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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY
INVESTIGATION/CORRECTIVE MEASURE STUDY WORK PLAN FOR AREA OF CONCERN E NS MAYPORT FL
7/1/2009
TETRA TECH NUS

Comprehensive **L**ong-term **E**nvironmental **A**ction **N**avy

CONTRACT NUMBER N62467-04-D-0055

09JAX0009

RCRA Facility Investigation/ Corrective Measure Study Work Plan
for the
Moral, Welfare, and Recreation Department Equipment Storage Area (Area of Concern E)

Naval Station Mayport
Jacksonville, Florida

Contract Task Order 0088

July 2009

NAVFAC Naval Facilities Engineering Command NAVFAC SOUTHEAST

NAS Jacksonville
Jacksonville, Florida 32212-0030

TETRA TECH NUS, Inc.

09JAX0009

RCRA FACILITY INVESTIGATION / CORRECTIVE MEASURE STUDY WORK PLAN FOR THE MORALE, WELFARE, AND RECREATION DEPARTMENT EQUIPMENT STORAGE AREA (AOC E)

NAVAL STATION MAYPORT
JACKSONVILLE, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Naval Facilities Engineering Command Southeast
NAS Jacksonville
Jacksonville, Florida 32212-0030

Submitted by:
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CONTRACT NUMBER N62467-04-D-0055
CONTRACT TASK ORDER 0088

JULY 2009

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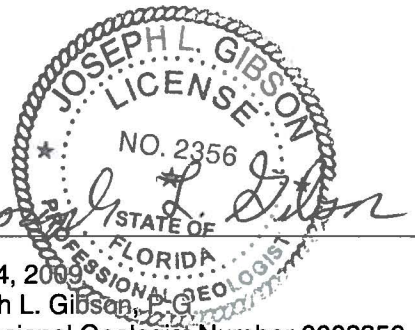
This document, *RCRA Facility Investigation / Corrective Measure Study Work Plan for the Morale, Welfare, and Recreation Department Equipment Storage Area (Area of Concern E), Naval Station Mayport, Jacksonville, Florida*, has been prepared under the direction of a Florida Registered Professional Geologist. The work and professional opinions rendered in this report were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice. This document was prepared for Naval Station Mayport, Jacksonville, Florida and should not be construed to apply to any other site.



July 24, 2009
Joseph L. Gibson, P.G.
Professional Geologist Number 0002356

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ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
bls	Below Land Surface
CEC	Cation Exchange Capacity
CLEAN	Comprehensive Long-term Environmental Action Navy
CMS	Corrective Measure Study
COC	Chemical of Concern
CS	Confirmatory Sampling
CTL	Cleanup Target Level
CTO	Contract Task Order
°C	Degree Celsius
ERA	Ecological Risk Assessment
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FID	Flame Ionization Detector
FL-PRO	Florida Petroleum Range Organics
FOL	Field Operations Leader
GCTL	Groundwater Cleanup Target Level
GPS	Global Positioning Survey
HHRA	Human Health Risk Assessment
HSA	Hollow Stem Auguring
HSO	Health and Safety Officer
IDW	Investigative Derived Waste
LOI	Location of Interest
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MWR	Morale, Welfare, and Recreation
NAVFAC SE	Naval Facilities Engineering Command Southeast
NAVSTA	Naval Station
Navy	United States Navy
NIST	National Institute of Standards and Testing
NTU	Nephelometric Turbidity Unit
OVA	Organic Vapor Analyzer
PAH	Polynuclear Aromatic Hydrocarbon

ACRONYMS AND ABBREVIATIONS (continued)

PCB	Polychlorinated Biphenyl
POC	Point of Contact
PVC	Polyvinyl Chloride
QAM	Quality Assurance Manager
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RPM	Remedial Project Manager
SB	Subsurface Soil Sample
SCTL	Soil Cleanup Target Level
SOP	Standard Operating Procedure
SS	Surface Soil Sample
SVOC	Semivolatile Organic Compound
Team	NAVSTA Mayport Environmental Partnering Team
TRPH	Total Recoverable Petroleum Hydrocarbon
TtNUS	Tetra Tech NUS, Inc.
TOM	Task Order Manager
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
Work Plan	RFI/CMS Work Plan

1.0 INTRODUCTION

Tetra Tech NUS, Inc. (TtNUS) has prepared this Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI)/Corrective Measure Study (CMS) Work Plan for the Morale, Welfare, and Recreation (MWR) Department Equipment Storage Area [Area of Concern (AOC) E] located at the Naval Station (NAVSTA) Mayport, Jacksonville, Florida. This RFI/CMS Work Plan has been prepared for the United States Navy (Navy) Naval Facilities Engineering Command Southeast (NAVFAC SE) under the Comprehensive Long-term Environmental Action Navy (CLEAN) IV Contract Number N62467-04-D-0055 Contract Task Order (CTO) 0088. This Work Plan is designed to guide soil and groundwater investigations and the completion of the RFI and CMS Reports for the site recognized as AOC E at NAVSTA Mayport.

This Work Plan consists of six sections. Section 1.0 is the introduction, which includes descriptions of the objective and scope, the project management organization, the field organization, and the project schedule. Section 2.0 provides descriptions and background information and also presents the sampling rationale. Section 3.0 describes the soil and groundwater investigation and analysis plan. Section 4.0 details the field tasks and associated methodologies. Section 5.0 includes information regarding the deliverables pertaining to this Work Plan. Section 6.0 summarizes the NAVSTA Mayport support tasks for the subject work scope. The appendices include Historical Information (Appendix A), TtNUS Field Forms (Appendix B), and the NAVSTA Mayport Standard Operating Procedure (SOP) for Investigative Derived Waste (IDW) (Appendix C).

1.1 OBJECTIVES AND SCOPE

The overall objective of the RFI/CMS at AOC E is to determine the nature, extent, and fate of contaminant releases at AOC E and identify, screen, and evaluate corrective measure alternatives. As part of the RFI/CMS effort, a human health risk assessment (HHRA) and an ecological risk assessment (ERA) will be completed in order to determine possible pathways of contaminant release, the rate of migration of contaminant release, and the identification and assessment of associated risks to possible human and ecological receptors.

The objectives of the RFI/CMS activities proposed at AOC E include:

- Delineate arsenic and total recoverable petroleum hydrocarbons (TRPH) soil contamination by soil sample collection.
- Install, develop, sample, and survey monitoring wells for groundwater investigation.
- Collect supporting data to evaluate potential risk at the site.

- Develop a site-specific HHRA and ERA.
- Prepare a RFI Report following United States Environmental Protection Agency (USEPA) guidance to evaluate soil and groundwater media contamination.
- Prepare a CMS Report based on information provided in the RFI Report. Up to five remedial action alternatives for both soil and groundwater will be evaluated, including No Action and Monitored Natural Attenuation.

The scope of work for the RFI/CMS includes soil sampling, monitoring well installations, groundwater sampling, water level measurements, and draft and final RFI and CMS Report preparations. HHRA and ERA information will be incorporated into the RFI Report, provided that the subject investigation completes the delineation of potential soil and groundwater contamination. Historical results from investigations prior to the RFI will be qualitatively evaluated, comparing them with current investigation results for identification of trends in concentrations and comparing contaminant types. Results from the planned investigation discussed herein and previous RFI efforts will be evaluated quantitatively for risk assessment. Data collected during RFI efforts and HHRA and ERA documentation will serve as the primary means to support the CMS for the evaluation of remedial action alternatives that will be protective of human health and the environment.

The purpose of this Work Plan is to present the rationale and the specific tasks to achieve the objective of the RFI/CMS. This Work Plan is designed to provide direction for field, laboratory, and office staff to ensure that specific procedures are properly implemented in a safe and scientifically defensible manner. The Work Plan is designed to provide a logical rationale for the investigative approach based on known regional and site-specific background information.

1.2 PROJECT MANAGEMENT AND ORGANIZATION

TtNUS is responsible for the overall management of the project, including field sampling activities. Navy personnel will actively support the investigation and will coordinate with personnel from TtNUS during field activities. The responsible organizations and personnel involved in the management of the project are as follows:

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Mr. Joseph Gibson
Task Order Manager (TOM)

At the direction of the RPM, TtNUS is responsible for the overall management and implementation of the field activities. Responsibilities of other key project personnel are discussed in the following sections.

1.3 FIELD ORGANIZATION

Experienced TtNUS personnel will perform the duties of the Field Operations Leader (FOL). The FOL will be responsible for the coordination of on site project personnel and will provide technical assistance when required. The FOL will coordinate and be present during sampling activities and will ensure the availability and maintenance of sampling materials/equipment. The FOL will be responsible for the completion of sampling and chain-of-custody documentation, will sign chain-of-custody forms for samples, and will ensure the proper handling and shipping of samples.

The QAM, although not formally identified as field personnel, will be responsible for adherence to quality assurance (QA)/quality control (QC) guidelines. Strict adherence to these procedures is required for the collection of acceptable and representative data.

The Site HSO will be designated before initiation of field activities and will be responsible for ensuring that field personnel adhere to health and safety requirements. The Site HSO will be present during intrusive field activities.

1.4 COMMUNITY RELATIONS

The RPM will be notified immediately if representatives of the local community contact TtNUS during this project. A public meeting will be conducted during the RFI/CMS completion if one is requested during the public comment period. If a public meeting is requested, TtNUS will be responsible for all meeting set-up activities and preparing and distributing meeting minutes. Formal project relations with the public will be through NAVFAC SE. TtNUS personnel will not release project information to any outside entity without prior approval of NAVFAC SE or NAVSTA Mayport.

1.5 DELIVERABLES AND DATA MANAGEMENT

A project database will be initiated to promote the proper collection and storage of field data and documentation of activities. On-site data management will include recording of all sampling and other activities in the field. All soil and groundwater analytical data will be subjected to validation. Data validator(s) will review the data to ensure that the analytical results were obtained through the approved methodology, and that the appropriate levels of QC were followed.

All project data will be loaded into the TtNUS data management system in order to preserve the referential integrity of the data. The QAM for this study appoints a Quality Assurance Officer responsible to ensure that QA/QC requirements are met and to inspect the work activities and project deliverables to make sure that QC activities are not compromised.

Draft and final versions of the RFI and CMS Reports will be prepared as part of this investigation and will be made available to the NAVSTA Mayport Environmental Partnering Team (Team) before the final report is issued. Following reviews by the Team, issues will be resolved and the report finalized along with the appropriate response to comments documentation.

TtNUS will update the Environmental Geographic Information System for NAVSTA Mayport to incorporate data including soil sample locations, groundwater monitoring well locations, United States Geological Survey Digital Raster Graphs, computer-aided design and drafting mapping, and available aerial photographs.

1.6 PROJECT SCHEDULE

Field activities will be conducted in two separate events. Soil investigation conducted in the first event will consist of the advancement of soil borings, collection and analysis of soil samples, and the installation of five temporary piezometers and two shallow monitoring wells. Groundwater table elevations recorded during the first event will determine the groundwater flow direction. A second field event will consist of the installation, development, sampling, and surveying of monitoring wells.

Soil cuttings and development/purge water associated with field activities at AOC E will be containerized and managed as IDW. Soil, groundwater, and IDW samples will be sent for analyses by a fixed-base laboratory. After laboratory analyses have been received, the proper disposal method for IDW will be determined. Following sections summarize IDW requirements and handling procedures.

Laboratory analyses are expected to be completed approximately 30 days after the second event of field activities at AOC E have concluded. The Draft RFI Report, incorporating a HHRA and ERA, for AOC E is

scheduled to be delivered to members of the Team approximately five months after receiving analytical data. The Draft CMS Report is scheduled to be delivered for review approximately one month following the submittal of the Final RFI Report.

2.0 BACKGROUND INFORMATION

The sampling and analysis plan for the current investigation has been established based on previous investigations and results. This section describes the site characteristics of AOC E and provides a summary of the previous investigations and results. Information from previous investigations is presented in Appendix A.

2.1 SITE DESCRIPTION

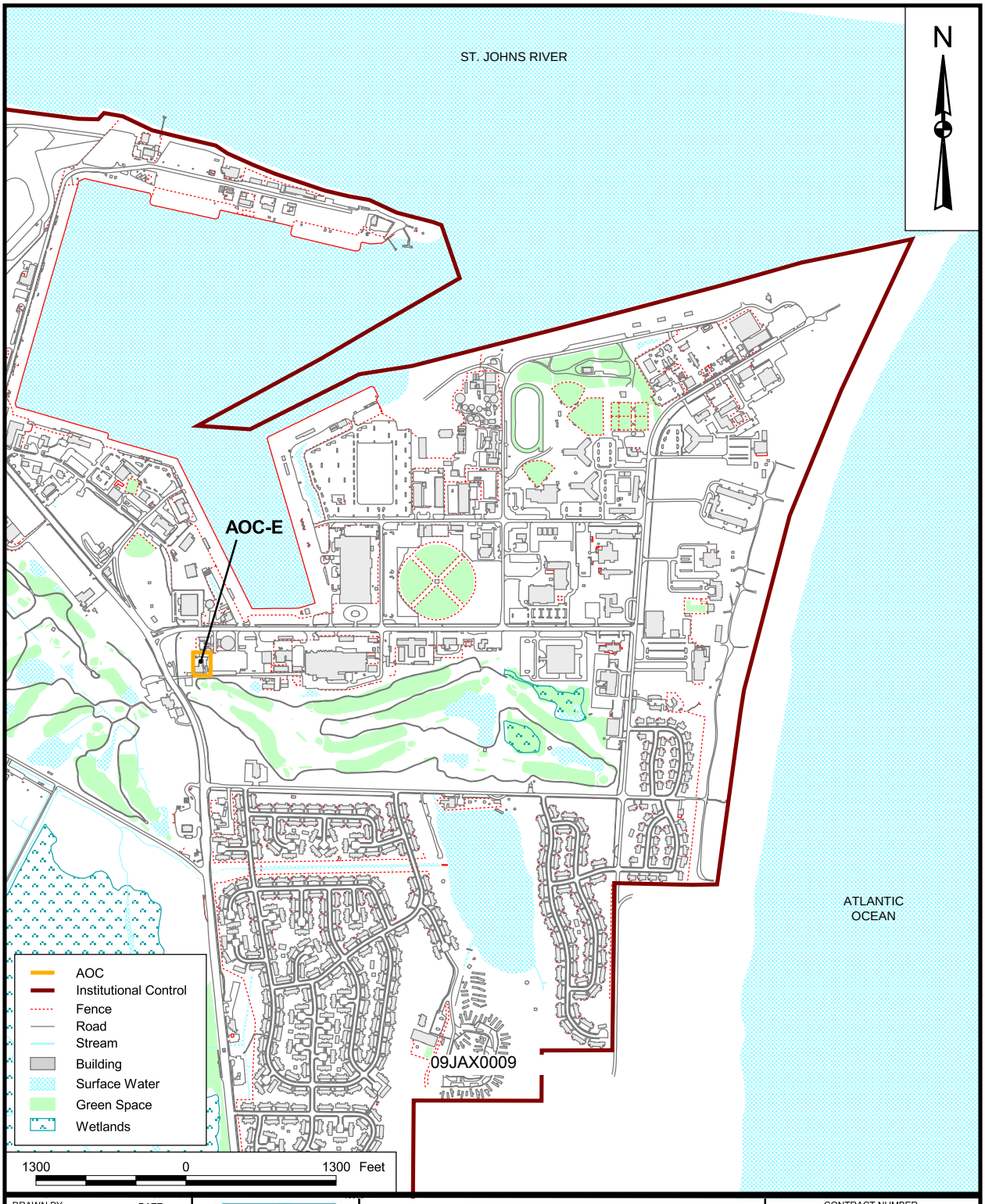
NAVSTA Mayport is located within the corporate limits of City of Jacksonville, Duval County, Florida and is approximately 12 miles to the east northeast of downtown Jacksonville and adjacent to the town of Mayport. The NAVSTA Mayport complex is located on the northern end of a peninsula bounded by the Atlantic Ocean to the east and the St. Johns River to the north and west. NAVSTA Mayport occupies the entire northern part of the peninsula except for the town of Mayport, which is located to the west between the complex and the St. Johns River. A Site Location Map is in included as Figure 2-1.

AOC E is where the MWR Department provides maintenance and storage for golf course maintenance equipment and supplies for such activities. The site has a 6-foot stockade style wooden fence surrounding the property, with the only opening being located at the entrance in the southwestern corner of the site. A limestone gravel road forms a circular drive providing access to the various buildings and structures, with Building 349 located in the center.

Operations conducted at the site are limited to tasks similar to an engine repair or automotive service garage. Herbicides and fertilizers used for the golf course vegetation maintenance are not stored or mixed at AOC E. Equipment and supplies to maintain golf course maintenance equipment are stored and/or serviced within four on-site buildings. The four buildings include the following:

1. Building 349, the largest and most utilized building where equipment is repaired and stored.
2. An unnamed three-walled and sided equipment storage building used to store small tractors.
3. Building 349B, a dry storage shed where items such as tires, bolts, and rope are stored.
4. An unnamed waste storage building where waste generated during daily operations is stored.

A concrete pad, approximately 20 feet by 20 feet, is attached to the equipment shop (Building 394), and is where equipment is worked on and is used as short term storage. Two concrete-floored storage areas are attached to the equipment shop (Building 394). Both of the areas are designed for spill containment. One is used for hazardous waste generated during daily operation, and the other is used for waste oil storage.



DRAWN BY S. STROZ	DATE 9/20/06	SITE LOCATION MAP AOC E NAVAL STATION MAYPORT JACKSONVILLE, FLORIDA	CONTRACT NUMBER CTO -0088
CHECKED BY M. PAITUVI	DATE 10/05/07		APPROVED BY — DATE —
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 2-1 / REV 0

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A 350-gallon steel aboveground storage tank (AST) containing fuel oil is located along the eastern wall of Building 394. The AST is equipped with a concrete spill containment basin. The spill containment basin appears to be in good condition and is fitted with a discharge pipe.

On the eastern boundary of the site, there is a concrete pad with a storm drain located in the center of the pad. This pad is used to remove debris from equipment such as mowers. The approximate size of the wash pad is 8 feet by 8 feet, and the drain is reportedly connected to the NAVSTA Mayport storm sewer system. A former dry storage shed was located in the southeastern corner along the property boundary.

Two 500-gallon steel ASTs are located in the northwestern corner of the site. These ASTs are located adjacent to each other and each has secondary containment. One of the ASTs contains diesel and the other contains gasoline. Both ASTs are used for filling equipment and vehicles. It has also been reported that the ASTs were formerly located east of the equipment shed on the northwestern corner for the site. A Site Map showing the features of AOC E is provided as Figure 2-2.

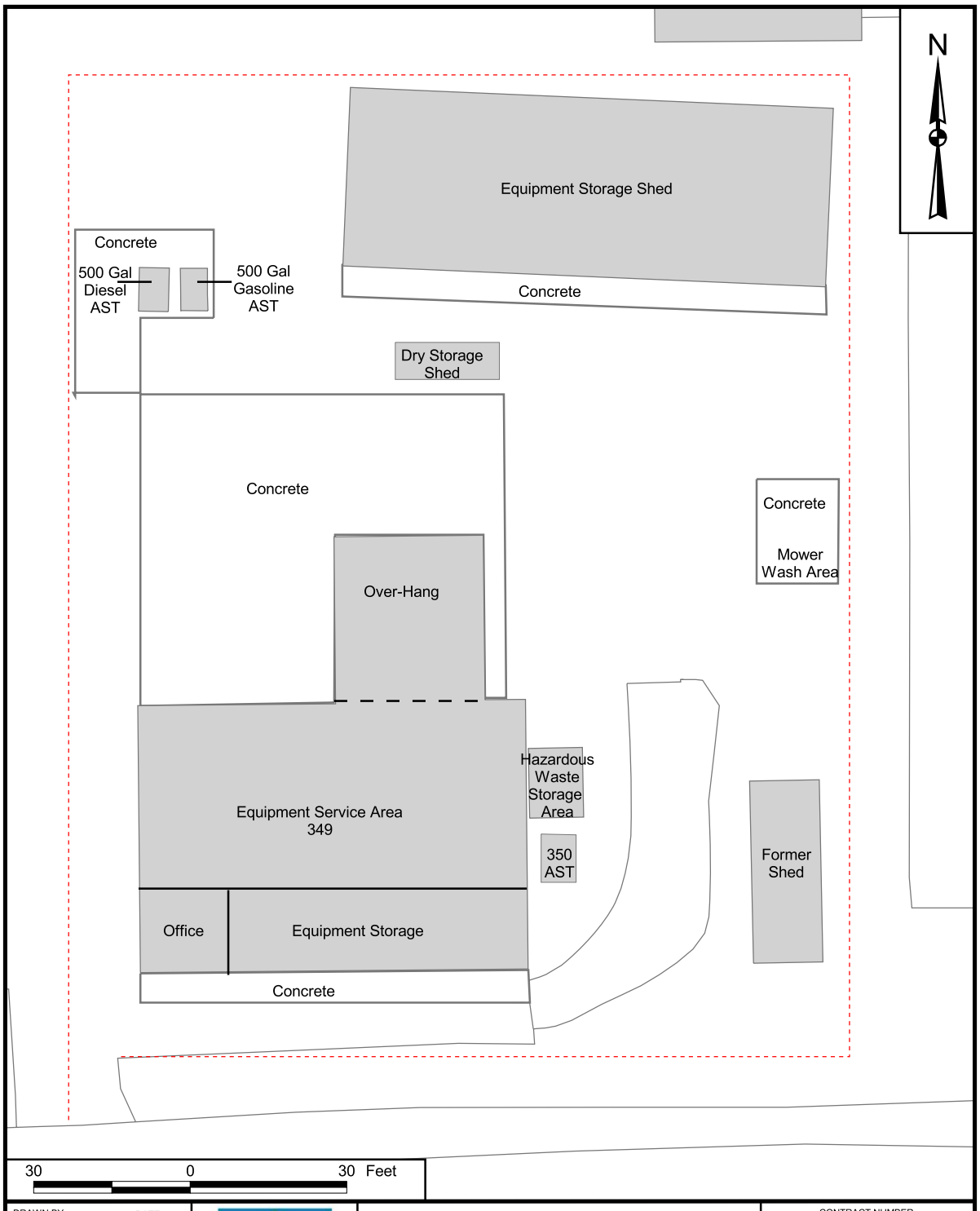
2.2 INVESTIGATIONS PRIOR TO THE RFI/CMS

TtNUS conducted confirmatory sampling (CS) of soil and groundwater at AOC E in May 2007 in order to characterize site conditions and identify potential source areas. The following six locations of interest (LOIs) were identified during the CS (TtNUS, 2007):

- LOI 1: Building 349 including the adjacent cement pad and waste storage areas.
- LOI 2: The equipment storage shed located along the northern property boundary.
- LOI 3: The area of the former dry storage shed along the eastern property boundary in the southeastern portion of the site.
- LOI 4: The dry storage shed in the center of the property.
- LOI 5: The ASTs area in the northwestern corner of the site.
- LOI 6: The wash pad area located on the eastern boundary.

CS field activities were completed May 16, 2007 through May 17, 2007. The results and conclusions presented on this section are based on the information provided in the CS Report prepared by TtNUS and submitted to NAVFAC SE presenting investigation methodology used and data and observations recorded during CS activities (TtNUS, 2007).

As part of CS activities, a total of 40 soil borings were completed to the water table across the site to cover the soil surrounding each LOI (see Figure 2-1 in Appendix A). At each boring location, the soil was screened every 2 feet using an organic vapor analyzer (OVA) equipped with a flame ionization detector (FID) in accordance with the headspace screening method described in Chapter 62-770.200(2) Florida



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COST/SCHEDULE-AREA			APPROVED BY: — DATE: —
SCALE: AS NOTED			DRAWING NO.: FIGURE 2-2 ; REV: 0

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Administrative Code (FAC). No positive FID responses were recorded from any of the 40 soil screening locations.

A total of 12 surface soil samples were collected between 0 and 1 foot below land surface (bls) in the vicinity of each identified LOI (see Figure 2-2 in Appendix A) where greater adverse impacts were suspected based on site operations and conditions. Soil samples were sent to a fixed-based laboratory to be analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons (PAHs), TRPH, 8-RCRA metals, polychlorinated biphenyls (PCBs), and pesticides. Analytical results indicated that TRPH concentrations above the Chapter 62-777, FAC, Soil Cleanup Target Levels (SCTLs) occurred in five soil sampling locations (see Figure 3-1 in Appendix A).

During the May 2007 investigation activities, groundwater samples were collected from six temporary piezometers installed next to soil sampling locations in order to consistently investigate the presence and nature of the contamination at the site. Groundwater grab samples were sent to a fixed-base laboratory to be analyzed for Appendix IX VOC, Appendix IX SVOC, PAHs, TRPH, 8-RCRA metals, PCBs and pesticides. The analytical data showed arsenic concentrations above Chapter 62-777, FAC, Groundwater Cleanup Target Levels (GCTLs) present in the groundwater in the vicinity of the wash pad area and in the vicinity of the former dry storage shed (see Figure 3-2 in Appendix A). No soil contamination was reported at these groundwater impacted locations.

Chemicals of concern (COCs) identified at concentrations exceeding regulatory criteria included TRPH in soil and arsenic in groundwater samples collected for this investigation. Concentrations reported by the laboratory for these two COCs exceeded Florida Department of Environmental Protection (FDEP) Cleanup Target Levels (CTLs) comparison criteria (FDEP, 2005). A definite source of contamination was not identified.

3.0 SAMPLING RATIONALE AND ANALYSIS PLAN

Limited information is available regarding potential contamination of soil and groundwater at AOC E. Based on the previous investigation, TRPH and arsenic concentrations above FDEP CTLs occurred in the soil and groundwater at the site; however, additional information is necessary to delineate the vertical and horizontal extent of the contamination and to identify the source locations.

As part of the RFI effort, surface soil, subsurface soil, and groundwater samples will be collected and analyzed for TRPH and arsenic. The RFI efforts will be divided in two events. The first event will consist of a multi-phase soil investigation, the installation of piezometers on the site in order to determine groundwater flow direction, and the installation of two shallow monitoring wells in order to confirm groundwater contamination at locations reported with GCTL exceedances during the previous investigation. The second event will include monitoring well installation and groundwater sampling activities. Field observations and measurements will be recorded and evaluated during investigation activities in order to collect media samples in areas of greatest potential of contamination. Field investigation procedures are described in Section 4.0.

3.1 EVENT 1: SOIL INVESTIGATION AND PRELIMINARY GROUNDWATER INVESTIGATION

In order to delineate the horizontal extent of soil contamination in the impacted areas identified in previous investigations, surface soil samples will be collected from the perimeter of the reported impact locations and analyzed for TRPH. Surface soil samples will be collected between 0 foot and 1 foot bls using a hand auger in the designated locations. In order to delineate vertical soil contamination, subsurface soil will be collected from the reported exceedance locations. Based on analytical data and following this rationale, surface soil samples will continue to be collected from the perimeter of the locations where constituent concentrations are reported above SCTLs, and subsurface soil samples will be collected from the exceedance points. In this manner, the soil investigations will expand laterally and vertically as necessary to define the extent of contamination. Twenty-one initial surface soil and five subsurface soil sampling locations have been identified based on CS results for the first phase of soil investigation. Up to 100 soil borings may be completed across the site during RFI activities. Surface and subsurface soil samples will also be collected at the location of two shallow monitoring wells (MW01 and MW02) that are to be installed at the site. These samples will be analyzed the following geochemical parameters: bulk density, pH, and cation exchange capacity (CEC). The geochemical parameters will be used to evaluate the potential of arsenic to leach to groundwater. Summaries of soil sampling rationale and proposed analyses are provided on Table 3-1. The proposed initial surface soil and subsurface soil sampling locations are shown in Figure 3-1. The proposed location of monitoring wells MW01 and MW03 is shown in Figure 3-2.

TABLE 3-1
RATIONALE FOR SOIL SAMPLING LOCATIONS

AOC E
NAVSTA MAYPORT
JACKSONVILLE, FLORIDA

Sample Location	Anticipated Analytical Sample Depths	Rationale for Location[3]	Analyses
SS01 through SS021[1]	0-1 foot bls	Surface soil samples collected in the perimeter of locations of previous SCTLs exceedances. Samples will be collected within 10 feet from the point of exceedance in order to delineate the horizontal extent of contamination.	TRPH [Florida Petroleum Range Organics (FL-PRO)]
SB01 through SB05[2]	0-2 foot bls 2-4 feet bls[2]	Based on previous soil investigation, collect soil screening data (above water table) every 2 feet, and collect soil samples from exceedance locations to determine potential associated contamination.	

Notes:

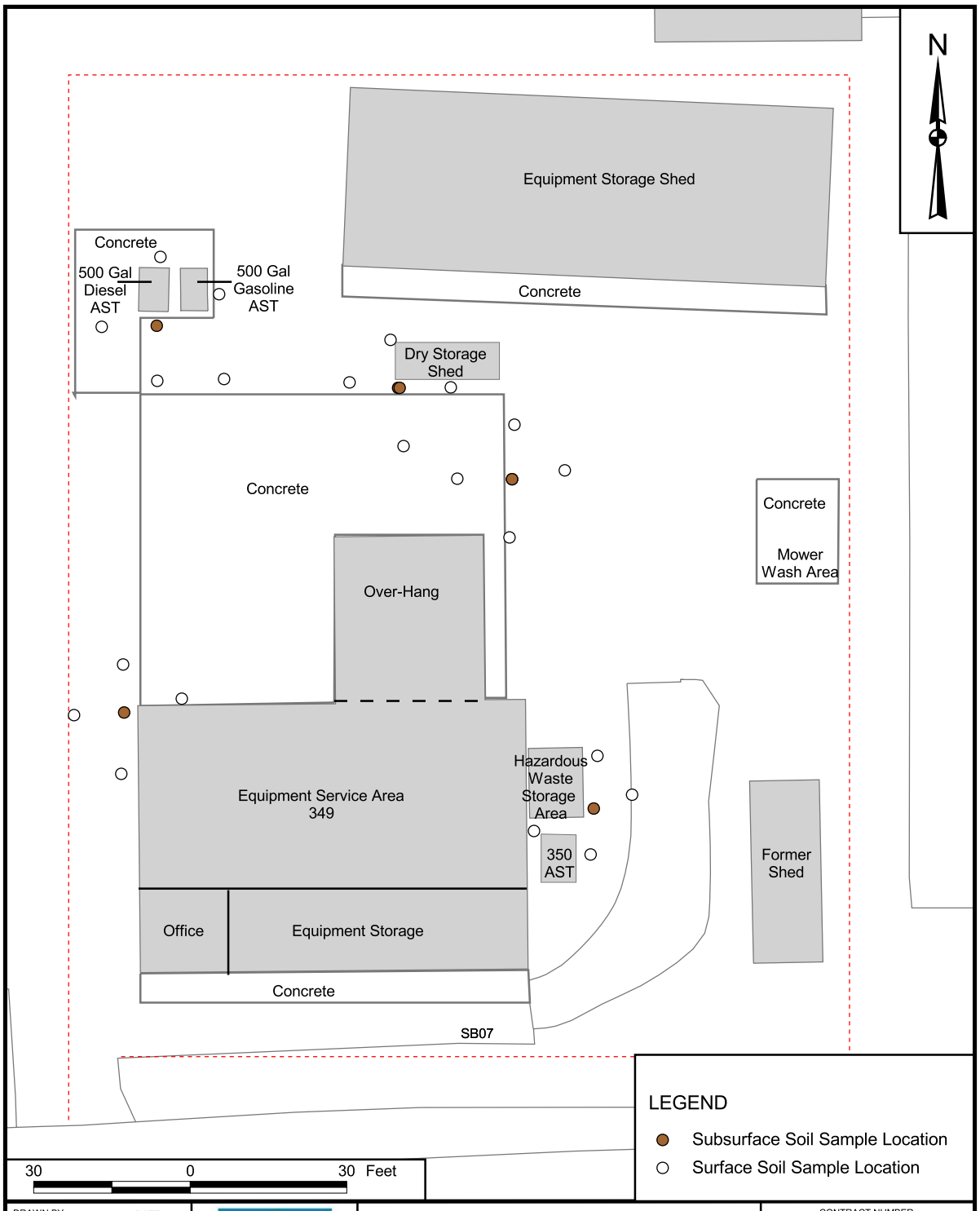
[1] A total 25 surface soil samples will be initially collected at the site and up to 100 soil borings might be completed across the site. The actual number of soil borings and samples is dependent on soil observation and analytical results recorded during soil investigation.

[2] Soil samples will not be collected below the water table. Samples will be collected every 2 feet (2, 4, 6, 8, etc.) until the water table is reached. Each sample will be screened for the presence of hydrocarbon contamination using an OVA equipped with a FID. The subsurface sample exhibiting the highest OVA reading at each location will be collected for laboratory analysis. If no evidence of contamination is observed, an unsaturated soil sample will be collected directly above the water table. The water table at the site is generally expected to be between 2 to 6 feet bls, but could possibly extend to deeper at some locations. In the event a deep water table is present at a soil sample location, a middle sample will need to be collected.

[3] Soil sampling rationale described on this table will continue to apply based on data collected from SS01 through SS021. In this manner, subsurface soil samples will be completed at locations exhibiting elevated contaminant concentrations, and surface soil samples will be collected from the perimeter of these locations. This rationale will continue for up to 100 soil borings.

SB = Subsurface Soil Sample
SS = Surface Soil Sample

Subsurface soil samples will be collected every 2 feet (2, 4, 6, 8, etc.) until the water table is reached using a hand auger. The water table at the site is generally expected to be between 2 and 6 feet bls (TtNUS, 2007). Soil samples will not be collected below the water table. Each sample will be screened for the presence of hydrocarbon contamination using an OVA equipped with a FID in accordance with the headspace screening method described in Chapter 62-770.200(2), FAC. The subsurface sample exhibiting the highest OVA reading at each location will be collected for laboratory analysis for TRPH. If no evidence of contamination is observed, an unsaturated soil sample will be collected directly above the water table.



DRAWN BY: S. STROZ	DATE: 04/07/09	PROPOSED INITIAL SOIL SAMPLING LOCATIONS MAP AOC - E NAVAL STATION MAYPORT JACKSONVILLE, FLORIDA	CONTRACT NUMBER: CTO-0088
CHECKED BY: J. GIBSON	DATE: 04/07/09		APPROVED BY: — DATE: —
COST/SCHEDULE-AREA			APPROVED BY: — DATE: —
SCALE: AS NOTED			DRAWING NO.: FIGURE 3-1 REV: 0

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All soil samples will be collected in accordance with FDEP SOPs (FDEP, 2008). Soil investigation methodologies are detailed within Section 4.0 of this Work Plan.

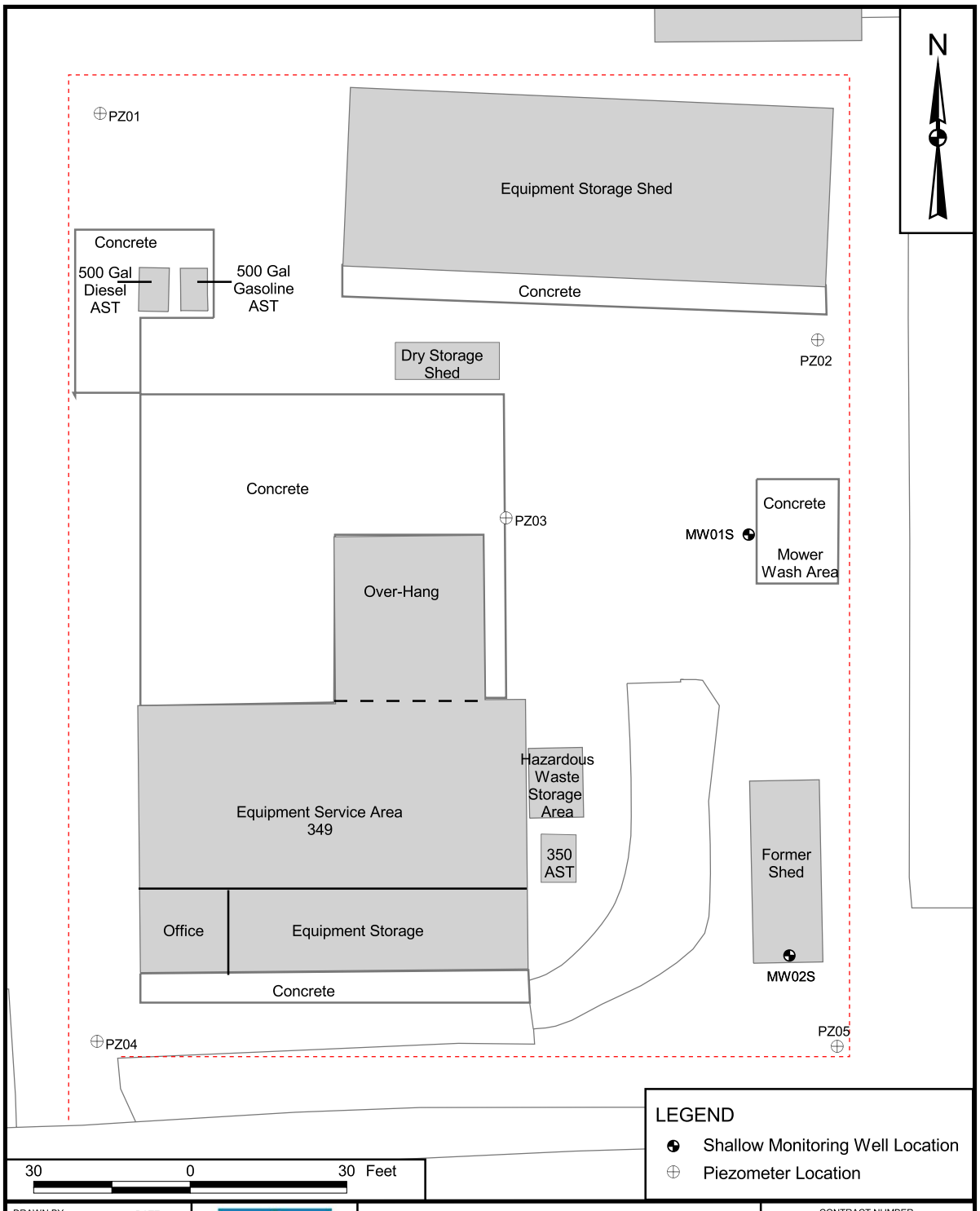
Five temporary piezometers will be installed across AOC E during Event 1. These temporary wells will be constructed of 5 feet of 0.010-slot polyvinyl chloride (PVC) well screen and 2 to 5 feet of solid riser, and the natural sand formation will serve as a filter pack. A round of water level measurements will be collected at the piezometers and monitoring wells at AOC E in order to accurately determine groundwater flow at the site. The locations for these temporary piezometers are shown on Figure 3-2.

Two shallow monitoring wells (MW01 and MW02) will be installed at AOC E at the locations with previously reported GCTL exceedances in order to confirm the presence of contamination at these points. Hollow stem auguring (HSA) methods will be used to install the 2-inch diameter wells to an approximate depth of 15 feet. Using a 10-foot screen, the monitoring wells will be screened across the water table. The newly installed monitoring wells will be developed using a mechanical pump to ensure that groundwater samples are representative of site conditions prior to sampling activities. The grout in the well will be allowed to cure for 24 hours before sampling and analysis for TRPH and arsenic. Groundwater samples will be collected from the new monitoring wells using a low-flow technique and in accordance with FDEP SOPs (FDEP, 2008). The locations of the monitoring wells to be installed as part of Event 1 are shown on Figure 3-2. Summaries of monitoring well location rationale and proposed analyses are provided in Table 3-2. Monitoring well installation and groundwater sampling procedures are discussed in Section 4.0 of this Work Plan.

Soil and groundwater samples will be immediately placed into laboratory-supplied containers. The samples will be labeled, preserved on ice, and transported to a National Environmental Laboratory Accreditation Conference-certified laboratory following Chain of Custody protocol. The groundwater and soil samples will be analyzed in conformance with either USEPA SW-846 6010B for arsenic or FL-PRO methodology for TRPH with complete Contract Laboratory Program-like data packages to allow for data validation. A summary of laboratory analytical requirements for soil and groundwater samples are included in Table 3-3.

3.2 EVENT 2: GROUNDWATER INVESTIGATION

Up to a total of 15 shallow monitoring wells will be installed across AOC E to assist in the delineation of groundwater contamination. Two shallow monitoring wells will be installed during Event 1 (MW01 and MW02), and the additional monitoring well locations (MW03 through MW15) will be determined based on data collected during the Event 1 field investigation.



DRAWN BY: S. STROZ	DATE: 10/08/07	PIEZOMETER AND SHALLOW MONITORING WELL LOCATION MAP AOC E NAVAL STATION MAYPORT JACKSONVILLE, FLORIDA	CONTRACT NUMBER: CTO-0088
CHECKED BY: M. PAITUVI	DATE: 10/08/07		APPROVED BY: — DATE: —
COST/SCHEDULE-AREA			APPROVED BY: — DATE: —
SCALE: AS NOTED			DRAWING NO.: FIGURE 3-2 REV: 0

P:\GIS\MAYPORT_NS\MAPDOCS\APR\BLDG_349.APR PIEZOMETER AND SHALLOW MW LOCATIONS LAYOUT 10/08/07 SS

TABLE 3-2
RATIONALE FOR GROUNDWATER SAMPLING LOCATIONS

AOC E
NAVSTA MAYPORT
JACKSONVILLE, FLORIDA

Sample Location[1]	Approximate Total Depth (bls)[3]	Rationale for Location	Analyses
Temporary Piezometers PZ01 through PZ05[1]	10 feet	Collect water level measurements in order to determine groundwater flow direction at the site	NA
Shallow Wells MW01 and MW02	15 feet	Confirm or deny any potential groundwater contamination and aid in site geology/hydrogeology evaluation	▪ RCRA Appendix IX metals (arsenic) ▪ TRPH
Shallow Wells MW03 through MW15[2]	15 feet	Define extent of groundwater contamination and aid in site geology/hydrogeology evaluation (If required)	▪ RCRA Appendix IX metals (arsenic) ▪ TRPH

Notes:
[1] Temporary wells will be completed during Event 1 of the investigation.
[2] Well locations are subject to change based on the field data and observations recorded during investigation activities.
[3] Approximate depths are subject to change based on field observations and water table measurements at the site.

TABLE 3-3
SUMMARY OF SOIL AND GROUNDWATER ANALYTICAL REQUIREMENTS

AOC E
NAVSTA MAYPORT
JACKSONVILLE, FLORIDA

Analysis	Analytical Method	Sample Volume(1)	Bottleware	Preservation(2)	Holding Time(3)
SOIL SAMPLING: FIXED-BASE LABORATORY					
TRPH	FL-PRO	4 oz	Glass	Cool to 6 °C	7 days to extraction; 40 days from extraction to analysis
CEC	USEPA SW-846 9081	4 oz	Glass	Cool to 4 °C	6 months to analysis
pH	USEPA SW-846 9045C	4 oz	Glass	Cool to 4 °C	Analyze as soon as possible
Bulk density	ASTM D 2937-94M	-	Sleeve	-	-
GROUNDWATER SAMPLING: FIXED-BASE LABORATORY					
Appendix IX metals (arsenic)	USEPA SW-846 6010B	1 Liter	Polyethene, plastic cap, plastic liner	Cool to 4 °C; dark HNO_3 to pH<2	Within 180 days
TRPH	FL-PRO	4 oz	Amber glass, Teflon ™-lined cap	Cool to 4 °C; dark	7 days to extraction; 40 days from extraction to analysis

NOTES:
1 Sample volume may vary based on laboratory requirements.
2 HNO_3 - Nitric acid
3 Holding times are measured from the date/time of sample collection.
°C = Degrees Celsius

HSA methods will be used to install 2-inch diameter wells to an approximate depth of 15 feet. Using a 10-foot screen, the monitoring wells will be screened across the water table. The newly installed monitoring wells will be developed using a mechanical pump to ensure that groundwater samples are representative of site conditions prior to sampling activities. The grout in the well will be allowed to cure for 24 hours before sampling. Monitoring well installation procedures are discussed in Section 4.0 of this Work Plan.

Top of casing elevations and a round of water level measurements will be collected from the newly installed and existing monitoring wells at AOC E prior to groundwater sampling in order to accurately determine the groundwater flow. Groundwater samples will be collected from the new monitoring wells using a low-flow technique and sent to a fixed-base laboratory for analysis of TRPH and arsenic. Field measurements of temperature, pH, turbidity, and specific conductance for groundwater will be collected to determine aquifer stabilization during well purging. All groundwater samples will be collected in accordance with FDEP SOPs (FDEP, 2008). A summary of the groundwater sample locations and proposed analysis is presented in Table 3-2.

Procedures for groundwater investigation are detailed within Section 4.0 of this Work Plan. Groundwater samples collected during the field program will be collected and analyzed in conformance with USEPA SW-846 6010B and FL-PRO methodology, with complete Contract Laboratory Program-like data packages to allow for data validation. A summary of laboratory analytical requirements for groundwater samples is included in Table 3-3.

3.3 LABORATORY ANALYSIS AND QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

As part of the analytical program, QA/QC samples will be collected during soil and groundwater activities. The field sampling team will provide the appropriate additional sample volume as prescribed by the laboratory requirements for laboratory duplicate and matrix spike samples.

Rinsate blanks are collected to determine whether the source water or the decontamination process have introduced contaminants to the environmental samples collected. Field duplicates are a single sample split into two portions for a determination of the precision of the sampling and analysis method employed in the laboratory. The additional samples for analysis of the matrix spike (MS)/matrix spike duplicates (MSD) will be collected with a frequency of 1 per 20 samples per matrix. The frequency for the collection of the field quality control samples are detailed in Table 3-4.

TABLE 3-4
FREQUENCY OF FIELD QUALITY CONTROL SAMPLES

AOC E
NAVSTA MAYPORT
JACKSONVILLE, FLORIDA

Type Of Samples	Frequency
Rinsate Blank	1 per media per sample event
Field Duplicate	1 per 20 samples per matrix
MS/MSD	1 per 20 samples per matrix

4.0 FIELD INVESTIGATION

Analysis of the previous investigation results suggests that additional data is needed to characterize the extent of potential soil and groundwater contamination at AOC E. Adjustments to this Work Plan may be necessary as new data becomes available. If new field investigation methods or changes to existing methods become necessary as a result of adjustments to the scope of work, then the proposed revisions will be presented by TtNUS to the Team for review and approval.

The planned activities for the RFI include the following general categories of field investigation activities:

- Measurement of groundwater potentiometric levels.
- Collection of groundwater samples.
- Field measurement of physical and chemical properties of soil and groundwater samples.
- Collection of subsurface soil samples using hand auger techniques.
- Collection of surface soil samples.
- Installation of groundwater monitoring wells via HSA in the shallow zone of the aquifer.
- Decontamination of investigation equipment.
- Sample management.
- Field QC, documentation, and record keeping.
- IDW management.
- Surveying.

4.1 STANDARD OPERATION PROCEDURES

A variety of field investigation activities will be conducted at NAVSTA Mayport to meet the objectives of the RFI/CMS. Field activities will be conducted in accordance with the Site Specific Health and Safety Plan and the FDEP SOPs for Field Activities (FDEP, 2008). In the event the FDEP SOPs do not apply to a specific task, TtNUS will defer to the TtNUS Corporate SOPs (TtNUS, 2004) or Navy guidance.

These guidelines will be followed to ensure the data is consistent with regulatory requirements and meet the data quality objectives. A copy of the above-referenced guidance documents along with this Work Plan will be maintained on site by TtNUS field personnel at NAVSTA Mayport and will be reviewed with the field team before work begins.

4.2 FIELD TEAM ORGANIZATION

The TtNUS RFI field team will consist of staff members who will conduct the field investigation activities. The organization of the field team is described below.

- The FOL is responsible for the day-to-day direction of personnel in the field. The FOL will assign tasks to field team personnel, direct the sequence of activities, coordinate with NAVSTA Mayport personnel, coordinate subcontractors, and review tasks in progress and those completed. The FOL will ensure that project-specific plans are implemented and that activities are in compliance with appropriate guidelines.

- The Project Safety Officer is responsible for ensuring that proper health and safety procedures are identified and implemented for the project and that project-related health and safety incidents are properly investigated. In the event that only a small number of project staff are required on site, the duties of the Project Safety Officer may be assigned to the FOL or another member of the field team. The Project Safety Officer or designee will report directly to the TtNUS Corporate Director of Health and Safety.

- The Field Geologist will oversee soil boring and monitoring well installation activities and may conduct various environmental sampling activities. Duties will include logging and documentation of drilling and well construction, environmental sample collection and handling, and ensuring that the approved methods are implemented. The field geologist may also conduct tests for identifying subsurface conditions and characterizing the groundwater flow regime.

- Sampling Personnel will be responsible for properly locating, collecting, preserving, packaging, documenting, and shipping environmental samples to the laboratory.

4.2.1 Mobilization

TtNUS must perform several internal tasks before field mobilizations. These tasks include the following:

- Preparation of technical and subcontractor bid specifications.
- Selection and mobilization of subcontractors.
- Acquisition and preparation of equipment for transportation to the field.
- Acquisition and preparation of expendable supplies for transportation to the field.
- Arrangement of transportation and lodging for field personnel.

In addition to internal efforts, external mobilization efforts will be coordinated with the NAVSTA Mayport POC. A list of the steps to be taken includes the following:

- Select staging areas for equipment and IDW.
- Select decontamination area(s).
- Complete security procedures for project and subcontractor personnel to gain access to NAVSTA Mayport.
- Ensure supplies of potable water are accessible.
- Coordinate with base personnel to acquire an excavation/digging permit from the Public Works Office.

Multiple decontamination facilities may be selected or constructed by the drilling subcontractor before the beginning of field activities at locations deemed appropriate by the NAVSTA Mayport POC and TtNUS. Site reconnaissance will be performed before initiation of field activities. Some of these activities will be performed with the assistance of NAVSTA Mayport personnel. These activities are listed below:

- Locating and setting up of decontamination facilities.
- Identifying the potable water source(s), electrical outlets, and other utilities to be used during field activities.
- Locating temporary storage for soil cuttings and purge/development water drums as well as solid wastes generated during field activities (e.g., Tyvek suites, gloves, plastic sheeting).
- Marking/staking sample locations.
- Locating underground and aboveground utilities within the work areas (including water, gas, sanitary sewer lines, drainage lines, telephone cable, and electric lines). Overhead electric lines may be shielded, if necessary.
- Erecting any necessary barricades and/or temporary fencing.

4.3 FIELD LOGBOOKS AND FORMS

Field logbooks and standard data collection forms will be completed for field investigation, sample description, and data collection activities. These forms include sample log sheets (for soil and groundwater samples), a daily record of drilling activities, and equipment calibration logs. Copies of these forms can be found in Appendix B.

A bound, weatherproof field logbook shall be maintained by each sampling event leader. The FOL or designee will record the information related to sampling or field activities. This information may include sampling time, weather conditions, unusual events (e.g., well tampering), field measurements,

descriptions of photographs, or other such details. A site logbook shall be maintained by the FOL. This book will contain a summary of daily site activities.

Each field team member who is supervising a drilling subcontractor must complete a daily record of drilling activity. This form documents the stage, hours, methods, materials, and supplies used during daily drilling activities. The information contained on this form is used for billing verification and progress reports. The driller's signature is required at the end of each working day to verify work accomplished, hours worked, standby time, and material used. An example of this form is provided in Appendix B.

At the completion of field activities, the FOL will submit to the TOM field records, data, field logbooks, site logbooks, chain-of-custody receipts, sample log sheets, drilling logs, daily logs, and other such forms.

4.4 MONITORING WELL INSTALLATION

The monitoring wells will be installed using HSA methods. The wells will be completed to approximate depths of 15 feet bls as determined in the field. Two-inch diameter, Schedule 40 PVC, flush-threaded casing with 10 feet of 0.01-in. factory-slotted PVC screen will be used. The well screens will be placed such that the screens bracket the water table. Once the screen and riser pipe are in place, the annulus of the boring will be backfilled with clean, 20/30, silica sand from the bottom of the borehole to 2 feet above the top of the screen. A fine-sand seal at least 2 feet thick will be installed on top of the 20/30 silica sand. The remainder of the annulus of the borehole will be grouted by pumping cement/bentonite slurry through a tremie pipe up to 2 feet bls.

4.4.1 General Drilling Requirements

The only drilling fluid used will be potable water. In addition, lubricants used on the HSA rig will not introduce or mask COCs being investigated at the site. Trash, waste, grout, cuttings, and waste fluids associated with the monitoring well installation activities will be disposed of in accordance with the methods previously used at NAVSTA Mayport.

The items listed below will also be part of the SOP for monitoring well installation:

- Data related to well construction will be documented on a monitoring well sheet (Appendix B).
- Each well will be constructed by a driller and drilling company certified by the State of Florida.
- Well locations will be approved by the NAVSTA Mayport POC before installation.
- Glue will not be used to join screen or casing.
- A notch or mark will be made into the top of the casing to be used as a reference point for the elevation survey and for measuring water levels.

4.4.2 Well Casing and Screen Materials

Permanent and temporary monitoring wells will be constructed of Schedule 40 PVC casing and screen manufactured for environmental applications (i.e., no inked markings, shipped clean in individual, sealed wrappings) and meeting the requirements of the American Society for Testing and Materials (ASTM) F 480 and D 1785 (ASTM, 2006). The use of PVC will make the construction of these wells consistent with that of wells previously installed at NAVSTA Mayport. If conditions are encountered where the use of PVC in well construction is inappropriate, then stainless steel or another suitable material will be selected and presented to FDEP and Navy personnel for approval before being used.

4.4.3 Filter Pack and Screen Design

RFI well construction will follow previous NAVSTA Mayport investigation practice of using a 20/30-size gradation filter material coupled with a 0.010-inch, factory-slotted well screen. This filter pack size and screen slot size combination has previously been used at NAVSTA Mayport, and groundwater samples of acceptable quality have been obtained.

The 20/30 filter size is compatible with a formation that has a D30 size (i.e., 30 percent finer by weight than the D30 sieve size) in the range of fine sand. If visual inspection of the drill cuttings or split-spoon samples indicates that the D30 size of the formation is significantly coarser than this range (e.g., uniform medium to coarse sand and/or gravel), then an alternate filter pack and screen slot size combination will be recommended in accordance with FDEP SOPs.

4.4.4 Well Surface Completion

Each monitoring well surface completion will be flush mount. The riser pipe will be cut to approximately 3 inches bls using an inside pipe cutter and a v-notch or mark will be made into the north edge of the top of casing for surveying purposes. A protective steel casing will be flush-mount installed around each monitoring well. The flush-mount covers shall be a minimum 8-inch round security vault provided with sealing gasket to reduce the amount of water infiltration. Each well will be fitted with a locking expansion plug and stainless steel lock. A 2-foot by 2-foot by 6-inch thick concrete pad will be constructed around each flush mount monitoring well. The flush mounted casings shall be completed 1 inch above existing grade and the apron tapered to be flush with existing grade at the edges such that water will run off of the apron. The protective casing shall be completed with a metal identification tag indicating the corresponding well identifier.

The tag specifications include the following:

- 4-inch by 4-inch by 0.032-inch stainless steel or aluminum.
- 3/16 inch lettering.
- 1/8 inch diameter mounting holes.
- Black printed or stamped lettering.

4.4.5 Well Development

Monitoring wells will be developed to remove fine-grained sediments. The preferred method of development will be surging alternated with overpumping. Development equipment will be decontaminated before being placed in the well. Throughout the development procedure, discharge water color and volume shall be documented. Wells will be developed until the following criteria are achieved:

- Stabilization of the following parameters occurs:
  - Temperature is constant for three consecutive readings.
  - pH plus or minus 0.1 unit.
  - Specific conductivity plus or minus 10 percent of scale.
  - Turbidity is below 10 Nephelometric Turbidity Units (NTUs).
- A minimum of five well volumes is removed from the monitoring well.
- Accumulated sediment is removed from the well.

The well development process will begin no sooner than 24 hours after well installation. Detergents, bleaches, soaps, or other such items will not be used to develop a well. Following development and after the water levels have been allowed to stabilize a minimum of 24 hours, the static water level will be measured and recorded. Data related to well development, including alternate development methodologies and their justification, will be written on the well development sheet (see Appendix B) or in the field logbook. Development water will be containerized and disposed of according to the NAVSTA Mayport SOP for IDW (see Appendix C).

4.5 SAMPLE HEAD SPACE ANALYSIS

Soil vapor head space analyses will be performed in general accordance with the method described in Chapter 62-770.200(2), FAC. Soil samples will be analyzed for their total hydrocarbon content using an OVA equipped with a FID. Charcoal filters will be used to differentiate between methane (a naturally occurring gas) and petroleum hydrocarbon vapors. This information will be recorded in the field logbook.

The following steps will be used to prepare soil samples for head space analysis:

- Each soil sample to be analyzed will be equally split and placed into two clean, 8-ounce glass jars.
- Each sample jar will be filled to approximately one-half of its volume, if sufficient sample volume is available.
- Aluminum foil covers will be sealed over the open end of the glass jar using a threaded, metal ring.
- The sample jars will be allowed to equilibrate under a temperature range of 20 to 32 °C for approximately 5 minutes.
- The head space will be measured by piercing the aluminum foil with the FID probe and recording the highest sustained reading.
- The FID will be calibrated daily and calibration will be confirmed every 20 samples.
- If FID readings above background are detected in the first jar, the second sample jar will be measured using an in-line charcoal filter to determine the portion of the total reading attributable to methane gas.

4.6 GROUNDWATER LEVEL MEASUREMENTS

Measurement of the depth to water in monitoring wells will be performed according to FDEP SOPs. A minimum of one complete round of water level measurements will be obtained from site monitoring wells. These measurements will also fall within a 48-hour period of consistent weather conditions to minimize atmospheric/precipitation effects on groundwater conditions. Measurements will be collected at least 24 hours after well development using an electrical water level indicator. A permanent reference point on the top of each well casing will be used for determining the depth to water. Measurements will be recorded on a field water level measurement sheet (see Appendix B) and in the field logbook to the nearest 0.01 foot. Static water levels will be measured in each well before any fluid is withdrawn. If floating hydrocarbon is detected in the monitoring wells, the thickness of the free product will be measured with an electronic interface probe and an adjusted water level will be calculated for the monitoring well.

4.7 SOIL SAMPLING

Up to 100 soil borings may be completed across AOC E. Surface and subsurface soil samples will be collected as part of RFI efforts. Soil samples will be immediately placed into laboratory-supplied containers. The samples will be labeled, preserved on ice, and transported to the laboratory. Surface and subsurface soil samples will be analyzed for TRPH in conformance with FL-PRO methodology, with complete Contract Laboratory Program-like data packages to allow for data validation. QA/QC requirements are summarized in Table 3-4.

4.7.1 Surface Soil Sampling

Surface soil samples will be collected at approximately 0.5 to 1 foot bls. Surface soil samples will be collected in accordance with FDEP SOP FS 3100 (FDEP, 2008).

4.7.2 Subsurface Soil Sampling

Soil borings are to be completed to the water table using a hand auger and in accordance with FDEP SOP FS 3200 (FDEP, 2008). Soil screening samples will be collected every 2 feet and will be screened using an OVA as indicated in Section 4.5.

4.8 GROUNDWATER SAMPLING

Groundwater samples will be collected using low-flow purging (typically a rate of less than 1 liter per minute) and sampling with a peristaltic pump and Teflon™ tubing dedicated to each well. All groundwater samples will be collected using the procedures as specified in FDEP SOP FS 2000 (FDEP, 2008). If light non-aqueous phase liquid is detected in any monitoring well prior to sampling, a groundwater sample will not be collected at that location.

Prior to groundwater sample collection, the monitoring wells will be purged to remove stagnant water in the well casing. Both purging and sampling operations will be conducted at a flow rate that results in a groundwater turbidity measurement of 20 NTUs or less if possible.

Groundwater samples will be immediately placed into laboratory-supplied containers. The samples will be labeled, preserved on ice, and transported to the laboratory. Groundwater samples will be analyzed for arsenic and TRPH in conformance with USEPA SW-846 and FL-PRO methodology, with complete Contract Laboratory Program-like data packages to allow for data validation. QA/QC requirements are summarized in Table 3-4.

4.9 FIELD MEASUREMENTS

Field measurements recorded during field and sampling operations include screening breathing air around the workspace area, screening soil samples, and screening air quality within the well casing. Also, field measurements of groundwater temperature, pH, turbidity, specific conductance, dissolved oxygen, and water levels will be taken. The following instruments are anticipated to be used during the field activities:

- FID.
- YSI 556 water quality data meter (or equivalent).

- Electronic water-level meter.
- LaMotte 2020 turbidity meter (or equivalent).

Field instruments are calibrated according to the manufacturer's procedures and in accordance with the following:

- YSI 556 water quality meters (or equivalent) are commonly used in place of separate temperature, conductivity, pH, and dissolved oxygen meters. This device can record six separate parameters and is calibrated before each day's use.
- LaMotte 2020 turbidity meters are used to give a more accurate measurement of turbidity. This device will be calibrated before each day's use.
- FIDs will be calibrated as per the manufacturer's recommendations.

Instrument calibration is recorded on an Equipment Calibration Log Sheet provided in Appendix B. During calibration, a maintenance check is performed on each piece of equipment. If damaged or defective parts are identified during the maintenance check and it is determined that the damage could have an impact on the instrument's performance, the instrument will be removed from service until the defective parts can be repaired or the instrument replaced.

4.9.1 Field Instrument Control Limits

QA/QC specifications for field measurements are summarized in Table 4-1. This table shows the control parameters to be assessed, control limits, and corrective actions to be implemented. The TtNUS representative on site at each well and boring will confirm measurements of total depth of holes, dimensions and placement of well screens and casings, and volume and placement of filter pack and grout materials by independent observation or measurement. The FOL will review field forms and field logbook entries for indications of measurement data outside of the control range.

TABLE 4-1
FIELD QA/QC SPECIFICATIONS

AOC E
NAVAL STATION MAYPORT
JACKSONVILLE, FLORIDA

Analysis	Control Parameter	Control Limit	Corrective Action	FDEP SOP Number
Air monitoring using an OVA	Daily check of calibration of FID	Calibration to manufacturer's specifications	Recalibrate. If unable to calibrate, replace.	
pH of water	Continuing calibration check of pH 7.0 buffer	pH = 7.0 ± 0.1	Recalibrate. If unable to calibrate, replace electrode.	FT 1100
Specific conductance of water	Continuing calibration check of standard solution	± 1% of standard	Recalibrate.	FT 1200
Temperature of water	Check against NIST precision thermometer	± 0.1 °C at two different temperatures	Reset thermistors in accordance with manufacturer's specifications; dispose of inaccurate thermometer.	FT 1400
Dissolved Oxygen	Continuing dissolved oxygen determinations	Calibration to manufacturer's specifications	Recalibrate.	FT 1500
Turbidity	Continuing measurement of the scattering effect that suspended solids have on the propagation of light through a body of water	Calibration to manufacturer's specifications	Recalibrate.	FT 1600

Notes:
NIST – National Institute of Standards and Technology

4.9.2 Manufacturers' Specifications

The FOL shall collect a copy of the available manufacturers' specifications and material safety data sheets, if applicable, for supplies and equipment that are used in the collection of environmental samples. This shall apply to, but not be limited to, the following:

- Calibration gases.
- Sample containers.
- Decontamination solvents and detergents.
- Laboratory-grade/analyte-free water.
- Reagents.

- Drilling additives.
- Bentonite and cement.
- Filter pack materials.
- Well casing and screen.
- Disposable bailers, filters, and tubing.

The manufacturers' specifications will be included in the project files at the end of the field mobilization.

4.10 DECONTAMINATION PROCEDURES

The decontamination of major equipment (e.g., HSA rigs) and sampling equipment (e.g., split-spoons) will minimize the spread of contamination to clean zones, reduce cross-contamination of samples when equipment is used at more than one sampling location, and minimize exposure to site personnel. FDEP SOPs for decontamination (FDEP-SOP FC 1000) will be followed (FDEP, 2008).

Major equipment will be decontaminated at the equipment decontamination area as necessary. Sampling equipment will be decontaminated in tubs or drainage pans to allow rinse water to collect for disposal. Rinsate samples will be collected from the decontaminated sampling equipment by rinsing the clean equipment with analyte-free water. The sampling equipment will then be wrapped in aluminum foil and stored in a clean area until use. Clean sampling equipment will not be allowed to come into contact with the ground or any potentially contaminated surfaces before use at the sampling location.

Disposable material (e.g., gloves, Tyvek suits) generated during decontamination will be bagged and stored in drums for proper disposal.

4.10.1 Soil Sampling Equipment

Stainless steel spoons, bowls, and other soil-sampling equipment will be decontaminated after each use. The decontamination procedure outlined in FDEP SOP FC 1000 will be used (FDEP, 2008).

4.10.2 Water Sampling Equipment

Peristaltic pumps will be used to purge and collect water samples. Dedicated Teflon™ tubing will be used for each sampling location. Water level indicators will be used to monitor water levels in the monitoring wells during sampling. Water level indicators will be cleaned in general accordance with FDEP SOP FC 1000 between each sampling location (FDEP, 2008).

4.10.3 Major Equipment

Between each well or boring, major equipment used for sample collection such as HSA rigs will be decontaminated. The equipment decontamination area will be used as necessary. Decontamination will consist of steam-cleaning, washing with Liquinox (or equivalent), and rinsing with potable water. If necessary, surfaces will be scrubbed until visible soil and possible contaminants have been removed. Dirt, grime, grease, oil, loose paint, and rust flakes shall be removed. The inside surfaces will be similarly cleaned. The decontamination area will be constructed and operated to contain solids and liquids produced.

4.11 SAMPLE HANDLING

4.11.1 Sample Containers, Preservation, Holding Times and Analysis

The samples containers, preservatives holding times, and specific analysis are provided in Table 3-2.

4.11.2 Laboratory Sample Identification

The sample identification system to be used in the field to identify each sample taken during the RFI field effort will be in accordance with FDEP SOP FD 5000 (FDEP, 2008). The coding system provides a tracking record to allow the retrieval of information about a particular sample and to ensure that each sample is uniquely identified.

Each sample will be assigned a unique codified sample identification number. The unique nomenclature established for this sampling event is as follows:

1		2		3		4
MPT-AOCE	-	SBXX or SSXX or MWXX	-	XX	-	MMDDYY

Sample nomenclatures for soil and groundwater samples are as follows:

- MPT-AOCE = NAVSTA Mayport, AOC E.
- SBXX = represents a subsurface soil sample where XX is a consecutive number beginning with '01.'
  SSXX = represents a surface soil sample where XX is a consecutive number beginning with '01.'
  MWXX = represents a groundwater sample where XX is monitoring well number.
- XX = Depth sample was collected at (feet bls) [not used for groundwater samples.
- MMDDYY = Month, Day, and Year of sample collection.

An example of the above nomenclature is as follows:

- A surface soil sample collected on August 29, 2006, from soil location SS02 at AOC E collected 1 foot bls would be represented by MPT-AOCE-SS02-01-082906.
- If the well MW01 at AOC E was sampled on August 29, 2006, the sample identification would be represented by MPT-AOCE-MW01-082906.

QA/QC samples required for the analytical program are summarized in Table 3-4. QA/QC samples collected during the field activities will be labeled in ascending order identifying the nature of the sample (rinsate, duplicate, MS/MSD). Examples of labeling for these samples follow:

- Rinsates: Rinsate samples will be labeled in ascending sequential order beginning with -01. For example, the first rinsate blank sample collected during AOC E characterization would be designated MPT-AOCE-RINSATE01-082906. Table 3-4 specifies the requirements for equipment rinsate blanks.

- Matrix Spike: MS samples will be labeled in ascending sequential order beginning with -01 for samples collected. An example of this is as follows: the second MS sample sent during the AOC E characterization would be designated MPT-AOCE-MS02-082906.

Pre-preserved, certified-clean bottleware will be supplied by the subcontracted laboratory for all samples.

4.11.3 Sample Custody, Packaging and Shipping

Custody of samples must be maintained and documented at all times. Chain-of-custody begins with the collection of the samples in the field. FDEP SOP 001/01 FS 1000 and TtNUS SOP SA-6.3 provide a description of the chain-of-custody procedures to be followed.

Samples will be packaged and shipped in accordance with FDEP SOP 001/01 FS1000: General Sampling and applicable sections of FS2200 and FS3000. The FOL will be responsible for completion of the following forms when samples are collected for shipping:

- Sample labels.
- Chain-of-custody labels.
- Appropriate labels applied to shipping coolers.
- Chain-of Custody forms.
- Federal Express air bills.

FS1000 also addresses the topics of containers, holding times, and sample preservations.

4.12 INVESTIGATION DERIVED WASTE

IDW generated during RFI field activities will be containerized in drums and stored on site until analysis of the media has been reviewed and appropriate decisions for the disposal of the waste can be made by the NAVSTA Mayport environmental coordinator. Purge water, decontamination water, and soil cuttings will be collected and containerized in Department of Transportation-approved (Specification 17C) 55-gallon drums. Each drum will be sealed, labeled, and left at a drum staging area pending groundwater analytical results or composite waste sample results and will be subsequently managed in accordance with procedures described in the NAVSTA Mayport SOP for IDW Waste (see Appendix C).

Weekly IDW inspections will occur for IDW temporarily stored on site to ensure that IDW is properly secured and labeled, that IDW drums are not compromised, and that IDW is removed from the site in a timely manner. A Weekly Investigative Derived Waste Checklist for NAVSTA Mayport (see Appendix C) will be completed during these IDW inspections and submitted to Diane Racine. Once the field events are completed and analytical results obtained, the IDW will be transported and disposed of off site by a subcontractor.

4.13 GLOBAL POSITIONING SURVEY LOCATIONS

The locations of sample points, soil borings, and wells may initially be determined during the field investigation using a portable Global Positioning Survey (GPS) instrument with sub-meter accuracy. This information may be helpful in plotting results and analyzing the data coverage in real-time to make data acquisition decisions during RFI field activities. The GPS instrument will be used in accordance with the manufacturer's instructions, and the results will be recorded in the field records. Monitoring wells and other selected points will be permanently located using a professional surveyor at the close of the field activities.

5.0 RFI/CMS REPORT PREPARATION

Following the soil and groundwater sampling events, an RFI Report will be prepared. This report will describe sampling activities, analytical results, and evaluate analytical and field data. Analytical summary tables and figures including, but not limited to, sample location maps, groundwater flow maps, and contaminant concentration maps will be presented as required. The RFI Report will summarize the data and provide and recommendations for future actions, as may be required. A HHRA and ERA will be conducted as part of the RFI. The HHRA and ERA will include a contaminant identification, exposure assessment, exposure assessment, toxicity assessment, and risk characterization.

The risk assessments evaluate the potential threat to human health and the environment based on applicable regulatory criteria in the absence of any remedial action, providing basis for determining if remedial action is necessary.

Following the acceptance of the final RFI Report, a CMS Report will be prepared to identify, screen, and evaluate corrective measure alternatives for all media at AOC E. The CMS Report will identify the contaminants and media that present unacceptable risk to human and the ecological receptors and evaluate and recommend potential corrective measures for addressing those risks. Up to five alternatives for soil and/or groundwater will be evaluated including No Action and Monitored Natural Attenuation.

6.0 NAVSTA MAYPORT SUPPORT

The NAVSTA Mayport facility POC will be responsible for the following activities:

- Providing access to the site.
- Answering questions related to NAVSTA Mayport policies and procedures.
- Signing manifests associated with IDW disposal, conducting IDW disposal, and providing TtNUS with a copy of the manifests for inclusion in the report.

REFERENCES

ASTM (American Society for Testing and Materials), 2006. F480-02 Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80 and D1785-06 Standard Specification for PVC Plastic Pipe, Schedules 40, 80, and 120.

FDEP (Florida Department of Environmental Protection), 2005. Technical Report: Development of Cleanup Target Levels for Chapter 62-777, FAC, Division of Waste Management, Tallahassee, Florida, February.

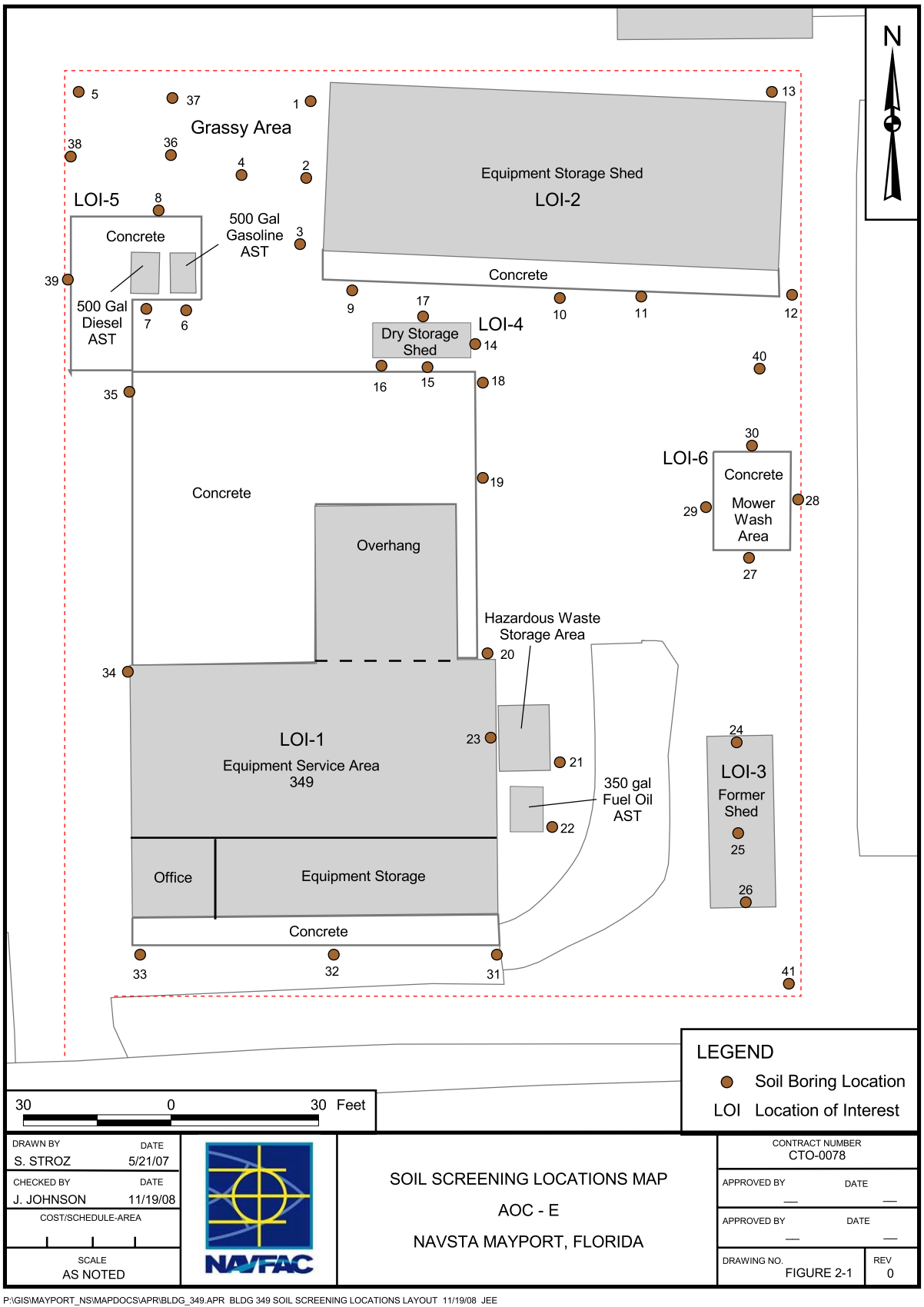
FDEP, 2008. Department of Environmental Protection Standard Operating Procedures for Field Activities DEP-SOP-001/01, Bureau of Laboratories Environmental Assessment Section, Tallahassee, Florida. March.

TtNUS (Tetra Tech NUS, Inc.), 2004. Corporate Standard Operating Procedures.

TtNUS, 2007. Confirmatory Sampling Report for Area of Concern E, Naval Station Mayport, J, Florida. Prepared for Southeast Division, Naval Facilities Engineering Command. October.

APPENDIX A

HISTORICAL INFORMATION



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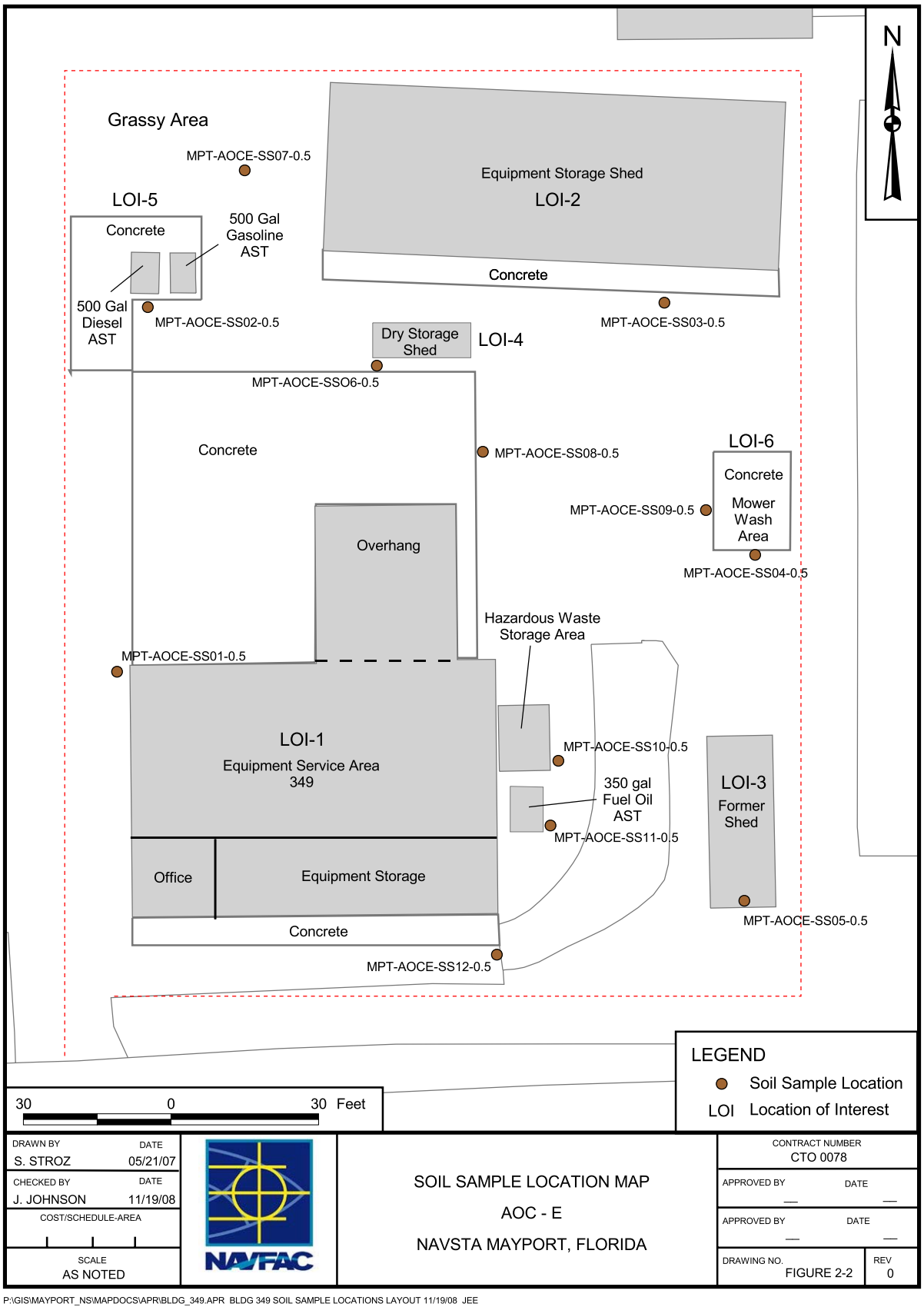
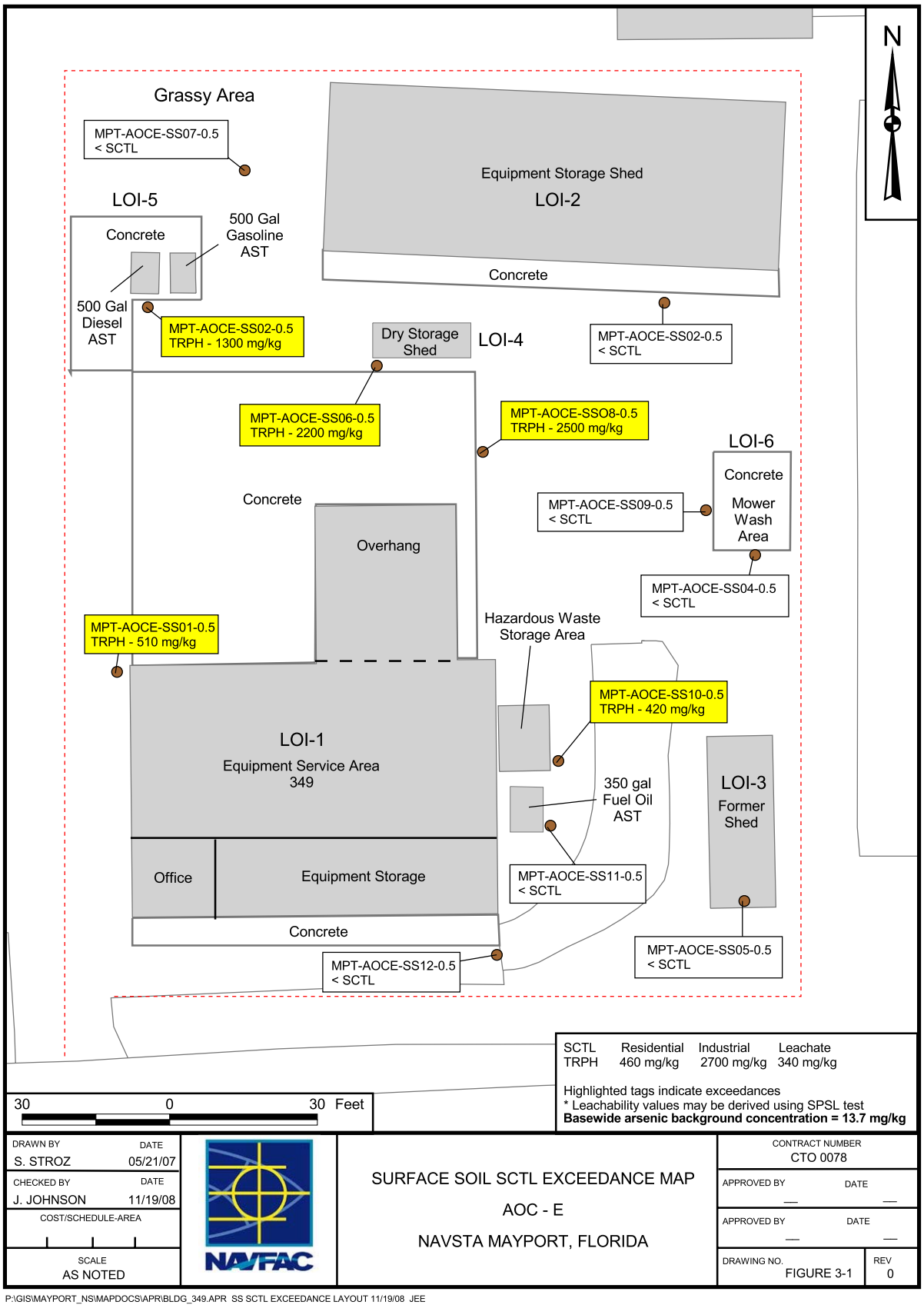
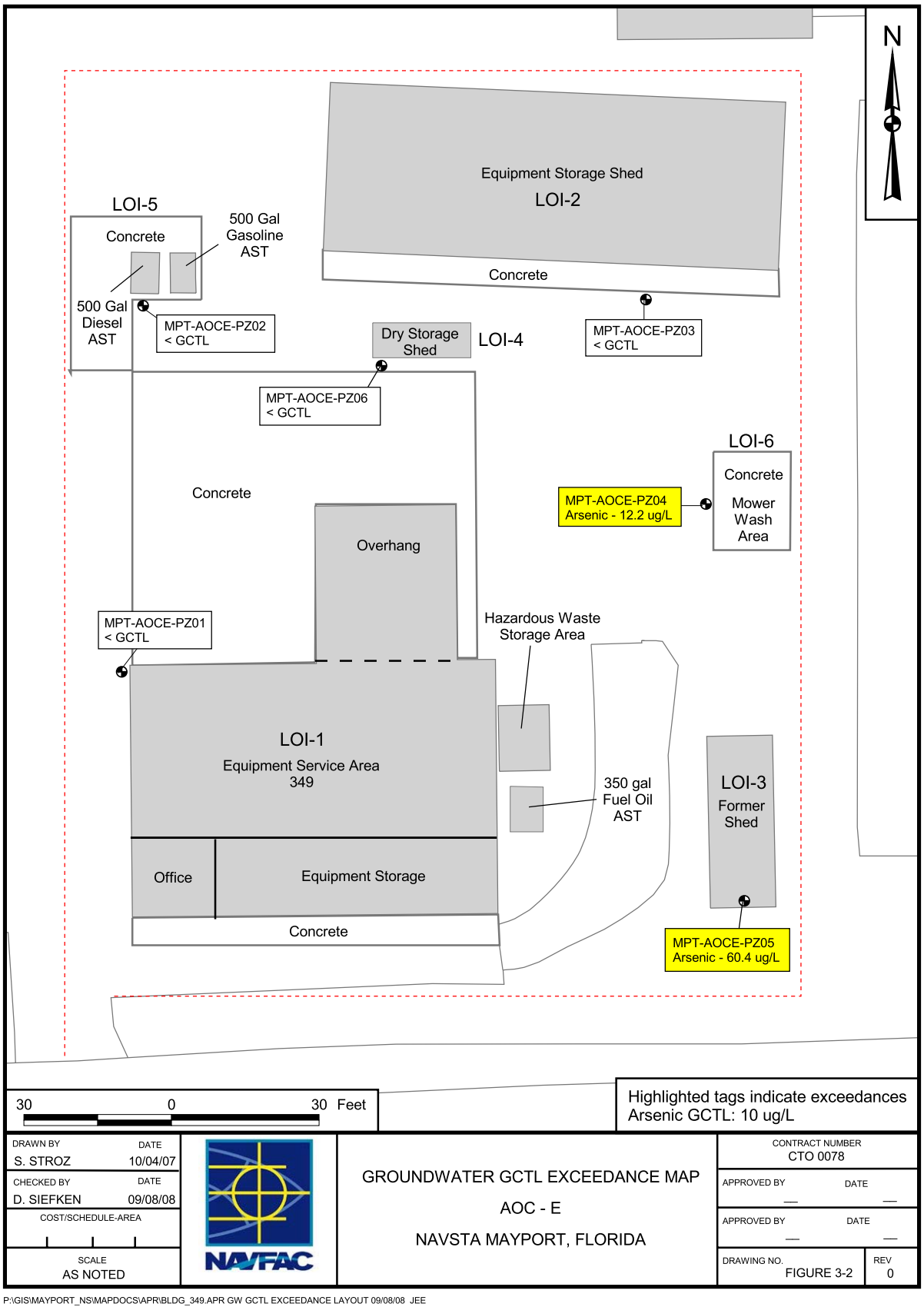


DRAWN BY: S. STROZ	DATE: 05/21/07	SOIL SAMPLE LOCATION MAP AOC - E NAVSTA MAYPORT, FLORIDA	CONTRACT NUMBER: CTO 0078
CHECKED BY: J. JOHNSON	DATE: 11/19/08		APPROVED BY: — DATE: —
COST/SCHEDULE-AREA			APPROVED BY: — DATE: —
SCALE: AS NOTED			DRAWING NO.: FIGURE 2-2 REV: 0

P:\GIS\MAYPORT_NS\MAPDOCS\APR\BLDG_349.APR BLDG 349 SOIL SAMPLE LOCATIONS LAYOUT 11/19/08 JEE


N
Grassy Area
MPT-AOCE-SS07-0.5
< SCTL
Equipment Storage Shed
LOI-2
LOI-5
Concrete
500 Gal
Gasoline
AST
Concrete
500 Gal
Diesel
AST
MPT-AOCE-SS02-0.5
TRPH - 1300 mg/kg
Dry Storage
Shed
LOI-4
MPT-AOCE-SS02-0.5
< SCTL
MPT-AOCE-SS06-0.5
TRPH - 2200 mg/kg
MPT-AOCE-SSO8-0.5
TRPH - 2500 mg/kg
LOI-6
Concrete
Mower
Wash
Area
Concrete
Overhang
MPT-AOCE-SS09-0.5
< SCTL
MPT-AOCE-SS04-0.5
< SCTL
MPT-AOCE-SS01-0.5
TRPH - 510 mg/kg
Hazardous Waste
Storage Area
MPT-AOCE-SS10-0.5
TRPH - 420 mg/kg
LOI-1
Equipment Service Area
349
350 gal
Fuel Oil
AST
LOI-3
Former
Shed
Office
Equipment Storage
MPT-AOCE-SS11-0.5
< SCTL
Concrete
MPT-AOCE-SS12-0.5
< SCTL
MPT-AOCE-SS05-0.5
< SCTL
30 0 30 Feet
SCTL Residential Industrial Leachate
TRPH 460 mg/kg 2700 mg/kg 340 mg/kg
Highlighted tags indicate exceedances
* Leachability values may be derived using SPSL test
Basewide arsenic background concentration = 13.7 mg/kg
DRAWN BY S. STROZ DATE 05/21/07
CHECKED BY J. JOHNSON DATE 11/19/08
COST/SCHEDULE-AREA
SCALE AS NOTED
NAVFAC
SURFACE SOIL SCTL EXCEEDANCE MAP
AOC - E
NAVSTA MAYPORT, FLORIDA
CONTRACT NUMBER CTO 0078
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 3-1
REV 0
P:\GIS\MAYPORT_NS\MAPDOCS\APR\BLDG_349.APR SS SCTL EXCEEDANCE LAYOUT 11/19/08 JEE



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CHECKED BY: D. SIEFKEN	DATE: 09/08/08		APPROVED BY: — DATE: —
COST/SCHEDULE-AREA			APPROVED BY: — DATE: —
SCALE: AS NOTED			DRAWING NO.: FIGURE 3-2 REV: 0

P:\GIS\MAYPORT_NS\MAPDOCS\APR\BLDG_349.APR GW GCTL EXCEEDANCE LAYOUT 09/08/08 JEE

APPENDIX B

FIELD FORMS

Tetra Tech NUS, Inc.

DAILY ACTIVITIES RECORD

PROJECT NAME: _____ **PROJECT NUMBER:** _____

CLIENT: _____ **LOCATION:** _____

DATE: _____ **ARRIVAL TIME:** _____

Tt NUS PERSONNEL: _____ **DEPARTURE TIME:** _____

CONTRACTOR: _____ **DRILLER:** _____

ITEM	QUANTITY ESTIMATE	QUANTITY TODAY	PREVIOUS TOTAL QUANTITY	CUMULATIVE QUANTITY TO DATE

COMMENTS: _____

_____

_____

_____

APPROVED BY:

_____ _____

Tt NUS REPRESENTATIVE DRILLER

DATE: _____

Tetra Tech NUS, Inc.

EQUIPMENT CALIBRATION LOG

PROJECT NAME : ____________________ INSTRUMENT NAME/MODEL: ____________________

SITE NAME: ____________________ MANUFACTURER: ____________________

PROJECT No.: ____________________ SERIAL NUMBER: ____________________

Date of Calibration	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot No.)	Remarks and Comments
			Pre-calibration	Post-calibration	Pre-calibration	Post-calibration		

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: _____ **Project No.:** _____

Location: _____ **Personnel:** _____

Weather Conditions: _____ **Measuring Device:** _____

Tidally Influenced: Yes ____ No ____ **Remarks:** _____

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level Indicator Reading (feet)*	Thickness of Free Product (feet)*	Groundwater Elevation (feet)*	Comments

* All measurements to the nearest 0.01 foot

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: _____
Project No.: _____

[] Domestic Well Data
[] Monitoring Well Data
[] Other Well Type: _____
[] QA Sample Type: _____

Sample ID No.: _____
Sample Location: _____
Sampled By: _____
C.O.C. No.: _____
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: / Time:	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. (^{0}C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	Other
Method:								

PURGE DATA:

Date:	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method:								
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type:								
Total Well Depth (TD):								
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

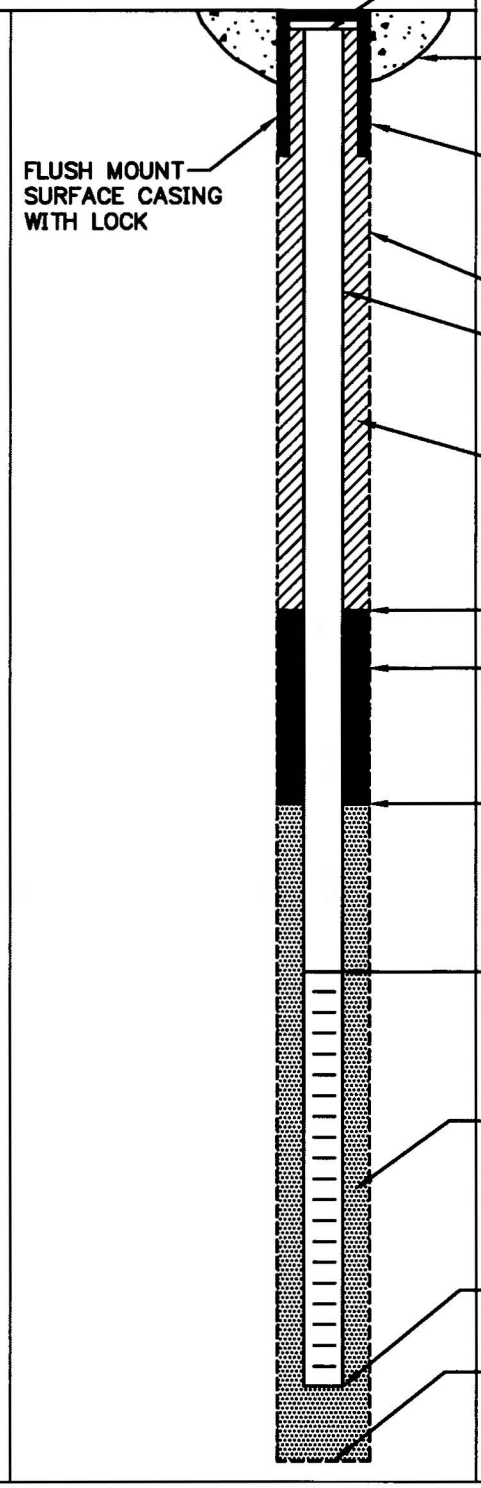
WELL NO.: _____

Tetra Tech NUS, Inc.

OVERBURDEN
MONITORING WELL SHEET
FLUSH - MOUNT

PROJECT _____	LOCATION _____	DRILLER _____
PROJECT NO. _____	BORING _____	DRILLING METHOD _____
DATE BEGUN _____	DATE COMPLETED _____	
FIELD GEOLOGIST _____		DEVELOPMENT METHOD _____
GROUND ELEVATION _____	DATUM _____	

ACAD:FORM_MWFM.dwg 07/20/99 INL



ELEVATION TOP OF RISER: _____

TYPE OF SURFACE SEAL: _____

_____

TYPE OF PROTECTIVE CASING: _____

_____

I.D. OF PROTECTIVE CASING: _____

DIAMETER OF HOLE: _____

TYPE OF RISER PIPE: _____

_____

RISER PIPE I.D.: _____

TYPE OF BACKFILL/SEAL: _____

_____

ELEVATION/DEPTH TOP OF SEAL: _____ / _____

TYPE OF SEAL: _____

_____

ELEVATION/DEPTH TOP OF SAND: _____ / _____

ELEVATION/DEPTH TOP OF SCREEN: _____ / _____

TYPE OF SCREEN: _____

SLOT SIZE x LENGTH: _____

TYPE OF SAND PACK: _____

_____

DIAMETER OF HOLE IN BEDROCK: _____

ELEVATION / DEPTH BOTTOM OF SCREEN: _____ / _____

ELEVATION / DEPTH BOTTOM OF SAND: _____ / _____

ELEVATION/DEPTH BOTTOM OF HOLE: _____ / _____

BACKFILL MATERIAL BELOW SAND: _____

_____

Tetra Tech NUS, Inc.

MONITORING WELL DEVELOPMENT RECORD

Site: _____ Depth to Bottom (ft.): _____ Project Name: _____
Well: _____ Static Water Level Before (ft.): _____ Project Number: _____
Date Installed: _____ Static Water Level After (ft.): _____ Site Geologist: _____
Date Developed: _____ Screen Length (ft.): _____ Drilling Co.: _____
Dev. Method: _____ Specific Capacity: _____
Pump Type: _____ Casing ID (in.): _____

Time	Estimated Sediment Thickness (Ft.)	Cumulative Water Volume (Gal.)	Water Level Readings (Ft. below TOC)	Temperature (Degrees C)	pH	Specific Conductance (Units _____)	Turbidity (NTU)	Remarks (odor, color, etc.)

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: _____
Project No.: _____

[] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other: _____
[] QA Sample Type: _____

Sample ID No.: _____
Sample Location: _____
Sampled By: _____
C.O.C. No.: _____

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date:	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

APPENDIX C

NAVSTA MAYPORT SOP FOR IDW

Standard Operating Procedure for Investigative Derived Waste

1. At Naval Station Mayport (NAVSTA), Investigative Derived Waste is defined as soil or water that is generated from the remedial investigation of contaminated sites. IDW can include, but not be limited to, drill cuttings, purge water, soil, sediment or decontamination water. Operations usually associated with IDW include soil and groundwater sampling, monitoring well installation and decontamination of equipment used for sampling and installation.

2. IDW will be containerized when generated and kept at the site of generation as coordinated with the tenant occupying the area. Drums can be moved to other locations in the general area to accommodate NAVSTA personnel movement or requirements within reason. A central location can be identified prior to the sampling event if in the best interest of the government.

3. IDW drums shall be clearly identified with "Awaiting Analytical" sticker visible containing contractor name and phone number, generation location, date of generation, NAVSTA point of contact, and contents of drum. A drum log using the format of Enclosure (1) shall be completed for each drum and provided to the NAVSTA point of contact when drum is generated. Drums shall be inspected weekly until disposal using Enclosure (2) and inspection form shall be faxed to NAVSTA Environmental Department. When sample results have been received, the analytical shall be provided to the NAVSTA point of contact for waste and disposal determination. The contractor shall be responsible for disposal of all IDW. IDW with analytical results less than Cleanup Target Levels identified in 62-777 Florida Administrative Code may be disposed onsite if sufficient soil is at location. IDW may not be disposed in storm drain or on an impervious surface. In certain conditions, non-hazardous IDW may be disposed through a sewer lift station to the Wastewater Treatment Plant with prior written approval by the Utility Engineer at Public Works Center Jacksonville.

4. If the IDW is identified as hazardous waste, the contractor shall manage drums per the NAVSTA Hazardous Waste Management Plan (SOPA(ADMIN) MYPTINST 5090.1F) and shall be disposed through the NAVSTA Hazardous Waste Storage Facility with the contractor paying disposal cost to PWC (2005 cost approximately $1.75/pound). IDW that is not hazardous waste but does not meet the Target Levels to be disposed onsite, the contractor shall arrange for the IDW to be legally transported and disposed at an approved facility. The contractor will coordinate with NAVSTA personnel to sign the non-hazardous manifest as generator.

Revised 1/24/2006

Naval Station Mayport Investigative Derived Waste Drum Log

Contractor Company Name: _____

Individual Name: _____

Location Name: _____
(i.e. SWMU number, Bldg number)

Date of generation: _____

Expected date of results: _____

Drum Number: __various (See Table Below for additional info.)_____
(Use site # and unique drum number)

Drum No.	**Type of Waste** (i.e. drill cuttings, purge water)	**Quantity of Waste** (gals/lbs)	**Date**	**Individual's Initials/ Name**

Enclosure (1)

Revised 1/24/2006

WEEKLY INVESTIGATIVE DERIVED WASTE INSPECTION CHECKLIST
NAVAL STATION MAYPORT

This form is to be completed legibly by the contractor when conducting weekly inspections of IDW drums.

All discrepancies shall be corrected immediately. Failure to correct discrepancy(s) shall result in contractual action.

Date: _____

Inspector: _____

Company Name: _____

		YES	NO
1.	Are all containers properly labeled/dated?		
2.	Are containers compatible with contents?		
3.	Are all containers in good condition?		
4.	Are containers closed?		
5.	Are lids/caps/bolts/rings tight?		
6.	Are any containers dated longer than 60 days?		
7.	Number of containers inspected. _____		
Comments:			
Date/nature of repairs or remedial actions:			
Copy to: NAVSTA Mayport N4E FAX: 270-7398 (EACH FRIDAY)			

Enclosure (2)

Revised 1/24/2006