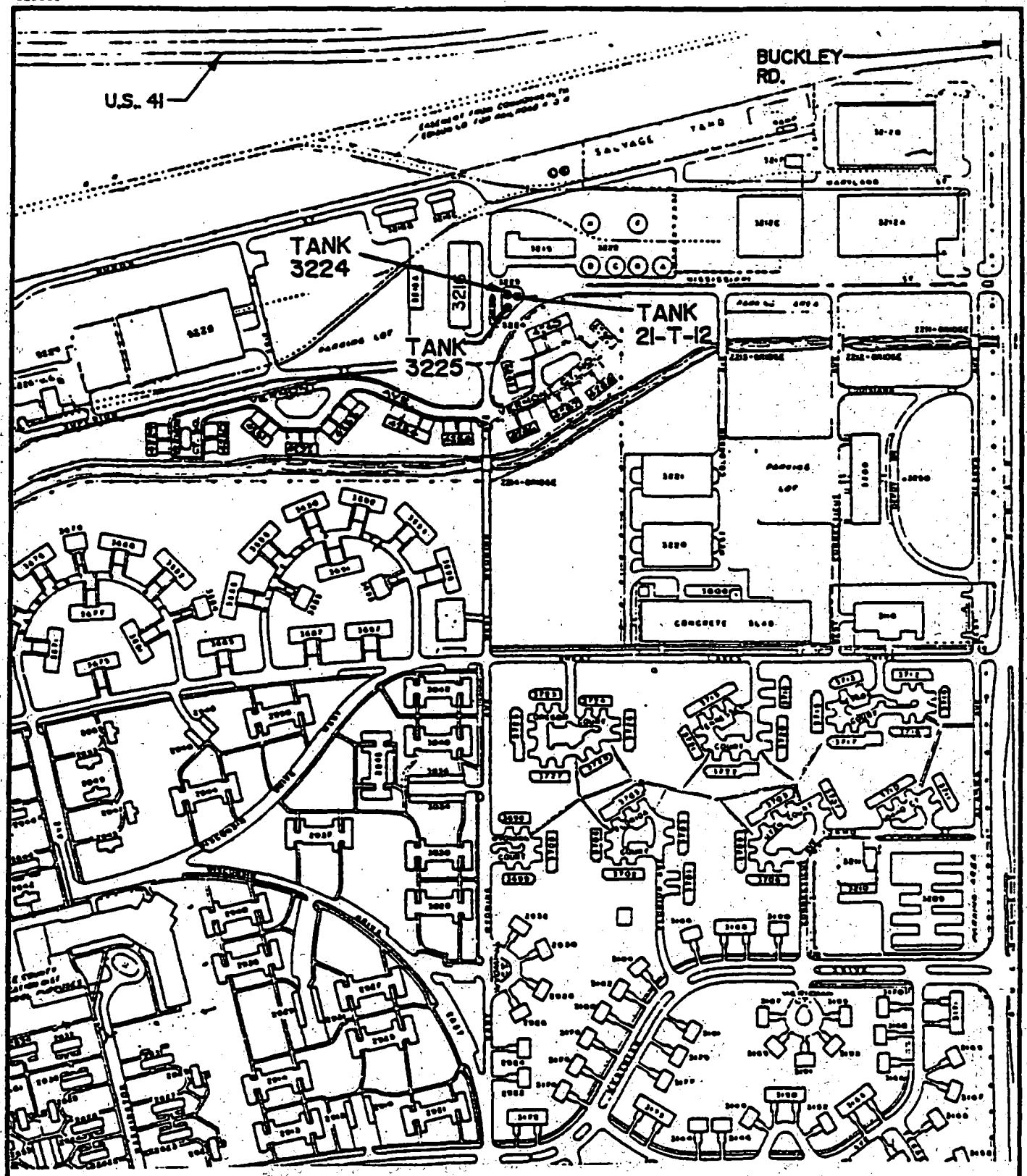

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FIGURE 2- 4
TANK #21- T-12, #3224
AND #3225 LOCATION
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS

CTO 0049
20611

DUNCAN-PARNELL, INC. CHARLOTTE, NC 800-768-7768

2.3.1 Tank 21-T-2

This out of service UST is metal, is 500 gallons in capacity, and was used to store gasoline for boat refueling. It was installed in 1955 at the northwest corner of Building 13, which is referred to as the boat house. The UST is covered by concrete. Because this UST failed tightness testing, it was reported to the IEPA as a potential leaking tank, but based on a review of NTC files, does not appear to have been assigned an incident number by the Illinois Emergency Management Agency (IEMA). Please refer to Section 3.2.10 for a further description of IEMA incident numbers. The results of past tightness testing conducted on this UST are presented in Table 2-2.

2.3.2 Tank 21-T-6

This out of service UST has been reported as being either 550, 600 or 1,000 gallons in size. It is constructed of metal, was installed in 1951, and was used to store waste oil generated at the Naval Exchange Service Station, referred to as Building 144. It is located under concrete on the east edge of Building 144. Because this UST failed tightness testing, it was reported to the IEPA as a potential leaking tank, but based on a review of NTC files, does not appear to have been assigned an incident number by the IEMA. The results of past tightness testing conducted on this UST are presented in Table 2-2.

2.3.3 Tank 23-T-11

This out of service UST is constructed of metal, is 5,000 gallons in size, and was installed in 1973 to store diesel fuel. It is located under grass near the northeast edge of Building 238. A manhole is present which allows access to the top of this UST. When the manhole cover is removed, the top of the tank is visible about 5 feet below ground surface. Because this tank failed tightness testing, it was reported as a leaking tank to the IEPA, and was assigned incident number 911218 by IEMA. The results of past tightness testing conducted on this UST are presented in Table 2-2.

2.3.4 Tank 21-T-12

This out of service UST is metal, 12,000 gallons in size, and was installed in 1970 to store gasoline. This UST is located adjacent to tanks 3224 and 3225 north of Building 3216, and is covered by grass. The UST was taken out of service in approximately 1989 when it was discovered that it was taking on water. NTC notified IEPA that water was entering this UST and consequently, that this UST may be leaking. It does not appear that an incident number has been assigned for this UST, and it has never been tested for tightness.

TABLE 2-2

TANK TIGHTNESS TESTING HISTORIES
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

UST ID	DECEMBER 1989 AINLAY TANK TESTING	OCTOBER 1990 NDE TECHNOLOGY, INC.	MAY 1991 CITY TANK & PUMP, INC.
21-T-2	Failed with leak rate of 0.156 gph	Passed with gain rate of 0.012 gph	Not Tested
21-T-6	Failed with gain rate of 0.058 gph	Passed with gain rate of 0.041 gph	Not Tested
23-T-11	Failed with leak rate of 0.438 gph	Passed with gain rate of 0.002 gph	Failed with leak rate of 0.180 gph
21-T-12	Not Tested	Not Tested	Not Tested
3224	Not Tested	Passed with leak rate of 0.035 gph	Not Tested
3225	Not Tested	Not Tested	Not Tested

Source: Engineering Science, November 1991, "Testing of Underground Storage Tanks."

gph = gallons per hour

Failure rate was based on sensitivity of test. Failure rate for the AINLAY tests was $\pm$0.03 gph. Failure rate for the other two tests was $\pm$0.1 gph.

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2.3.5 Tank 3224

This UST is metal and is 4,000 gallons in size. It is actively being used for storage of diesel fuel. It was installed in 1949 and is located adjacent to tanks 21-T-12 and 3225, north of Building 3216. This tank is connected to an operable diesel fuel pump. The results of past tightness testing conducted on this UST are presented in Table 2-2.

2.3.6 Tank 3225

This UST is metal, 2,000 gallons in size, and has been out of service since 1979. It is located adjacent to tanks 21-T-12 and 3224, north of Building 3216. It was installed in 1949. No records could be located which indicate what type of material was was stored in the UST when it was in use. During a site visit, the HALLIBURTON NUS Team and Navy personnel present unlocked the fill pipe, and stuck a wooden measuring stick down the pipe. The stick went down the pipe 50 inches before being stopped by an obstruction which may have been an elbow in the fill pipe. Because of the obstruction, the HALLIBURTON NUS Team was unable to determine if this tank is empty or full. Four inches of liquid were measured on top of the obstruction. The liquid was identified as old diesel fuel by a worker from Building 3216. This tank has never been tested for tightness.

3.0 REMEDIAL INVESTIGATION OBJECTIVES AND TASKS

3.1 REMEDIAL INVESTIGATION OBJECTIVES

The objectives of the RI will be to:

1. Estimate the horizontal and vertical extent of soil contamination at each UST site.

2. Estimate the likelihood of groundwater contamination at each UST site.

3. Collect two soil samples to be tested for landfill disposal parameters.

4. Evaluate available UST remedial technologies.

5. For each UST site, select the best available contaminated soil remedial technology that is economically feasible.

Objectives 1, 2, and 3 will be accomplished through a drilling and subsurface soil sampling program and preparation of an RI report. Objectives 4 and 5 will be accomplished by preparing a FFS report, which will be submitted as a separate document along with the RI report.

The RI report will present an opinion on the likelihood of groundwater contamination at each UST site based on field screening, visual observations and laboratory analytical results. If it appears that groundwater at a particular UST site has likely been impacted from a release from the UST, this RI could be expanded into a second phase where the extent of groundwater contamination is determined.

3.2 REMEDIAL INVESTIGATION TASKS

The following tasks will be required to meet the objectives of the RI.

3.2.1 Task 1 - Magnetometer Survey

Prior to drilling, a magnetometer survey will be performed at the UST sites to determine the approximate limits of each UST. A two person survey team will perform the magnetometer survey. The survey team will use spray paint and/or pin flags to mark the approximate limits of each UST. The sampling team will then be able to place borings and collect subsurface soil samples with less risk of puncturing the UST or associated

piping. The survey team will prepare a brief technical memorandum detailing the magnetometer survey procedures and results. The technical memorandum will contain figures with dimensions showing the limits of each anomaly (UST) identified, and will be made available to the sampling team and the drilling subcontractor.

3.2.2 Task 2 - Mobilization

The HALLIBURTON NUS Team will prepare the subcontract documents required to bring a drilling subcontractor onto the project team.

The HALLIBURTON NUS Team will also order and obtain the necessary field equipment (sample bottles, coolers, vehicles, etc.) and health and safety equipment (HNu photoionization detector (PID), or organic vapor analyzer (OVA) flame ionization detector (FID), combustible gas meter, gloves, etc.) to conduct the investigation at each UST site.

Time will also be required for the sampling team to become familiar with the project Work Plan and HASP, and for the Field Team Leader (FTL) to coordinate with the Project Manager and the NTC Point of Contact.

3.2.3 Task 3 - Field Investigation

The first three objectives of the RI will be accomplished through a drilling and subsurface soil sampling program and the preparation of an RI report. The drilling and sampling program is described in detail in Section 4.0, Field Sampling Plan, of this Work Plan.

Generally, soil borings will be placed adjacent to each UST. The purpose of the soil borings will be to determine soil types, to visually inspect collected soil for petroleum product staining, to screen collected soil with an HNu PID or OVA FID, to collect soil samples for chemical analysis, and to determine the depth to the water table at each UST site. The results of the field screening and chemical analysis will be used to estimate the extent of soil contamination at each UST site.

The FSP presents the number of soil borings to be drilled at each UST site, the number of field samples to be collected, the depth intervals of each soil sample for chemical analysis, and the analytical parameters for which each soil sample will be analyzed.

In Illinois, soil contaminated with petroleum product due to an UST release is classified as a "special waste" and may be landfilled only in an IEPA permitted special waste landfill. During this investigation, two soil samples will be collected to be analyzed for special waste landfill disposal parameters. These parameters were selected based on conversations with the operators of two northeastern Illinois special waste landfills. The purpose of collecting these two samples is so that in the future, if the Navy decided to

remove one or more of the six USTs and excavate and landfill any associated contaminated soil, a landfill disposal sample will have already been collected. This should eliminate the need to remobilize a drill rig or backhoe for the sole purpose of collecting a disposal sample. However, the possibility exists that at the time any of the USTs are removed, the landfill disposal samples collected during this project would no longer be acceptable to the landfills, and other disposal samples would need to be collected.

3.2.4 Task 4 - Sample Analysis

This task includes laboratory chemical analysis of soil samples collected during the investigation at the six USTs. Soil samples collected during the investigation will be analyzed by a Naval Energy and Environment Support Activity (NEESA) approved laboratory.

3.2.5 Task 5 - Data Validation

Data validation will be performed by a HALLIBURTON NUS Team chemist in accordance with the CLEAN data validation procedures established by the Navy. The data validation procedures are discussed in Section 5.7 of the QAPP.

3.2.6 Task 6 - Data Evaluation

The objective of data evaluation will be to determine whether subsurface soil contamination exists at a particular UST site which would indicate that a UST has likely released some of its contents. If contamination is found to be present, the areal distribution of the borings will be used to estimate the horizontal extent of soil contamination at each UST site. The vertical extent of soil contamination and the likelihood of groundwater contamination will be estimated by evaluating soil sample analytical data in conjunction with the results of PID or FID screening. Tables will be developed to exhibit and summarize the analytical chemical data and to present comparisons made between on-site data and IEPA cleanup objectives.

3.2.7 Task 7 - Draft and Final Remedial Investigation Report

A draft RI report will be prepared to summarize the office and field activities performed, data collected, and conclusions regarding the extent of contamination at each UST site. The draft RI report will be finalized after incorporation of comments made by the Navy and other reviewing agencies.

Specifically, the following items will be included in the RI report, at a minimum:

- A summary of project background information.
- A detailed description and summary of the RI field work conducted including figures showing sampling locations, observations, soil boring logs, PID/FID screening results, and soil sample descriptions.
- A summary of the laboratory analytical results, including associated QA/QC documentation.
- A summary of the data evaluation completed, including a discussion of the extent of soil contamination at each UST site, and the likelihood of groundwater contamination at each UST site.

3.2.8 Task 8 - Draft and Final Focused Feasibility Study Report

A draft FFS report will be prepared and will recommend the HALLIBURTON Team's preferred remedial action for each UST site. The preferred remedial action(s) will be selected based on the action's effectiveness to achieve IEPA cleanup objectives, implementability and cost. The draft FFS report will be finalized after incorporating comments made by Navy and other reviewing Agencies.

3.2.9 Task 9 - Project Management

The HALLIBURTON NUS Team Project Manager will be responsible for implementing the RI and coordinating and monitoring daily project activities. Responsibilities include:

- Serving as the principal contact with the Navy Remedial Project Manager (RPM).
- Ensuring that the project is appropriately staffed.
- Monitoring the project budget and schedule to identify variances and take appropriate corrective action, if needed.
- Providing overall project direction and resolving problem areas.

3.2.10 Task 10 - Illinois EPA Reporting Requirements

If analytical data are received from the project laboratory which indicate that one or more of the project USTs have likely released some of their contents, the Navy is required by Illinois law to report the UST release(s) to IEMA and IEPA. IEMA must be contacted within 24 hours of release confirmation (i.e., receipt of analytical data showing contamination is present at one or more of the UST sites). IEMA will then issue an Incident Number for each UST site where a release has occurred. Within 20 days and 45 days of release confirmation, the Navy is required to submit an IEPA 20-Day Certification Form and an IEPA 45-Day Certification Form for each UST site. The HALLIBURTON NUS Team will prepare these forms for submittal by the Navy. A Navy representative will need to sign these forms and have them notarized. An example 20-Day Certification Form is provided in Appendix A. An example 45-Day Certification Form is provided in Appendix B.

4.0 FIELD SAMPLING PLAN

This FSP provides the HALLIBURTON NUS field sampling team with the overall direction and techniques necessary to meet the objectives of the field sampling program.

4.1 FIELD SAMPLING PROGRAM OBJECTIVES

The objectives of this field sampling program are to:

1. Collect data sufficient to estimate the horizontal and vertical extent of soil contamination at each UST site.

2. Collect data sufficient to estimate the likelihood of groundwater contamination at each UST site.

3. Collect two soil samples to be tested for landfill disposal parameters.

These objectives will be achieved through a drilling and soil sampling program at each UST site.

4.2 SITE ACCESS

Site access is controlled through the pass office at the NTC Main Entrance located on Sheridan Road. A drivers license, proof of vehicle registration, and proof of vehicle insurance are required to obtain a pass. Once a pass has been obtained, access to the UST sites is unrestricted.

Fifteen working days prior to the anticipated start of field activities, the HALLIBURTON NUS Team Project Manager will contact the Navy Southern Division RPM to obtain verbal permission to begin work. Subsequent to receiving the Navy's authorization to begin work, the HALLIBURTON NUS Field Team Leader (FTL) will notify the NTC Point of Contact to inform him of the upcoming work. The NTC Point of Contact will then coordinate with the FTL and NTC Public Works Center (PWC) to obtain all necessary drilling permits and utility clearances.

4.3 PROJECT ORGANIZATION AND PERSONNEL RESPONSIBILITIES

The key personnel connected with this project, their respective organizations and the chain of communications are presented below and in Figure 4-1.

- Daryle Fontenot
  Remedial Project Manager

  Southern Division
  Naval Facilities Engineering Command
  2155 Eagle Drive, P.O. Box 190010
  North Charleston, SC 29419-9010
  Phone (803) 743-0607
  Fax (803) 743-0563

- Robert Ogrodowski
  Activity Point of Contact

  c/o Commanding Officer
  Naval Training Center Great Lakes, Building 5
  Great Lakes, IL 60088
  Attn: Code FAC3
  Phone (708) 688-2796

- John Trepanowski
  CLEAN Program Manager

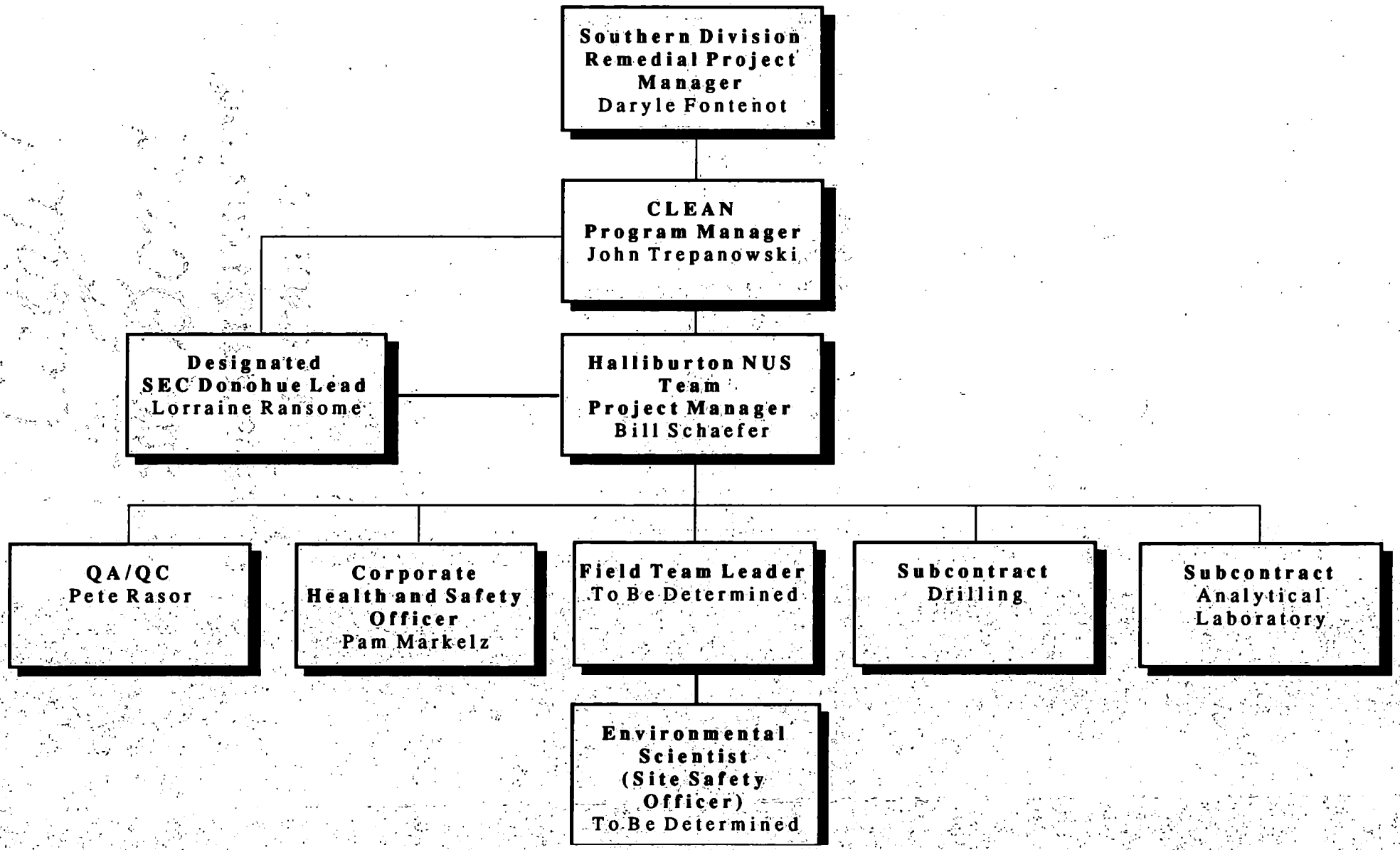
  HALLIBURTON NUS Environmental Corporation
  999 West Valley Road
  Wayne, PA 19087
  Phone (215) 971-0900

- Bill Schaefer
  Project Manager

  SEC Donohue Inc. (HALLIBURTON NUS Team Member)
  111 North Canal Street, Suite 305
  Chicago, IL 60606
  Phone (312) 902-7100
  Fax (312) 902-7099

Field work will be performed by a two person sampling team comprised of the FTL and an environmental scientist, who will serve as the the Site Safety Officer (SSO). The specific responsibilities of the two sampling team members are discussed below.

FIGURE 4-1
HALLIBURTON NUS TEAM PROJECT ORGANIZATION CHART
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993



4.3.1 Field Team Leader

The FTL will have overall responsibility for completion of field activities according to this FSP. The FTL is the coordinator of activities at the site and is the communication link between the sampling team and the HALLIBURTON NUS Team Project Manager. The FTL will be on-site during all field activities and will oversee operations. The FTL will be responsible for the following:

- Mobilizing and demobilizing the sampling team.
- Assuring that the sampling team is familiar with this document and the HASP.
- Directing and monitoring the drilling subcontractor.
- Completing soil boring logs and collecting soil samples for chemical analysis, as necessary.
- Ensuring that samples are packaged and shipped in accordance with the FSP and QAPP.
- Ensuring that Investigative Derived Wastes (IDW) are properly managed as described in Section 4.9.
- Resolving logistical problems hindering field activities such as equipment malfunctions or personnel conflicts.
- Completing the site logbook on a daily basis.
- Completing a sample tracking logbook.
- Informing the HALLIBURTON NUS Team Project Manager of daily activities.

4.3.2 Site Safety Officer

The SSO will be present on-site during field operations and will be responsible for health and safety activities. The SSO reports to the SEC Donohue Corporate Health and Safety Manager (CHSM), and indirectly to the FTL, Project Manager and CLEAN Health and Safety Manager. The SSO is responsible for the following:

- Controlling health and safety-related field operations such as monitoring of workers for heat or cold stress and calibration and operation of safety equipment.

- Terminating work if an imminent safety hazard, emergency condition, or other potentially dangerous situation, such as detrimental weather conditions, is encountered.

- Conducting and documenting a health and safety meeting each day, or as needed, at the site.

- Ensuring that the sampling team complies with the HASP.

- Completing boring logs and collecting soil samples for chemical analysis, as necessary.

- Ensuring that NTC personnel are adequately advised and kept clear of potentially contaminated materials.

4.4 MAGNETOMETER SURVEY

4.4.1 Introduction

This section details the equipment to be used and the standard procedures to be followed for obtaining magnetic gradient data which will allow a determination to be made of the approximate limits of the six USTs.

4.4.2 Equipment

Equipment required for the magnetometer survey will consist of:

- A proton procession magnetometer with portable gradiometer sensors capable of measuring the earth's total magnetic field to a resolution within 1.0 gamma.

- Portable computer with interface cable.

- Data reduction software.

- Computer contouring software.

- Site base map.

- Field logbook.

4.4.3 Procedures

A two person survey team to consist of an instrument operator to record field observations and survey traverse information and an assistant to hold and orient the gradiometer sensors will conduct the survey. Magnetometer survey traverse lines will be spaced preliminarily 10 feet apart and oriented north-south. Magnetic gradient data will be recorded preliminarily at 5-foot intervals along each traverse line. The survey line number, traverse direction, start and finish station numbers of each survey line, and visible sources of signal interference will be recorded in a field logbook as surveying progresses. A base station location free of signal interference will be established at each survey area. Magnetometer background readings will be collected at the base station at the beginning, end, and every hour during the survey. The total magnetic field and magnetic gradient data will be digitally recorded. The digital field data will be downloaded daily to a portable computer and stored on diskette for subsequent data reduction.

4.4.4 Decontamination

No equipment decontamination is required.

4.4.5 Quality Control

In the field, digital data acquired during the magnetometer survey data will be computer contoured to confirm that reliable data has been collected and to verify that adequate survey area coverage has been attained to determine the approximate limits of each UST. Original field documentation, computer disks, and data plots will be stored in a secure area until completion of the field program. Field documentation will undergo an internal QC by the Project Manager or senior technical staff after completion of field activities. Upon completion of the field program, documentation will be relinquished to the Project Manager.

4.4.6 Documentation

Data collected during the magnetometer survey will be digitally recorded and stored on diskette. Field observations, manually recorded data, and equipment calibration checks will be recorded in a bound field logbook. Subsequent to the geophysical survey field activities, a task-specific technical memorandum will be prepared documenting the procedures and results of the survey. The technical memorandum will be made available to the sampling team and drilling subcontractor.

4.5 SOIL BORING AND SUBSURFACE SOIL SAMPLING

4.5.1 Introduction

A total of 18 soil borings will be drilled at the six UST sites. The purpose of the soil borings will be to determine soil types, to visually inspect collected soil for petroleum product staining, to screen collected soil with an HNu PID or OVA FID, to collect soil samples for chemical analysis, and to determine the depth to the water table at each UST site.

4.5.2 Equipment

The following equipment will be needed to accomplish the drilling and sampling program at each UST site:

- A fully-equipped drill rig (to be supplied by the drilling subcontractor) capable of:
  - Accomplishing soil boring with 4-1/4-inch or 6-1/4-inch inside diameter (ID) hollow stem augers to a maximum depth of 20 feet.
  - Performing continuous 2-inch ID split spoon sampling.
- Power steam cleaner for drill rig and auger flight decontamination (to be supplied by the drillers).
- Materials to restore disturbed concrete cover.
- Materials to construct a decontamination pad, including a sump pump (to be supplied by the drillers).
- Empty, clean, Department of Transportation (DOT) approved, 55-gallon drums (to be supplied by the drillers) to containerize IDW.
- Bentonite for grouting boreholes (to be supplied by the drillers).
- Water, distilled (American Society for Testing and Materials (ASTM) Type II) and tap.
- Isopropanol.
- Five-gallon buckets with tight lids.
- Alconox or Liquinox soap.

- Scrub brushes.
- Stainless steel mixing bowls and spoons.
- Visqueen.
- Sample containers.
- Munsell Soil Color Chart.
- Health and safety equipment as specified in the HASP.
- Ziploc® bags and garbage bags.
- Sample packaging and shipping paperwork and materials (tape, labels, etc.).
- Field logbook.
- Camera and film.
- Field documentation forms as included in Appendix C.

4.5.3 Procedures

Soil borings will be drilled approximately 5 feet away from the limits of the USTs as determined by the magnetometer survey. Soil borings will be advanced using the Hollow Stem Auger (HSA) technique. Soil samples will be retrieved continuously using split spoon samplers. The FTL or SSO will classify and log the samples using the Unified Soil Classification System (USCS) and a Munsell Soil Color Chart. The FTL or SSO will screen the split spoon soil samples for the presence of organic vapors using an HNu PID or OVA FID, and will collect soil samples for chemical analysis.

The number of soil borings to be placed at each UST site was determined based upon the capacity of each UST. Specifically, for those USTs with a capacity less than 1,000 gallons, two soil borings were selected. For those tanks with a capacity between 1,000 and 4,000 gallons, three soil borings were selected. For those tanks with a capacity greater than 4,000 gallons, four soil borings were selected.

Soil boring locations are presented on Figure 4-2 for Tank 21-T-2; Figure 4-3 for Tank 21-T-6; Figure 4-4 for Tank 23-T-11; and Figure 4-5 for Tanks 21-T-12, 3224, and 3225. The soil boring locations presented in Figures 4-2 through 4-5 may be adjusted slightly based on the results of the magnetometer survey, based on the presence of utilities identified on Great Lakes PWC maps, and based on field conditions encountered.

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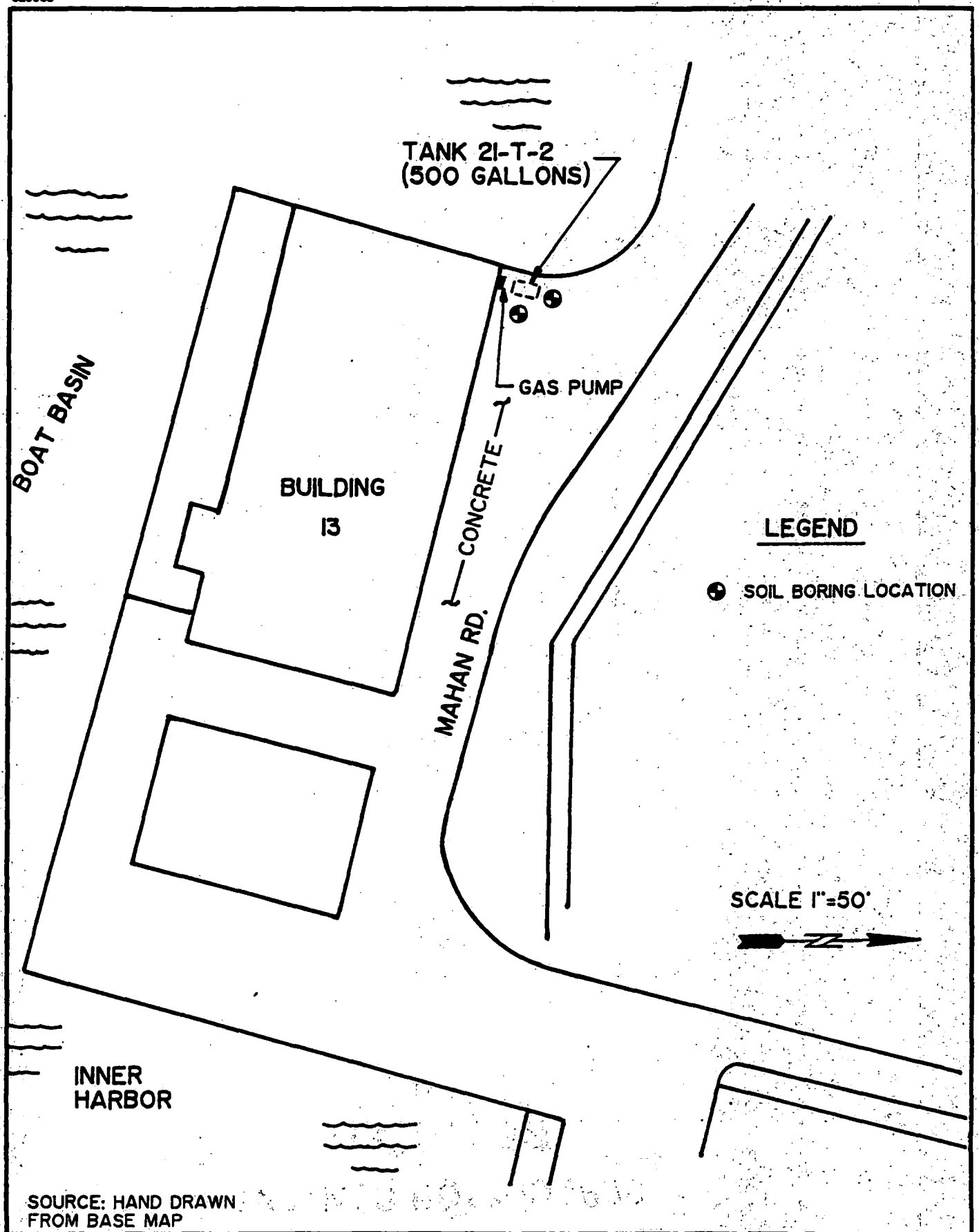

SOURCE: HAND DRAWN
FROM BASE MAP

SEC DONOHUE
Environment & Infrastructure

FIGURE 4- 2
BORING LOCATION MAP
FOR TANK 21- T-2
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS

CTO 0049
20611

DUNCAN-PARNELL, INC. CHARLOTTE, NC 800-769-7788

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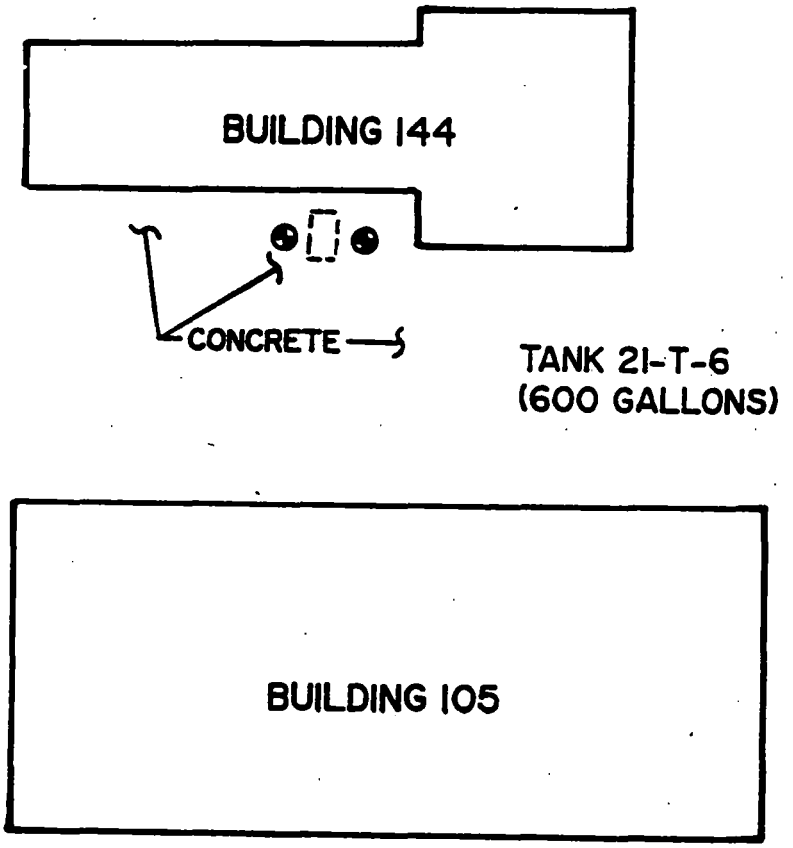

LEGEND

● SOIL BORING LOCATION

SCALE 1"=40'

• SOURCE: HAND DRAWN FROM BASE MAP

SEC DONOHUE
Environment & Infrastructure

FIGURE 4- 3
BORING LOCATION MAP
FOR TANK 21- T-6
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS

CTO 0049
20611

DUNCAN-PARNELL, INC. CHARLOTTE, NC 800-768-7788

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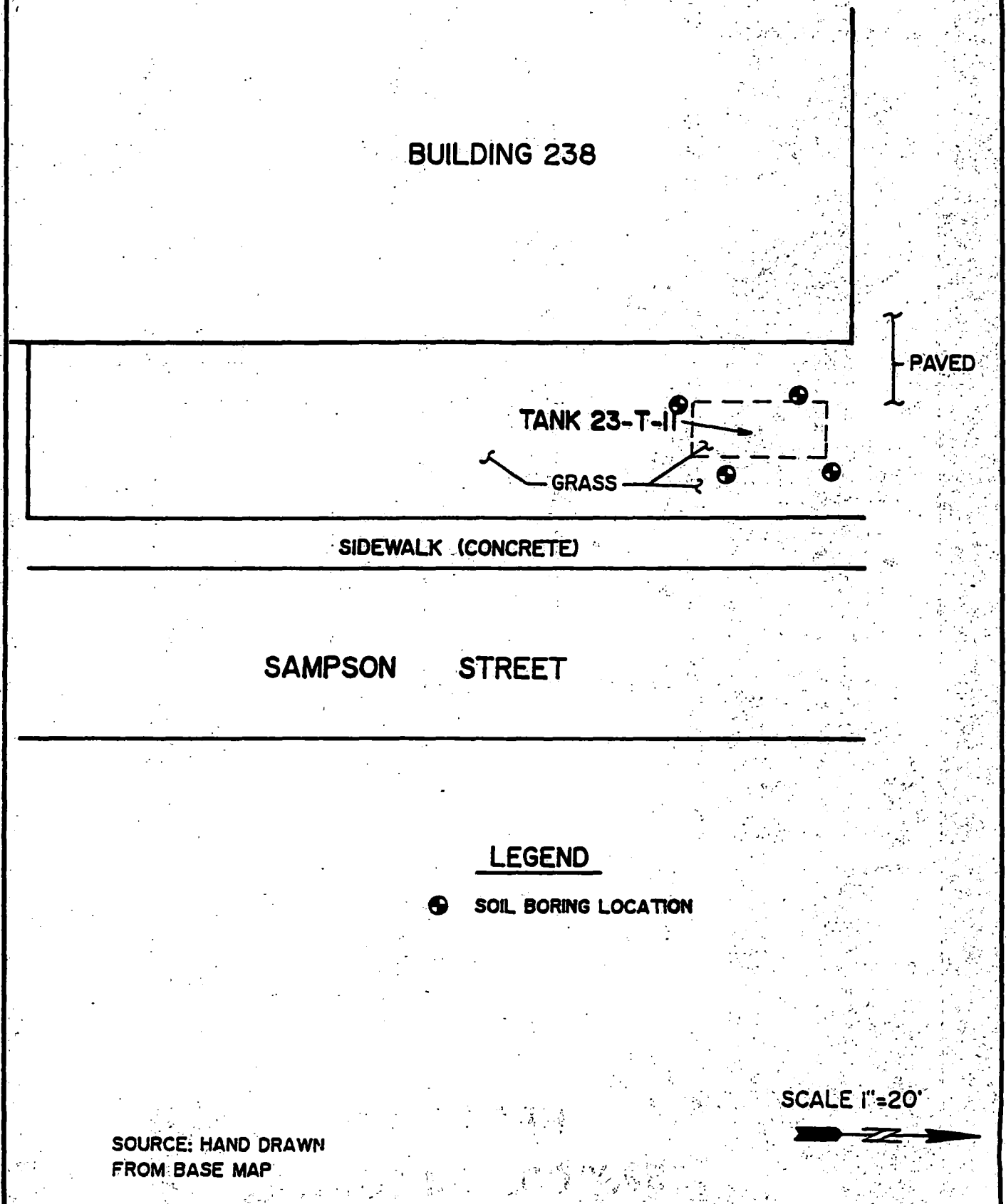

SOURCE: HAND DRAWN FROM BASE MAP

SEC DONOHUE
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FIGURE 4- 4
BORING LOCATION MAP
FOR TANK 23- T-II
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS

CTO 0049
20611

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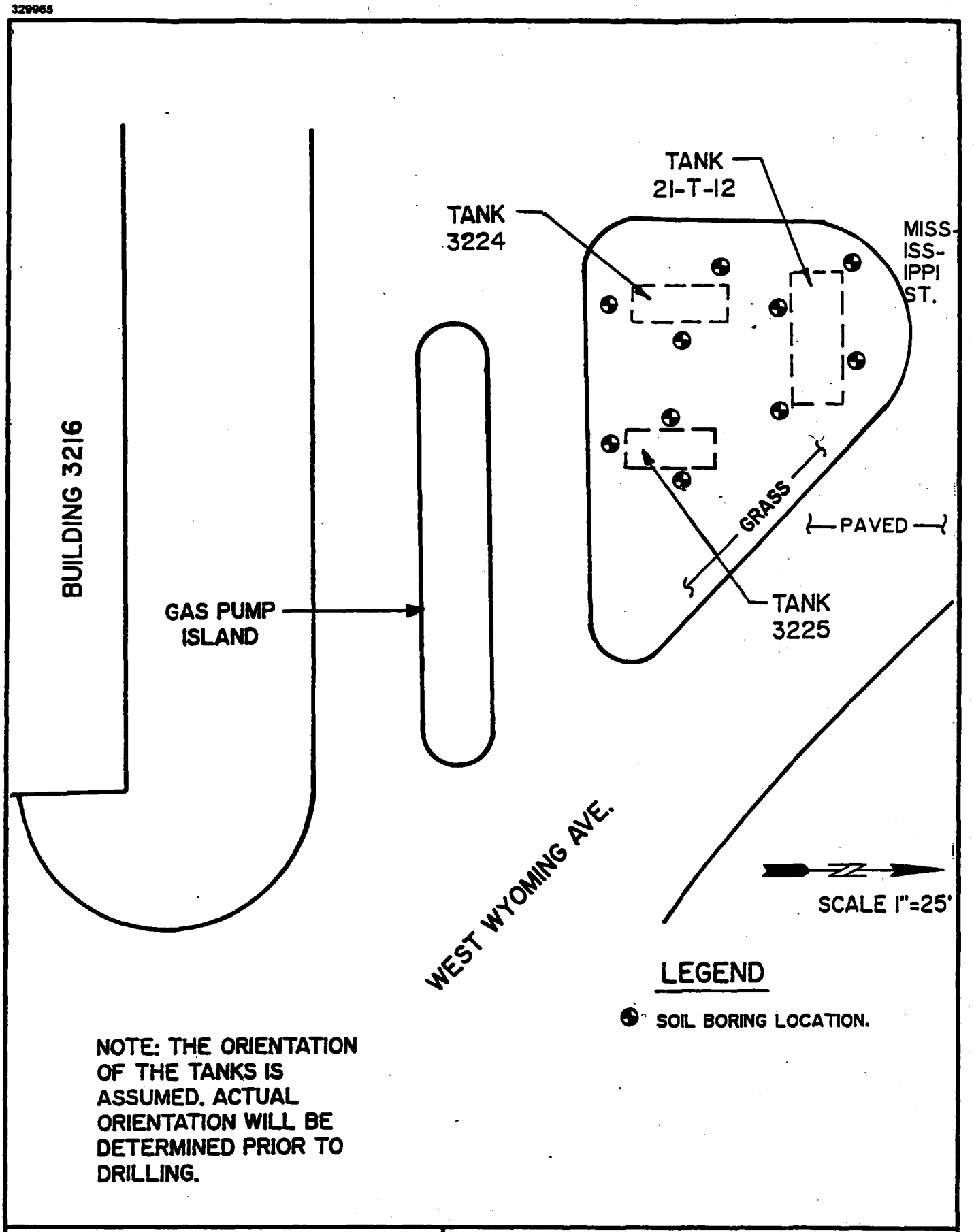

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FIGURE 4- 5
BORING LOCATION MAP FOR
TANKS 21- T-12, 3224 AND 3225

CTO 0049
20611

NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS

DUNCAN-PARNELL, INC. CHARLOTTE, NC 800-768-7768

Continuous split spoon soil samples will be collected at two foot depth intervals from ground surface to the bottom of each boring. Each split spoon sample will be monitored for the presence of organic vapors using a PID or FID by passing the probe of the PID or FID across the soil collected in the split spoon. The results of the PID/FID monitoring will be recorded on boring logs. Each boring will be continued until the water table is reached, or to a maximum depth of 20 feet. The depth to the water table will be recorded on the boring logs. Based upon drilling work previously done at the golf course (shown on Figure 2-2), the depth to the water table at each site is expected to be between 10 and 15 feet.

In addition to PID/FID monitoring, a maximum of three soil samples will be collected for chemical analysis from each soil boring. Two of the soil samples will be collected in the unsaturated zone from depth intervals which have been preliminarily selected based upon the estimated depth to the bottom of each UST (provided in Table 4-1). The third soil sample will be collected from the depth interval immediately above the water table. The FTL will attempt to collect soil samples from the depth intervals presented in Table 4-2. However, the actual depth intervals may change in the field based on PID/FID readings. In a particular soil boring, those depth intervals in the unsaturated zone with the highest PID/FID readings will be submitted to the laboratory for chemical analysis. However, in all soil borings, a soil sample will be collected immediately above the water table and submitted to the laboratory for chemical analysis. The analytical results of this sample will be used to estimate the likelihood of groundwater contamination at each UST site.

At each depth interval where a soil sample for chemical analysis is to be collected, the volatile organic compound (VOC) fraction will be collected first by transferring soil directly from the split spoon sampler into samples jars using a stainless steel spoon, with no mixing. Soil in the VOC sample jars will be compacted as much as possible to minimize head space. All other fractions will be collected by transferring soil from the split spoon sampler to a stainless mixing bowl using a stainless steel spoon. The soil will be stirred in the bowl until a homogeneous mixture is obtained. Rocks will be removed. The soil mixture will be divided into quadrants and aliquots will be taken from each quadrant and placed into the required sample jars. The required sample jars are listed in Table 4-3, the sampling and analysis summary table.

Each of the soil samples for chemical analysis will be tested for parameters that have been selected based upon IEPA cleanup objectives (provided in Table 4-4). For example, for those USTs that contain or have contained diesel fuel, IEPA has established cleanup objectives for the VOCs benzene, ethylbenzene, toluene and xylene (collectively referred to as BETX), and for polynuclear aromatic hydrocarbons (PNAs). Therefore, on this project, soil samples collected from soil borings drilled adjacent to the USTs known

TABLE 4-1

ESTIMATED UNDERGROUND STORAGE TANK DIMENSIONS
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

UST ID	CAPACITY (GALLONS)	DIAMETER(1) (FEET)	APPROXIMATE LENGTH (FEET)	ESTIMATED DEPTH FROM GROUND SURFACE TO BOTTOM OF TANK (FEET)
21-T-2	500	4.0	5.3	7
21-T-6	600	5.3	3.6	8
23-T-11	5,000	6.0	23.6	10
21-T-12	12,000	Unknown	Unknown	12(2)
3224	4,000	Unknown	Unknown	9(2)
3225	2,000	Unknown	Unknown	8(2)

(1) Source: Engineering Science, November 1991, "Testing of Underground Storage Tanks."

(2) Estimate made based on capacity of UST.

R/49WPF/AA3

TABLE 4-2

SAMPLE LOCATIONS, DEPTHS, AND ANALYTICAL PARAMETERS
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

UST ID	NO. OF SOIL BORINGS	MAXIMUM NO. OF FIELD SAMPLES	SAMPLE DEPTH INTERVALS (FEET)	ANALYTICAL PARAMETERS EACH SAMPLE
SOIL SAMPLES FOR CONTAMINATION CHARACTERIZATION				
21-T-2	2	6	8-10 10-12 At Water Table	BETX Total Lead TCLP Lead
21-T-6	2	6	8-10 10-12 At Water Table	Priority Pollutant VOCs, BNAs Pesticide/PCBs, Metals TCLP Metals
23-T-11	4	12	10-12 12-14 At Water Table	BETX PNAs(1)
21-T-12	4	12	10-12 12-14 At Water Table	BETX Total Lead TCLP Lead
3224	3	9	8-10 12-14 At Water Table	BETX PNAs(1)
3225	3	9	8-10 10-12 At Water Table	Priority Pollutant VOCs, BNAs Pesticide/PCBs, Metals TCLP Metals

TABLE 4-2 (Continued)

SAMPLE LOCATIONS, DEPTHS, AND ANALYTICAL PARAMETERS
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

UST ID	NO. OF SOIL BORINGS	NO. OF FIELD SAMPLES	SAMPLE DEPTH INTERVALS (FEET)	ANALYTICAL PARAMETERS EACH SAMPLE
SOIL SAMPLES FOR LANDFILL DISPOSAL TESTING				
21-T-2, 23-T-11, 21-T-12, 3224 and 3225	No additional borings required	1 sample	(2)	Paint Filter Flashpoint TCLP Metals Corrosivity (pH) Reactive Cyanide Reactive Sulfide Total Organic Halogens
21-T-6	No additional borings required	1 sample	(3)	Paint Filter Flashpoint Corrosivity (pH) Total Organic Halogens Reactive Cyanide Reactive Sulfide TCLP Metals Phenol PCB Scan F-listed solvent scan

BNAs - Base/Neutral and Acid Extractable Compounds
BETX - Benzene, Ethylbenzene, Toluene, Xylene
FID - Flame Ionization Detector
PID - Photoionization Detector
PNAs - Polynuclear Aromatic Hydrocarbons
TCLP - Toxicity Characteristic Leaching Procedure
UST - Underground Storage Tank
VOC - Volatile Organic Compounds

TABLE 4-2 (Continued)

SAMPLE LOCATIONS, DEPTHS, AND ANALYTICAL PARAMETERS
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

(1) PNAs include the following compounds: naphthalene, acenaphthene, anthracene, fluoranthene, fluorene, pyrene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(a)anthracene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-c,d)pyrene, acenaphthylene, benzo(g,h,i)perylene, and phenanthrene.

(2) A soil sample will be collected from a depth interval that exhibits organic vapor readings above background as detected by a PID/FID. The sample can be collected from any boring at any of the five UST sites. If none of the soil exhibits organic vapor readings above background, this sample will be collected from the last boring drilled at the last of the five UST sites.

(3) A soil sample will be collected from any depth interval in any boring at UST 21-T-6, as long as the soil exhibits organic vapor readings above background as detected by a PID/FID. If none of the soil exhibits organic vapor readings above background, this sample will be collected from 8-10 feet in the last boring drilled at this UST site.

R/49WPF/AA3

TABLE 4-3

SAMPLING AND ANALYSIS SUMMARY TABLE
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

UST ID	FIELD SOIL SAMPLES	FIELD PARAMETERS	LAB PARAMETERS	METHODS	SAMPLE CONTAINERS	MAXIMUM HOLDING TIMES(1)
21-T-2	6	VOCs by PID/FID	BETX	8240	3 - 60 ml vials	7 days
			Total Lead	6010	One 4 oz glass jar	6 months
			TCLP Lead	1311/6010	One 8 oz glass jar	(2)
23-T-11	12	VOCs by PID/FID	BETX	8240	3 - 60 ml vials	7 days
			PNAs	8310	One 8 oz glass jar	(3)
21-T-12	12	VOCs by PID/FID	BETX	8240	3 - 60 ml vials	7 days
			Total Lead	6010	One 4 oz glass jar	6 months
			TCLP Lead	1311/6010	One 8 oz glass jar	6 months
3224	9	VOCs by PID/FID	BETX	8240	One 8 oz glass jar	7 days
			PNAs	8310	One 8 oz glass jar	(3)
3225	9	VOCs by PID/FID	Priority Pollutant			
			VOCs	8240	3 - 60 ml vials	14 days
			BNAs	827/8310	One 8 oz glass jar	7 days to extraction
			Pesticides/PCBs	8080	One 8 oz glass jar	7 days to extraction
			Metals	(4)	One 8 oz glass jar	6 mos, merc. 28 days
			TCLP Metals	1311/6010	One 8 oz glass jar	(2)
Sample from above 5 tanks	1*	VOCs by PID/FID	Paint Filter	9095	One 8 oz glass jar	28 days
			Flashpoint	1010	One 8 oz glass jar	28 days
			TCLP Metals	1311/6010	One 8 oz glass jar	(2)
			Corrosivity (pH)	9045	One 8 oz glass jar	14 days
			Reactive Cyanide	7.3.3.2		14 days
			Reactive Sulfide	7.3.4.1		14 days
			Total Organic Halogens	9020	One 8 oz glass jar	14 days

TABLE 4-3 (Continued)

SAMPLING AND ANALYSIS SUMMARY TABLE
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

UST ID	FIELD SOIL SAMPLES	FIELD PARAMETERS	LAB PARAMETERS	METHODS	SAMPLE CONTAINERS	MAXIMUM HOLDING TIMES(1)
21-T-6	6	VOCs by PID/FID	Priority Pollutant			
			VOCs	8240	3 - 60 ml vials	14 days
			BNAs	827/8310	One 8 oz glass jar	7 days to extraction
			Pesticides/PCBs	8080	One 8 oz glass jar	7 days to extraction
			Metals	(4)	One 8 oz glass jar	6 mos, merc. 28 days
			TCLP Metals	1311/6010	One 8 oz glass jar	(2)
	1*	VOCs by PID/FID	Paint Filter	9095	One 8 oz glass jar	28 days
			Flashpoint	1010	One 8 oz glass jar	28 days
			Reactive Cyanide	7.3.3.2	One 8 oz glass jar	14 days
			Reactive Sulfide	7.3.4.1		14 days
			Corrosivity (pH)	9045		14 days
			Phenol	9065	One 8 oz glass jar	28 days
			PCB Scan	8080	One 8 oz glass jar	(3)
			F-listed Solvent Scan	8240/8270	Two 8 oz glass jars	(3)
			Total Organic Halogens	9020	One 8 oz glass jar	14 days
			TCLP Metals	1311/6010	One 8 oz glass jar	(2)

Note: Methods are identified from Test Methods for Evaluating Solid Waste, USEPA - SW846, Third Edition, November 1986

* This soil sample will be tested for landfill disposal parameters.

Preservations requirement for all samples is to cool to 4°C.

QUALITY CONTROL SAMPLES

One trip blank is required with every shipping container with soil or water samples for VOC and/or BETX analysis.

Field duplicate samples will be collected at a frequency of one per ten soil samples collected.

Rinsate blanks will be collected at a rate of one per day. However, only samples from every other day will be analyzed. The sampling team will designate which rinsate blank samples are to be analyzed.

Field blanks will be prepared at a rate of one per source of decontamination water per sampling event.

TABLE 4-3 (Continued)

SAMPLING AND ANALYSIS SUMMARY TABLE
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

BNAs	-	Base/Neutral and Acid Extractable Compounds
BETX	-	Benzene, Ethylbenzene, Toluene, Xylene
FB	-	Field Blank
FD	-	Field Duplicate
PCB	-	Polychlorinated Biphenyl
PID/FID	-	Photoionization Detector/Flame Ionization Detector
PNAs	-	Polynuclear Aromatic Compounds
RB	-	Rinsate Blank
TCLP	-	Toxicity Characteristic Leachate Procedure
VOCs	-	Volatile Organic Compounds

(1) Holding times are as defined in 40 CFR 136 for water samples. The same holding times will be used for soil samples.
(2) 180 days to TCLP extraction, 180 days to analysis. Mercury - 28 days to TCLP extraction, 28 days to analysis.
(3) 7 days to extraction, 40 days to analysis.
(4) Methods 6010/7060/7421/7471/7740

R/49WPF/AA4

TABLE 4-4

IEPA GENERIC SOIL CLEANUP OBJECTIVES
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

TYPE OF UST	APPLICABLE SOIL CLEANUP OBJECTIVES (mg/kg)	
Unleaded Gasoline	Benzene	0.005
	BETX	11.705
Leaded Gasoline	Benzene	0.005
	BETX	11.705
	TCLP Lead	Determined on a Site by Site Basis
No. 2 Diesel Fuel	Benzene	0.005
	BETX	11.705
	Napthalene	0.025
	Acenaphthene	8.4
	Anthracene	42.0
	Fluoranthene	5.6
	Fluorene	5.6
	Pyrene	4.2
	Total Carcinogenic PNAs	0.004
	Total Non-Carcinogenic PNAs	4.2
Waste Oil	Priority Pollutant	Determined on a Site by Site Basis
	VOCs, BNAs, Pest/PCBs, Metals	
	TCLP Metals	

Source: "Leaking Underground Storage Tank Manual," IEPA, September 1991.

Acronyms:
- BETX - Benzene, Ethyl Benzene, Toluene, and Xylene
- BNAs - Base/Neutral/Acid Extractable Compounds
- Pest/PCBs - Pesticide/Polychlorinated Biphenyls
- PNAs - Polynuclear Aromatic compounds
- TCLP - Toxicity Characteristic Leaching Procedure
- UST - Underground Storage Tank
- VOCs - Volatile Organic Compounds

CTO49/GRLKS/WPF/FEB93

to have formerly contained diesel fuel (tanks 23-T-11 and 3224) will be analyzed BETX and PNAs. The same rationale holds for the parameters selected for samples collected at the gasoline UST sites (tanks 21-T-2 and 21-T-12) and the waste oil UST site (tank 21-T-6). Because the contents of UST 3225 are not known for certain, soil samples collected from soil borings drilled adjacent to this tank shall be analyzed for the most conservative parameter list, which is the list established for waste oil tanks.

At UST site 21-T-6 (the waste oil UST), one additional soil sample will be collected to be analyzed for the landfill disposal parameters listed in Table 4-2. The sampling team will collect the sample from soil which exhibits PID/FID readings above background. If none of the soil collected at this UST site exhibit PID/FID readings above background, the sample will be collected from 8-10 feet (near the expected bottom of this UST) in the second boring.

For the other five USTs, one soil sample will be collected to be analyzed for the landfill disposal parameters listed in Table 4-2. The sampling team will collect the sample from soil from any of the five UST sites which exhibit PID/FID readings above background. If none of the soil collected at the five UST sites exhibits PID/FID readings above background, the soil sample will be collected from the last boring drilled at the last UST site.

Upon completion of a soil boring, the borehole will be backfilled to ground surface with bentonite grout. Any excess drill cuttings which exhibit measurable organic vapors above background on a PID/FID will be containerized as described in Section 4.9. Concrete surface cover will be restored if previously present.

If the soils collected from a soil boring at a particular UST site are found to be saturated with petroleum product, or if free petroleum product is observed in a recovered split spoon, the FTL will contact the HALLIBURTON NUS Team Project Manager. The Project Manager, in consultation with the Navy RPM, will make a decision whether to place additional borings at that UST site.

4.5.4 Decontamination

The drilling subcontractor will supply the materials and tools necessary to construct a temporary decontamination pad at a location or locations central to the UST sites and designated by the Navy. The decontamination pad will be constructed in a manner to allow washwater and rinsewater to be collected in a sump which will be located at one end of the pad. A pump will then be used to transfer collected liquid from the sump into 55-gallon drums or into a larger tank (refer to Section 4.9).

Before arrival at NTC, and prior to exit from NTC, the drill rig and auger flights will be decontaminated using a power spray washer. Auger flights will also be decontaminated between soil boring locations.

Sampling equipment, such as split spoon samplers and mixing bowls, will be decontaminated at each individual UST drilling location. The decontamination procedure for the sampling equipment will be:

1. Alconox or Liquinox soap and tap water wash.
2. Tap water rinse.
3. Isopropanol rinse.
4. Two distilled water (ASTM Type II) rinses.

Washwater and rinsewater generated during sample equipment decontamination will be containerized in 5-gallon buckets at each UST site. At the end of work each day, the 5-gallon buckets will be covered with tight fitting lids and transported to the temporary, central decontamination pad where the buckets will be emptied into 55-gallon drums or a larger tank.

Isopropanol rinse will be kept separated from washwater and rinsewater. The isopropanol will be allowed to evaporate throughout the duration of the project. Any isopropanol remaining at the end of the project will be added to a 55-gallon drum or a larger tank containing wash and rinse waters.

4.5.5 Quality Control

In order to verify the quality of the soil sampling process, field duplicates, rinsate blanks, field blanks, and trip blanks will be collected.

Field duplicate soil samples will be collected at the same time and in the same manner as the original soil sample, and at a rate of one per ten field samples. If there is not enough material in the mixing bowl to fill a second set of jars, a second split spoon will be driven to the same depth interval as close as possible to the original borehole location to collect additional soil for the duplicate sample.

Rinsate blank samples will be collected by pouring distilled water (ASTM Type II) through decontaminated split spoon sample tubes and allowing the runoff to fill required sample containers. One rinsate blank sample will be collected each day. However, the samples will be analyzed by the laboratory every other day. The sampling team will specify on Chain of Custory forms which rinsate blank samples are to be analyzed.

Field blank samples will be collected from each different source of water used for decontamination by pouring the source water directly into required sample containers.

Trip blanks are defined as samples which originate from analyte-free water taken from the laboratory to the sampling site and returned to the laboratory for VOC analysis. Trip blanks will be collected and analyzed for VOCs at the rate of one trip blank per shipping container containing samples for VOC or BETX analysis.

4.5.6 Documentation

Soil boring information and other observations made by the sampling team will be recorded in a project logbook and on the appropriate field forms included in Appendix C. Photographs of drilling and sampling activities will be taken, developed and labeled with adhesive description labels. A sample tracking logbook will be maintained by the FTL. This logbook will contain the items bulleted in Section 4.7.

4.6 SAMPLE IDENTIFICATION SYSTEM

Soil samples will be identified using the following system.

Field 1: Project Identification ("GL###" for Great Lakes, CTO###. For example, if the RI CTO is CTO No. 115, the Project Identification will be GL115).

Field 2: Soil Boring Number (Soil borings completed during the RI will be numbered sequentially from SB01 through SB18).

Field 3: Soil Sample Depth Interval (6-8 or 10-12 (feet), for example).

Examples of specific soil sample identifications are as follows:

GL###-SB04-6-8	Great Lakes, CTO###, soil boring 4, depth interval of 6 to 8 feet.
GL###-SB12-10-12	Great Lakes, CTO###, soil boring 12, depth interval of 10 to 12 feet.

Field duplicate samples will be identified so that the laboratory is unaware the sample is a field duplicate. This will be accomplished by assigning field duplicate samples a "dummy" depth interval. The FTL will record in the field logbook the locations of all field duplicate sample pairs.

Rinsate blank samples will have an identification code of "RB" followed by a numerical code which will be assigned in sequential order (for example, sample GL###/RB/05 is the fifth rinsate blank sample collected during the project).

Field blank samples will have an identification code of "FB" followed by a numerical code which will be assigned in sequential order (for example, sample GL###/FB/03 is the third field blank sample collected during the project).

Trip blank samples will have an identification code of "TB" followed by a numerical code which will be assigned in sequential order (for example, sample GL###/TB/06 is the sixth trip blank sample collected during the project).

4.7 SAMPLE HANDLING

The FTL is responsible for the care and custody of the samples collected until they are given to a carrier for shipment to the laboratory.

A label will be affixed to the sample container of each soil sample to be submitted to the laboratory for chemical analysis. The following information shall be included on the sample label:

- Site name.
- Sample identification number using the previously identified system.
- Date and time of sample collection.
- The initials of the sampler.
- Sample preservative used, if any.
- The types of analyses to be conducted.

A Chain of Custody (COC) Form will be completed in the field and will accompany the samples at all times. An example COC Form is included in Appendix C. The COC Forms will contain the following minimum information:

- Project name.
- Signature of samplers.
- Sample identification number.
- Grab or composite sample designation.
- Description of the sample location.
- Signatures of individuals involved in sample collection and packaging.
- Sample matrix.
- Sample preservative used, if any.
- Sample analyses.
- Carrier airbill numbers.

COC Forms will be completed legibly using waterproof ink.

The FTL will maintain a sample tracking logbook throughout the duration of the project. This sample logbook is separate from the field logbook. Information to be included in the sample tracking logbook includes:

- Date of sample collection.
- Time of sample collection.
- Initials of sampler.
- Sample identification number.
- Sample matrix.
- Analyses.
- Sample jar label number, if any.
- Date shipped.
- Laboratory.
- Carrier airbill number.

4.8 SAMPLE PACKAGING AND SHIPPING

Shipping containers will be secured using reinforced strapping tape and custody seals to help ensure that samples have not been disturbed during transport. Packaging of samples will be accomplished as follows.

An adhesive sample label will be attached to each sample container. Each sample container will then be placed in an appropriately sized Ziploc® bag and sealed. Bagged samples will be placed in foam shipping sleeves or wrapped with bubble wrap.

An appropriately sized, insulated, metal or plastic shipping container will be selected, and the drain plug will be taped on the inside and outside with tape. Samples (in sleeves or bubble wrap) will then be placed into the shipping container. To keep the samples at 4° C, the containers will be surrounded on the bottom, sides and top with ice. Ice will be placed in Ziploc® bags so that water will not fill the cooler as the ice melts. COC Forms will be placed in plastic Ziploc® bags and taped to the inside of the shipping container lid.

The closed shipping container will be taped with reinforced strapping tape in two locations. Custody seals will be placed on opposite corners of the shipping container so that the seals will break when the shipping container is opened. The seals will be covered with clear tape.

A label marked "Environmental Samples" will be placed on top of the shipping container. Appropriate sides of the shipping container will be marked "This End Up" and arrows will be added accordingly.

Shipping containers will be shipped to the project laboratory on the same day that the samples were collected through a reliable commercial carrier, such as Federal Express, Emery, or Purolator. Arrangements will be made with the laboratory to accept Saturday delivery of samples.

4.9 WASTE DISPOSAL

It is anticipated that the following IDW will be generated during this project:

- Decontamination fluids.
- Drill cuttings.
- Used personal protective equipment (PPE).

IDW will be handled in the following manner:

- Decontamination fluids. A decontamination pad will be constructed at a location designated by the Navy. Decontamination fluids will be collected in a sump located at one end of the decontamination pad. A pump will be used to pump the decontamination fluids from the sump into 55-gallon drums or into a larger tank. The containerized decontamination fluid will be stored in a secure storage area to be designated by the Navy. Washwater and rinsewater generated during decontamination of sampling equipment at the individual UST sites will be added to the drums or larger tank in the storage area on a daily basis. Any isopropanol which has not evaporated by the end of the project, will be added to these drums as well. The containerized fluids will be discharged to the NTC sanitary sewer system, with prior permission.

- Drill cuttings. When a soil boring is completed, the borehole will be filled with cement bentonite grout to ground surface at the boring location. Drill cuttings will be spread on the ground surface at the boring location, except for those cuttings which exhibit visual signs of petroleum contamination, or which exhibit organic vapors detectable above background levels with a PID/FID. These cuttings will be drummed for off-site disposal. Drums containing drill cuttings will be labeled and placed in a secure storage area to be designated by the Navy.

- PPE. According to IEPA, PPE generated during environmental investigations is classified as an IEPA special waste. Therefore, all PPE will be containerized.

The Navy will be responsible for removal and proper disposal of all accumulated IDW following completion of the field investigation program. A detailed inventory of project-related IDW will be provided to the Navy prior to completion of the RI. IDW will be kept to a minimum.

5.0 QUALITY ASSURANCE PROJECT PLAN

This Quality Assurance Project Plan (QAPP) describes the policies, organization, goals, functional activities (sample collection, chemical analyses, etc.), and generally accepted QA/QC protocols required to achieve the Data Quality Objectives (DQOs) for the UST RI at NTC.

5.1 QUALITY ASSURANCE OBJECTIVES

Achieving the intended project objectives requires that data collected from the field conform to an appropriate level of quality. The quality of a data set is measured by certain characteristics of the data, namely; precision, accuracy, representativeness, completeness, and comparability (PARCC). The PARCC goals for a particular project are determined by the intended use of the data, usually referred to as DQOs. DQOs are discussed in Section 5.1.1 and the PARCC parameters are discussed in Section 5.1.2. All laboratory analyses will be performed by a laboratory that has been approved by NEESA and Southern Division.

5.1.1 Data Quality Objective

The DQO level proposed for this project is Level C, as defined by NEESA in "Sampling and Chemical Quality Assurance Requirements for the Navy Installation Restoration Program" (NEESA, 1988).

Level C is to be used for sites near a populated area, not on the National Priorities List, and not likely to be undergoing litigation. Level C includes review of laboratory QA and the site Work Plan. The laboratory must successfully analyze a performance sample, undergo an audit, correct deficiencies found during the audit, and provide monthly progress reports on QA. The laboratory must have passed the performance sample furnished by the Superfund Contract Laboratory Program (CLP) in the past year (NEESA, 1988).

5.1.2 PARCC Parameters

The PARCC goals for the work covered by this Work Plan are discussed in the following sections. The information obtained in reviewing the PARCC parameters will be incorporated into the RI report.

5.1.2.1 Precision and Accuracy

Precision and accuracy characterize the amount of variability and bias inherent in a data set. Precision describes the reproducibility of measurements of the same parameter for a sample under the same or similar conditions. Precision is expressed as a range (the difference between two measurements of the same parameter) or as a relative percent difference (the range relative to the mean, expressed as a percent). Range and Relative Percent Difference (RPD) values are calculated as follows:

$$\text{Range} = OR - DR$$

and

$$RPD = \frac{OR - DR}{1/2\,(OR + DR)} \times 100\%$$

where:

OR = original sample result
DR = duplicate sample result

The internal laboratory control limits for precision are three times the standard deviation of a series of RPD or range values. RPD values may be calculated for both laboratory and field duplicates, and can be compared to the control limits as a QA check.

Accuracy is the comparison between experimental and known or calculated values expressed as a percent recovery (%R). Percent recoveries are derived from analysis of standards spiked into deionized water (standard recovery) or into actual samples (matrix spike or surrogate spike recovery). Recovery is calculated as follows:

$$\%R = \frac{E}{T} \times 100\%$$

where:

E = Experimental result
T = True value or theoretical result

with

$$T = \frac{(\text{Sample aliquot})\,(\text{Sample conc.}) + (\text{Spike aliquot})\,(\text{Spike conc.})}{\text{Sample aliquot}}$$

Control limits for accuracy are set at the mean plus or minus three times the standard deviation of a series of %R values. Organic %R values are set at the mean plus or minus two times the standard deviation.

Field and laboratory precision and accuracy performance can affect the attainment of project objectives, particularly when compliance with established criteria is based on laboratory analysis of environmental samples. Such criteria are used in risk assessment and screening of remedial alternatives. Given the uncertainties associated with field work and laboratory activity, the following overall precision and accuracy goals are identified to meet the project objectives:

- Precision: $\pm$50 percent RPD
- Accuracy: $\pm$50 percent R

Analytical precision and accuracy will be evaluated upon receipt of the laboratory data. Analytical precision will be measured as the relative standard deviation of the data from the laboratory (internal) duplicates. Analytical accuracy measures the bias as the percent R from matrix spike and surrogate spike samples.

Field sampling precision and accuracy are not easily measured. Field contamination, sample preservation, and sample handling will affect precision and accuracy. By following the procedures described in the FSP, precision and accuracy errors associated with field activities can be minimized. Field duplicates, equipment rinsate blanks, and field blanks will be used to estimate field sampling and accuracy.

No project resources will be expended to develop precision and accuracy data for method (field or analytical) validation except those commonly applied for collection of routine QA/QC data. Routine QA/QC data will include analyses from field duplicates and equipment rinsate blanks based on the existing guidance that specifies the type and proportion of samples submitted for QA/QC (NEESA, 1988).

Validity of data with respect to its intended use will be assessed based on laboratory-supplied QA/QC data and protocols outlined in EPA's National Functional Guidelines for Validating Data. In general, results that are rejected by the validation process will be disqualified from application to the intended use. Qualified data will be used to the greatest extent practicable.

5.1.2.2 Representativeness

Representativeness describes the degree to which analytical data accurately and precisely define the material being measured. Several elements of the sampling and sample handling process must be controlled to maximize the representativeness of the analytical data. Sample collection, preservation, and storage are discussed in Section 4.0 of this document. The sampling program is designed to ensure that the data obtained during the RI accurately represent the site conditions.

To ensure that sample aliquots to be analyzed are representative, samples will be homogenized in the laboratory by removing non-representative materials (e.g., sticks and stones), then stirring, shaking, crushing, and/or blending the sample as appropriate to the matrix.

5.1.2.3 Completeness

Completeness describes the amount of data generated that meets the objectives for precision, accuracy, and representativeness versus the amount of data expected to be obtained. For relatively clean, homogeneous matrices, 100 percent completeness is expected. However, as matrix complexity and heterogenicity increase, completeness may decrease. Where analysis is precluded or where DQOs are compromised, effects on the overall investigation must be considered. Whether or not any particular sample is critical to the investigation will be evaluated in terms of the sample location, the parameter in question and the intended data use.

5.1.2.4 Comparability

One of the objectives of the QAPP is to provide analytical data of comparable quality between sample locations. Both analytical procedures and sample collection techniques will maximize the comparability of the RI data within this investigation.

5.1.3 Quality Control Samples

The QC samples to be collected during the sampling effort are identified below. Each type of field quality control sample will undergo the same preservation, holding times, analysis, reporting, and validation as the field samples. Field QC samples will be collected in accordance with "Sampling and Chemical Quality Assurance Requirements for the Navy Installation Restoration Program" (NEESA, 1988).

5.1.3.1 Field Duplicates

Field duplicate results are used to assess the combined field and laboratory precision. The results are anticipated to exhibit more variability than laboratory duplicates, which measure only laboratory precision. Field duplicate samples will be collected at a frequency of ten percent per sample matrix. Field duplicate results will be compared to assess sample homogeneity, handling, shipping, storage, preparation, and analysis.

5.1.3.2 Trip Blanks

Trip blanks are defined as samples which originate from analyte-free water taken from the laboratory to the sampling site and returned to the laboratory for VOC analysis. Trip blanks will be collected and analyzed at the rate of one trip blank per shipping container containing soil samples for VOC or BETX analysis.

5.1.3.3 Equipment Rinsate Blanks

Equipment rinsate blanks are obtained under representative field conditions by running analyte-free deionized water through sample collection equipment after decontamination and prior to use, and collecting the runoff in the appropriate sample containers for analysis. These samples are used to assess the effectiveness of decontamination procedures. Rinsate blanks will be prepared at the rate of one per day during soil sampling events. However, only samples from every other day will be analyzed. The sampling team will specify which rinsate blank samples are to be analyzed. Rinsate blanks will be analyzed for the same parameters as the related samples.

5.1.3.4 Field Blanks

Field blanks will consist of the source water used in decontamination and will be prepared at the rate of one per source of water per sampling event. Field blanks will be analyzed for the same parameters as the related samples.

5.1.3.5 Method Blanks

Method blanks are generated within the laboratory during the processing of the actual samples. These blanks are processed using the same reagents and procedures and at the same time as the actual samples. Contamination found in a method blank would indicate that similar contamination found in the samples may have been introduced in the laboratory and is not actually present in the original samples. Method blanks will be prepared and analyzed for VOCs at a frequency of one per analytical batch, or one per 12-hour analysis period, whichever is greater. Method blanks will be prepared and analyzed for all other samples at a frequency of one per 20 samples or one per day, whichever is greater.

5.1.3.6 Laboratory Duplicates

Duplicate samples prepared in the laboratory account for analytical variability, only. Laboratory duplicates are prepared by splitting duplicate samples and analyzing the resulting samples following the same procedures.

For organic analyses, the laboratory duplicates are analyzed as field duplicates and matrix spike/matrix spike duplicates, as discussed in Section 5.1.3.1 and 5.1.3.7. Assessment of duplicate results will be consistent with USEPA and NEESA guidelines.

For inorganic analyses, laboratory duplicates will be analyzed from each group of samples of a similar matrix type and concentration. Laboratory duplicate results will be assessed in accordance with USEPA and NEESA guidelines.

5.1.3.7 Matrix Spikes and Matrix Spike Duplicates

Matrix spikes are prepared by adding a known quantity of analyte into an actual field sample. The matrix spike is prepared and processed as specified in the cited methods (Table 5-1). Recovery of the spike reflects the ability to accurately determine the quantity of the analyte in that particular sample.

Matrix spike results are expressed in terms of percent recoveries. Matrix spike recoveries must fall within the established control limits specified in the cited methods (Table 5-1).

Matrix spike duplicates are identical to matrix spikes. Another aliquot of the same field sample used for the matrix spike is fortified with an identical quantity of analyte and processed in an identical manner. In addition to providing a measure of the accuracy of the determination, the results of the matrix spike and matrix spike duplicate provide a measure of the precision of the determinations. The precision is expressed as the RPD. RPDs must fall within the established control limits specified in the cited methods (Table 5-1).

For organic analyses, samples for matrix spike/matrix spike duplicate analyses will be collected at as frequency of one per every ten samples. For all other analyses, samples for matrix spikes will be collected at a frequency of one per every 20 samples.

5.2 SAMPLING PROCEDURES

Field sampling will be conducted in accordance with the applicable sections of the FSP. Allowable sample holding times, preservation, and sample container requirements are outlined in Table 4-3 in the FSP.

TABLE 5-1

SUMMARY OF ANALYTICAL METHODS
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

Analysis	Method(1)
BETX	8240
PNAs	8310
TCLP Lead	1311/6010
VOCs	8240
BNAs	8270
Pesticide/PCBs	8080
Metals	6010, 7060, 7421, 7471, 7740
TCLP Metals	1311/6010
Paint Filter	9095
Flashpoint	1010
Reactive Cyanide	7.3.3.2
Reactive Sulfide	7.3.4.1
Corrosivity (pH)	9045
Phenol	9065
F-Listed Solvents	8240, 8270
Total Organic Halogens	9020

(1) Test Methods for Evaluating Solid Waste, USEPA, SW846, Third Edition, November, 1986 and updates.

BETX - Benzene, Ethylbenzene, Toluene, Xylene
BNAs - Base/Neutral and Acid Extractable Compounds
PCBs - Polychlorinated Biphenyls
PNAs - Polynuclear Aromatic Hydrocarbons
TCLP - Toxicity Characteristic Leaching Procedure
VOCs - Volatile Organic Compounds

R/49WPF/AA3

5.3 SAMPLE IDENTIFICATION

As samples are collected and containerized in the field, a label will be affixed to the sample jars. The information to be recorded on the sample labels is listed in Section 4.7 of the FSP.

Each sample will be identified by a unique alphanumeric code which is described in the FSP. Information necessary to identity each sample, and the corresponding sample code, will be recorded in the field logbook. Sampling locations will be recorded on a scale map of the site.

After collection, preservations and labeling, the sample will be maintained under the COC procedures discussed below.

5.4 CHAIN OF CUSTODY PROCEDURES

COC procedures are intended to maintain and permanently document sample possession from the time of collection to disposal, in accordance with federal guidelines. A sample is considered to be under custody if:

- It is in the possession of the sampler/analyst.
- It is in view, after being in the possession of the sampler/analyst.
- It was in possession of the sampler/analyst and was then placed by the sampler/analyst in a secure location.
- It is in a designated secure area.

The COC Form will be initiated in the field for all samples collected. The information to be recorded on the COC Form is listed in Section 4.7 of the FSP.

The field custodian will: sign; enter the date, time, and custody seal numbers on the COC Form; tear off and retain the pink copy; and place the white (original) and yellow copies in a sealed plastic bag that is taped to the inside lid of the shipping container. Each shipping container will be sealed with custody seals, which are signed and dated by the sample custodian.

All custodians will sign and date the COC Form when they assume custody of the sample container, and again when they have relinquished custody to someone else. The shipper's airbill will be retained by the last custodian prior to shipment.

The laboratory sample custodian will receive and sign the COC Form for the laboratory, and record the date, time, and custody seal numbers. The laboratory login record will explicitly state the condition of the custody seals, any evidence of damage, whether the seal is airtight, and the completeness of accompanying records. After inspection, each sample will be logged in and assigned a unique laboratory sample identification number. In addition, the following information will be entered in the logging system for each sample:

- Field sample identification number.
- Date received.
- Project name and number.
- Collection date.
- Sample type.
- Condition of sample.
- Sample pH.
- Temperature of sample cooler (if samples were stored on ice).
- Analyses to be preformed.
- Assigned storage location.

The laboratory sample custodian will notify the laboratory project director if samples are received that are damaged, warm, frozen, or incompletely documented. The laboratory project director or laboratory program coordinator will contact the HALLIBURTON NUS Team Project Manager with any discrepancies. If samples cannot be analyzed within the holding times, the Project Manager will be notified so recollection can occur as necessary.

5.5 CALIBRATION PROCEDURES

5.5.1 Field Instrumentation

Field equipment requiring calibration will be calibrated and operated in accordance with the manufacturer's instructions and manuals. At a minimum, calibration will be performed at the start of field activities each day. Recalibration will take place if necessary during the course of each day. The calibration results for each field instrument will be recorded in the field logbook and on appropriate field data sheets.

5.5.2 Laboratory Instrumentation

Calibration is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet the necessary detection limits. All laboratory instrumentation will be calibrated according to the analytical method being utilized. Once a laboratory has been selected for this project, a copy of the laboratory's QA program manual will be supplied to the Navy RPM.

5.6 ANALYTICAL PROCEDURES

Environmental samples collected during the field investigations covered by this Work Plan will be analyzed by a NEESA-approved laboratory under a Basic Ordering Agreement (BOA) with the HALLIBURTON NUS Team. All analytical procedures will conform to established methods approved by USEPA and meet NEESA Level C as defined by "Sampling and Chemical Quality Assurance Requirements for the Navy Installation Restoration Program" (NEESA, 1988). The methods of analysis are those shown in Table 5-1. Tables 5-2 through 5-7 provide specific compounds for PNAs, priority pollutant parameters, and F-listed solvents.

5.7 DATA REDUCTION, VALIDATION AND REPORTING

5.7.1 Laboratory Data Review

The Laboratory QC Coordinator will be responsible for performing data review in the laboratory. The precision and accuracy of data will be computed and compared to the control limits as part of the data review process. Precision is determined from the analytical results of duplicate samples. Accuracy is computed from spike recoveries.

5.7.2 Analytical Records

All results will be reported in accordance with the referenced methodology (Table 5-1) and should include all deliverables as outlined in Section 5.7.3.

5.7.3 Data Deliverables

A report narrative should accompany each submission, summarizing the contents, results and all relevant circumstances of the work. The following data deliverables are required from the laboratory:

- Analyses requested
- Sample Identification
  - Date and time collected.
  - Date extracted and/or digested.
  - Date and time analyzed.
  - COC documentation; including sample login and tracking information.

TABLE 5-2

POLYNUCLEAR AROMATIC HYDROCARBONS
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

Polynuclear Aromatic Hydrocarbons (PNAs)

- Acenaphthene
- Anthracene
- Fluoranthene
- Fluorene
- Naphthalene
- Pyrene

Carcinogenic PNAs

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Chrysene
- Dibenzo(a,h)anthracene
- Benzo(k)fluoranthrene
- Indeno(1,2,3-c,d)pyrene

Non-Carcinogenic PNAs

- Acenaphthylene
- Benzo(g,h,i)perylene
- Phenanthrene

Source: Leaking Underground Storage Tank Manual (IEPA, September 1991).

R/49WPF/AA3

TABLE 5-3

PRIORITY POLLUTANT
VOLATILE ORGANIC COMPOUNDS
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

Acrolein
Acrylonitrile
Benzene
Carbontetrachloride
Chlorobenzene
1,1-Dichloroethane
1,2-Dichloroethane
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
Chloroethane (Ethyl Chloride)
2-Chloroethylvinyl Ether
Chloroform
1,1-Dichloroethylene
Trans-1,2-dichloroethylene
1,2-Dichloropropane
Cis-1,3-Dichloropropene
Trans-1,3-Dichloropropene
Ethyl benzene
Methylene Chloride (Dichloromethane)
Methyl Chloride (Chloromethane)
Methyl Bromide (Bromomethane)
Bromoform
Dichlorobromomethane
Chlorodibromomethane
Tetrachloroethylene
Toluene
Trichloroethylene
Vinyl Chloride (Chloroethylene)

R/49WPF/AA3

TABLE 5-4

TOXICITY CHARACTERISTIC LEACHING PROCEDURE METALS
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

Arsenic
Barium
Cadmium
Chromium
Lead
Mercury
Selenium
Silver

R/49WPF/AA3

CTO49/GRLKS/WPF/FEB93

TABLE 5-5

PRIORITY POLLUTANT
BASE/NEUTRAL AND ACID EXTRACTABLE COMPOUNDS
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

Dimethyl Nitrosamine
1,2,4-Trichlorobenzene
1,2-Dichlorobenzene
1,2-Diphenylhydrazine
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2,4,6-Trichlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
2-Chloronaphthalene
2-Methyl-4,6-Dinitrophenol (Dinitrocresol)
2-Nitrophenol
3,3'-Dichlorobenzidine
4-Bromophenyl phenyl ether
4-Chloro-3-Methylphenol
4-Chlorophenyl phenyl ether
4-Nitrophenol
Acenaphthene
Acenaphthylene
Anthracene
Benzidine
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
bis(2-Chloroethoxy)methane
bis(2-Chloroethyl)ether
bis(2-Chloroisopropyl)ether
bis(2-Ethylhexyl)phthalate
Butylbenzyl phthalate
Chrysene
Di-n-butyl phthalate
Di-n-octyl-phthalate
Dibenzo(a,h)Anthracene
Diethylphthalate
Dimethylphthalate
Fluoranthene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(1,2,3-c,d,)Pyrene
Isophorone
N-Nitrosodi-n-propylamine
N-Nitrosodimethylamine
N-Nitrosodiphenylamine
Napthalene
Nitrobenzene
Pentachlorophenol
Phenanthrene
Phenol
Pyrene

R/49WPF/AA3

TABLE 5-6

PRIORITY POLLUTANT PESTICIDES/PCBs NAVAL TRAINING CENTER GREAT LAKES, ILLINOIS FEBRUARY 1993

Endrin Aldehyde
Heptachlor
Heptachlor Epoxide
Alpha - BHC
Beta - BHC
Delta - BHC
Gamma - BHC (Lindane)
Toxaphene
Aldrin
Dieldrin
Chlordane
Methoxychlor
4,4'-DDT
4,4'-DDE
4,4'-DDD
Endosulfan I
Endosulfan II
Endosulfan Sulfate
Endrin

PCBs as Aroclors
1016
1221
1232
1242
1248
1254
1260

R/49WPF/AA3

TABLE 5-7

F-LISTED SOLVENT SCAN
NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS
FEBRUARY 1993

Acetone
Benzene
n-Butyl alcohol
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Cresols (and cresylic acid)
Cyclohexanone
1,2-dichlorobenzene
2-ethoxyethanol
Ethyl acetate
Ethyl benzene
Ethyl ether
Isobutanol
Methanol
Methylene chloride
Methyl ethyl ketone
Methyl isobutyl ketone
Nitrobenzene
2-Nitropropane
Pyridine
Tetrachloroethylene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,1,2-Trichloro-1,2,2-trifluoroethane
Trichloroethylene
Trichlorofluoromethane
Xylene

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- Sample Results
  - Sample results.
  - Field duplicate results.
  - Laboratory blanks, field blanks, and trip blanks results.
  - Matrix spike/matrix spike duplicate and/or blank spike results.
  - Surrogate recoveries, if applicable.

- Support QA/QC
  - Methodology.
  - Method detection limits.
  - Initial and continuing calibration summaries; including standard chromatograms and integration tables.
  - Percent solids for soils.
  - Cleanup procedures used, if applicable.
  - Laboratory QA/QC procedures and checklists.

5.7.4 Data Validation

Data validation is a process of review of the analytical results and documentation against established criteria. Validation of all data generated as part of this field investigation will be performed in accordance with HALLIBURTON NUS and USEPA guidelines. USEPA guidelines are presented in the following documents:

- National Functional Guidelines for Organic Data Review, USEPA draft, December 1990, Revised June, 1991.

- Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, USEPA, February 1, 1988, modified November 1, 1988.

- Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, USEPA, June 13, 1988, modified February 1989.

Validation of data generated from non-CLP methods will involve thorough review of the method specified QA/QC criteria, including method blanks, field blanks, instrument calibration, spikes and duplicates.

Validation will be performed by a HALLIBURTON NUS Team chemist and will include a QA assessment to assess that the proper analytical and QA/QC protocols were followed by the laboratory. Data qualifiers will be reviewed by the data validator and specific data validation qualifiers will be added to data spreadsheets.

5.8 DATA ASSESSMENT PROCEDURES

Analytical data will be evaluated for precision, accuracy, and completeness. The acceptability of the analytical precision and accuracy will be determined by comparing to the control limits recommended in the methods. Data determined to be insufficiently precise or accurate will be subject to the corrective action prescribed by the appropriate analytical method. The QC samples used in the determination of precision and accuracy were previously described in Section 5.1.3.

5.9 INTERNAL QUALITY CONTROL

QC samples will be collected in the field to assess sampling precision and accuracy. The types and frequency of QC samples that will be prepared during this field investigation are discussed in Section 5.1.3.

Internal laboratory QC checks include matrix spike and matrix spike duplicate analysis, sample duplicate analysis, method blank analysis, and system monitoring compounds (surrogate) recoveries. Laboratory QC procedures will be performed in accordance with EPA requirements and NEESA Level C.

5.10 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits of field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the FSP and QAPP.

5.10.1 Field Audits

An audit of field activities (sampling and measurements) will be conducted by the Project Manager. The audit will include examination of field sampling records, sample collection, sample handling and packaging, and COC procedures. The audit will occur at the onset of the project to verify that all established procedures are followed. A follow-up audit will be conducted to correct deficiencies and to verify that QA procedures are maintained throughout the investigation.

5.10.2 Laboratory Audits

The performance and system audits of the laboratory will be conducted by NEESA personnel. Additional audits may be conducted by the HALLIBURTON NUS Team QA Advisor. The system audits, which will be performed on an annual basis, will include examination of laboratory documentation on sample receiving, sample login, sample

storage, COC procedures, sample preparation and analysis, instrument operating records, etc. The performance audits will be conducted annually, but may be conducted on a quarterly basis. The analytical results of performance samples will be evaluated to ensure the laboratory maintains a good performance.

5.11 PREVENTIVE MAINTENANCE

Field measurement equipment (PID/FID) will be maintained in accordance with the manufacturer's instructions. The SEC Donohue field equipment maintenance program consists of the following elements:

- The equipment manager keeps an inventory of the equipment in terms of items (model and serial number), quantity, and conditions. Each item of equipment is signed out when in use, and its operating condition and cleanliness checked upon return.

- The equipment manager conducts routine checks on the status of equipment and is responsible for the stocking of spare parts and equipment readiness.

- The equipment manager maintains the equipment manual library and trains field personnel in the proper use and care of equipment.

- The FTL is responsible for working with the equipment manager to make sure that the equipment is tested, cleaned, charged, and calibrated in accordance with the manufacturer's instructions before being taken to the job site.

5.12 CORRECTIVE ACTIONS

The QA program will enable problems to be identified, controlled, and corrected. Potential problems may involve nonconformance with the analytical methods established for the project or other unforeseen difficulties. Any person identifying an unacceptable condition will notify the Project Manager. The Project Manager, with the assistance of the Project QA Advisor, will be responsible for developing and initiating appropriate corrective action and verifying that the corrective action has been effective. Corrective actions may include resampling and/or reanalysis of samples or modifying project procedures. If warranted by the severity of the problem (for example, if a change in the approved Work Plan is required), the Navy will be notified and their approval will be obtained prior to implementing any change.

5.13 QUALITY ASSURANCE REPORTS/DOCUMENTATION

A bound, weatherproof site logbook shall be maintained by the FTL. The FTL or his/her designee shall record all information related to sampling and field activities. The information should include sample description, location, sampler, sampling time, weather conditions, unusual events, field measurements, description of photographs, etc. Sample collection data will also be recorded on a matrix-specific sample collection-data log for each collected sample. The site logbook will contain a summary of each day's activities and will reference sample collection data log sheets when applicable.

Custody of samples must be maintained and documented at all times. COC begins with the collection of the samples in the field. Section 5.4 addresses the topic of sample custody.

At the completion of field activities, the FTL shall submit to the Project Manager all field records, the site logbook, COC receipts, and the sample tracking logbook. The Project Manager will ensure that these materials are properly labelled, organized, and entered into the project file.

Changes in project drilling and sampling procedures may be necessary as a result of changed field conditions or unanticipated events. A summary of the sequence of events associated with field changes is as follows:

- The FTL notifies the Project Manager of the need for the change.
- If necessary, the Project Manager will discuss the change with the pertinent individuals (e.g., HALLIBURTON NUS personnel and Navy RPM) and will provide verbal approval or denial to the FTL for the proposed change.
- If approved, the FTL will document the change on a Field Modification Form and forward the form to the Project Manager at the earliest convenient time (e.g., end of the work week).
- The Project Manager will sign the form and distribute copies to the Navy RPM, the HALLIBURTON NUS QA Advisor, the FTL, and the project file.
- The FTL will attach his or her copy of the completed Field Modification Form to the field copy of the affected document (i.e., HASP).

6.0 REFERENCES

Engineering-Science, November 1991, Testing of Underground Storage Tanks.

Dames & Moore, September 1991, Technical Memorandum on the Remedial Investigation Step for the Naval Training Center Great Lakes, Illinois.

IEPA, September 1991, Leaking Underground Storage Tank Manual.

Naval Energy and Environmental Support Activity, June 1988, Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program, NEESA 20.1-047B.

NTC, September 1986, Naval Training Center Great Lakes, IL Master Plan.

Rogers, Golden & Halpern, March 1986, Initial Assessment Study, Naval Complex Great Lakes, Illinois, NEESA 13-102.

USEPA, February 1, 1988, Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses, modified November 1, 1988.

USEPA, June 13, 1988, Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, modified February 1989.

USEPA, December 1990, National Functional Guidelines for Organic Data Review, draft, revised June, 1991.

R/49WPF/AA1

APPENDIX A

IEPA 20-DAY CERTIFICATION FORM

Illinois Environmental Protection Agency
LEAKING UNDERGROUND STORAGE TANK PROGRAM
20 DAY CERTIFICATION

ESDA INCIDENT # _____

Date Release Confirmed ____/____/_____

Facility Name: _____

Mailing address: _____

City: _____ Zip Code: _____

County: _____

In accordance with Title 35 Subtitle G, Part 731.162 the following certification is made:

1. I am/we are the owner and operator of the underground storage tank system(s) from which a release was reported under the ESDA incident correctly identified above;
2. That as much of the regulated substance as necessary to prevent further release to the environment, has been removed;
3. That there has been a visual inspection of any above ground releases or exposed below ground releases;
4. That further migration of the released substance into surrounding soils and groundwater has been prevented;
5. That monitoring and mitigation of any fire and safety hazards posed by vapors or free product that have migrated from the UST excavation zone and entered into substance structures (such as sewers or basements) will continue;
6. That hazards posed by contaminated soils that are excavated or exposed as a result of release confirmation, site investigation, abatement or corrective action activities will be remediated;
7. That if the treatment remedies include treatment or disposal of soils, The owner/operator will comply with 35 Illinois Administrative Code, Subtitle G and other applicable rules and regulations;
8. That measurement for the presence of a release was where contamination is most likely to be present at the UST site;
9. That in selecting sample types, sample locations and measurement methods, the nature of the stored substance, the type of backfill, depth to groundwater and other factors as appropriate for identifing the presence and source of the release has (or will be) considered;
10. That the appropriate procedures will be used to investigate and determine the possible presence of free-product, and began free-product removal as soon as possible, if applicable, in accordance with Section 731.164;
11. That a summary of the above activities will be provided within 45 days of the confirmation of a release.

SIGNATURES

OWNER	and OPERATOR *(if different from owner)*
name: _____	name: _____
title: _____	title: _____
signature: _____	signature: _____
date: _____	date: _____

NOTARY PUBLIC

name: _____

date: _____ seal

My commission expires _____, 19___ .

This Agency is authorized to require this information under Illinois Revised Statutes, 1989, Chapter 111 1/2, Section 1004 and 1021. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000 for each day the failure continues, a fine up to $50,000 and imprisonment up to 5 years. This form has been approved by the Forms Management Center.

IL 532 2018
LPC 424 9/91

APPENDIX B

IEPA 45-DAY CERTIFICATION FORM

This Agency is authorized to require this information under Illinois Revised Statutes, 1989, Chapter 111 1/2, Section 1004 and 1021. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000 for each day the failure continues, a fine up to $50,000 and imprisonment up to 5 years. This form has been approved by the Forms Management Center.

IESDA INCIDENT _____

Illinois Environmental Protection Agency
LEAKING UNDERGROUND STORAGE TANK PROGRAM
45 DAY REPORT

A. SITE IDENTIFICATION

Site # (IEPA Generator number): _____

(leave blank if unknown)

IESDA #: _____

Facility Name: _____

Mailing address: _____

City: _____ Zip Code: _____

County: _____

WILL THE OWNER/OPERATOR SEEK REIMBURSEMENT FOR CORRECTIVE ACTION COSTS FOR THIS SITE FROM THE UNDERGROUND STORAGE TANK FUND? (CHECK ONE): **YES ___ NO ___**

Has it been demonstrated that the release associated with this incident has been remediated to Agency clean-up objectives for soil and groundwater. (CHECK ONE) **YES___ NO___**

OWNER

Name: _____

Address: _____

_____

Contact Name: _____

Phone: _____

OPERATOR *(if different from owner)*

Name: _____

Address: _____

_____

Contact Name: _____

Phone: _____

CONSULTANT

Firm: _____

Address: _____

_____

Contact Name: _____

Phone: _____

SURVEYOR

Firm: _____

Address: _____

_____

Contact Name: _____

Phone: _____

B. TYPE RELEASE *(please check one)* Minor ___ Significant ___ Major ___

C. SIGNATURES

I hereby affirm that all information contained in this 45 Day Report is true and accurate to the best of my knowledge and belief.

OWNER

name: _____

title: _____

signature: _____

date: _____

OPERATOR *(if different from owner)*

name: _____

title: _____

signature: _____

date: _____

LAND SURVEYOR

name: _____

title: _____

signature: _____

date: _____ registration number: _____

IL 532 2019
LPC 425 9/91

IESDA INCIDENT _____

PROFESSIONAL ENGINEER

The release from the Underground Storage Tank(s) System associated with Incident number _____ at the facility described in this 45 Day Report has been remediated in accordance with 35 Ill. Adm. Code, Part 731, Subpart F, and other applicable rules and regulations. The remediation has achieved the clean-up objectives set forth by the Agency in _____. I certify under penalty of law that this 45 Day Report, supporting documents and all attachments were prepared under my direction or supervision. To the best of my knowledge and belief, the 45 Day Report, supporting documents, and all attachments are true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

name: _____

title: _____

signature: _____ SEAL

date: _____

registration number: _____

D. REPORTS SUBMITTED

Indicate the name and date of any reports previously submitted and any additional information or documents attached to or submitted with this report which are to be included in the review of this 45 Day Report.

_____

_____

E. PERSONNEL ON THE SITE

Provide the name, titles and dates of the regulatory or company personnel on-site during the initial abatement activities (e.g. OSFM inspector, IEPA inspector, etc.):

NAME	TITLE	DATE

F. TANK INFORMATION

Total number of underground storage tanks at this site : _____

For each underground storage tank (UST) system removed or release remediated provide:

Capacity (gal) _____

Year of Installation: _____ Condition of UST system upon removal: _____

Product Stored in UST system: _____

Amount released: _____

Cause of release: _____

Capacity (gal): _____

Year of Installation: _____ Condition of UST system upon removal: _____

Product Stored in UST system: _____

Amount released: _____

Cause of release: _____

2. Describe the procedures used for cleaning the tank: _____

3. For any of the following that were removed or generated during the UST system removal, describe the procedures for management and storage, treatment or disposal of this material.

   Product: _____

   Tank bottoms: _____

   Tank sludges: _____

   Product in tanks: _____

   Tank rinse waters: _____

   Tank waste-water mixtures: _____

   Tank system: _____

   Other (please describe): _____

   Date that all tank cleaning operations were completed: _____

4. Provide copies of manifests used to transport the above material from the site.

H. RELEASE INFORMATION

Provide the information below:

1. The steps taken to test for the extent of the release considering the type of the stored substance, type of backfill, depth to groundwater and other factors appropriate for identifying the presence and source of the release.

2. The actions taken to prevent further release of the regulated substance.

3. If the release was associated with the lines or dispenser, briefly describe the problem.

4. Provide a discussion of the potential of utility conduits to provide a pathway for the movement of contamination off-site.

I. FREE PRODUCT ACTION

Was free product encountered during the investigation (check one) : **YES** ___ **NO** ___

If YES, the following questions must be answered:

1. The name of the person responsible for implementing the free product removal measures.

2. The estimated quantity, type and thickness of free product observed or measured in wells, boreholes and the excavations.

3. The dates that free product was discovered, and the steps taken to remove product.

4. The type of free product recovery system used, including plan sheets, diagrams, description of equipment and a site map indicating the recovery system location.

5. An indication of whether any discharge will take place on-site or off-site during the recovery operation and where this discharge will be located.

6. The type of treatment applied to any discharge and the effluent quality expected.

7. The steps that have been or are being taken to obtain necessary permits for any discharge.

8. The disposition of the recovered free product.

9. Pursuant to 35 Ill. Adm. Code, Section 731.165(b) the Owner/Operator must, within 30 days of this 45 Day Report, submit a completed Corrective Action Form that includes a Groundwater Investigation Plan.

J. SOIL EXCAVATION

Provide information on the following:

1. Dimensions of excavation(s): _____

   _____

   Original tank backfill material: _____

   _____

   Native soil type: _____

   Quantity of contaminated soil removed: _____

   _____

2. Was groundwater encountered? (check one): **YES** __ **NO** __

   If YES, pursuant to 35 Ill. Adm. Code, Section 731.165(b) the Owner/Operator must, within 30 days of this 45 Day Report, submit a completed Corrective Action Form that includes a Groundwater Investigation Plan.

3. Describe the steps which have been taken to control and remedy hazards posed by contaminated soils that are excavated or exposed as a result of release confirmation, site investigation, abatement of corrective action activities.

4. Has the owner/operator complied with the requirements of 35 Ill Adm. Code, Parts 702, 703, 705, 722 through 728, 807 through 815 and other applicable rules and regulations for the storage, treatment and/or disposal of soils managed at the site? **YES**___ **NO**___

K. SITE MAPS

1. Provide topographic map which shows the location of the site and provide the following for the site:

   township: _____ range: _____ section: _____

   latitude: _____ longitude: _____

2. Provide a site map with locations of the:

   - UST System(s)
   - product and dispenser lines
   - pumps and islands
   - sewer, gas, water and electrical utility lines
   - nearby buildings, roads, etc.

3. Provide a site map and cross-section indicating areas of:

   - UST System(s), vertically and horizontally
   - soil excavation
   - soil borings
   - soil and groundwater sampling locations
   - monitoring well locations

4. Provide a map and cross-section showing the extent of soil and groundwater contamination.

L. SOIL BORINGS TO DETERMINE THE EXTENT OF CONTAMINATION

If a soil boring sampling program has been undertaken to determine the extent of contamination, provide the following:

1. Drilling method(s) that were used, and why these methods were chosen.

2. The basis for determining the location and minimum number of borings to be placed on site.

3. A discussion of the approach that will be taken to determine the location and number of additional borings required.

4. Activities taken to prevent cross-contamination between boreholes.

5. A discussion of how the sampling interval for each boring was determined and collected.

6. A discussion of how off-site soil contamination impacts will be investigated.

7. Copies of borings logs.

M. SOIL SAMPLING FOR VERIFICATION OF COMPLETION OF REMEDIAL ACTIVITIES

The following must be provided:

1. A completed Laboratory Certification Form (attached) must be provided with all soil sample data.

2. A sampling protocol for soil sample collection.

3. Basis for determining the location and minimum number of soil samples taken.

4. Discussion of the approach that will be taken to determine the location and number of additional samples required.

5. Activities taken to prevent cross-contamination between samples.

6. The analytical results from soil sampling in tabular format showing detection limits and with raw data also included as an attachment.

N. GROUNDWATER SAMPLING FOR VERIFICATION OF COMPLETION OF REMEDIAL ACTIVITIES

If groundwater samples were taken, the following must be provided:

1. A completed Laboratory Certification Form (attached) must be provided with all groundwater sample data.
2. A sampling protocol for groundwater collection.
3. Basis for determining the well location and minimum number of groundwater samples taken.
4. Discussion of the approach that will be taken to determine the location and number of additional samples required.
5. Activities taken to prevent cross-contamination between samples.
6. The analytical results from groundwater sampling in tabular format showing detection limits and with raw data also included as an attachment.

O. REMEDIATION DOCUMENTATION

1. Original photographs taken during the cleanup to document the site conditions and remedial activities. Photographs must show all important cleanup activities that took place on the site. Photographs must be in duplicate, mounted, and labeled.
2. A copy of the permit for tank removal issued by the Office of the State Fire Marshal or, if in the City of Chicago provide documentation of approval for removing the tank.

IESDA INCIDENT _____

Illinois Environmental Protection Agency
LABORATORY CERTIFICATION
for the 45 Day Report

1. a. I was responsible for sample collection. I certify that samples were collected using approved USEPA procedures.

   _____ (Initial)

   b. I was not responsible for sample collection.

   _____ (Initial)

2. I certify that chain of custody procedures were followed prior to receipt by the laboratory, as documented on the chain of custody forms.

   _____ (Initial)

3. I certify that quality assurance/quality control procedures were established and carried out.

   _____ (Initial)

4. I certify that proper preservation techniques were followed.

   _____ (Initial)

5. I certify that sample holding times were not exceeded.

   _____ (Initial)

6. I certify that SW-846 Analytical Laboratory Procedure (USEPA) methods were used for the analysis.

   _____ (Initial)

7. I certify that the lowest practicable quanitation limit found in SW-846 for soils and groundwater were met for each parameter.

   _____ (Initial)

I hereby affirm that all information contained in this form is true and accurate to the best of my knowledge and belief. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

LABORATORY

Name: _____

Title: _____

Address: _____

_____

Signature: _____

Date: _____

SAMPLE COLLECTOR

Name: _____

Company: _____

Title: _____

Address: _____

_____

Signature: _____

Date: _____

This Agency is authorized to require this information under Illinois Revised Statutes, 1989, Chapter 111 1/2, Section 1004 and 1021. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $25,000 for each day the failure continues, a fine up to $50,000 and imprisonment up to 5 years. This form has been approved by the Forms Management Center.

IL 532 2020
LPC 426 9/91

APPENDIX C

FIELD DOCUMENTATION FORMS

Sheet ___ of ___

Donohue

Engineers & Architects

COMPUTER AIDED DESIGN/DRAFTING

BORING LOG

SOIL BORING NO. ( )

SITE: _____ PROJECT NO. _____

DRILLING METHOD: _____

FOREMAN: _____

ASSISTANT: _____

GEOL./ENG'R. _____

LOG BY: _____

WATER LEVEL READINGS

DATE	TIME	DEPTH	
			W.D.
			S.C.R.
			A.C.R.
			HRS. A.D.
			HRS. A.D.

GROUND SURFACE ELEV. _____

PHYSICAL SETTING: _____

DATE START: _____

DATE COMPLETE: _____

DEPTH TO CHANGES IN STRATA	DEPTH IN FEET	SAMPLING DATA								USCS	SOIL DESCRIPTION	COMMENTS
		NO.	T	A	R	PENETRATION						
						1st	2nd	3rd	N			

SHEET ___ OF ___

Donohue

Engineers & Architects

DRILLING DATA

SOIL BORING NUMBER

ADDITIONAL DRILLING DATA

Split Tube Size _____ ID _____ OD
Hammer Wt. _____ lb _____ in drop
Thin Wall Tube Size ___ OD
Casing Used _____ LF _____ Dia.
Casing Hammer _____ lb _____ in drop
Drill Rod Size _____
Drill Bit Type _____ (a) _____ (b)
Drill Bit Size _____ (a) _____ (b)
Auger Type _____ OD
Hollow Stem Auger ___ ID
Core Barrel Size _____ ID _____ Length
Core Bit Serial _____
Core Bit Serial _____
Drill Mud Type _____
Drill Mud Formula _____
Depth Drill Mud Used _____
Back Filled Date _____
Method _____ by _____
Drill Rig Mfg. Mod. _____
Other Equip _____
Other Equip. _____

DRILLING INFORMATION

1. Record measurements in tenths of feet.
2. For samples, record sample type (split spoon, shelby, core) depths, sample interval, length of sample recovered.
3. Record first encountered water and any other distinct water producing zones.
4. Record blow counts (density), hammer weight, length of fall for driven samples.
5. Record use of drilling fluids, fluid type, source of water, fluid losses, interval (and soil type) where fluid loss occurred, if determinable, quantitive estimate of volume of fluid loss.
6. Record drilling equipment used and general drilling procedures.
7. Record all problems encountered during drilling.
8. Collect samples of backfill, grout, and concrete.
9. Report general drilling conditions; (temperature, raining, etc.)

Soil/Rock Description Requirements

1. Soil
   a. Written classification
   b. USCS symbol
   c. Estimated % of secondary components "% and size gravel, cobbles
   d. Color, mottling
   e. Plasticity (general)
   f. Consistency (cohesive) or density (non-cohesive)
   g. Moisture
   h. Texture/fabric/bedding
   i. Depositional environment
2. Rock
   a. Classification
   b. Lithologic characteristics
   c. Bedding/banding
   d. Color
   e. Hardness
   f. Degree of cementation
   g. Texture
   h. Structure
   i. Degree of weathering
   j. Solution or void conditions
   k. Primary and secondary estimated hydraulic conductivity, rationale
   l. Note natural and coring induced rock breaks, and lost core including probable reason for. Include number of fractures per foot, number of fractures per total length of recovery.

Texture	Abbreviation	Size	Abbreviation	Soil Particle Size
Boulder	Bo			Over 3.0"
Gravel	Gr	Large	L	1.0" to 3.0"
		Medium	M	.38" to .99"
		Small	Sm	2.0mm to .38"
Sand	S	Coarse	Co	.75mm to 1.99mm
		Medium	M	.25mm to .74mm
		Fine	F	.05mm to .24mm
Silt	Si			.002mm to .049mm
Clay	C			Smaller than .022mm

Consistency	Abbreviation	N	Density	Abbreviation	N
Very Soft	VS	0-2	Very Loose	VL	0-4
Soft	S	3-4	Loose	L	5-9
Medium	M	5-8	Medium Dense	MD	10-29
Stiff	St	9-16	Dense	D	30-49
Very Stiff	VST	17-30	Very Dense	VD	50+
Hard	H	Over 30			

% of Dry Weight	Term	Abbreviation
0-10	Trace or Occassional	TR or OC
11-20	Little	LI
21-35	Some	SO
36-50	And or With	& or W/

CONDITIONS FOR USE OF SOIL BORING LOG

This field soil boring log records the soil descriptions and other data observed or measured in the field by qualfied soil technicians. The soils between the samples may have been determined by the "feel" of the drill bit or wash cuttings. The changes between the soil strata may be transitional rather than abrupt, particularly with respect to color, weathering, and consistency changes. The amount of large sized gravel or boulders is generally estimated because the sampling tubes seldom retain these larger sized soil particles. Delayed readings of ground water

SHEET ____ OF ____

Donohue | Soils Data Form | Soil Sample Area _____

Soil Subsample _____

Engineers & Architects & Scientists | Site _____ | Project No. _____

DATE _____

TIME _____

COLLECTOR _____

_____

SAMPLE DEPTH _____

_____

_____

_____

PHYSICAL DESCRIPTION OF SUBSAMPLING LOCATION: _____

DESCRIPTION OF SUBSAMPLE: _____

ANY OTHER CHARACTERISTICS OF NOTE: _____

Donohue ENGINEERS ARCHITECTS SCIENTISTS

Chain of Custody Record

Check delivery method:
- ☐ Samples delivered in person
- ☐ Donohue courier
- ☐ Common carrier
- ☐ Mail

Custody Seal #

Project Number	Project Name/Client
Samplers: (Signature)	

Item No.	Sample Description (Field ID Number)	Date	Time	Grab	Comp.	Lab Sample Number	Container Number	Analysis Required												X-Field Filtered	X-Sep. Record Mtrl.	Sample Type (Water, Soil) etc.	Matrix: Sample Container
1																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							
13																							
14																							
15																							
16																							

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Disposed of by: (Signature)	Items:	Date/Time
Relinquished by: (Signature)	Date/Time	Received by: (Signature) [Laboratory]	Disposed of by: (Signature)	Items:	Date/Time

Send Lab Results To:	Remarks:	Laboratory Receiving Notes:
		Custody Seal Intact?
		Temp. of Shipping Container:
		Sample Condition:

White Copy – Lab Yellow Copy – File Pink Copy – Client

M/F/Rusche/Chain of Custody

Donohue ENGINEERS ARCHITECTS SCIENTISTS

DAILY TIME LOG

Date: ____/____/____

Circle: Sun Mon Tue Wed Thu Fri Sat

Site: _____ Project No.: _____

Weather: _____

Task/Equipment: _____

Firm/Contractor's Personnel: _____ Hrs On-Site: _____

Donohue's Personnel: _____ Hrs On-Site: _____

Site Visitors: _____

Time Log indicating work in progress, remarks:

0600 – 0630 _____

0630 – 0700 _____

0700 – 0730 _____

0730 – 0800 _____

0800 – 0830 _____

0830 – 0900 _____

0900 – 0930 _____

0930 – 1000 _____

1000 – 1030 _____

1030 – 1100 _____

1100 – 1130 _____

1130 – 1200 _____

1200 – 1230 _____

1230 – 1300 _____

1300 – 1330 _____

1330 – 1400 _____

1400 – 1430 _____

1430 – 1500 _____

1500 – 1530 _____

1530 – 1600 _____

1600 – 1630 _____

1630 – 1700 _____

1700 – 1730 _____

1730 – 1800 _____

Items requiring follow-up: _____

Over for Summary

ENGINEERS
ARCHITECTS
SCIENTISTS

Project: _____
Project Location: _____
Project No.: _____
Site Safety Officer: _____
Date: _____
Page No.: _____

Daily Sign–In/Out Log

Time In	Time Out	Name	Firm	Purpose On–Site

Note: This form is to be completed on a daily basis by all personnel working on the site.

Donohue ENGINEERS ARCHITECTS SCIENTISTS

Project: _____
Project No.: _____
Site Safety Officer: _____
Date: _____

Work Zone
Entry and Exit Log

Time In	Time Out	Name/Firm	Site Location	HNU/OVA Readings (in Breathing Zone)	Level PPE (D/C/B)

Note: This form is to be completed on a daily basis by all on–site personnel working within a work zone. Submit this log to the Corporate Health and Safety Manager on a weekly basis.

Date ___/___/___

Circle: Sun Mon Tue Wed Thu Fri Sat

Atmospheric Monitoring Log
Field Health and Safety

Site: _____ Project No.: _____

Site Safety Officer: _____

Action Levels: D ☐ ——→ C ☐ ——→ B ☐ ——→ (Stop work call in for instructions)

(Check box and write in levels for upgrade)

Task/Equipment: _____

Weather: _____

Time	OVA PPM	HNu PPM	O_2 %	LEL %	H_2S PPM		Comments: Duration of Readings, Upgrades, Location, etc.

Additional Comments: _____

_____

_____

_____

Signature: _____

INSTRUMENT CALIBRATION LOG

INSTRUMENT: _____

Date Calibrated	Known Standard	Actual Instrument Reading	Adjustments Made	Calibrated By	Comments

COMMENTS: _____