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SAMPLING AND ANALYSIS PLAN FOR PRELIMINARY SITE CHARACTERIZATION STUDY (SITE 43)

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NAS PENSACOLA
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Naval Air Station
Pensacola
Pensacola, Florida

Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order CTO-0096

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SAMPLING AND ANALYSIS PLAN FOR PRELIMINARY SITE CHARACTERIZATION STUDY (SITE 43)

NAVAL AIR STATION PENSACOLA PENSACOLA, FLORIDA

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Naval Facilities Engineering Command
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1.0 INTRODUCTION

Tetra Tech NUS, Inc., (TtNUS) under contract to the Department of Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) is submitting this Sampling and Analysis Plan (SAP) for Site 43 at Naval Air Station (NAS) Pensacola located in Pensacola, Florida. The SAP is a planning document prepared for preliminary site characterization investigations to be completed at this site. This SAP was prepared on behalf of the Navy at Naval Air Station (NAS) Pensacola under contract No. N62467-94-D-0888. The SAP was developed based on the results of a geophysical survey (EnSafe/Allen & Hoshall, 1994).

1.1 FACILITY BACKGROUND

NAS Pensacola **(Figure 1-1)** is located in Escambia County, in Florida's northwest coastal area, approximately 5 miles west of the Pensacola City limits. The approximately 5,000-acre installation was constructed in the 1800's. Prior to construction, the facility was undeveloped and sparsely vegetated. Land use at NAS Pensacola consists of various military housing, training, and support facilities as well as large industrial complexes for major repairs and refurbishment of aircraft engines and frames. Additional details on the NAS Pensacola facility may be found in the facility administrative record. The subject site is located at the southwest corner of Murray and Taylor Roads and consists of an area approximately 200 feet by 200 feet in size.

1.2 PURPOSE OF THE SAP

The SAP serves as a guide for the preliminary site characterization activities to be conducted at Site 43. This plan documents the procedures for field activities and sample analyses. The SAP specifies the sampling protocol and procedures for data collection and sample analysis, sample locations, frequency of samples to be collected, sample designations, sample handling and analysis, sampling equipment, and handling of investigationderived wastes (IDW). This plan was prepared in accordance with the Tetra Tech NUS, Inc. Quality Assurance Program Manual, dated October 1,1998.

The field activities for the preliminary site characterization will include the collection of samples from surface soil, subsurface soil, and groundwater for submission to a qualified laboratory for analysis. The data collected during the preliminary site characterization will be used in preparing a Site Characterization Report.

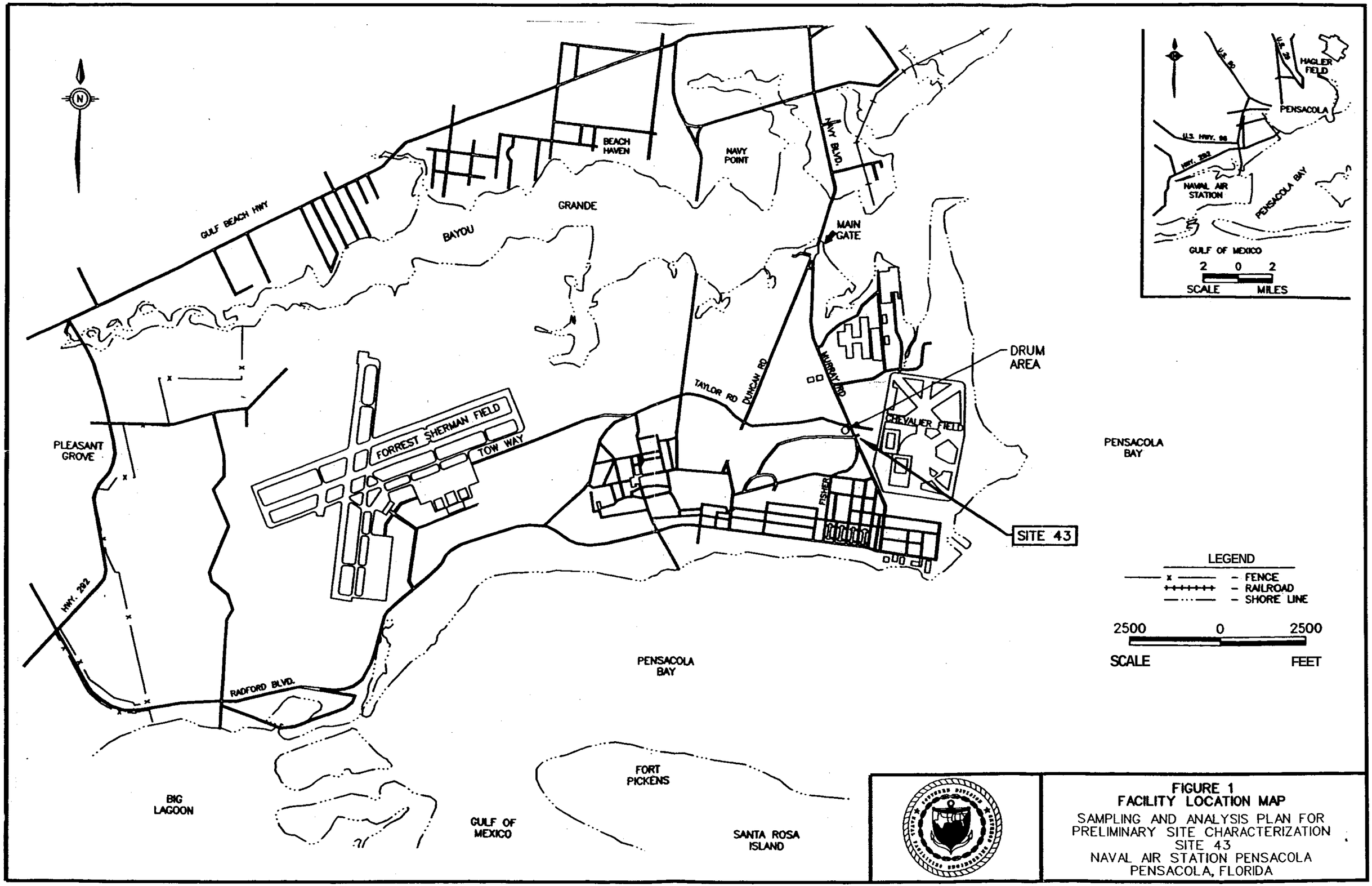

FIGURE 1
FACILITY LOCATION MAP
SAMPLING AND ANALYSIS PLAN FOR
PRELIMINARY SITE CHARACTERIZATION
SITE 43
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

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1.3 SITE DESCRIPTION

Site 43 (Figure 1-2) is located at the southwest comer of Murray and Taylor Roads, west of Site 10. The area is planted with grass and contains a tennis court, an unfenced basketball court, and access roads to the officers' quarters. The historical usage of the area is unknown. In December 1992, a child playing with a metal detector discovered a partially buried drum exposed at the surface just east of the tennis court. The area was fenced to prevent general access until further investigations could be conducted.

1.4 REGULATORY SETTING

The Navy Installation Restoration (IR) program was designed to identify and abate or control contaminant migration resulting from past operations at naval installations, with the goal of expediting and improving environmental response actions while protecting human health and the environment. The IR program is conducted in accordance with Section 120 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and Executive Order 12580. CERCLA requires that federal facilities comply with the act, both procedurally and substantively. Site 43 is being investigated as part of CERCLA requirements.

1.5 REPORT ORGANIZATION

The SAP is organized into eight chapters (Chapters 1.0 to 8.0). Chapter 1.0 presents the purpose, site description, and regulatory setting for the Preliminary Assessment at NAS Pensacola. Chapter 2.0 summarizes previous investigations. Chapter 3.0 presents the investigative methodology for conducting the assessment. Chapter 4.0 presents the site-specific data quality assessment. Chapter 5.0 addresses the waste resulting from investigation activities. Chapter 6.0 discusses the investigative results of the assessment. Chapter 7.0 presents the sampling and analysis schedule of operations for the site assessment activities. Chapter 8.0 includes the references used in preparing this planning document. Supporting data are provided in the Appendices.

2.0 PREVIOUS INVESTIGATIONS

This chapter summarizes previous investigations performed at Site 43 at NAS Pensacola. Previous investigations include a geophysical survey.

2.1 GEOPHYSICAL SURVEY, 1994

The historical usage of the study area is unknown. In December 1992, a child playing with a metal detector discovered a drum exposed at the surface just east of the tennis court. The area was promptly fenced off to prevent general access until an investigation could be performed. Two partially buried drums were observed inside of the fenced area. One drum was in a vertical position; its end punctured revealing standing water in the interior. The second drum also appeared to be in a vertical position but was not obviously punctured. A third iron object resembling a drum rim was observed between the fenced area and the tennis court. Smaller, rusted metal debris was observed at the surface. No odors, visible soil stains, or other indications of contaminant release were observed.

Ensafe/Allen & Hoshall conducted a geophysical investigation in March 1994 using gradient and total magnetic surveys. Geophysics was applied to the site because it is non-invasive and could provide a comprehensive overview of potential buried drums relatively quickly and easily. The objectives of the investigation were to determine the areal extent of the disposal area and to determine if it was an extensive or limited drum disposal area. The geophysical survey was performed using a gradient magnetic geophysical survey, which responds exclusively to ferrous metals. The total magnetic field and vertical magnetic gradient were measured during the survey.

As a result of the investigation, an area approximately 100-foot by 120-foot was identified as a possible disposal area. The suspected size of the disposal area was larger than the original fenced area. A large section of land on the north half of the surveyed area was interpreted as free of drums. Although cultural clutter (buried utilities, metal fences, poles, buildings, etc.) precluded a definitive interpretation, magnetic anomalies typical of drums were limited to an area approximately 100 feet by 120 feet in size. The geophysical survey suggested that the disposal area was not systematic and widespread, but limited in areal dimension and the number of disposed drums. The actual number of drums disposed in the area was not determined. The report concluded that the drum disposal area, as well as several anomalies discovered outside the disposal area, should be further explored by trenching to a depth of 5 feet. Other anomalies less likely to be drums should be investigated with hand-tools. To-date, no soil or groundwater investigations have been conducted in the study area.

Figure 2-1 shows the results of the total magnetic field survey. Figure 2-2 shows the results of the magnetic gradient survey. Figure 2-3 provides an interpretation of the survey results, identifying the areas of suspected drum locations that require further investigation.

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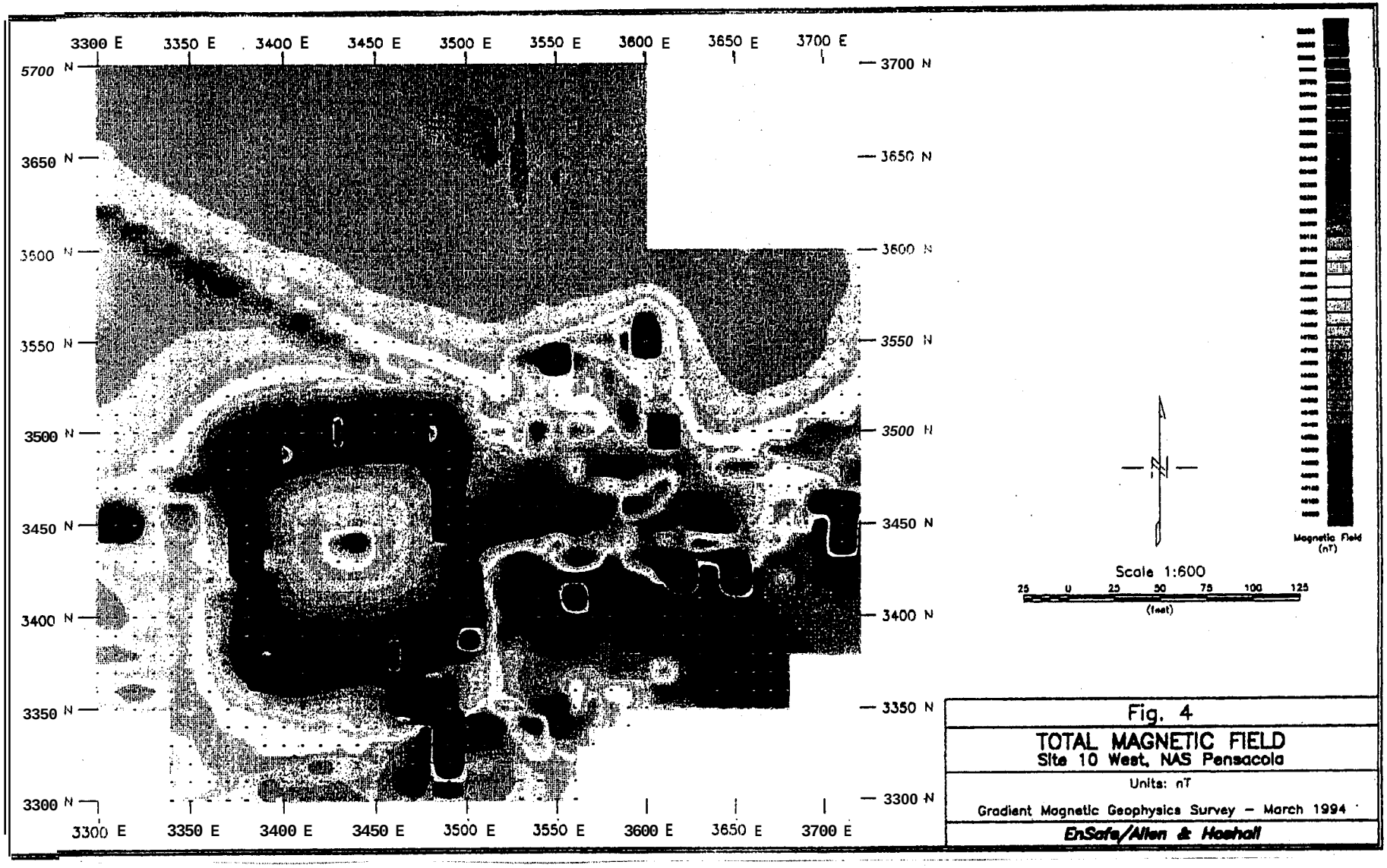

FIGURE 2-1
TOTAL MAGNETIC FIELD SURVEY

SAMPLING AND ANALYSIS PLAN FOR
PRELIMINARY SITE CHARACTERIZATION
SITE 43
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORI

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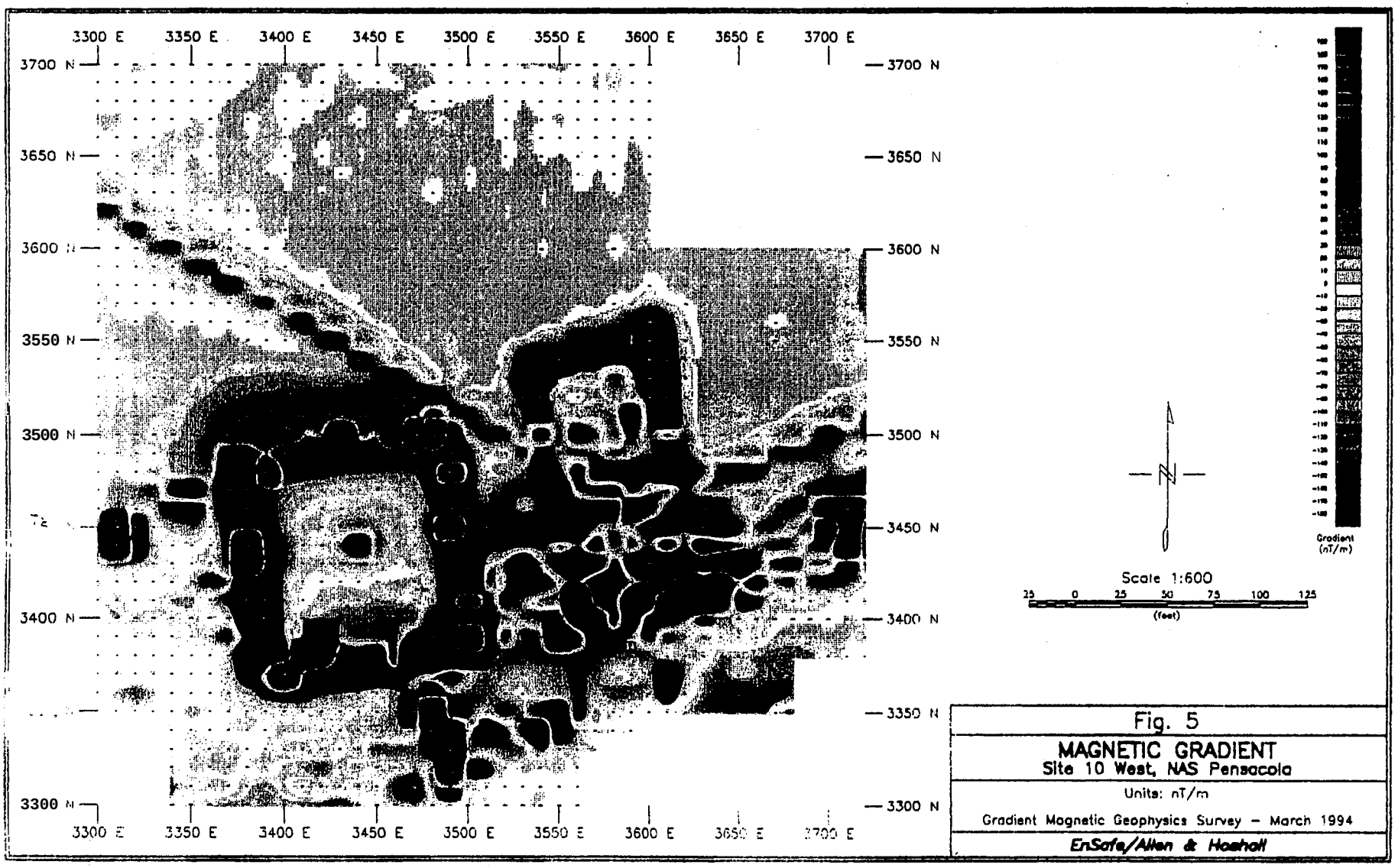

Fig. 5

MAGNETIC GRADIENT
Site 10 West, NAS Pensacola

Units: nT/m

Gradient Magnetic Geophysics Survey – March 1994

EnSafe/Allen & Hoshall

FIGURE 2-2
MAGNETIC GRADIENT SURVEY

SAMPLING AND ANALYSIS PLAN FOR
PRELIMINARY SITE CHARACTERIZATION
SITE 43
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

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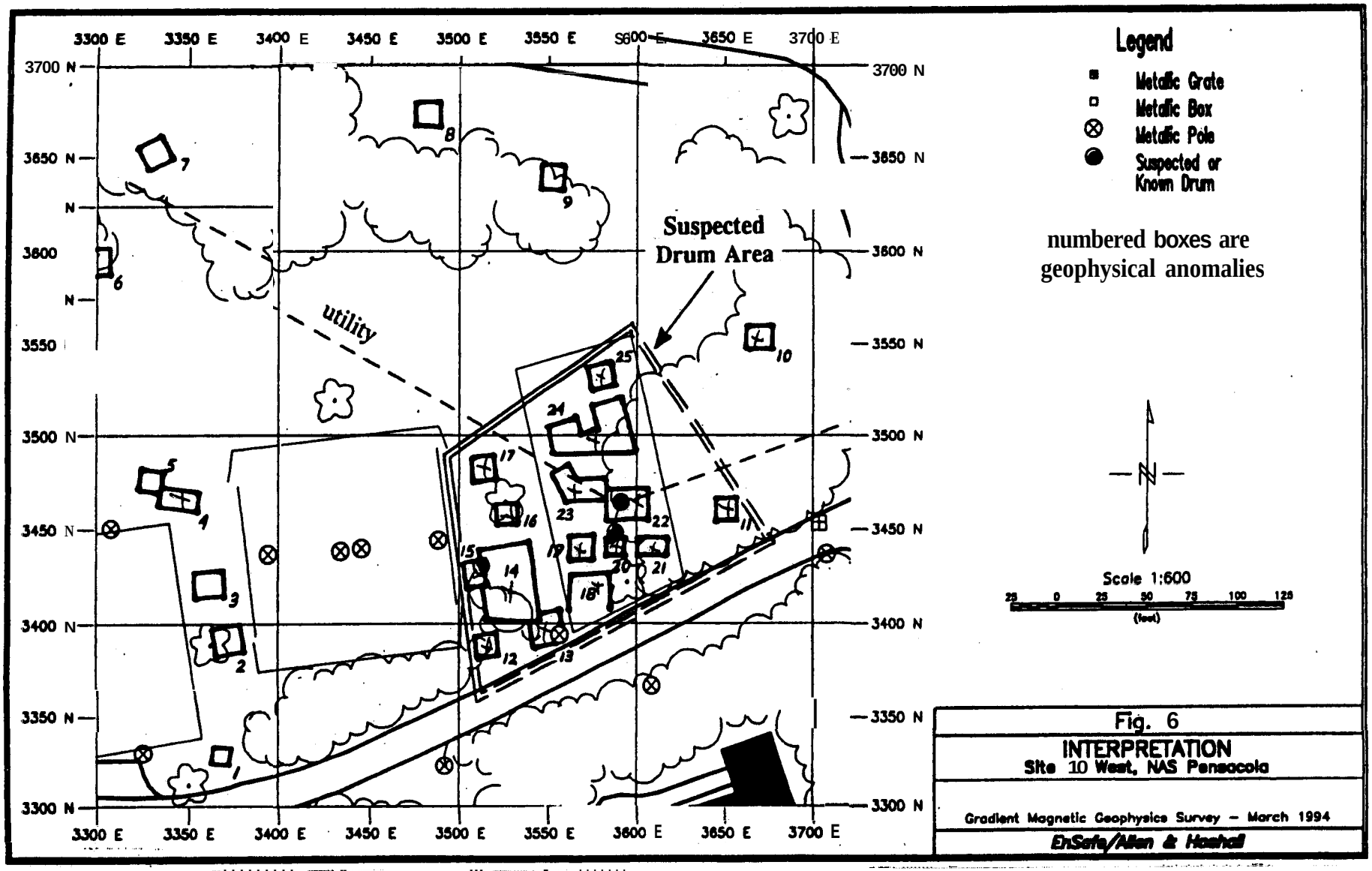


FIGURE 2-3
SUSPECTED DRUM LOCATIONS

SAMPLING AND ANALYSIS PLAN FOR
PRELIMINARY SITE CHARACTERIZATION
SITE 43
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

CAD FILE NO./DATE: 0189A005.dgn/4-20-99

3.0 TECHNICAL APPROACH

3.1 FIELD INVESTIGATION METHODS

The preliminary site characterization field investigation at Site 43 focuses primarily on investigation of magnetic anomalies identified during the 1994 geophysical survey and evaluation of associated impacts (if any) to soil and groundwater. Analysis of the previous geophysical investigation data suggests that additional investigation is needed to confirm the presence or absence of buried drums and other metallic debris within the study area.

The Scope of Work (SOW) for the investigations was planned based on a review of the existing data, regulatory guidance [e.g., FDEP Soil and Groundwater Cleanup Guidance], and in consultation with Navy personnel. Adjustments to the planned SOW may be necessary as new data become available. If new field investigation methods or changes to existing methods are required, then the revised methods will be presented by TtNUS to the Southern Division's Remedial Project Manager, FDEP and USEPA Region 4 regulatory representatives, and NAS Pensacola's Environmental Coordinator for review and approval.

3.1.1 Standard Operating Procedures

A variety of field investigation activities will be conducted at NAS Pensacola to meet the objectives of the preliminary site characterization SOW. To ensure that all data are consistent with regulatory requirements, the data collection activities will follow the Standard Operating Procedures (SOPs) issued by the USEPA in ***Environmental Investigations Standard Operating Procedures Quality Assurance Manual*** (1996b). All such activities will comply with TtNUS's FDEP COMPQAP #980038 (1998), which was approved by FDEP on August 24,1998.

In some instances the planned investigation activities (e.g., well construction) may not be specifically addressed in the Comprehensive Quality Assurance Plan (COMPQAP); in other cases a methodology presented in the COMPQAP, or a specific step thereof, may be deemed inconsistent with site-specific conditions or previous investigation methods used at NAS Pensacola. In these cases the USEPA Region 4 Environmental Investigations SOPs (USEPA 1996b), Navy technical guidance, or project-specific SOPs adopted by or prepared by TtNUS will be invoked.

A copy of the SAP and each of the guidance documents will be maintained in the TtNUS field office at NAS Pensacola and will be reviewed with the field team before work begins. Project-specific SOPs that are adopted by or prepared by TtNUS for this investigation are presented in Appendix B of this Work Plan and are discussed in the following sections.

3.1.2 General Site Operations

3.1.2.1 Field Team Organization

The TtNUS field team will consist of staff members who will be assigned temporary duty at NAS Pensacola and who will conduct the field investigation activities. The organization of the field team is described below.

- The Field Operations Leader (FOL) is responsible for the day-today direction of personnel in the field, The FOL will assign tasks to field team personnel, direct the sequence of activities, coordinate with NAS Pensacola 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 Proiect 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 Health and Safety Plan developed for the field investigation is included in Appendix C.

- 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.

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

3.1.2.2 Mobilization

Several internal tasks must be performed by TtNUS before the field mobilization. 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, and
- Arrangement of transportation and lodging for field personnel.

In addition to internal efforts, external mobilization efforts will be coordinated with the NAS Pensacola Point of Contact (POC). A list of the steps to be taken includes the following:

- Obtain keys to existing locks on wells (other than those installed by TtNUS),
- Set up the investigation field office and coordinate utilities hookup,
- Select staging areas for equipment and IDWs,
- Select decontamination area(s) with electrical hookup, potable water, and drainage to an oil/water separator,
- Complete security procedures for project and subcontractor personnel to gain access to the Base,
- Ensure that supplies of potable water are accessible, and
- Coordinate with Base personnel to locate buried utilities.

A location will be assigned by the Base POC to be used as a personnel/communication field 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 Base POC and TtNUS.

Site reconnaissance will be performed before initiation of field activities. Some of these activities will be performed with the assistance of NAS Pensacola 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.
- Laboratory analysis of the de-ionized (DI) water used during the investigation

- Collecting and shipping to the laboratory a field blank of the potable water source to be used for field decontamination 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).
- Reconnoitering and 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). Electric lines may be shielded, if necessary.
- Erecting any necessary barricades and/or temporary fencing.

3.1.3 Field Investigation Activities

The planned SOW for the preliminary site characterization includes the following general categories of field investigation activities:

- Test pitting to investigate the anomalies identified in the geophysical report;
- Collection of surface soil samples;
- Installation of soil borings and collection of subsurface soil samples using direct-push (DPT) or conventional drilling techniques;
- Installation of DPT groundwater monitoring wells in the shallow zone of the alluvial aquifer;
- Collection of groundwater samples;
- Measurement of groundwater potentiometric surface;
- Field measurement of physical and chemical properties of soil and groundwater samples;
- Decontamination of investigation equipment;
- Sample management;
- Field QC, documentation, and recordkeeping;
- IDW management; and
- Location survey.

As described in Section 3.1.1, all field investigation activities will be performed in accordance with the appropriate regulatory and project-specific SOPs. Project-specific SOPs will be given priority, followed by the FDEP COMPQAP and then USEPA Region 4 SOPs when SOPs for the same task differ. Copies of all guidance documents will be located in the TtNUS field office at NAS Pensacola. Table 3-1 presents a cross-reference guide to the applicable SOPs for the general field activities listed above. Table 3-1 focuses on the SOPs deemed most likely to be used by the field investigation team.

TABLE 3-1

STANDARD OPERATING PROCEDURES CROSS REFERENCE[a]
SITE CHARACTERIZATION STUDY WORK PLAN FOR SITES 43 AT
NAS PENSACOLA
PENSACOLA, FLORIDA
PAGE 1 OF 2

ACTIVITY	FDEP[b]		EPA-4[c]		B&R ENVIRONMENTAL[d]	
SOIL SAMPLING						
General	A	4.0 / 4.3.1-4.3.2	A	12.3		
Manual Sampling	A	4.3.4	A	12.3.1		
Power-Driven Sampling	A	4.3.4.5	A	12.3.2		
VOC Samples	A	4.3.2	A	5.13.9 / 12.4.1		
Sample Mixing	A	4.3.2	A	5.13.8		
DRILLING						
Safety			A	6.7		
Direct-Push					A	3.1.3.1
Augering			A	6.3.1		
Rotary			A	6.3.3		
Abandonment			A	6.9		
WELL CONSTRUCTION						
Overdrilling			A	6.4.2		
Annular Space			A	6..4.1		
Casing and Screen			M	6.6.2	A	3.1.3.2
Installing the Well			M	6.5.1 / 6.5.2		3.1.3.3
Filter Pack			A	6.4.3 / 6.6.3		
Filter Pack and Screen Design			M	6.6.4	A	3.1.3.4
Well Seal and Grouting			A	6.4.4 / 6.4.5		
Surface Completion			A	6.4.6 / 6.4.7 / 6.4.8		3.1.3.3.4
Development			A	6.8		3.1.3.3.6
Temporary Wells			A	6.1		
GROUNDWATER SAMPLING						
General	A	4.0 / 4.2.1 / 4.2.5.2				
Purging		4.2.5.3-4.2.5.5	A	7.2.1 / 7.2.2 / 7.2.4		
Sample Methods		4.2.5.6	A	7.3.1 / 7.3.3		
Sample Containers / Preservation	A	4.2.2	A	7.3.4		
Trace Organic and Metals	A	4.2.5.6 (g)	M	5.13.9 / 7.3.5	A	3.1.3.5
Temporary Wells	A	4.2.9				
Auxillary Data			A	7.3.7		
FIELD MEASUREMENTS						
Groundwater Levels	A	4.2.5.4	M	15.8	A	3.1.3.6
pH, Temperature, Conductivity	A	7.5.2 / 7.5.3 / 7.5.5	A	16.2-16.4		
Dissolved Oxygen	A	7.5.4	A	16.7		3.1.3.11
Turbidity			A	16.5		
Redox Potential					A	3.1.3.7
Ferrous Iron (Fe++)					A	3.1.3.8
Air Monitoring / Head Space	A	7.5.7			A	3.1.3.9
Residual Product Detection					A	3.1.3.10

TABLE 3-1

STANDARD OPERATING PROCEDURES CROSS REFERENCE[a]
SITE CHARACTERIZATION STUDY PHASE I WORK PLAN FOR
SITE 43 AT NAS PENSACOLA
PENSACOLA, FLORIDA
PAGE 2 OF 2

ACTMTY	FDEP[b]		EPA-4[c]		B&R ENVIRONMENTAL[d]	
General	A	4.1.1 / 4.1.3				
Reagents	A	4.1.2				
Sampling Equipment	A	4.1.4			A	3.1.3.3.8–9
Filters	A	4.1.6				
Tubing	A	4.1.7.1-4.1.7.5				
Pumps	A	4.1.8				
Field Equipment	A	4.1.9.1 / 4.1.9.2			A	3.1.3.3.10
Analyte-Free Water Containers	A	4.1.10				
Ice Chests / Shipping Containers	A	4.1.11				
SAMPLE HANDLING						
General			A	5.13.3 / 5.13.7		
Sample Containers	A	4.4.1				
Preservation and Holding Times	A	4.4.2	A	5.13.6		
Documentation	A	5.0 / 5.3	A	3.3		
Sample Identification	A	5.3.2	A	3.2.1	A	3.1.12
Packing and Transportation	A	4.4.3.2				
FIELD QUALITY ASSURANCE/QUALITY CONTROL						
Field Calibration	A	7.5				
Field Equipment Decontamination		7.5..1				
Quality Control Samples	A	9.1				
Control Limits	A	7.5			A	3.1.13
Corrective Action	A	11			A	3.1.14
INVESTIGATION-DERIVED WASTE						
Investigation Waste Disposal	A	4.4.5			A	3.1.15
Nonhazardous Waste			A	5.15 / 5.15.1		
Hazardous Waste			A	5.15 / 5.15.2		
RECORDKEEPING						
Field Logbooks and Forms			A	3.5	A	3.1.16
Manufacturer's Specifications					A	3.1.17
Chain-of-Custody Forms	A	5.3				
Field Calibration Records	A	7.0				
SURVEYING						
GPS Surveys					A	3.1.10
NGVD Surveys					A	3.1.10

[a] Annotations found in this reference table indicate the following:
A – Standard Operating Procedure (SOP) that is fully adopted.
M – Modification of existing Florida Department of Environmental Protection (FDEP) or U.S. Environmental protection Agency (EPA) SOP documented in project-specific SOP.

[b] Denotes FDEP SOPa adopted by Brown 6 Root Environmental, source:
FDEP Comprehensive Quality Assurance Plan #870055G, March 1996.
Number shown indicates the chapter and section h the FDEP SOPa.

[c] Denotes EPA Region 4 Environmental Investigations SOPa and Quality Assurance Manual, May 1996. Number shown indicates the section in the EPA SOPa.

[d] Denotes project-specific SOPa adopted by or prepared by Brown 6 Rod Environmental for the conduct of work at Naval Air Station Pensacola.
Number shown indicates the text section in which the SOP may be found.
GPS – Global Postioning System
NGVD – Natural Geodetic Vertical Datum
VOC – volatile organic compound

If activities arise that are not referenced in Table 3-1, then the project-specific SOPs, COMPQAP, the USEPA Region 4 SOPs, or Navy guidance will be invoked (in that order) with approval by USEPA, FDEP, and Navy personnel. Project-specific SOPs referenced in Table 3-1 is discussed in the following sections.

3.1.3.1 Direct-Push Sampling

A direct-push technology (DPT) soil sampling device (e.g., Geoprobe® system) may be used to obtain subsurface soil samples at NAS Pensacola. Unlike conventional drilling techniques, DPT probing tools do not create an open borehole into which soil sampling devices are inserted. DPT allows investigators to push a closed sampler to depth, open the sampler, and obtain a discrete soil sample that is relatively undisturbed. For this project a DPT sampler may be used for collecting shallow soil samples (typically less than 30 feet). DPT may also be utilized to install shallow monitoring wells for preliminary groundwater assessment.

The samples may be collected from any discrete depth interval, but will typically be used above the zone of perched groundwater saturation. The DPT sampler usually has an inner diameter of 1 to **2** inches and recovers a soil core measuring 2 to 4 feet in length. If deemed necessary, liners made of material compatible with the contaminants of interest will be used inside the soil sampler to keep the sample intact after it is extruded from the sampler and to reduce the likelihood of cross-contamination or false-positive laboratory results.

To collect a sample the DPT sampler is attached to the leading end of the pushing rods and driven in a closed and sealed position into the subsurface soil using a hydraulic and/or percussion driver. At the top of the desired sampling interval, the pushing is temporarily stopped and an internal release mechanism in the sampler is triggered using extension rods inserted down the inside of the push rods. After the release is activated, the sampler is again driven forward, collecting soil in the sample tube as a piston retracts. The probe assembly is then retrieved and the soil sample is removed for examination.

After removal from the sampler barrel, the sample is extracted and placed on a fresh, clean surface. If a liner is used, it is separated into four 6-inch-long sections (along perforations in the brass liners), and the exposed soil is screened with a flame ionization detector (FID). Samples selected for laboratory analyses will be immediately placed into laboratory-supplied containers. If liners were used, the open ends will be covered with clean, Teflon™ tape, capped, and sealed with exterior tape. The samples will be labeled, preserved on ice, and transported to the laboratory.

All portions of the probe assembly that are inserted into the ground will be decontaminated before each use using standard decontamination procedures (see Table 3-1). An equipment rinsate blank will be collected from the decontaminated sampler at the prescribed frequency.

3.1.3.2 Well Casing and Screen Materials

All permanent and temporary monitoring wells will be constructed of Schedule 40 polyvinyl chloride (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. This variance from the USEPA Region 4 SOPs' requirement for stainless steel casing and screen materials is based on previous investigation results that show that background groundwater quality (e.g., pH) and dissolved contaminants in groundwater (e.g., petroleum hydrocarbons) are not present at concentrations detrimental to the use of PVC. Furthermore, the use of PVC will make the construction of these wells consistent with that of wells previously installed at NAS Pensacola. If conditions are encountered for which PVC is inappropriate, then stainless steel or another suitable material will be selected and presented to USEPA, FDEP, and Navy personnel for approval before being used.

3.1.3.3 Monitoring Well Installation

3.1.3.3.1 Shallow Well Installation

The shallow wells will be installed by DPT methods. If DPT is unable to install the monitoring wells they will be drilled by either hollow-stem auger (HSA) or mud rotary techniques dependent on field conditions.

Monitoring wells installed by DPT will be constructed of approximately 2-inch diameter stainless steel or Schedule 40 PVC, flush-threaded casing with 15-feet, 0.01-in. slotted, pre-packed stainless or PVC screens. Although the DPT borehole is self healing, a sand pack and grout will be installed as described below for HAS wells.

Monitoring wells installed by HAS will be constructed as follows. The wells will be constructed of up to 2-inch diameter, Schedule 40 PVC, flush-threaded casing with 15-feet, 0.01-in. slotted, PVC screens. The well screens will be placed such that the screens bracket the water table. If HSA drilling is used, the wells will be constructed inside the auger.

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. If the well is constructed

inside augers, the sand will be maintained at a depth of several inches inside the augers to ensure an adequate sand pack around the well. A fine sand seal at least 1 foot 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 a cement/bentonite slurry through a tremie pipe up to 2 feet below land surface (bls).

3.1.3.3.2 Well Surface Completion

The surface completion of the monitoring wells may be constructed flush with the ground. A freely draining valve box (or equivalent) with a locking cover shall be placed over the well head. The top of the well riser will be at least 1 inch above the bottom of the box. The box lid will be centered in a 2-foot x 2-foot, 2-inch-thick concrete pad sloping at 0.25 inch/foot away from the box. If the pad is expected to have heavy traffic passing over it, steel-reinforcing bars will be used. Concrete curbs may be installed at each side of the concrete pads adjacent to high traffic areas. Well identification will be permanently marked on the box lid and casing cap (if possible).

3.1.3.3.3 General Drilling Reauirements

The only drilling fluids used will be water or drilling mud. The drilling mud will carry a chemical analysis from the manufacturer. In addition, lubricants used on the rig will not introduce or mask chemicals of concern (COCs) at the site being investigated. All trash, waste, grout, cuttings, and drilling fluids associated with the drilling activities will be disposed of by the drilling subcontractor in accordance with the Standard Operating Procedure for IDW (Appendix B).

The items listed below will also be part of the SOP for drilling.

- All data related to well construction shall be documented on a monitoring well sheet (Appendix D-2).
- A driller and drilling company certified by the State of Florida will construct each well.
- Well locations will be approved by the Base POC before installation.
- Glue will not be used to join screen or casing.
- At each well nest location, lithologic soil samples will be taken continuously using DPT coring tool.
- The top of the casing will be cut using an inside diameter pipe cutter.
- A notch will be cut into the top of the casing to be used as a reference point for the elevation survey and for measuring water levels.

3.1.3.3.4 Well Development

Monitoring wells will be developed to remove fine-grained sediments and to break down the filter cake or smearing along the borehole well. The preferred method of development will be surging alternating with pumping. All 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:

- Turbidity remains within a 10 Nephelometric Turbidity Unit (NTU) range for 2 consecutive readings;
- Stabilization of the following parameters occurs:
  - temperature: plus or minus 1°C,
  - pH: plus or minus 1 unit, and
  - specific conductivity: plus or minus 5 percent of scale; and
- Accumulated sediment is removed from the well.

In general, the following will be conducted or considered during the well development process:

- Development will begin no sooner than 24 hours after well installation;
- If drilling mud is used during drilling, the total drilling fluid volume will be removed; and
- No detergents, bleaches, soaps, or other such items will be used to develop a well.

After 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. All data related to well development, including alternate development methodologies and their justification, will be written on the well development sheet **(Appendix D-2)** or in the field logbook.

3.1.3.3.5 Decontamination Procedures

The decontamination of major equipment (e.g., drilling rigs, dump trucks, backhoes) and sampling equipment is necessary to minimize the spread of contamination to clean zones, to reduce exposure to personnel, and to reduce cross-contamination of samples when equipment is used at more than one sampling location.

Major equipment will be decontaminated in a temporary equipment decontamination area. Sampling equipment will be decontaminated in tubs or drainage pans so that solvents can be collected and disposed of. Rinsate samples will be collected, as required, 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 at an off-base location.

3.1.3.3.6 Soil Samplinn Equipment

All stainless steel spoons, bowls, and other soil-sampling equipment will be decontaminated after each use. The decontamination procedure outlined below will be used.

- Wash and scrub the equipment with a solution of Liquinox (or equivalent) and potable water.
- Rinse with potable water
- Rinse non-steel equipment with 10 to 15 percent reagent-grade nitric acid (HNO^3) when sampling for trace metals.
- Rinse with analyte-free water.
- Rinse twice with isopropanol.
- Air dry (if possible) and wrap in oil-free aluminum foil (if appropriate).

3.1.3.3.7 Water Samplinn Equipment

Peristaltic pumps may be used to purge and collect water samples. Submersible pumps are not to be used. Purging and sampling performed with pumps will use dedicated discharge lines for each sampling location. Peristaltic pumps will be cleaned outside between uses at each sampling location. Pump decontamination procedures are as follows:

- Wash with Liquinox and potable water,
- Rinse with potable water, and
- Rinse with analyte-free water.

Equipment will be decontaminated in the manner outlined below.

- Wash and scrub equipment with a solution of Liquinox (or equivalent) and potable water.
- Rinse with potable water.
- Rinse non-steel equipment with 10 to 15 percent reagent-grade HNO^3 when sampling for trace metals.
- Rinse with analyte-free water.
- Rinse twice with isopropanol.
- Air dry (if possible) and wrap in oil-free aluminum foil.

Any additional equipment used in sampling will be decontaminated by following the procedure outlined above.

3.1.3.3.8 Maior Equipment

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

Liquids will be directed to an oil/water separator before release to the Base's sanitary sewer system. Solids will be retained and tested to determine appropriate disposal.

3.1.3.4 Filter Pack and Screen Design

The USEPA Region 4 SOPs (USEPA 1996b) require that the filter pack used for monitoring well annular space be selected based on grain size analysis of the formation interval adjacent to the well screen interval. The site characterization study well construction will follow the practice of using a 20/30-size gradation filter material coupled with a 0.010-inch, machine-slotted well screen. This filter pack size and screen slot size combination has previously been used at NAS Pensacola.

3.1.3.5 Trace Metals Sampling in Groundwater

Groundwater samples to be analyzed for trace levels of inorganics will be collected in a manner consistent with the procedure developed in USEPA Region IV SOP guidance. The monitoring wells will be purged and sampled using low-flow/low stress techniques. Efforts will be made to reduce groundwater turbidity below 10 NTUs. Filtered groundwater samples will not be collected. Monitoring well purge water records will be recorded in the field logbook or on monitoring well purge record forms included in Appendix D.

3.1.3.6 Groundwater Level Measurements

Measurement of the depth to water in monitoring wells will be performed according to TtNUS's COMPQAP and USEPA Region 4 SOPs, with the exception that measuring devices will not be calibrated against an Invar steel surveyor's chain. All devices used during a given measuring event will, however, be calibrated against each other to ensure that accurate relative measurements are made during the data collection event. The results of the calibration will be recorded in the field logbook.

A minimum of one complete round of water level measurements will be obtained from the monitoring wells installed during the Site Characterization Study (SCS) Phase I investigation. All measurements will be collected 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. Water level measurements will be recorded in the field logbook to the nearest 0.01 foot. Static water levels will be measured in each well before any fluid is withdrawn. An electronic interface probe will be used to evaluate the presence and thickness of floating hydrocarbons in the monitoring wells.

3.1.3.7 Sample Head Space Analysis

Soil vapor head space analyses will be performed according to the method prescribed in FDEP Rule 62-770.200(8) of the Florida Administrative Code (FAC). Soil samples will be analyzed for their total hydrocarbon content using an organic vapor analyzer (OVA) equipped with a FID. A photoionization detector (PID) may be used only after a determination of the instrument's equivalent response to a FID has been made. Charcoal filters will be used to differentiate between methane (a naturally occurring gas) and petroleum hydrocarbon vapors. The calibration of the FID will be checked before the analyses. 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 2 clean, 16-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 20–30°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; and
- 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.

3.1.3.8 Residual Free Product Detection in Soils

Residual free product field detection techniques using ultraviolet (UV) light or red dye will be used for soil borings and monitoring wells installed near suspected DNAPL source areas. UV light or red dye field tests will be performed on soil samples collected from the top of significant clay layers (greater than 4 feet thick) and other suspected locations based on field observations (i.e., elevated FID readings, odors, staining). Some petroleum-based, light nonaqueous-phase liquid (NAPLs) and some solvent-based DNALPs will fluoresce when exposed to UV light. Other NAPLs that may not fluoresce may be detected by mixing the soil sample with a colored, hydrophobic dye and watching for the presence of colored NAPL.

When a UV light is used to detect NAPLs, the suspect soil sample will be placed in a light-tight box containing a UV light. The box will be equipped with a shaded viewing port to eliminate ambient light, and the sample reaction will be directly observed for the presence of fluorescence. Alternatively, a darkened, well-ventilated room equipped with a UV light may be used if conveniently located near the sample collection site.

When samples are to be dye-tested, a portion of the suspect soil (e.g., 8-ounces volume, if available) will be placed into a clear, 1-liter jar. A volume of potable water and Red Oil (commercially available low-toxicity dye) sufficient to create a separate liquid phase following mixing (i.e., approximately 16 ounces) will be added to the sample, and the mixture will be agitated for a sufficient time to desegregate the majority of the soil sample.

Following mixing, the jar will be allowed to sit and will be observed for the presence of a colored NAPL fraction. Because of their natural cohesiveness, clay-rich samples may not readily desegregate, and mechanical breakage of the sample before mixing may be necessary.

3.1.3.9 Laboratory Sample Identification

The sample identification system to be used in the field to identify each sample taken during the preliminary site characterization will be in accordance with Navy standards and TtNUS SOP CT-04, contained in Appendix B-3. 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 is assigned a series of codes indicating the site (e.g., PEN-43), sample type, sample location, sample depth, and sample round (i.e., sequential order or date). The sample nomenclature system has been designed to maintain consistency between field, laboratory, and database sample numbers. In addition, the system facilitates cost-effective data evaluation because data can be easily sorted by matrix and/or depth or by other such parameters.

3.1.3.10 Field Instrument Control Limits

QA/QC specifications for field measurements are summarized in Table 3-2. 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 3-2

FIELD QA/QC SPECIFICATIONS
SITE CHARACTERIZATION STUDY WORK PLAN FOR
SITE 43
NAS PENSACOLA
PENSACOLA, FLORIDA

Analysis	Control Parameter	Control Limit	Corrective Action
Air monitoring using an organic vapor analyzer (FID)	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.
Specific conductance of water	Continuing calibration check of standard solution	± 1% of standard	Recalibrate.
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.

FID – flame ionization detector
NIST – National Institute of Standards and Technology

3.1.3.11 Corrective Actions

Comprehensive QA activities will be conducted by TtNUS to ensure that the data obtained from the sampling program as well as the resultant work products are technically valid. Any staff member engaged in project work who discovers or suspects a nonconformance is responsible for identifying and segregating (if applicable) the nonconforming item as well for forwarding a report to the Task Order Manager and QA Manager for investigation and corrective action. The QA Manager has the responsibility for assuring the overall adequacy of corrective actions and summarizing this information in a status report to TtNUS management.

Before its use in the field, each instrument will be calibrated to ensure that it is capable of producing usable data indicative of site conditions. While in the field, QC data, such as duplicate field measurements or QC check standards, will be collected for field instruments and used to evaluate the continued acceptable performance of each instrument. Table **3-2** lists the corrective actions to be implemented whenever field instruments fail to meet the established control limit criteria.

Field data will be reviewed by the site geologist while in the field. Extreme readings (i.e., readings that appear significantly different from other readings at the same site) will be accepted only after the instrument has been checked for malfunction and the readings have been verified by retesting (with an alternate instrument, if possible).

QC data obtained from field duplicates, field blanks, trip blanks, or equipment blanks will be collected while in the field and assessed by the QA Manager or the cognitive Task Order Manager to evaluate the overall quality of the sample collected. Whenever the results of the field QC samples fail to meet the acceptance criteria, as identified in Table **3-2,** corrective actions will be initiated.

Potential corrective actions will be dependent upon the final use of the data; however, appropriate corrective actions may include the following, as determined by the Task Order Manager in conjunction with the QA Manager:

- Evaluation of the suspect QC data by comparison to other QC samples taken at the same site or on the same date or analyzed by the same equipment/technician for similar contamination,
- Reanalysis of the QC sample in question (if possible),
- Qualification of the results, and
- Resampling.

Non-TtNUS parties involved in identified nonconformances will be notified initially by telephone with a follow-up formal correspondence explaining the deficiency. The responsible outside parties will be required to investigate the nonconformance and offer an appropriate corrective action. Notification, tracking, and ultimate closure of reported nonconformances and the review/approval of submitted corrective actions shall be the responsibility of the TtNUS QA Manager.

3.1.3.12 Investigation-Derived Waste

All IDW generated during the preliminary site assessment activities will be handled and disposed of in accordance with Section 5.0 of this document.

3.1.3.13 Field Logbooks and Forms

Field logbooks and standard data collection forms will be completed for field investigation, sample description, and data collection activities. These will include sample log sheets (for soil and groundwater samples), a daily record of drilling activities, and equipment calibration logs. An example of these forms can be found in Appendix D-2.

A bound, weatherproof field logbook shall be maintained by each sampling event leader. The FOL or designee will record all 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. The requirements of the site logbook are outlined in SOP SA-6.3, attached in Appendix B-4. This book will contain a summary of the day's activities and will reference the field logbooks when applicable.

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 D-2.

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

3.1.3.14 Manufacturers' Specifications

The FOL shall collect a copy of the available manufacturers' specifications for all 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-gradelanalyte-freewater;
- Reagents;
- Drilling additives;
- Bentonite and cement;
- Filter pack materials;
- Well casing and screen; and
- Disposable bailers, filters, tubing.

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

3.1.3.15 Surveying

3.1.3.1 5.1 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 preliminary site characterization. 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, however, will be permanently located using a NGVD survey at the close of the field mobilization.

3.1.3.1 5.2 National Geodetic Vertical Datum Survey Locations

The locations of monitoring wells installed during SCS Phase I will be measured by a certified land surveyor. Each point will be measured from a reference location that is tied to the Florida State Plane Coordinate System.

The surveys shall be third-order according to the methods prescribed in the ***Civil Engineering Handbook*** (Urquhart 1962). An X–Y coordinate system shall be used to identify locations. The X coordinate will be the east–west axis; the Y coordinate will be the north–south axis. The reference location will be the origin.

All surveyed locations will be reported using the Florida State Plane Coordinate System. Existing installation benchmarks will serve as the horizontal and vertical datums for the survey. Elevations and horizontal locations will be recorded to the nearest hundredth of a foot. The elevations of all monitoring wells will be surveyed at the water level measuring reference point on the top of the well casing and on the undisturbed ground surface adjacent to the well pad.

3.2 SITE-SPECIFIC FIELD SAMPLING ACTIVITIES

The technical approaches to all of the individual tasks constituting the field investigation are described in the following sections.

3.2.1 Proposed Investigation Site 43: Buried Drum Site

3.2.1.1 Source Area of Concern

The buried drum site is the only source area of concern for Site 43.

3.2.1.2 Proposed Investigation Summary

The objective of this investigation is to confirm the suspected extent and nature of the drum disposal area and determine if drum disposal activities have adversely affected the soil or groundwater at the site. The nature of contamination will be characterized and the need for an initial remedial action (IRA) or further extensive investigation will be determined. The investigation activities proposed for soil and groundwater at Site 43 are described in the following sections.

- The study area will be marked with survey flags that correspond to the survey coordinates used in the 1994 Ensafe/Allen & Hoshall geophysical investigation. Utilization of this grid system will ensure accurate mapping of the drum area as well as accurate correlation with geophysical data.

- Test pitting will be performed in order to investigate the geophysical anomalies identified during the 1994 Ensafe/Allen & Hoshall geophysical investigation. The results of the investigation will be used to determine if an IRA will be necessary to facilitate site closure. TtNUS personnel will prepare public notices if an IRA is performed.

- Excavated drums will be placed in DOT-approved overpak containers and secured onsite until analytical results of the soil samples are received. Whenever possible, excavated materials will be returned to the appropriate excavation.

- If the integrity of an excavated drum is compromised (cracked, punctured, etc.), then a sample will be collected from any liquid contained inside of the drum. If an excavated drum contains liquids, but the integrity has not been compromised, then the drum will be sampled at a later date.

- Soil samples will be collected for headspace screening with an OVA/FID or PID. Results of the OVA analysis will determine the need for further investigation utilizing Level B personal protective equipment, and to compare the sample OVA results against Soil Target Cleanup Levels (STCLs) defined in Chapter **62-785,** F.A.C.

- Surface and subsurface soil samples will be collected in conjunction with test-pitting activities from select locations at Site 43. Sample locations will be based on the findings of the geophysical report.

- Water table monitoring wells will be installed at the site to determine if drum disposal activities have impacted the surficial aquifer. The monitoring wells will be installed using direct push technology (DPT).

- Subsequent to installation and development of the monitoring wells, groundwater samples will be collected from each well for laboratory analysis. Analysis will include CLP-TCL volatile organics, semi-volatile organics, pesticides, polychlorinated biphenols (PCBs), and CLP-TAL metals as well as leachability. The groundwater analytical results will be compared to the Florida primary and secondary standards defined in Chapter **62-550,** F.A.C. and the Groundwater Cleanup Target Levels (GCTLs) defined in Chapter **62-785,** F.A.C.

3.2.2 Soil Investigation Scope

Test pits will be excavated to the shallower of either five feet bls or groundwater in the buried drum areas. Soil samples from the buried drum areas will be collected directly from the excavator bucket. In the other investigation areas, subsurface soil samples will be collected with a stainless-steel hand auger. Hand-auger borings will be advanced to the water table.

Soil sample quantities are based on eighteen surface soil samples and eighteen subsurface samples collected from the depth interval exhibiting the highest OVA readings or other characteristics at the discretion of the geologist. A surface soil sample will not be collected from borings in paved areas. The soil analytical results will be used to assess if soil at Site **43** is contaminated and to characterize the contamination in accordance with the SCTLs defined in Chapter **62-785,** F.A.C.

The supporting rationale for the soil boring locations is presented below.

Preliminary Assessment Rationale for Soil Sampling at Site 43	
Soil Sample Identification	**Rationale**
Subsurface Soil Samples **43SU01, 43SU02, 43SU03, 43SU04, 43SU05, 43SU06, 43SU07, 43SU08, 43SU09, 43SU10, 43SU11, 43SU12, 43SU13, 43SU14, 43SU15, 43SU16, 43SU17, 43SU18**	Soil investigation recommended in the **1994** Geotechnical Survey based upon magnetic anomalies.
Surface Soil Samples **43SS01, 43SS02, 43SS03, 43SS04, 43SS05, 43SS06, 43SS07, 43SS08, 43SS09, 43SS10, 43SS11, 43SS12, 43SS13, 43SS14, 43SS15, 43SS16, 43SS17, 43SS18,**	Soil investigation recommended in the **1994** Geotechnical Survey based upon magnetic anomalies.

The locations of the soil borings will be determined in the field as the test pit excavation progresses. This will enable TtNUS to provide adequate delineation of potential site impacts to the soil.

3.2.2.1 Soil Sampling Criteria

Samples of surface soils will be collected using a hand auger. The subsurface soils in the vicinity of the drums/debris will be collected directly from the excavator bucket. Soil samples from well borings will be collected from DTP samplers. A surface soil sample will not be collected from borings in paved areas. Each vadose zone soil sample will be screened for organic vapors following the headspace analysis as prescribed in Chapter **62-770.200(8),** F.A.C. Soil samples will not be collected below the water table. Soil samples will be selected for laboratory analysis from unpaved areas at the discretion of the site geologist based on field observations. Soil samples will be analyzed for CLP-TCL volatile organics, semi-volatile organics, pesticides, polychlorinated biphenols (PCBs), CLP-TAL metals as well as leachability.

3.2.3 Groundwater Investigation Scope

The preliminary site assessment at Site 43 will include four water table monitoring wells, surrounding the site. Groundwater laboratory analysis from samples collected from the wells will be used to assess groundwater quality and potential source for groundwater contamination, if present. The supporting rationale for these wells is presented below. The site assessment rationale for the proposed monitoring wells is provided below.

Preliminary Site Assessment Rationale for Monitoring Wells at Site 43	
Monitoring Well Location	**Rationale**
Groundwater Monitoring Wells NAS-43-1S, NAS-43-2S, NAS-43-3S, NAS-43-4S	Investigate the presence and character of any groundwater contamination in the shallow aquifer zone at the source area; piezometric control points to determine the shallow groundwater flow direction.

The locations of the monitoring wells will be determined in the field as the test pit excavation progresses. This will enable TtNUS to provide adequate delineation of potential site impacts to the groundwater.

3.2.3.1 Groundwater Sampling Criteria

Groundwater from all new wells will be analyzed for: CLP-TCL VOCs and SVOCs, PCBs, pesticides, CLP-TAL metals as well as leachability. The analyses to be performed on groundwater samples from the proposed new wells is summarized on **Table 3-3**. The groundwater analytical results will be compared to the Florida primary and secondary standards defined in Chapter 62-550, F.A.C. and the Groundwater Cleanup Target Levels (GCTLs) defined in Chapter 62-785, F.A.C.

Natural attenuation and water quality parameters to be analyzed are shown below.

Parameter	Test Method	Test Location
Dissolved Oxygen (DO)	DO Meter (DO >0.5 mg/L) Field Titration Kit (DO <0.5 mg/L)	Field
Nitrate	E300	Laboratory
Iron II (Fe^{+2})	Hach Method 8146	Field
Sulfate	E300	Laboratory

TABLE 3-3

GROUNDWATER ANALYSES
SITE CHARACTERIZATION STUDY
SITE 43
NAS PENSACOLA
PENSACOLA, FLORIDA

Site Number	Well Number	TCL–VOCs SW8260	TCL–SVOCs SW8270	TAL–Metals + CN	Pesticides/PCBs SW8081
43	PEN-43-1S	X	X	X	X
43	PEN-43-2S	X	X	X	X
43	PEN-43-3S	X	X	X	X
43	PEN-43-4S	X	X	X	X

PCB–polychlorinated biphenyl
SVOC–semivolatile organic compound
TAL–Target Analyte List
TCL–Target Compound List
VOC–volatile organic compound

Sulfide	E300	Laboratory
Methante	SW3810, Modified	Laboratory
Oxidation-Reduction Potential (Redox)	Redox Meter	Field
pH	pH Meter	Field
Temperature	Meter	Field
Specific Conductance	Meter	Field
Dissolved Organic Carbon	SW9060	Laboratory
Alkalinity	Hach Kit AL, AP, MG-L	Field
Chloride	E300 or SW9050	Laboratory

3.2.4 Quality Assurance/Quality Control Samples

All environmental sampling will be performed in accordance with procedures outlined in the COMPQAP. QC samples including equipment blanks, trip blanks, and field duplicates will be collected as outlined in Section 9.1 of the COMPQAP (TtNUS 1998). The frequency with which these QC samples will be collected is summarized in the box below. At least one field blank will also be collected during each field sampling event.

Number of Samples	Precleaned Equipment Blank	Field-Cleaned Equipment Blank	Trip Blank (VOCs)	Duplicate
10+	minimum of one, then 5%	minimum of one, then 5%	one per cooler	minimum of one, then 10%
5-9	one"	one*	not required	one
<5	one*	one*	not required	not required

"Note: For nine or fewer samples, a preclean d equipment blank and
A field-cleaned equipment blank must be collected if equipment is cleaned in the field.

3.2.5 Investination-Derived Waste Sampling

Investigationderived waste (IDW) from the soil sampling will be returned to the location where it was generated. IDW from groundwater well development will be characterized by groundwater samples collected from those wells following development. IDW from decontamination fluids will be sampled separately for any contaminants discovered in the groundwater.

Investigation-derived water will be containerized and segregated into the following categories:

- Decontamination fluids
- Development; and
- Purge water from wells.

A summary of the preliminary site characterization sampling and analysis program and QC analysis are presented in Tables 3 4 and 3-5.

TABLE 3 4
ANALYTICAL PROGRAM SUMMARY
SITE CHARACTERIZATION REPORT WORK PLAN FOR
SITE 43
NAS PENSACOLA
PENSACOLA FLORIDA

Sample Identification	Estimated Quantity	CLP/TCL vocs	CLP/TCL SVOCs	CLP/TAL Metals and CN	CLP/TCL Pesticides/ PCBs	TCLP
Analysis Method		SW-846 8260	SW-846 8270	(A)	SW-846 8081	
SURFACE SOIL						
Site 43	4	4	4	4	4	0
SUBSURFACE SOIL						
Site 43	4	4	4	4	4	0
GROUNDWATER SAMPLES						
Site 43	4	4	4	4	4	0
TOTAL SAMPLES	12	12	12	12	12	4'

(A) CLP/TAL Inorganics analyses by Methods SW6010, SW7471 or SW7470, SW9010, and SW9065.
'Sample will be collected if required.
**Sediment samples may be substituted for surface soil samples if standing water covers the site.
Notes:
TCL – Target compound list
CLP – Contract Laboratory Program
TCLP – Toxicity Characteristic Leaching Procedure
PCB – Polychlorinated biphenyls
TPH – Total petroleum hydrocarbons
QC – Quality control
USEPA – U.S. Environmental Protection Agency
SVOC – Semivolatile organic compound
VOCs – Volatile organic compound
TAL – Target analyte list

TABLE 3-5
ANALYTICAL QC PROGRAM SUMMARY
SITE CHARACTERIZATION STUDY WORK PLAN FOR
SITE 43
NAS PENSACOLA
PENSACOLA FLORIDA

Sample Identification	Surface Soil Samples	Subsurface Soil Samples	Sediment Samples	Groundwater Samples	Surface Water Samples
SOIL QC SAMPLES					
Duplicate	1	1	0	0	0
Matrix Spike	0	0	0	0	0
Matrix Spike Duplicate	0	0	0	0	0
Trip Blanks	1	1	0	0	0
Equipment Blanks	1	0	0	0	0
Field Banks	0	0	0	*0*	*0*
TOTAL SOIL SAMPLES	3	2	0	*0*	*0*
GROUNDWATER QC SAMPLES					
Duplicate	0	0	0	1	0
Matrix Spike	0	0	0	0	0
Matrix Spike Duplicate	0	0	0	0	0
Trip Blanks	0	0	0	1	0
Equipment Blanks	0	0	0	1	0
Field Banks	0	0	0	1	*0*
TOTAL GROUNDWATER SAMPLES	0	0	0	4	*0*

Notes:
QC – Quality control

4.0 SAMPLE ANALYSES AND VALIDATION

The draft site-specific Quality Assurance Project Plan for Site 43 is provided in **Appendix F.**

4.1 DATA VALIDATION

Data collected during the SCS will be validated to verify data quality is sufficient to allow the completion of a risk assessment should one be needed.

The approach to providing reliable data that meet the DQOs will include QA/QC requirements for each type of analytical data generated during the field investigation. The QA/QC efforts for laboratory analyses will include collection and submittal of QC samples and the assessment and validation of data from the subcontract laboratories. Analytical data will be subjected to independent data validation in accordance with the following guidelines:

- ***USEPA Contract Laboratory Program National functional Guidelines for Organic Data Review*** (USEPA 1994d);
- ***USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*** (USEPA 1994e); and
- ***Navy Installation Restoration Laboratory Qualify Assurance Guide*** **(NFESC 1996)**.

Sample Analvsis

Samples collected during the preliminary SCS field activities will be analyzed in accordance with the DQOs established in Section 2.0. The number of samples (including QA/QC samples) and analyses planned for the NAS Pensacola SCS are summarized in Section 3.0.

Data quality indicators include the precision, accuracy, representativeness, comparability, and completeness parameters. These parameters will be used within the data validation process to evaluate data quality. The achievable limits for these parameters vary with the DQO level of the data. The limits used for laboratory analytical data in this program will be at or below those set by the CLP for Level D DQOs.

4.2 DATA EVALUATION

The purpose of this task is to assess the usability of validated data results based upon data comparisons to non-site-related conditions. Results that meet the DQO requirements and are considered usable will be compared to background sampling results. Results of the data evaluation will be documented in the SCR report. The following data evaluations and comparisons will be made:

- Evaluation of detection limits,
- Evaluation of counting errors,
- Evaluation of equilibrium data,
- Evaluation of qualified data,
- Comparison of laboratory and field blanks to sample results, and
- comparison of laboratory and field duplicate results.

COPCs will be identified through evaluation of the following criteria:

- Background sampling results,
- Frequency of detection, and
- Extent of contamination.

If an additional investigation is needed the COPCs will be used throughout the data evaluation, fate and transport assessment, risk assessment, and FS.

Statistical analyses will be used in the data evaluation process and will involve a variety of analytical methods including exploratory analyses and the use of the standard *t* test and/or the Mann-Whitney test. The following paragraphs briefly describe each of the methods along with its application.

Exploratory analyses include evaluation of tables and graphs, including histograms, probability plots, and boxplots. Histograms and probability plots are used to understand and classify data distributions. In addition, tables of descriptive statistics (e.g., frequency of detection, minimum, quartiles, mean, maximum) will be evaluated. These tables alone may provide an adequate understanding of the distributions of some analytes, particularly those with few detected concentrations. Boxplots are used for side-by-side comparisons of different data sets (e.g., background versus potentially contaminated media); they graphically indicate quartiles, means, potential outliers, and properties such as skew in distributions.

Background will be compared to site data using several numerical approaches in addition to the graphical techniques described above. Site data will be compared to two times the background mean as well as the background maximum and other descriptive statistics. If necessary, statistical testing will be performed using the *t* test, Mann-Whitney test, or both. Results of the *t* test will be used when the data have a normal distribution or can be made to approximate the normal through transformation (taking the logarithm of each datum transforms a lognormal distribution to the normal). Results of the Mann-Whitney test will be used when at least one of the distributions being compared cannot be classified. Although not required to draw conclusions about the difference between background and site data, performing both tests simultaneously can provide a better understanding of the distributional patterns affecting test results.

4.3 DATA MANAGEMENT

Data management will be performed to track and manage environmental and QC data collected during the field investigation from the time the data are obtained through data analysis and report evaluation. Coordination and management of environmental and QC sample analysis by the contracted laboratories is also part of this task. Assessment activities generate data including sample locations, measurements of field parameters, and the results of laboratory analyses.

Reports regarding the collection and analyses of sample data will also be generated. The SCS process entails the flow of data collected in the field and generated by the analytical laboratory work to those involved in project evaluation and decision making. Management of data collected during SCS activities will ensure accessibility of data to support environmental data analysis, risk assessments, and the evaluation of remedial action alternatives.

Samples will be tracked from field collection activities to analytical laboratories following standard chain-of-custody procedures. Sample information recorded on the chain-of-custody forms will be transferred (electronically or manually) into the sample tracking portion of the database management system (DMS), thereby enabling the samples to be tracked through final disposition.

Analytical results, applicable QA/QC data, validation flags, chain-of-custody information, and any other applicable information will be incorporated into the DMS. All data will be verified after uploading to ensure completeness and accuracy.

5.0 INVESTIGATION-DERIVEDWASTE MANAGEMENT

IDW generated during the preliminary site investigation activities will be managed in accordance with the procedures described in Field Investigation Standard Operating Procedures. This document, which is included as Appendix B of this Work Plan, emphasizes management of all IDW in an environmentally responsible manner consistent with the CERCLA program, Resource Conservation and Recovery Act (RCRA) requirements, and the base's standard procedures. The objectives of the IDW management plan are

- Management of IDW in a manner that prevents contamination of uncontaminated areas (by IDW) and that is protective of human health and the environment;

- Minimization of IDW, thereby reducing costs and the potential for human or ecological exposure to contaminated materials; and

- Compliance with federal and state requirements that are ARARs.

6.0 SITE CHARACTERIZATION REPORT

The draft Site Characterization Report (SCR) will include appropriate sections concerning site background, investigation activities, physical characteristics, nature and extent of contamination, and aquifer characteristics. The suggested SCR format is presented in Table 6-1.

After internal review, the draft SCR will be issued to the SOUTHNAVFACENGCOM for review. The final SCR will be issued upon incorporation of review comments.

TABLE 6-1

SITE CHARACTERIZATION REPORT
PRELIMINARY ASSESSMENT WORK PLAN FOR
SITE 43
NAS PENSACOLA
PENSACOLA, FLORIDA

Executive Summary

1.0 Introduction
- 1.1 Purpose of Report
- 1.2 Site Physical Description
  - 1.2.1 Site Description
  - 1.2.2 Site History
  - 1.2.3 Previous Investigations
- 1.3 Report Organization

2.0 Site Background

3.0 Site Conditions
- 3.1 Physiography
- 3.2 Hydrogeology
  - 3.1.1 Regional
  - 3.1.2 Site Specific

4.0 Methodologies and Equipment
- 4.1 Soil Boring Advancement, Soil Sampling, and Organic Vapor Analyzer (OVA) Headspace Analysis
- 4.2 Monitoring Well Installation and Construction
- 4.3 Water Table Elevation Measurements
- 4.4 Groundwater Sampling and Analyses

5.0 Nature of Contamination
- 5.1 Chemical Components and Contaminants, in the Following Media.
  - 5.1.1 Soils and Vadose Zone
  - 5.1.2 Groundwater

6.0 Summary and Conclusions
- 6.1 Summary
- 6.2 Conclusions
- 6.3 Recommendations

7.0 Professional Review Certification

Appendices

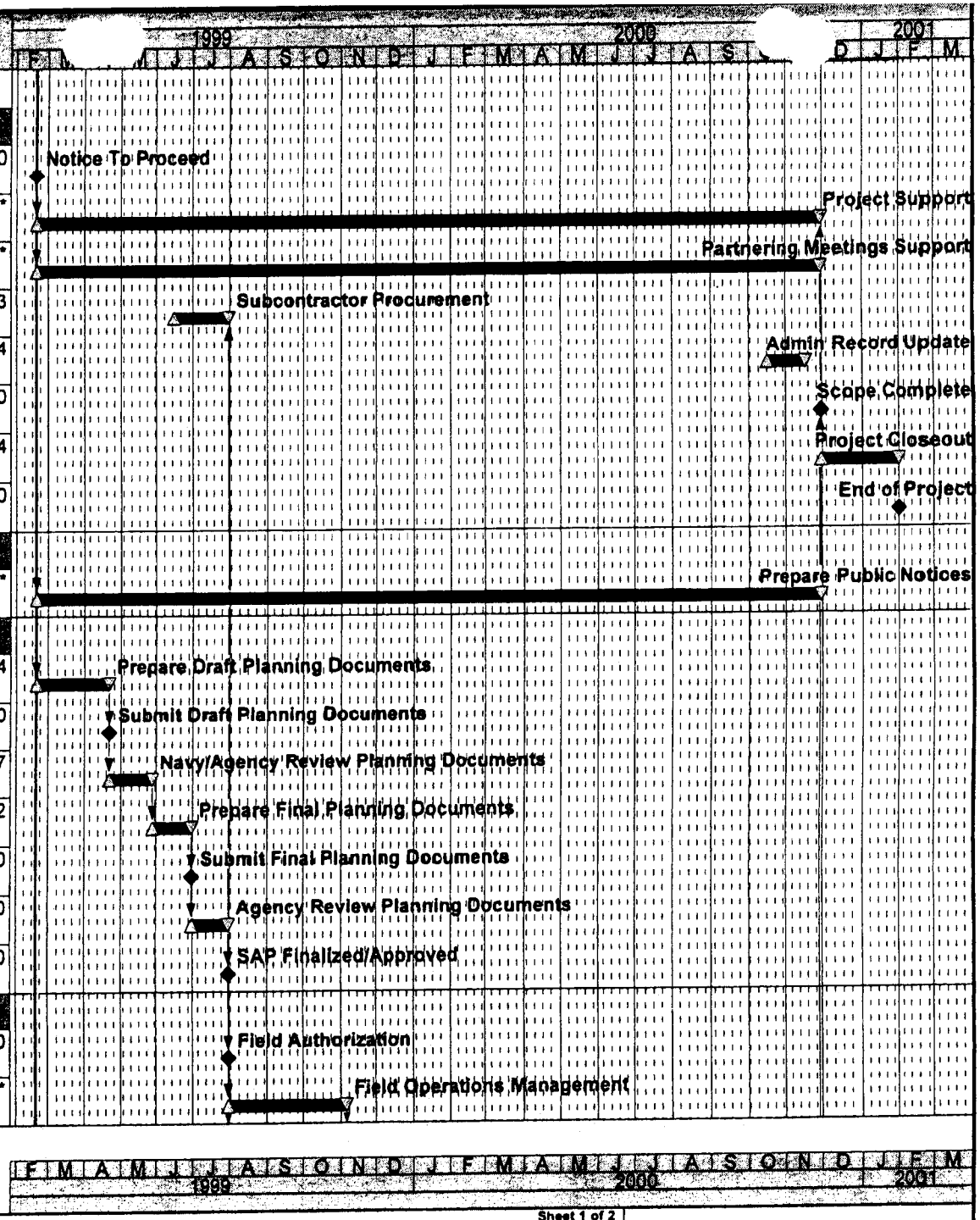
A – Site Conditions
B – Lithologic Logs – Borings and Test Pits
C – Soil Sample Analytical Data
D – Groundwater Sample Analytical Data

7.0 PROJECT SCHEDULE

The field investigation activities are proposed to begin in August 1999. The Final Preliminary Site Characterization Report is scheduled for submittal to the Navy and regulatory personnel in January 2000. The estimated start and finish dates as well as the duration of each task, in working days, are shown on the project schedule shown on Figure 7-1. This schedule is based on assumed site conditions and will be updated monthly to reflect actual progress during the project.

SOW 104 NAS PENSACOLA SITE 43 CHARAC

Activity ID	Activity Description	Cal ID	Early start	Early finish	Orig Dur
PROJECT MANAGEMENT					
EH0010105	Notice To Proceed	2	18FEB99*		0
EH0010115	Project Support	1	18FEB99	29NOV00	648*
EH0010125	Partnering Meetings Support	1	18FEB99	29NOV00	648*
EH0010130	Subcontractor Procurement	2	15JUN99	30JUL99	33
EH0010140	Admin Record Update	2	16OCT00*	16NOV00	24
EH0010235	Scope Complete	2		29NOV00	0
EH0010245	Project Closeout	2	30NOV00	31JAN01	44
EH0010255	End of Project	2		31JAN01	0
COMMUNITY RELATIONS					
EH0020115	Prepare Public Notices	1	18FEB99	29NOV00	648*
PLANNING DOCUMENTS					
EH0040115	Prepare Draft Planning Documents	2	18FEB99	20APR99	44
EH0040117	Submit Draft Planning Documents	2		20APR99	0
EH0040120	Navy/Agency Review Planning Documents	1	21APR99	27MAY99	37
EH0040125	Prepare Final Planning Documents	2	28MAY99	29JUN99	22
EH0040127	Submit Final Planning Documents	2		29JUN99	0
EH0040130	Agency Review Planning Documents	1	30JUN99	30JUL99	30
EH0040135	SAP Finalized/Approved	2		30JUL99	0
FIELD INVESTIGATIONS					
EH0050101	Field Authorization	1	31JUL99		0
EH0050105	Field Operations Management	1	31JUL99	05NOV99	98*



Project Start	18FEB99
Project Finish	31JAN01
Data Date	18FEB99
Run Date	24FEB99

Early Bar
Progress Bar
Critical Activity

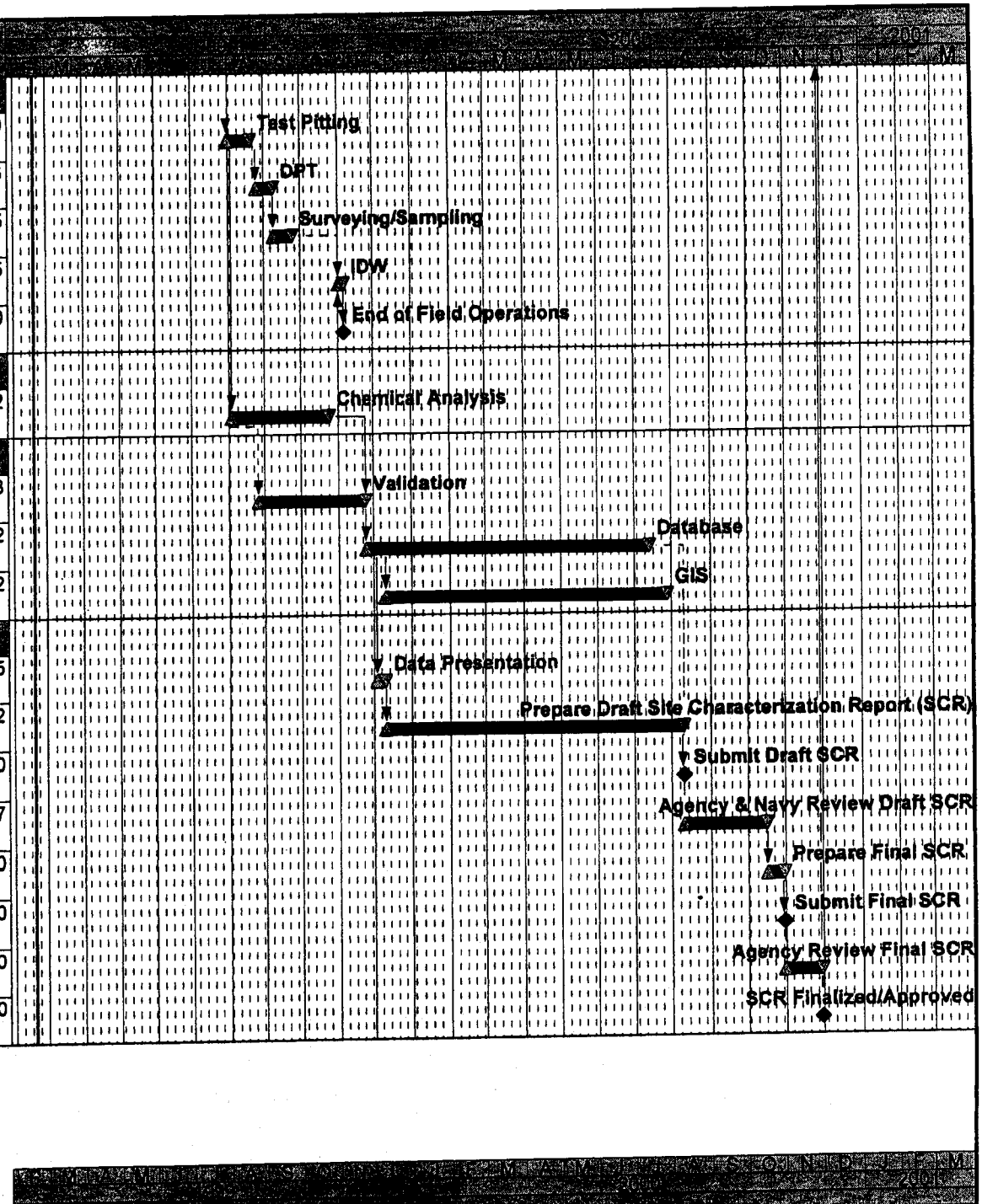
PORT:EH01

Sheet 1 of 2

NAVY - CLEAN III (SDIV)

BASELINE SCHEDULE

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Orig Float
FIELD INVESTIGATIONS					
EH0050110	Test Pitting	1	31JUL99	19AUG99	20
EH0050125	DPT	1	25AUG99	08SEP99	15
EH0050135	Surveying/Sampling	1	09SEP99	23SEP99	15
EH0050140	IDW	1	01NOV99	05NOV99	5
EH0050185	End of Field Operations	1		05NOV99	0
LABORATORY ANALYSIS					
EH0060115	Chemical Analysis	1	04AUG99	24OCT99	82
DATA MANAGEMENT					
EH0070115	Validation	2	26AUG99	23NOV99	63
EH0070120	Database	2	24NOV99	13JUL00	162
EH0070125	GIS	2	10DEC99	27JUL00	162
DATA EVALUATION REPORT					
EH0090110	Data Presentation	2	03DEC99	09DEC99	5
EH0090115	Prepare Draft Site Characterization Report (SCR)	2	10DEC99	10AUG00	172
EH0090120	Submit Draft SCR	2		10AUG00	0
EH0090125	Agency & Navy Review Draft SCR	1	11AUG00	16OCT00	67
EH0090135	Prepare Final SCR	2	17OCT00	30OCT00	10
EH0090140	Submit Final SCR	2		30OCT00	0
EH0090150	Agency Review Final SCR	1	31OCT00	29NOV00	30
EH0090160	SCR Finalized/Approved	2		29NOV00	0



Project Start FEB99
Project Finish 01
Data Date 99
Run Date 24FEB99

Early Bar
Progress Bar
Critical Activity

PORT:EH01

NA' EAN III (SDIV)
BASELINE SCHEDULE

Sheet 2 of 2

8.0 REFERENCES

American Society for Testing and Materials (ASTM) F 480 and D 1785.

Chapter 62-770, Petroleum Contamination Site Cleanup Criteria, September 23, 1998.

Ensafe/Allen & Hoshall, 1994, Geophysical Investigation of Buried Drum Area Site 10 (west), Naval Air Station Pensacola.

Tetra Tech NUS, Inc., Comprehensive Quality Assurance Plan #980038, 1998.

Tetra Tech NUS, Inc., Quality Assurance Program Manual, 1998.

USEPA (U.S. Environmental Protection Agency) 1996b. Environmental Investigations Standard Operating Procedures Quality Assurance Manual (EISOPQAM), Environmental Compliance Branch, Region 4, Science and Ecosystems Support Division, Athens, Georgia.

U.S. Geological Survey, Fort Barrancas, FLA" – Florida Quadrangle, 7.5 minute series, Topographic Quadrangle Maps of Florida: scale 1:24,000.

APPENDIX A

Geophysical Investigation of Buried Drum Area Site 10 (West)
NAS Pensacola

TECHNICAL MEMORANDUM

Geophysical Investigation of Buried Drum Area Site 10 (West), Naval Air Station Pensacola

September 14, 1994

Prepared by:

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Memphis, **TN 38134**
(901) 372-9115

on behalf of the **U.S.** Navy
CLEAN Contract **#N62467-89-D-0318**
CTO - **070**

SUMMARY

Responding to the discovery of several buried drums at the southwest comer of Murray and Taylor roads, west of Site **10** at Naval Air Station Pensacola, EnSafe/Allen & Hoshall conducted a gradient magnetics geophysical survey to define the extent of drum burial. The survey identified **a** 100-foot-by-120-foot zone where **drums** might **be** present. Excavating **this zone** is recommended. **A** large part of the study **area** appears **to** be clear of drums, suggesting that this may not **be an** extensive **site** of systematic disposal, but more likely is **limited** in *size* and the number of drums **disposed** of.

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1.0 INTRODUCTION

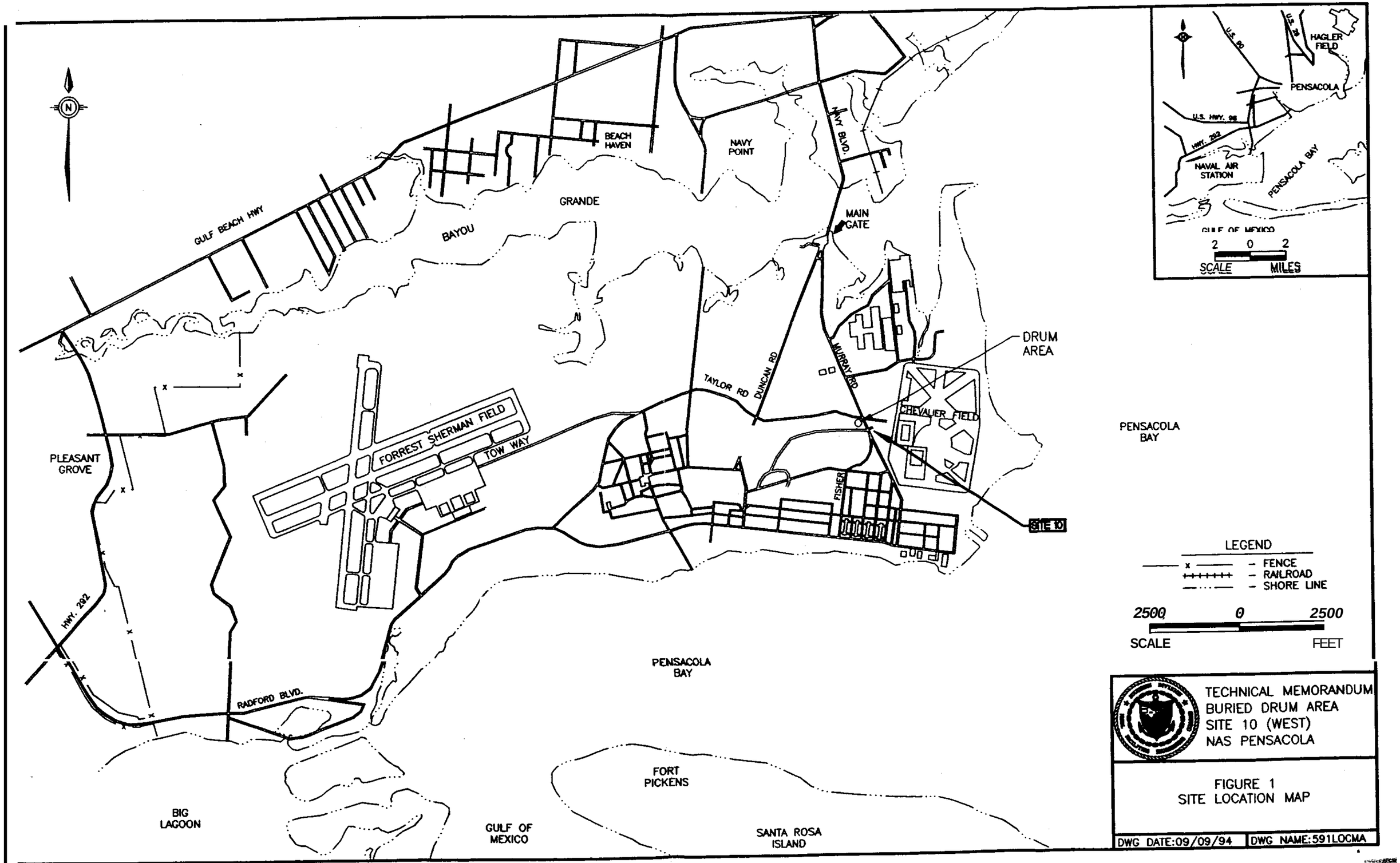
As a part of the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract with the United States Navy, EnSafe/Allen & Hoshall conducted a geophysical survey in March 1994 to investigate an area where several buried drums were discovered at Naval Air Station (NAS) Pensacola in Pensacola, Florida. The survey area lies west of Site 10, on the southwest corner of Murray and Taylor roads (see Figure 1). This Technical Memorandum describes the investigation of this area and recommends followup action.

2.0 SITE HISTORY

In December 1992, a child playing with a metal detector discovered a drum exposed at the surface just east of the tennis court. As a result of the discovery, the area was fenced to prevent access until the present investigation could be made.

Geophysics was applied to this site because it is non-invasive and can provide a comprehensive overview of potential buried drum locations relatively quickly and inexpensively. The objectives of the investigation were to:

- Determine the areal extent of the disposal area.
- Determine if this is a larger drum disposal area or if only a few drums are present.


N
GULF BEACH HWY
BEACH HAVEN
NAVY POINT
GRANDE
BAYOU
NAVY BLVD.
MAIN GATE
DRUM AREA
TAYLOR RD
DUNCAN RD
MURRAY RD
CHEVALIER FIELD
FISHER
SITE 10
FORREST SHERMAN FIELD
TOW WAY
PLEASANT GROVE
HWY. 292
RADFORD BLVD.
PENSACOLA BAY
PENSACOLA BAY
FORT PICKENS
BIG LAGOON
GULF OF MEXICO
SANTA ROSA ISLAND
U.S. 90
U.S. 29
HAGLER FIELD
PENSACOLA
U.S. HWY. 98
HWY. 292
NAVAL AIR STATION
PENSACOLA BAY
GULF OF MEXICO
2 0 2
SCALE MILES
LEGEND
FENCE
RAILROAD
SHORE LINE
2500 0 2500
SCALE FEET
TECHNICAL MEMORANDUM
BURIED DRUM AREA
SITE 10 (WEST)
NAS PENSACOLA
FIGURE 1
SITE LOCATION MAP
DWG DATE:09/09/94
DWG NAME:591LOCMA

3.0 METHODS

Magnetic Field Measurements

The study was done with a gradient magnetics geophysical survey, which responds exclusively to ferrous metals. This type of survey measures two magnetic parameters: the total magnetic field and the vertical magnetic gradient.

The *total magnetic field* has units of nanoTeslas (nT). By far the largest contribution to this measurement is the earth's magnetic field, which is roughly 50,000 to 52,000 nT in the southeast United States. Superposed on this large signal is a much smaller signal from local buried and above-ground metals. A buried object such as a drum can be thought of as a large, weak magnet with a positive pole at one end and a negative pole at the other. Depending upon the orientation of the drum and the position of the magnetometer at the surface, the drum magnetic field may add to or subtract from the earth's magnetic field value. By making sufficient measurements from the surface, the overall pattern of positive and negative anomalies can be mapped and the drum position and depth can be estimated.

The response of a buried drum varies greatly with the degree of remanent magnetism imparted by manufacture, the integrity of the drum, and its orientation and depth. Field experience shows that drums near the surface exhibit anomalies in the 20 to 200 nT range. Modem magnetometers can detect a single drum at up to 5 meters deep in the absence of noise.

An interfering factor in magnetic field measurements is "drift" caused by variations in solar activity. During solar storms, and particularly during peaks in the 11-year solar activity cycle, particles are ejected in a plasma from the sun's atmosphere and are blown outward by the solar wind. Some of these particles are trapped in the earth's magnetic field and flow down the earth's field lines into the atmosphere. This causes a current to flow, and hence a secondary magnetic field that varies with time. Solar pulsations can range from a few seconds to years in duration, and magnitudes during a single day can exceed 500 nT, although 10 to 100 nT is more

normal during "quiet" solar periods (as is the case for this year). In studies where the total magnetic field is the chief parameter to be interpreted, considerable effort is needed to correct for magnetic drift.

Another interfering factor is instrument noise. Most instruments can detect field changes as small as 0.1 nT, but slight variations in positioning of the sensor and other factors make the practical field noise threshold significantly larger. A good rule-of-thumb is that the smallest detectable field is about ± 1 nT.

The *vertical* magnetic *gradient* has units of nanoTeslas per meter (nT/m). Two magnetometer sensors *are* mounted at a fixed separation on a vertical pole. Each sensor measures the total magnetic field. The gradient is the difference in the two sensor readings, normalized to a 1-meter (m) separation. Gradient measurements have several strong advantages. First, since each of the two sensors responds equally to solar pulsations, these effects are removed from the gradient parameter. Similarly, strong magnetic effects from distant buildings and other magnetic features also *are* minimized in gradient data. However, for localized sources such as a drum, the lower sensor sees a stronger signal than the upper sensor, resulting in a gradient anomaly. In effect, gradient data separate local anomalies from regional anomalies. Most environmental applications are thus well served by making gradient measurements.

In a completely magnetic-free environment, the gradient is zero. Buried drums have responses of 10 to 200 nT/m, and the sign *can* be positive or negative, depending upon the drum's orientation and magnetic polarity. Practical field repeatability is about ± 1 nT/m.

Noise Sources

It is a rare project where the only metallic objects are buried drums. Nearly every site has other metallic debris, which is considered "noise" in terms of drum recognition. Chief among these is "culture," or man-made features such as buried pipes, cables, electric lines, fences, culverts,

light poles, reinforced concrete, etc. Culture is widespread at most environmental sites and can render magnetic measurements useless in certain cases.

In addition, there is the problem of surface clutter. Usually if drums are buried at a site, one also finds other metallic debris. Smaller items often can be distinguished from drum-sized objects, but in cases of extreme clutter this is difficult.

Technical Approach

The total magnetic field and the vertical gradient were measured with a GEM Systems GSM-19 proton-precession gradiometer with an Overhauser device. Data were obtained on a 10-foot-by-10-foot grid, which was tied to official NAS Pensacola easting/northing coordinates using the Navy CLEAN global positioning satellite (GPS) system. Two sensors were mounted on a vertical pole at a fixed separation of 56 centimeters (cm); the lower sensor was 2.2 m above ground surface. Measurements took only a few seconds, including the time required to walk to the next station. The data were stored automatically in a data recorder and were displayed on the instrument for evaluation of data quality and identification of anomalies. Data were transferred to a personal computer for processing and screen display.

In all, 1,575 measurements were made. An additional quantity of quality assurance (QA) and quality control (QC) measurements also was obtained.

QA/QC Results

Data accuracy is not directly checked in geophysical work because data precision is of far greater importance to detecting and interpreting field anomalies. Data accuracy is assured by proper factory construction and calibration of the instrument.

Data precision was checked 11 times throughout the two-day survey by repeating data at 11 stations along a baseline (Line 3300E, stations 3500 to 3600). The average standard

deviation for all the repeated gradient data was ±0.59 nT/m. The baseline crossed an "anomalous" and a "background" area; precision over the anomaly was slightly poorer than in the background area (±0.75 nT/m vs. ±0.50 nT/m, respectively), because slight positioning variations result in large data changes near an anomaly. The worst standard deviation at any single station was ±1.13 nT/m. Hence, one can consider the worst-case repeatability to be about ±1 nT/m. This is far smaller than the expected response from a single drum.

Magnetic drift due to solar activity also was monitored in the baseline data. Drift is a minor issue since it does not affect the gradient parameter, which is used for the present interpretation. For the record, drift in the total magnetic field parameter at station 3300E/3500N was small and fairly slow. The total field there averaged 50,097.0±12.6 nT over the course of the survey. Although there is no reason to do so now, the repeated data provide sufficient information to correct the total field measurements for drift.

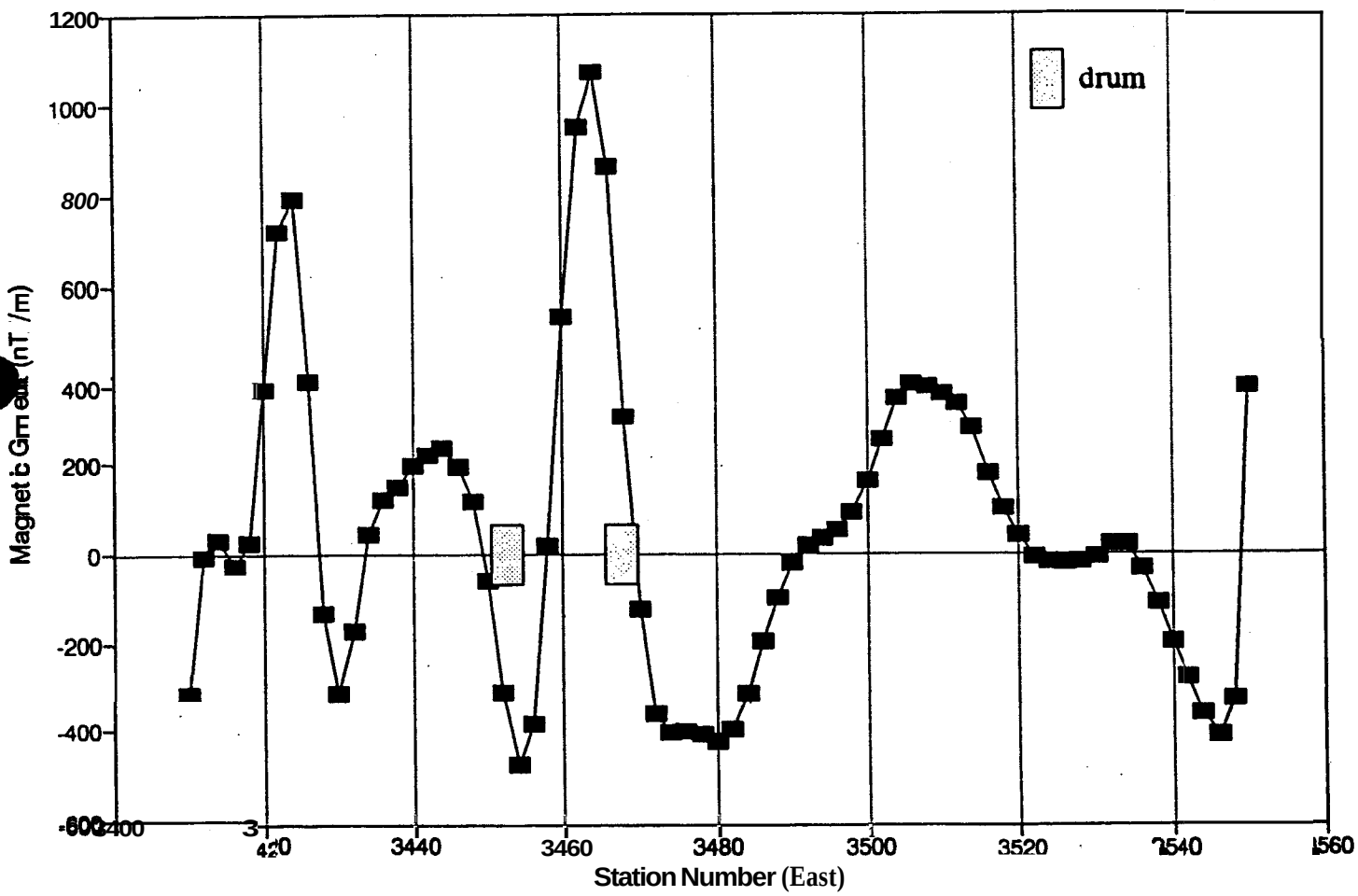
Spatial aliasing is a more important consideration. Aliasing occurs whenever sampling is done at a cruder interval than the variations being measured. The result is a hit-and-miss pattern of anomalies, with some resolved and others unresolved, depending upon the coincidental locations of sampling points. A familiar example of this in environmental work is soil sampling, during which one rarely has the luxury of having enough sample points to resolve all contaminant variations in an area (instead, a quasi-statistical sampling approach is often used to show the extent of contamination and, in some cases, to statistically sample the contaminant population).

An aliasing check was made by obtaining data at 2-foot increments along line 3588E inside the fenced drum area. This test line crossed two partially buried drums. Figure 2 shows the magnetic gradient data along the aliasing test line. The 2-foot station density defines a number of smoothly varying anomalies. The width of the smallest anomaly is about 6 feet, although most are wider than 10 feet. Thus, with a sampling density of 10 feet, one would encounter a moderate aliasing effect. However, the objective of this work is to define the areal extent of

drum burial; it is not necessarily helpful or cost-effective to achieve full definition of every small anomaly (indeed, "noise" from surficial metal debris and underground pipes prevent such detailed definition in many areas). In light of the overall objective, then, aliasing has little practical impact on the final results.

Figure 2 also shows a *typical drum* response, with positive-to-negative "crossovers" in the gradient data over the two known drums. This response is quite typical of data obtained over buried metals on north-facing lines. Anomaly amplitudes are as small as 200 nT/m and as large as 1,000 nT/m. These rather large anomalies may be enhanced by underground pipes or metal debris at the surface. But the test line serves as a template for recognizing other potential drum anomalies.

Figure 2
Aliasing Test, Line 3588E



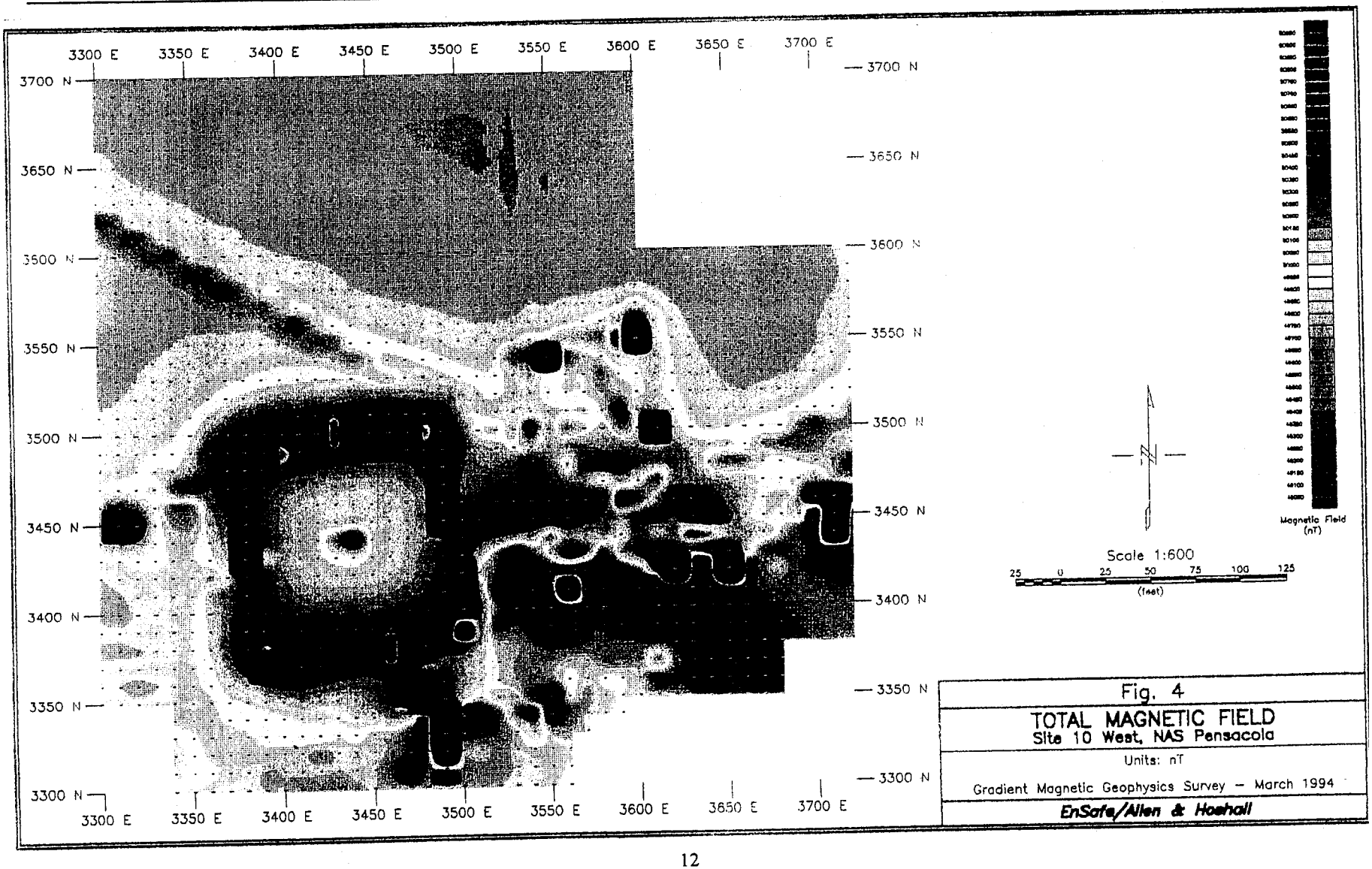


Fig. 4

TOTAL MAGNETIC FIELD
Site 10 West, NAS Pensacola

Units: nT

Gradient Magnetic Geophysics Survey – March 1994

EnSafe/Allen & Hoshall

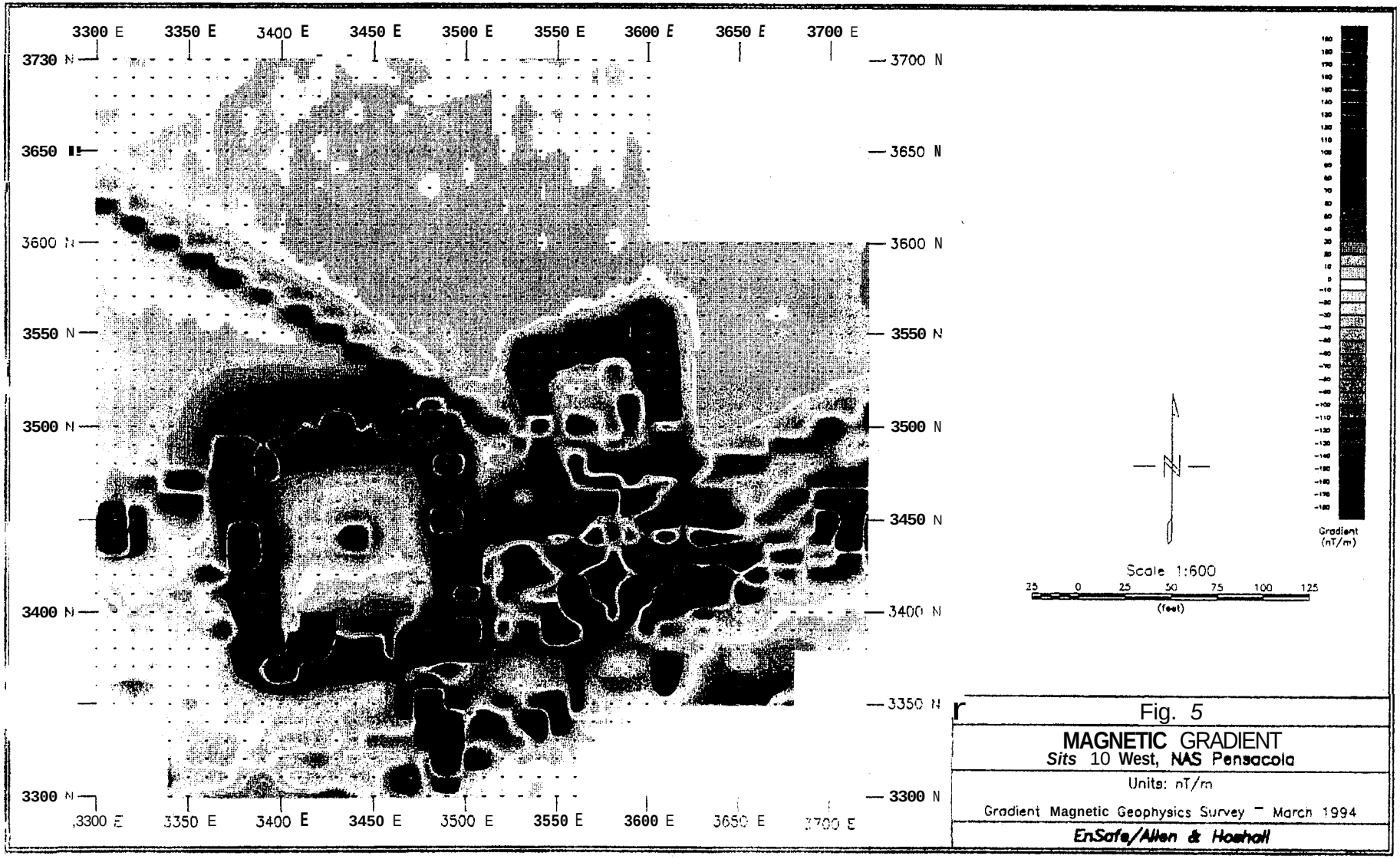


Fig. 5

MAGNETIC GRADIENT
Sits 10 West, NAS Pensacola

Units: nT/m

Gradient Magnetic Geophysics Survey – March 1994

EnSafe/Allen & Hoshall

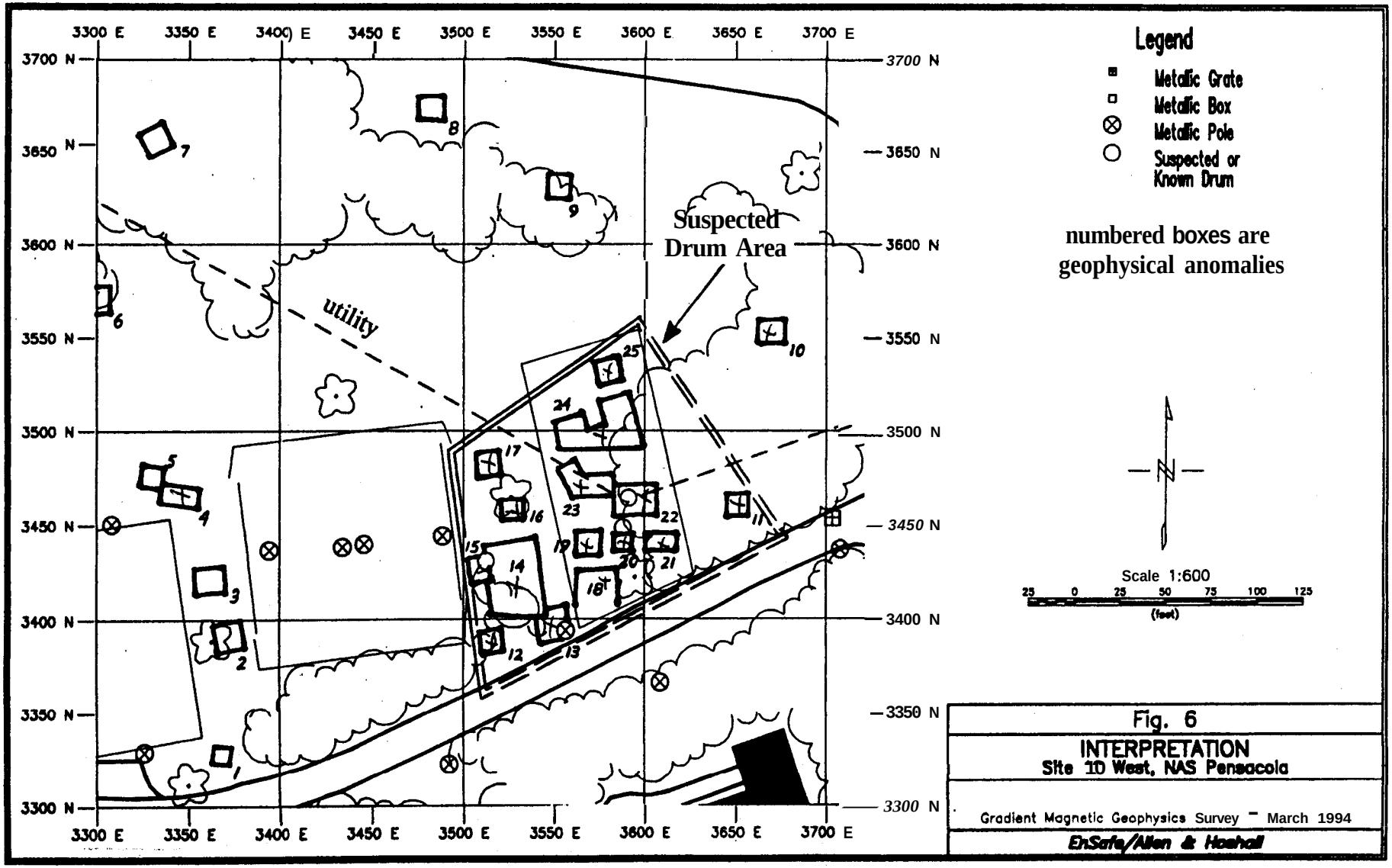
downward slope of the anomaly. A number of strong local anomalies lie along the access road to the south, which has subsurface cables, electric lines, and storm and sewer utilities. Finally, many metal poles, light fixtures, and storm grates produce strong anomalies.

Superposed on these anomalies attributed to culture are subtler anomalies, some of which are believed to be the result of buried metals. Figure 6 shows the interpretation of anomalies not likely to be caused by culture. It is possible that other anomalies have gone unrecognized near heavy culture, especially in the area's southern portion.

Anomalies 1 to 5 lie east of the basketball court; all but Anomaly 1 are strong and well-defined, and a near-surface source is indicated for all of them. Anomaly 4 should be investigated with a shovel or hand tool (see safety note in conclusions section).

Anomalies 6 to 10 are small-amplitude features in a broad area otherwise interpreted to be free of metal drums. These anomalies are smaller than a typical drum anomaly and are likely to be caused by a small piece of shallowly buried metal. However, one of these features should be excavated to confirm this interpretation (Anomaly 10 is the best candidate due to its proximity to the drum enclosure area).

Anomalies 11 to 25 have the amplitude and appearance consistent with buried drums, although it is quite possible that some are caused by other metal debris. Based on the data alone, there is no reason to consider any of these anomalies more likely to be caused by a drum than others. Instead, all of these features are worthy of investigation.


3300 E
3350 E
3400 E
3450 E
3500 E
3550 E
3600 E
3650 E
3700 E
3700 N
3650 N
3600 N
3550 N
3500 N
3450 N
3400 N
3350 N
3300 N
Suspected Drum Area
utility
Legend
Metallic Grate
Metallic Box
Metallic Pole
Suspected or Known Drum
numbered boxes are geophysical anomalies
N
Scale 1:600
25 0 25 50 75 100 125
(feet)
Fig. 6
INTERPRETATION
Site 10 West, NAS Pensacola
Gradient Magnetic Geophysics Survey - March 1994
EnSafe/Allen & Hoshall

Due to the presence of metal debris at the surface and the fusion of some anomalies, it is not possible to estimate the number of drums present. In most cases the causative metal object, whether drum or some other metal object, appears to be fairly shallow. Typical estimated depths are 5 feet or shallower.

Figure 6 shows the interpreted boundary enclosing possible drum anomalies. The east and south sides of this boundary are particularly uncertain due to interference from underground pipes. This area, which measures roughly 100 by 120 feet, is recommended for excavation to 5 feet to search for buried drums. Full excavation or a few well-placed trenches both should suffice to sample this area. Note that the area extends outside the fence.

5.0 CONCLUSIONS

A large section of land on the north half of the surveyed area is interpreted to be free of drums, with the unlikely possibility of drums at anomalies 6 to 10. Although cultural clutter precludes a definitive interpretation, anomalies of the type one might expect of drums are mostly confined to an area about 100 by 120 feet in size. Taken as a whole, the survey suggests this area is not one of systematic and widespread drum disposal, but is limited in areal dimensions and in the number of disposed drums.

The area of possible drums, defined in Figure 6, should be explored by trenching. If drums are found on the south or east parts of the fenced area, the excavation should be extended past the area shown. Caution should be exercised, as the geophysics indicates underground utilities are present in the areas to be dug up.

Although less likely to be drums, anomalies 4 and 10 also should be investigated with shovel or hand tools to confirm a non-drum source. In the unlikely event that a drum is found at one of these anomalies, the data will need to be re-evaluated to identify subtler anomalies that might require investigation.

The fenced drum area gate has no lock on it. Installing one for safety and site security is recommended.

APPENDIX B

Field Investigation Standard Operating Procedures

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5.0 PROCEDURES 3

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5.2 Sample Number Field Requirements 3
5.3 Example Sample Field Designations 4
5.4 Example Sample Numbers 6

1.0 PURPOSE

The purpose of this document is to specify a consistent sample nomenclature system that will facilitate subsequent data management in a cost-effective manner. The sample nomenclature system has been devised such that the following objectives can be attained:

- Sorting of data by matrix.
- Sorting of data by depth.
- Maintenance of consistency (field, laboratory, and data base sample numbers).
- Accommodation of all project-specific requirements on a global basis.
- Accommodation of laboratory sample number length constraints (10 characters).

20 SCOPE

The methods described in this procedure shall be used consistently for all projects requiring electronic data handling managed by personnel located in the Northeast Region of Brown & Root Environmental (Pittsburgh, Wayne, Holt, and Wilmington) and for any large contracts managed by the Northeast Region (e.g., NORTHDIV CLEAN, SOUTHDIV CLEAN, ARCS I, ARCS III, etc.). Smaller projects (as determined by Project Manager) are outside the scope of this SOP.

3.0 GLOSSARY

None.

4.0 RESPONSIBILITIES

Program Manager - It shall be the responsibility of the Program Manager (or designee) to inform contract-specific Project Managers of the existence and requirements of this Standard operating Procedure.

Project Manager - It shall be the responsibility of the Project Manager to determine the applicability of this Standard operating Procedure based on: (1) program-specific requirements, and (2) project size and objectives. It shall be the responsibility of the Project Manager (or designee) to ensure that the sample nomenclature is thoroughly specified in the relevant project planning document (e.g., sampling and analysis plan) and is consistent with this Standard Operating Procedure if relevant. It shall be the responsibility of the project manager to ensure that the Field Operations Leader is familiar with the sample nomenclature system.

Field Operations Leader - It shall be the responsibility of the Field Operations Leader to ensure that all field technicians or sampling personnel are thoroughly familiar with this Standard Operating Procedure and the project-specific sample nomenclature system. It shall be the responsibility of the Field Operations Leader to ensure that the sample nomenclature system is used during all project-specific sampling efforts.

5.0 PROCEDURES

5.1 Introduction

The sample numbering system consists of 12 distinct alpha-numeric characters, only 10 of which will be provided to the laboratory on the sample labels and chain-of-custody forms. The sample number provided to the lab shall be as follows where "A" indicates "alpha," "N" indicates "numeric," and "E" indicates "either"):

$$\overline{E}\ \overline{E}\ \overline{E}\ \overline{A}\ \overline{A}\ \overline{E}\ \overline{E}\ \overline{E}\ \overline{N}\ \overline{N}$$

Once the analytical results are received from the laboratory the sample number will be revised by a subroutine such that the sample number is more user friendly (i.e., dashes will be inserted). The sample number will then appear as follows:

$$\overline{E}\ \overline{E}\ \overline{E}\ -\ \overline{A}\ \overline{A}\ -\ \overline{E}\ \overline{E}\ \overline{E}\ -\ \overline{N}\ \overline{N}$$

If multiple sampling events occur (or are planned) for a given matrix, a subroutine within the database will be used to append two additional characters such that the sample number will appear as follows:

$$\overline{E}\ \overline{E}\ \overline{E}\ -\ \overline{A}\ \overline{A}\ -\ \overline{E}\ \overline{E}\ \overline{E}\ -\ \overline{N}\ \overline{N}\ -\ \overline{N}\ \overline{N}$$

Site Type Location Depth Round

5.2 Sample Number Field Requirements

The various fields in the sample number will include the following:

- Site Identifier
- Sample Type
- Sample Location
- Sample Depth Indicator
- Sampling Round

The site identifier must be a three-character field (numeric characters, alpha characters, or a mixture of alpha and numeric characters may be used). A site number is necessary since many facilities/sites have multiple individual sites, SWMUs, operable units, etc.

The sample type must be a two-character alpha field. Suggested codes are provided in Section 5.3 of this SOP.

The sample location must be a three-character field (alpha, numeric, or a mixture).

The depth field must be provided for all samples, regardless if it is strictly applicable (as discussed in Section 5.3).

The sampling round is optional, but, if provided, must be two numeric characters.

5.3 Example Sample Field Designations

Examples of each of the fields are as follows:

Site Number - Examples of site numbers/designations are as follows:

- A01 - Area of Concern Number 1
- 125 - Solid Waste Management Unit Number 125
- 000 - Base or Facility Wide Sample (e.g., upgradient well)
- BBG - Base Background

The examples cited are only suggestions. Each Project Manager (or designee) must designate appropriate (and consistent) site designations for their individual project.

Sample Type - Examples of sample types are as follows:

- AS - Air Sample
- BS - Biota Sample (See Note)
- CP - Composite Sample
- CS - Chip Sample
- DS - Drum Sample
- DU - Dust Sample
- FP - Free Product
- ID - Investigation Derived Waste Sample
- LT - Leachate Sample
- MW - Monitoring Well
- OF - Outfall Sample
- RW - Residential Well Sample
- SB - Soil Boring Sample
- SD - Sediment Sample
- SC - Scrape Sample
- SG - Soil Gas Sample
- SP - Seep Sample
- SS - Surface Soil Sample
- SU - Subsurface Soil Sample
- SW - Surface Water Sample
- TP - Test Pit Sample
- TW - Temporary Well Sample
- WC - Well Construction Material Sample
- WI - Wipe Sample
- WP - Well Point Sample
- WS - Waste/Sludge Sample

Note: The biota sample designation may be contingent upon the type of biota sampled (e.g., BL - Lobster; BF - Finfish; BC - Clam; BO - Oyster). Numerous other examples can be cited but will be site-specific.

This field will also be used to designate field Quality Control Samples, as follows:

TB - Trip Blank
FB - Field Blank
RB - Rinsate Blank (Equipment Blank)
BB - Bottle Blank
AB - Ambient Condition Blank

Field quality control samples should be numbered sequentially (e.g., RB-001; FB-010, etc.).

Filtered/unfiltered surface water or groundwater samples shall be handled in an separate manner, as subsequently discussed.

Location - Examples of the location field are as follows:

A01 - Grid node A1
001 - Monitoring Well 1

It is important that consistency be maintained with respect to the use of the characters "0" and O. Data base subroutines will not sort correctly if a mixture are used (e.g, A01 and A02).

Depth - Formerly, depth specifications were indicated with a four digit field (e.g., 0002 - 0 to 2 feet). While this is effective for depth sorting, it is difficult to include this level of detail in a 10-character lab number (FormMaster limitations). In addition, this approach will not accommodate non-integer depths (e.g., 2.5 feet to 4.5 feet).

Based on such potential problems, the following approach shall be used: Sample depths will simply represent the horizon from which the sample was obtained: For example, if ten split-spoon samples are collected from a boring, they will be numbered 01 through 10. The sample log sheet will be used to record the specific depth of the sample, and this information will be entered in a separator field in the data base.

Similar nomenclature will be used for depth-specific surface water and sediment samples, etc. If no depth information is required (e.g., groundwater samples), the field must still be filled (e.g., O, O).

This field will also be used for the designation of filtered and unfiltered samples. An unfiltered groundwater sample shall be designated as U0, if and only if, a corresponding filtered sample is collected. Such as sample shall be designated as F0.

Sampling Round - The sampling round field is straightforward. It can range from 01 to 99.

5.4 Example Sample Numbers

Examples of complete sample numbers (field/data base versus laboratory) are as follows:

Field/Data Base ID	Lab ID	Description
101-SB-A01-01	101SBA0101	The first sample (e.g., 0 to 2 feet) from soil boring A01 (grid) at Site 101.
101-SB-A01-02	101SBA0102	The second sample from boring A01 (could be the next depth interval or a duplicate of 101-SB-A01-01).
125-MW-001-01-01	125MW00101	A groundwater sample from monitoring well MW001 (first sampling round)
125-MW-001-02-01	125MW00102	A duplicate groundwater sample from monitoring well MW001 (first sampling round)
130-MW-003-U1-01	130MW003U1	An unfiltered groundwater sample from monitoring well MW003 (first sampling round)
130-MW-003-F1-01	130MW003F1	A filtered groundwater sample from monitoring well MW003 (first sampling round)
137-RB-001-00-01	137RB00100	The first rinsate blank collected at site 137.
137-TB-004-00-02	137TB00400	The fourth trip blank collected during the second sampling event at Site 137.
155-SW-003-01-01	155SW00301	A surface water sample collected from the surface of a pond at Site 155.
155-SW-OO3-02-01	155SW00302	A surface water sample collected from the bottom of the water column in a pond at Site 155.

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1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to identify and designate the field data record forms, logs and reports generally initiated and maintained for documenting Brown & Root Environmental field activities.

2.0 SCOPE

Documents presented within this procedure (or equivalents) shall be used for all Brown & Root Environmental field activities, as applicable. Other or additional documents may be required by specific client contracts.

3.0 GLOSSARY

None

4.0 RESPONSIBILITIES

Project Manager - The Project Manager is responsible for obtaining hardbound, controlled distribution logbooks (from the appropriate source), as needed. In addition, the Project Manager is responsible for placing all forms used in site activiiies (i.e., records, field reports, and upon the completion of field work, the site logbook) in the project's central file.

Field Operations Leader (FOL) - The Field Operations Leader is responsible for ensuring that the site logbook, notebooks, and all appropriate forms and field reports illustrated in this guideline (and any additional forms required by the contract) are correctly used, accurately filled out, and completed in the required time-frame.

5.0 PROCEDURES

5.1 Site Logbook

5.1.1 General

The site logbook is a hard-bound, paginated controlled distribution record book in which all major onsite activities are documented. At a minimum, the following activities/events shall be recorded (daily) in the site logbook:

- All field personnel present
- Arrival/departure of site visitors
- Arrival/departure of equipment
- Start or completion of borehole/trench/monitoring well installation or sampling activities
- Daily onsite activiies performed each day
- Sample pickup information
- Health and Safety issues (level of protection observed, etc.)
- Weather conditions

A site logbook shall be maintained for each project. The site logbook shall be initiated at the start of the first onsite activity (e.g., site visit or initial reconnaissance survey). Entries are to be made for every day that onsite activities take place which involve Brown & Root Environmental or subcontractor personnel. Upon completion of the fieldwork, the site logbook must become part of the project's central file.

The following information must be recorded on the cover of each site logbook:

- Project name
- Brown & Root Environmental project number
- Sequential book number
- Stan date
- End date

Information recorded daily in the site logbook need not be duplicated in other field notebooks (see Section 5.2), but must summarize the contents of these other notebooks and refer to specific page locations in these notebooks for detailed information (where applicable). An example of a typical site logbook entry is shown in Attachment A.

If measurements are made at any location, the measurements and equipment used must either be recorded in the site logbook or reference must be made to the site notebook in which the measurements are recorded (see Attachment A).

All logbook, notebook, and log sheet entries shall be made in indelible ink (black pen is preferred). No erasures are permitted. If an incorrect entry is made, the data shall be crossed out with a single strike mark, and initialed and dated. At the completion of entries by any individual, the logbook pages used must be signed and dated. The site logbook must also be signed by the Field Operations Leader at the end of each day.

5.1.2 Photographs

When movies, slides, or photographs are taken of a site or any monitoring location, they must be numbered sequentially to correspond to logbook entries. The name of the photographer, date, time, site location, site description. and weather conditions must be entered in the logbook as the photographs are taken. A series entry may be used for rapid-sequence photographs. The photographer is not required to record the aperture settings and shutter speeds for photographs taken within the normal automatic exposure range. However, special lenses, films, filters, and other image-enhancement techniques must be noted in the logbook. If possible, such techniques shall be avoided, since they can adversely affect the admissibility of photographs as evidence. Chain-of-custody procedures depend upon the subject matter, type of film, and the processing it requires. Film used for aerial photography, confidential information, or criminal investigation require chain-of-custody procedures. Adequate logbook notation and receipts must be compiled to account for routine film processing. Once processed, the slides of photographic prints shall be consecutively numbered and labeled according to the logbook descriptions. The site photographs and associated negatives must be docketed into the project's central file.

5.2 Site Notebooks

Key field team personnel may maintain a separate dedicated notebook to document the pertinent field activities conducted directly under their supervision. For example, on large projects with multiple investigative sites and varying operating conditions, the Health and Safety Officer may elect to maintain a separate site notebook. Where several drill rigs are in operation simultaneously, each site geologist assigned to oversee a rig must maintain a site notebook.

5.3 Sample Forms

A summary of the forms illustrated in this procedure is shown as the listing of Attachments in the Table of Contents for this SOP. Forms may be altered or revised for project-specific needs contingent upon client approval. Care must be taken to ensure that all essential information can be documented. Guidelines for completing these forms can be found in the related sampling SOP.

5.3.1 Sample Collection, Labeling, Shipment and Request for Analysis

5.3.1.1 Sample Log Sheet

Sample Log Sheets are used to record specified types of data while sampling. Attachments B-1 to B-4 are examples of Sample Log Sheets. The data recorded on these sheets are useful in describing the waste source and sample as well as pointing out any problems encountered during sampling. A log sheet must be completed for each sample obtained, including field quality control (QC) samples.

5.3.1.2 Sample Label

A typical sample label is illustrated in Attachment B-5. Adhesive labels must be completed and applied to every sample container. Sample labels can usually be obtained from the appropriate Program source or are supplied from the laboratory subcontractor.

5.3.1.3 Chain-of-Custodv Record Form

The Chain-of-Custody (COC) Record is a multi-part form that is initiated as samples are acquired and accompanies a sample (or group of samples) as they are transferred from person to person. This form must be used for any samples collected for chemical or geotechnical analysis whether the analyses are performed on site or off site. One part of the completed COC form is retained by the field crew while the other two or three portions are sent to the laboratory. The original (top, signed copy) and extra carbonless copies of the COC form shall be placed inside a large Ziploc-type bag and taped inside the lid of the shipping cooler. If multiple coolers are sent but are included on one COC form, the COC form should be sent with the first cooler. The COC form should then state how many coolers are included with that shipment. An example of a Chain-of-Custody Record form is provided as Attachment B-6. A supply of these forms are purchased and stocked by the field department of the various Brown & Root Environmental offices. Alternately, COC forms supplied by the laboratory may be used. Once the samples are received at the laboratory, the sample cooler and contents are checked and any problems are noted on the enclosed COC form (any discrepancies between the sample labels and COC form and any other problems that are noted are resolved through communication between the laboratory point-of-contact and the Brown & Root Environmental Project Manager). The COC form is signed and one of the remaining two parts are retained by the laboratory while the last part becomes part of the samples' corresponding analytical data package. Internal laboratory chain-of-custody procedures are documented in the Laboratory Quality Assurance Plan (LQAP).

5.3.1.4 Chain-of-Custody Seal

Attachment B-7 is an example of a custody seal. The Custody seal is also an adhesive-backed label. It is part of a chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field and sealed in coolers for transit to the laboratory. The COC seals are signed and dated by the samplers and affixed across the opening edges of each coder containing environmental samples. COC seals may be available from the laboratory; these seals may also be purchased from a supplier.

5.3.2 Geohydrological and Geotechnical Forms

5.3.2.1 Groundwater Level Measurement Sheet

A groundwater level measurement sheet, shown in Attachment C-1 must be filled out for each round of water level measurements made at a site.

5.3.2.2 Data Sheet for Pumping Test

During the performance of a pumping test (or an in-situ hydraulic conductivity test), a large amount of data must be recorded, often within a short time period. The pumping test data sheet (Attachment C-2) facilitates this task by standardizing the data collection format, and allowing the time interval for collection to be laid out in advance.

5.3.2.3 Packer Test Report Form

A packer test report form shown in Attachment C-3 must be completed for each well upon which a packer test is conducted following well installation.

5.3.2.4 Summary Loci of Boring

During the progress of each boring, a log of the materials encountered, operation and driving of casing, and location of samples must be kept. The Summary Log of Boring (Attachment C-4) is used for this purpose and must be completed for each soil boring performed. In addition, if volatile organics are monitored on cores, samples or cuttings from the borehole (using HNU or OVA detectors), these results must be entered on the boring log (under the 'Remarks' column) at the appropriate depth. The 'Remarks' column can also be used to subsequently enter the laboratory sample number and the concentration of a few key analytical results. This feature allows direct comparison of contaminant concentrations with soil characteristics.

5. ii Well Construction Details Form

A Monitoring Well Construction Details Form must be completed for every monitoring well piezometer or temporary well point installed. This form contains specific information on length and type of well riser pipe and screen, backfill, filter pack, annular seal and grout characteristics, and surface seal characteristics. This information is important in evaluating the performance of the monitoring well, particularly in areas where water levels show temporal variation, or where there are multiple (immiscible) phases of contaminants. Depending on the type of monitoring well (in overburden or bedrock), different forms are used (see Attachments C-5 through C-9). Similar forms are used for flush-mount well completions. The Monitoring Well Construction Details Form is not a controlled document.

5.3.2.6 Test Pit Log

When a test pit or trench is constructed for investigative or sampling purposes, a Test Pit Log (Attachment C-10) must be filled out by the responsible field geologist or sampling technician.

5.3.3 Equipment Calibration and Maintenance Form

The calibration or standardization of monitoring, measuring or test equipment is necessary to assure the proper operation and response of the equipment, to document the accuracy, precision or sensitivity of the measurement, and determine if correction should be applied to the readings. Some items of

equipment require frequent calibration, others infrequent. Some are calibrated by the manufacturer, others by the user.

Each instrument requiring calibration has its own Equipment Calibration Log (Attachment D) which documents that the manufacturer's instructions were followed for calibration of the equipment, including frequency and type of standard or calibration device. An Equipment Calibration Log must be maintained for each electronic measuring device used in the field; entries must be made for each day the equipment is used.

5.4 Field Reports

The primary means of recording onsite activities is the site logbook. Other field notebooks may also be maintained. These logbooks and notebooks (and supporting forms) contain detailed information required for data interpretation or documentation, but are not easily useful for tracking and reporting of progress. Furthermore, the field logbook/notebooks remain onsite for extended periods of time and are thus not accessible for timely review by project management.

5.4.1 Weekly Status Reports

To facilitate timely review by project management, Xeroxed copies of logbook/notebook entries may be made for internal use. To provide timely oversight of onsite contractors, Daily Activities Reports are completed and submitted as described below.

It should be noted that in addition to the summaries described herein, other summary reports may also be contractually required.

5.4.2 Daily Activities Report

5.4.2.1 Description

The Daily Activities Report (DAR) documents the activities and progress for each day's field work. This report must be filled out on a daily basis whenever there are drilling, test pitting, well construction, or other related activities occurring which involve subcontractor personnel. These sheets summarize the work performed and form the basis of payment to subcontractors (Attachment E is an example of a Daily Activities Report).

5.4.2.2 Responsibilities

It is the responsibility of the rig geologist to complete the DAR and obtain the driller's signature acknowledging that the times and quantities of material entered are correct.

5.4.2.3 Submittal and Approval

At the end of the shift, the rig geologist must submit the Daily Activities Report to the Field Operations Leader (FOL) for review and filing. The Daily Activities Report is not a formal report and thus requires no further approval. The DAR reports are retained by the FOL for use in preparing the site logbook and in preparing weekly status reports for submission to the Project Manager.

6.0 ATTACHMENTS

Attachment A	TYPICAL SITE LOGBOOK ENTRY
Attachment B-1	EXAMPLE GROUNDWATER SAMPLE LOG SHEET
Attachment B-2	EXAMPLE SURFACE WATER SAMPLE LOG SHEET
Attachment B-3	EXAMPLE SOIL/SEDIMENT SAMPLE LOG SHEET
Attachment B-4	CONTAINER SAMPLE LOG SHEET FORM
Attachment B-5	SAMPLE LABEL
Attachment B-6	CHAIN-OF-CUSTODY RECORD FORM
Attachment B-7	CHAIN-OF-CUSTODY SEAL
Attachment C-1	EXAMPLE GROUNDWATER LEVEL MEASUREMENT SHEET
Attachment C-2	EXAMPLE PUMPING TEST DATA SHEET
Attachment C-3	PACKER TEST REPORT FORM
Attachment C-4	EXAMPLE BORING LOG
Attachment C-5	EXAMPLE OVERBURDEN MONITORING WELL SHEET
Attachment C-5A	EXAMPLE OVERBURDEN MONITORING WELL SHEET (FLUSHMOUNT)
Attachment C-6	EXAMPLE CONFINING LAYER MONITORING WELL SHEET
Attachment C-7	EXAMPLE BEDROCK MONITORING WELL SHEET - OPEN HOLE WELL
Attachment C-8	EXAMPLE BEDROCK MONITORING WELL SHEET - WELL INSTALLED IN BEDROCK
Attachment C-8A	EXAMPLE BEDROCK MONITORING WELL SHEET - WELL INSTALLED IN BEDROCK (FLUSHMOUNT)
Attachment C-9	EXAMPLE TEST PIT LOG
Attachment D	EXAMPLE EQUIPMENT CALIBRATION LOG
Attachment E	EXAMPLE DAILY ACTIVITIES RECORD
Attachment F	FIELD TRIP SUMMARY REPORT

ATTACHMENT A
TYPICAL SITE LOGBOOK ENTRY

START TIME: _____ DATE: _____

SITE LEADER: _____

PERSONNEL:

BROWN & ROOT ENV.	DRILLER	EPA
_____	_____	_____
_____	_____	_____
_____	_____	_____

WEATHER: Clear, 68°F, 2-5 mph wind from SE

ACTIVITIES:

1. Steam jenney and fire hoses were set up.
2. Drilling activities at well ____ resumes. Rig geologist was _____. see Geologist's Notebook, No. 1, page 29-30, for details of drilling activity. Sample No. 123-21-S4 collected; see sample logbook, page 42. Drilling activities completed at 11:50 and a 4-inch stainless steel well installed. See Geologist's Notebook, No. 1, page 31, and well construction details for well _____
3. Drilling rig No. 2 steam-cleaned at decontamination pit. Then set up at location of well _____
4. Well _____ drilled. Rig geologist was _____. See Geologist's Notebook, No. 2, page ____ for details of drilling activities. Sample numbers 123-2241, 123-22-S2, and 123-2243 collected; see sample logbook, pages 43, 44, and 45.
5. Well ____ was developed. Seven 55-gallon drums were filled in the flushing stage. The well was then pumped using the pitcher pump for 1 hour. At the end of the hour, water pumped from well was "sand free.'
6. EPA remedial project manger arrives on site at 14:25 hours.
7. Large dump truck arrives at 14:45 and is steam-cleaned. Backhoe and dump truck set up over test pit _____
8. Test pit _____ dug with cuttings placed in dump truck. Rig geologist was _____. See Geologist's Notebook, No. 1, page 32, for details of test pit activiiies. Test pit subsequently filled. No samples taken for chemical analysis. Due to shallow groundwater table, filling in of test pit resulted in a very soft and wet area. A mound was developed and the area roped off —
9. Express carrier picked up samples (see Sample Logbook, pages 42 through 45) at 17:50 hours. Site activities terminated at 18:22 hours. All personnel off site, gate locked.

_____
Field Operations Leader

ATTACHMENT B-1
EXAMPLE GROUNDWATER SAMPLE LOG SHEET

GROUNDWATER

SAMPLE LOG SHEET

Page ____ of ____

Project Site Name: _____ Sample ID No.: _____

Project No: _____ Sample Location: _____

- ☐ Domestic Well Data
- ☐ Monitoring Well Data
- ☐ Other Well Type: _____
- ☐ QA Sample Type: _____

Sampled By: _____

C.O.C. No.: _____

Sampling Data

Date: / Time: / Method:	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD

Purge Data

Date: / Method:	Volume	pH	S.C.	Temp.(°C)	Turbidity	Color	TBD	TBD
	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type:	2							
	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5							
TD-WL (ft.) =								
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analyte	Preservative	Container Requirements	Collected (✓)

Observations/Notes:

Circle If Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	

TBD: To Be Determined

3

ATTACHMENT B-2
EXAMPLE SURFACE WATER SAMPLING LOG SHEET

SURFACE WATER SAMPLING LOG SHEET

Page ___ of ___

Project Site Name: _____

Project No.: _____

☐ Spring ☐ Pond
☐ Stream ☐ Lake
☐ Other _____
☐ QA Sample Type: _____

Sample ID No.: _____

Sample Location: _____

Sampled By: _____

C.O.C. No.: _____

Sample Date		
Date and Time	Method	Depth

pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD

Analysis	Preservative	Container Requirements	Collected (✓)

Observations/Notes:

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No.:	

TBD To Be Determined

ATTACHMENT 8-3
EXAMPLE SOIL/SEDIMENT SINGLE SAMPLE LOG SHEET

SOIL/SEDIMENT
SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: _____ Sample ID No.: _____

Project No.: _____ Sample Location: _____

- ☐ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sampled By: _____

C.O.C. No.: _____

Sample Method:	Composite Sample Data		
	Sample	Time	Color/Description
Depth Sampled:			
Sample Date and Time:			
Type of Sample			
☐ Grab			
☐ Composite			
☐ Grab-Composite	Grab Sample Data		
☐ High Concentration	Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)	
☐ Low Concentration			

Analyses	Container Type/Preservative	Collected At	Map:

Observations/Notes:

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	

ATTACHMENT B-4
CONTAINER SAMPLE LOG SHEET FORM

Brown & Root Environmental

Page ___ of __

☐ Container Data

Case #: _____

By: _____

Project Site Name: _____ Project Site No. _____

Brown & Root Env. Source No. _____ Source Location: _____

Container Source	Container Description
O Drum O Bung Top ☐ Lever Lock O Bolted Ring ☐ Other _____ ☐ Bag/Sack ☐ lank O Other _____	Color: _____ Condition: _____ Markings: _____ Vol. of Contents: _____ Other: _____

Disposition of Sample	Sample Description			
O Container Sampled ☐ Container opened but not sampled. Reason: _____ ☐ Container not opened. Reason: _____		Layer 1	Layer 2	Layer 3
	Phase	☐Sol. ☐Liq.	☐Sol. ☐Liq.	☐Sol. ☐Liq.
	Color	_____	_____	_____
	Viscosity	OL OM OH	☐L OM OH	☐L OM OH
	% of Total Volume	_____	_____	_____
	Other	_____	_____	_____

Monitor Reading:			
Sample Method:			
Sample Date & lime:	Sample Identification	Organic	Inorganic
Sampled by:			
Signature(s):			
	Date Shipped		
Analysis:	Time Shipped		
	Lab		
	Volume		

ATTACHMENT B-5

SAMPLE LABEL

Brown & Root Environmental PROJECT: _____

STATION LOCATION: _____

DATE: ____/____/____ TIME: _____ hrs.

MEDIA: WATER ☐ SOIL ☐ SEDIMENT ☐ _____ ☐

CONCENTRATION: LOW ☐ MEDIUM ☐ HIGH ☐

TYPE: GRAB ☐ COMPOSITE ☐

ANALYSIS	PRESERVATION
VOA ☐ BNAs ☐	Cool to 4°C ☐
PCBs ☐ PESTICIDES ☐	HNO_3 to pH < 2 ☐
METALS: TOTAL ☐ DISSOLVED ☐	NaOH to pH > 12 ☐
CYANIDE ☐	_____ ☐
_____ ☐	

Sampled by: _____

Remarks:

ATTACHMENT B-6

CHAIN-OF-CUSTODY RECORD FORM
(Original is 8.5 x 11")

PROJECT NO.	PROJECT NAME					NO. OF CONTAINERS							REMARKS
SAMPLERS: *(Signature)*													
STA NO.	DATE	TIME			STATION LOCATION								

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks:	

ATTACHMENT 8-7

CHAIN-OF-CUSTODY SEAL

CUSTODY SEAL

ATTACHMENT C-1
EXAMPLE GROUNDWATER LEVEL MEASUREMENT SHEET

GROUNDWATER LEVEL MEASUREMENT SHEET

Page ___ of ___

PROJECT NAME: _____ LOCATION: _____
PROJECT NUMBER: _____ MEASURING DEVICE: _____
PERSONNEL: _____ ADJUSTMENT FACTOR: _____
DATE: _____ REMARKS: _____
WEATHER CONDITIONS: _____

Well or Piezometer Number	Time	Elevation of Reference Point (Feet)*	Water Level Indicator Reading (Feet)*	Groundwater Elevation (Feet)*	Comments

*Measurements to nearest 0.01 foot.

Signature(s): _____

ATTACHMENT C-2
EXAMPLE PUMPING TEST DATA SHEET

PUMPING TEST DATA SHEET

Page ___ of ___

PROJECT NAME: _____
PROJECT NUMBER: _____
PUMPING TEST: [ ]
TEST NUMBER: _____
METHOD OF MEASUREMENT: _____
DATE(s): _____
STATIC H20 LEVEL (ft) (SO) _____

PUMPING WELL NUMBER: _____
MEASURED WELL NUMBER: _____
STEP DRAWDOWN TEST [3
MONITORING POINT: _____
DEPTH CORRECTION (ft) _____
PUMP SETTING (Ft. below monitoring point): _____
DISTANCE FROM PUMPING WELL (ft) (r): _____

PUMPING TEST PERFORMED BY _____
REMARKS: _____

MILITARY TIME	ELAPSED TIME SINCE PUMP START OR STOP (Min.)	WATER LEVEL (Ft.)	CORRECTION (Ft.)	DRAW DOWN OR RECOVERY (Ft.)	FLOW METER READING (Gals.)	PUMPING RATE (GPM)	REMARKS

SIGNATURE(s): _____

ATTACHMENT C-3

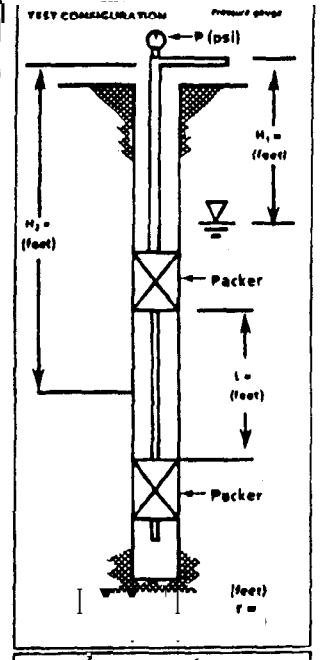
PACKER TEST REPORT FORM

PROJECT: _____ **PROJECT NO.:** _____ TEST NO: _____ PAGE ____ OF ____

BORING NO.: _____ **CASING DEPTH:** _____ CONTRACTOR: _____ STATIC WATER LEVEL _____

TEST INTERVAL: _____ BY: _____ CHECKED: _____ PACKER **PRESSURE** _____

Flow Test					Calculated Results							
Pressure, P (psi)	Elapsed Time (min)	Flow Reading	Δ Flow, ΔQ (ft³)	Δ Flow, ΔQ (gal)	Flow Rate Q (gal/min)	H_1* (ft)	Hp(ft) = 2.31·(psi)	H_2* (ft)	H = Hp + (H1 or H2)	Cp	K (ft/yr) = Cp·Q/H	K (cm/sec) = 9.67 x 10⁻⁷ K (ft/yr)



Length of test section in feet, L	Cp — Drilling bit size			
	7⅞" (1.5")	6⅞" (1.875")	6⅛" (2.3")	6" (1")
1	31,000	28,500	25,000	23,700
2	19,000	18,100	16,000	15,500
5	[illegible]	[illegible]	[illegible]	[illegible]
8	8,000	6,500	6,100	5,800
10	5,700	5,000	4,400	4,900
15	4,100	3,900	3,400	3,600
20	3,200	3,100	2,800	2,600

CP = (1/(2 π L)) ln(L/r) (70,315 5)
7.48 Gallons = 1 Ft³
1 psi = 2.31 ft head

* H_1 is used when the test length is below the water table.
H_2 is used when the test length is above the water table.

Remarks: _____

ATTACHMENT C-4
EXAMPLE BORING LOG

BORING LOG

Page ___ of ___

PROJECT NAME: _____ BORING NUMBER: _____
PROJECT NUMBER: _____ DATE: _____
DRILLING COMPANY: _____ GEOLOGIST: _____
WATER LEVEL DATA: _____

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows/6" or RQD (%)	Sample Recovery/ Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS	Remarks	PID or FID Reading (ppm)

*When rock coring enter rock brokeness.

CONVERTED TO MU: ___ Yes ___ No; WELL I.D.#: _____
REMARKS: _____

Signature(s): _____

LEGEND

SOIL TERMS

UNIFIED SOIL CLASSIFICATION (USCS)

COARSE-GRAINED SOILS — More Than Half of Material is LARGER Than No. 200 Sieve Size

FIELD IDENTIFICATION PROCEDURES (Excluding Particles Larger Than 3 Inches and Basing Fractions on Estimated Weights)			GROUP SYMBOL	TYPICAL NAMES
GRAVELS (50%(+)>1/4"Ø)	CLEAN GRAVELS (Low % Fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
		Predominantly one size or a range of sizes with some intermediate sizes missing.	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
	GRAVELS W/FINES (High % Fines)	Non-plastic fines (for identification procedures, see ML)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
		Plastic fines (for identification procedures, see CL)	GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.
SANDS 50%(+)<1/4"Ø	CLEAN SANDS (Low % Fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	SW	Well graded sand, gravelly sands, little or no fines.
		Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	Poorly graded sands, gravelly sands, little or no fines.
	SANDS W/FINES (High % Fines)	Non-plastic fines (for identification procedures, see MCL)	SM	Silty sands, poorly graded sand-silt mixtures.
		Plastic fines (for identification procedures, see CL)	SC	Clayey sands, poorly graded sand-clay mixtures.

FINE-GRAINED SOILS — More Than Half of Material is SMALLER Than No. 200 Sieve Size

FIELD IDENTIFICATION PROCEDURES (Excluding Particles Larger Than 3 Inches and Basing Fractions on Estimated Weights)	Identification Procedures on Fraction Smaller than No. 40 Sieve Size				GROUP SYMBOL	TYPICAL NAMES
		DRY STRENGTH (Crushing Characteristics)	DILATANCY (Reaction to Shaking)	TOUGHNESS (Consistency Near Plastic Limit)		
SILTS AND CLAYS Liquid Limit <50		None to Slight	Quick to Slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity.
		Medium to High	None to Very Slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		Slight to Medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity.
SILTS AND CLAYS Liquid Limit >50		Slight to Medium	Slow to None	Slight to Medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		High to Very High	None	High	CH	Inorganic clays of high plasticity, fat clays.
		Medium to High	None to Very Slow	Slight to Medium	OH	Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS	Readily identified by color, odor, spongy feel and frequently by fibrous texture.				Pt	Peat and other organic soils

Boundary classifications: Soils possessing characteristics of two groups are designated by combining group symbols. For example, GW-GC, well graded gravel-sand mixture with clay binder.
All sieve sizes on this chart are U.S. Standard.

DENSITY OF GRANULAR SOILS

DESIGNATION	STANDARD PENETRATION RESISTANCE-BLOWS/FOOT
Very Loose	0-4
Loose	5-10
Medium Loose	11-30
Dense	31-50
Very Dense	Over 50

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNC COMPRESSIVE STRENGTH (TONS/SQ. FT.)	STANDARD PENETRATION RESISTANCE-BLOWS/FOOT	FIELD IDENTIFICATION METHODS
Very Soft	Less than 0.25	0 to 2	Easily pentrated several inches by fist
Soft	0.25 to 0.50	2 to 4	Easily penetrated several inches by thumb.
Medium Stiff	0.50 to 1.0	4 to 8	Can be penetrated several inches by thumb.
Stiff	1.0 to 2.0	8 to 15	Readily indented by thumb.
Very Stiff	2.0 to 4.0	15 to 30	Readily indented by thumbnail.
Hard	More than 4.0	Over 30	Indented with difficulty by thumbnail.

ROCK TERMS

ROCK HARDNESS (FROM CORE SAMPLES)

Descriptive Terms	Screwdriver or Knife Effects	Hammer Effects
Soft	Easily Gouged	Crushes when pressed with hammer
Medium Soft	Can be Gouged	Breaks (one blow); crumbly edges
Medium Hard	Can be scratched	Breaks (one blow); sharp edges
Hard	Cannot be scratched	Breaks concheidally (several blows); sharp edges

ROCK BROKENESS

Descriptive Terms	Abbreviation	Spacing
Very Broken	(V. Br.)	0-2"
Broken	(Br.)	2"-1'
Blocky	(Bl.)	1'-3"
Massive	(M.)	3'-10'

LEGEND:

SOIL SAMPLES - TYPES

S-2" Split-Barrel Sample

ST-3" O.D. Undisturbed Sample

O - Other Samples, Specify in Remarks

ROCK SAMPLES - TYPES

X-NX (Conventional) Core (-2-1/8" O.D.)

Q-NQ (Wireline) Core (-1-7/8" O.D.)

Z - Other Core Sizes, Specify in Remarks

WATER LEVELS

12/18 ▼ 12.6' Initial Level w/Date & Depth

12/18 ▼ 12.6' Stabilized Level w/Date & Depth

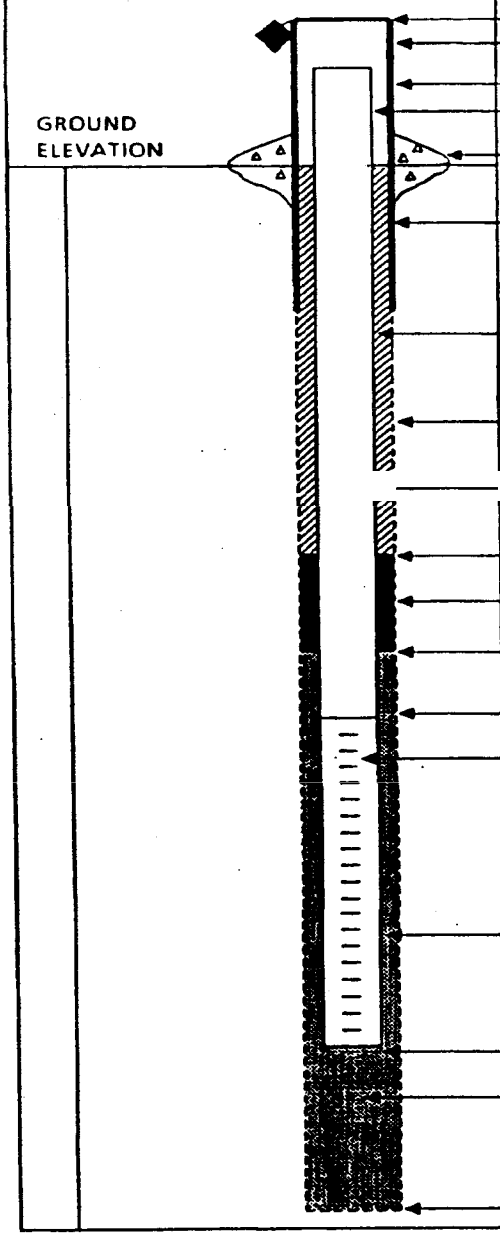
ATTACHMENT C-5
EXAMPLE OVERBURDEN MONITORING WELL SHEET

BORING NO.: _____

O'VERBURDEN
MONITORING WELL SHEET

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF SURFACE CASING: _____
ELEVATION OF TOP OF RISER PIPE: _____
STICK - UP TOP Of SURFACE CASING: _____
STICK - UP RISER PIPE _____
TYPE OF SURFACE SEAL: _____
I.D. OF SURFACE CASING: _____
TYPE OF SURFACE CASING: _____
RISER PIPE I.D. _____
TYPE OF RISER PIPE: _____
BOREHOLE DIAMETER: _____
TYPE OF BACKFILL: _____
ELEVATION/ DEPTH TOP OF SEAL: _____ / _____
TYPE OF SEAL: _____
DEPTH TOP OF SAND PACK: _____
ELEVATION / DEPTH TOP OF SCREEN: _____ / _____
TYPE OF SCREEN: _____
SLOT SIZE x LENGTH: _____
I.D. OF SCREEN: _____
TYPE OF SAND PACK: _____
ELEVATION / DEPTH BOTTOM OF SCREEN:
ELEVATION / DEPTH BOTTOM OF SAND PACK:
TYPE OF BACKFILL BELOW OBSERVATION WELL: _____
ELEVATION / DEPTH OF HOLE: _____ / _____

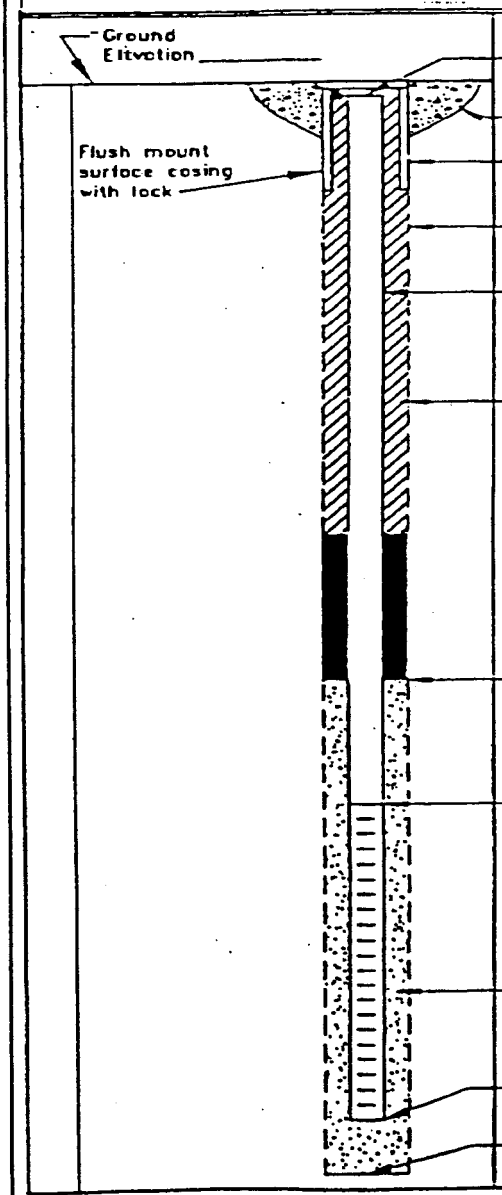
ATTACHMENT C-5A
EXAMPLE OVERBURDEN MONITORING WELL SHEET (FLUSHMOUNT)

BORING NO.: _____

MONITORING WELL SHEET

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOO _____
DEVELOPMENT METHOD _____



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: _____

DEPTH/ELEVATION TOP OF SAND: _____

DEPTH/ELEVATION TOP Of SCREEN: _____ / _____

TYPE OF SCREEN: _____

SLOT SIZE x LENGTH: _____

TYPE OF SAND PACK: _____

DIAMETER Of HOLE IN BEDROCK: _____

DEPTH/ELEVATION BOTTOM OF SCREEN: _____ / _____

DEPTH/ELEVATION BOTTOM OF SAND _____ / _____

DEPTH/ELEVATION BOTTOM OF HOLE: _____ / _____

BACKFILL MATERIAL BELOW SAND: _____

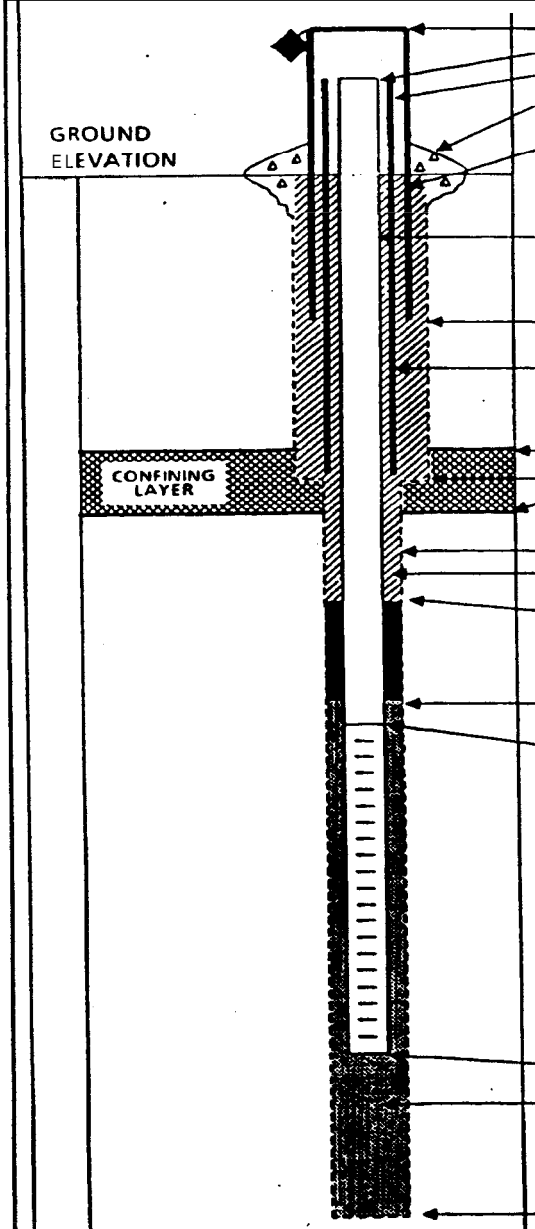
ATTACHMENT C-6
EXAMPLE CONFINING **LAYER** MONITORING WELL **SHEET**

BORING NO.: _____

CONFINING LAYER
MONITORING WELL SHEET

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF SURFACE CASING: _____
ELEVATION OF TOP OF RISER PIPE: _____
ELEVATION TOP OF PERM. CASING: _____
TYPE OF SURFACE SEAL: _____
I.D. OF SURFACE CASING: _____
TYPE OF SURFACE CASING: _____
RISER PIPE I.D. _____
TYPE OF RISER PIPE: _____
BOREHOLE DIAMETER: _____
PERM. CASING I.D. _____
TYPE OF CASING & BACKFILL: _____
ELEVATION / DEPTH TOP CONFINING LAYER: _____
ELEVATION / DEPTH BOTTOM OF CASING: _____
ELEVATION / DEPTH BOT. CONFINING LAYER: _____
BOREHOLE DIA. BELOW CASING: _____
TYPE OF BACKFILL: _____
ELEVATION/ DEPTH TOP OF SEAL: _____
TYPE OF SEAL: _____
DEPTH TOP OF SAND PACK: _____
ELEVATION/DEPTH TOP OF SCREEN: _____
TYPE OF SCREEN: _____
TYPE OF SAND PACK: _____
ELEVATION / DEPTH BOTTOM OF SCREEN: _____
ELEVATION / DEPTH BOTTOM OF SAND PACK: _____
TYPE OF BACKFILL BELOW OBSERVATION WELL: _____
ELEVATION / DEPTH OF HOLE: _____

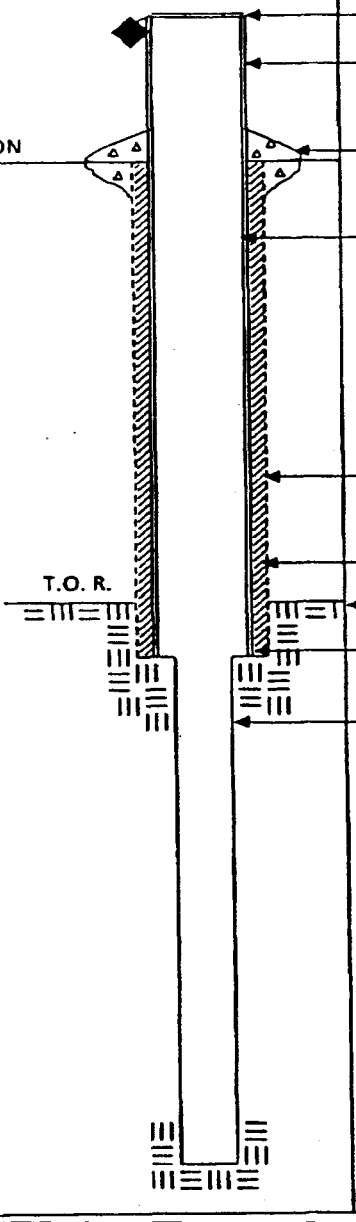
ATTACHMENT C-7
EXAMPLE BEDROCK MONITORING WELL SHEET - OPEN HOLE WELL

BORING NO.: _____

BEDROCK
MONITORING WELL SHEET
OPEN HOLE WELL

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF CASING: _____

STICK UP OF CASING ABOVE GROUND SURFACE: _____

N P E OF SURFACE SEAL: _____

I.D. OF CASING: _____

TYPE OF CASING: _____

TEMP. / PERM.: _____

DIAMETER OF HOLE: _____

TYPE OF CASING SEAL: _____

DEPTH TO TOP OF ROCK: _____

DEPTH TO BOTTOM CASING: _____

DIAMETER OF HOLE IN BEDROCK: _____

DESCRIBE IF CORE / REAMED WITH BIT:

_____

DESCRIBE JOINTS IN BEDROCK AND DEPTH:

_____

ELEVATION / DEPTH OF HOLE: _____ / _____

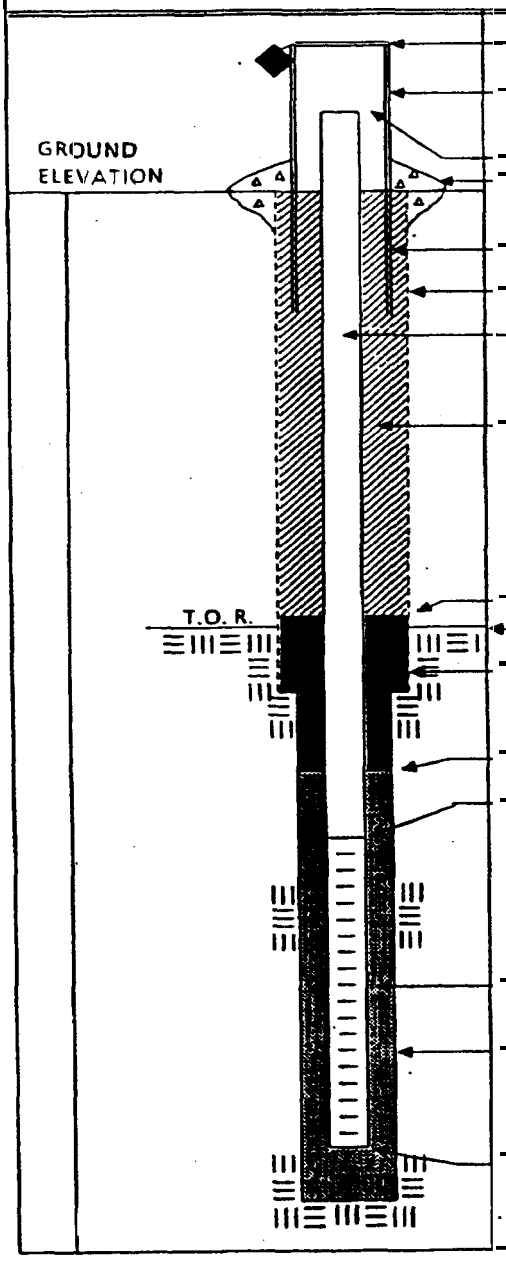
ATTACHMENT C-8
EXAMPLE BEDROCK MONITORING WELL SHEET - WELL INSTALLED IN BEDROCK

BORING NO.: _____

BEDROCK
MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF SURFACE CASING: _____

STICK UP OF CASING ABOVE GROUND SURFACE: _____

ELEVATION TOP OF RISER: _____

TYPE OF SURFACE SEAL: _____

I.D. OF SURFACE CASING: _____

DIAMETER OF HOLE: _____

RISER PIPE I.D.: _____

TYPE OF RISER PIPE: _____

TYPE OF BACKFILL: _____

ELEVATION/ DEPTH TOP OF SEAL: _____ / _____

ELEVATION / DEPTH TOP OF BEDROCK: _____ / _____

TYPE OF SEAL: _____

ELEVATION/ DEPTH TOP OF SAND: _____ / _____

ELEVATION/ DEPTH TOP OF SCREEN: _____ / _____

TYPE OF SCREEN: _____

SLOT SIZE x LENGTH: _____

I.D. SCREEN: _____

TYPE OF SAND PACK: _____

DIAMETER OF HOLE IN BEDROCK:

CORE / REAM: _____

ELEVATION/ OEPTH BOTTOM SCREEN: _____ / _____

ELEVATION / DEPTH BOTTOM OF HOLE: _____ / _____

ATTACHMENT C-8A
EXAMPLE BEDROCK MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK (FLUSHMOUNT)

BORING NO.: _____

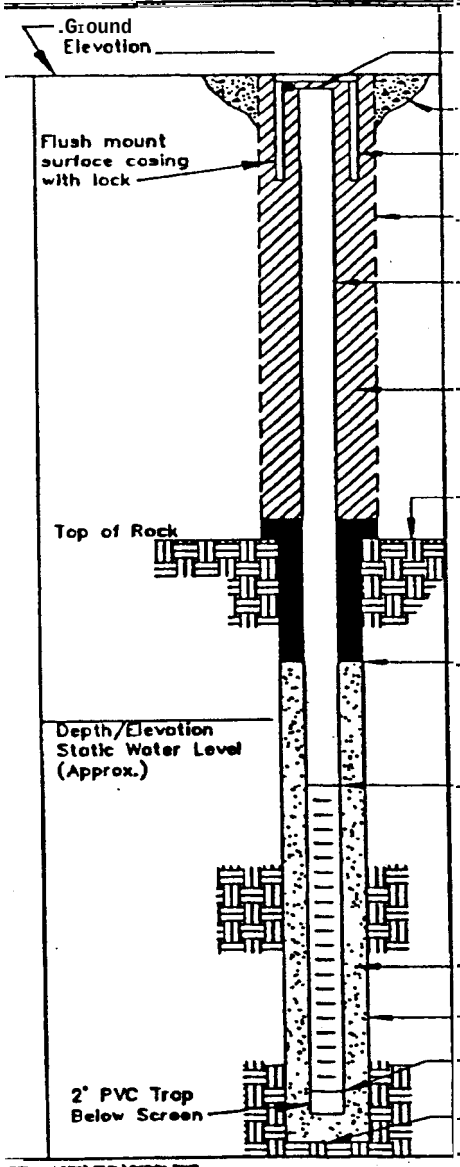
BEDROCK
MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK

'ROJECT _____ LOCATION: _____ DRILLER: _____

'ROJECT NO.: _____ BORING _____ DRILLING METHOD: _____

:LEVATION: _____ DATE: _____ DEVELOPMENT METHOD: _____

'IELD GEOLOGIST: _____



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: _____

_____

DEPTH/ELEVATION TOP OF BEDROCK: _____

DEPTH/ELEVATION TOP OF SAND: _____ / _____

DEPTH/ELEVATION TOP OF SCREEN: _____ / _____

TYPE OF SCREEN: _____

SLOT SIZE a LENGTH: _____

TYPE OF SAND PACK: _____

DIAMETER OF HOLE IN BEDROCK _____

DEPTH/ELEVATION BOTTOM OF SCREW- _____ / _____

DEPTH/ELEVATION BOTTOM Of SAND _____ / _____

DEPTH/ELEVATION BOTTOM OF HOLE: _____ / _____

BACKFILL MATERIAL BELOW SAND: _____

ACFI 1070\GEOL\BEDRI.DWG

ATTACHMENT C-9
EXAMPLE TEST PIT LOG

Root Environmental

DEPTH (FT.)	LITHOLOGY CHANGE (DOWN/FT.)	MATERIAL DESCRIPTION (Soil Density / Consistency, Color)	USCS	REMARKS

Test Pit Cross Section and / or Plan View

REMARKS

PHOTO LOG

TEST PIT

PAGE ___ Of ___

ATTACHMENT D
EXAMPLE EQUIPMENT CALIBRATION LOG

Brown & Root Environmental

EQUIPMENT CALIBRATION LOG

INSTRUMENT NAME / MODEL : _____

JOB NAME : _____

MANUFACTURER : _____

JOB NUMBER : _____

CALIBRATION DATE	INITIAL SETTINGS	STANDARDS USED	PROCEDURE	ADJUSTMENTS MADE	FINAL SETTINGS	SIGNATURE	COMMENTS

ATTACHMENT E
EXAMPLE DAILY ACTIVITIES RECORD

Brown & Root Environmental

DAILY ACTIVITIES RECORD

PROJECT _____ LOCATION _____
CLIENT _____ ARRIVAL TIME _____ JOB NO. _____
DATE _____ DEPARTURE TIME _____
CONTRACTOR _____ DRILLER _____
BORING NO. _____ HNUS REPRESENTATIVE _____

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

COMMENTS: _____

APPROVED BY:

_____ _____
HNUS FIELD REPRESENTATIVE DRILLER OR REPRESENTATIVE

3

ATTACHMENT F
FIELD TRIP SUMMARY REPORT
PAGE 1 OF 2

SUNDAY

Date: _____ Personnel: _____

Weather: _____ Onsite: _____

Site Activities: _____

_____

_____

_____

MONDAY

Date: _____ Personnel: _____

Weather: _____ Onsite: _____

Site Activities: _____

_____

_____

_____

TUESDAY

Date: _____ Personnel: _____

Weather: _____ Onsite: _____

Site Activities: _____

_____

_____

_____

WEDNESDAY

Date: _____ Personnel: _____

Weather: _____ Onsite: _____

Site Activiies: _____

_____

_____

_____

ATTACHMENT F
PAGE 2 OF 2
FIELD TRIP SUMMARY REPORT

THURSDAY

Date: _____ **Personnel:** _____

Weather: _____ **Onsite:** _____

Site Activities: _____

_____

_____

_____

FRIDAY

Date: _____ **Personnel:** _____

Weather: _____ **Onsite:** _____

Site Activities: _____

_____

_____

_____

SATURDAY

Date: _____ **Personnel:** _____

Weather: _____ **Onsite:** _____

Site Activities: _____

_____

_____

_____

APPENDIX C

Health and Safety Plan
Site 43
NAS Pensacola
Pensacola, Florida

Health and Safety Plan
for
Preliminary Site Characterization of Site 43 (Buried Drum Site)

Naval Air Station
Pensacola, Florida

Southern Division
Naval Facilities Engineering Command
Contract No. N62467-94-D-0888
Contract Task Order 0096

August 1999

HEALTH AND SAFETY PLAN
FOR
PRELIMINARY SITE CHARACTERIZATION
OF SITE 43 (BURIED DRUM SITE)

NAVAL AIR STATION
PENSACOLA, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION-NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:
Tetra Tech NUS, Inc.
661 Andersen Drive
Pittsburgh, Pennsylvania 15222

CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0096

AUGUST 1999

PREPAREDUNDERTHE
SUPERVISION OF:

TERRY HANSEN, P.G.
TASK ORDER MANAGER
TETRA TECH NUS, INC.
TALLAHASSEE, FLORIDA

APPROVED FOR SUBMISSION BY:

MATTHEW M. SOLTIS, CIH, CSP
CLEAN HEALTH & SAFETY MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

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1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been written to encompass site characterization activities that are to be conducted at Site 43 (Buried Drum Area) at Naval Air Station Pensacola (NAS Pensacola), Pensacola, Florida as part of Contract Task Order (CTO) 0096. Specifically, this HASP addresses the Preliminary Site Characterization (PSC) activities to investigate geophysical anomolies and determine if an initial remedial action (IRA) is necessary. This HASP is being prepared for NAS Pensacola as part of an overall effort conducted under Comprehensive Long-Term Environmental Action Navy (CLEAN III) administered through the U.S. Navy Southern Division Naval Facilities Engineering Command (NAVFAC), as defined under Contract Number N62467-94-D-0888. In addition to the HASP, a copy of the Tetra Tech NUS, Inc. (TtNUS) Environmental Health and Safety Guidance Manual must be present at the site during the performance of site activities. The Guidance Manual provides detailed information pertaining to the HASP, as well as TtNUS Standard Operating Procedures (SOP's). Both documents must be present at the site to comply with the requirements stipulated in the Occupational Safety and Health Administration (OSHA) standard 29 CFR 1910.120.

This HASP has been developed using the latest available information regarding known or suspected chemical contaminants and potential physical hazards associated with the proposed work and site. The HASP will be modified, if new information becomes available. All changes to the HASP will be made by the Project Health & Safety Officer (PHSO) and approved by the TtNUS Health and Safety Manager (HSM) and the Task Order Manager (TOM). The TOM will notify affected personnel of all changes.

1.1 KEY PROJECT PERSONNEL AND ORGANIZATION

This section defines responsibility for site safety and health for TtNUS and subcontractor employees engaged in onsite activities. Personnel assigned to these positions will exercise the primary responsibility for all onsite health and safety. These persons will be the primary points of contact for any questions regarding the safety and health procedures and the selected control measures that are to be implemented for onsite activities.

- The TtNUS TOM is responsible for the overall direction of health and safety for this project.

- The PHSO is responsible for developing this HASP in accordance with applicable OSHA regulations. Specific responsibilities include:

i. Providing information regarding site contaminants and physical hazards associated with the site.
ii. Establishing air monitoring and decontamination procedures.
iii. Assigning personal protective equipment based on task and potential hazards.
iv. Determining emergency response procedures and emergency contacts.
v. Stipulating training requirements and reviewing appropriate training and medical surveillance certificates.
vi. Providing standard work practices to minimize potential injuries and exposures associated with hazardous waste work.
vii. Modify this HASP, as it becomes necessary.

- The TtNUS Field Operations Leader (FOL) is responsible for implementation of the HASP with the assistance of an appointed ***SSO.*** The FOL manages field activities, executes the work plan, and enforces safety procedures as applicable to the work plan.

- The ***SSO*** supports site activities by advising the FOL on all aspects of health and safety on site. These duties may include:

i. Coordinates all health and safety activities with the FOL.
ii. Selects, applies, inspects, and maintains personal protective equipment.
iii. Establishes work zones and control points in areas of operation.
iv. Implements air monitoring program for onsite activities.
v. Verifies training and medical clearance of onsite personnel status in relation to site activities.
vi. Implements Hazard Communication, Respiratory Protection Programs, and other associated health and safety programs as they may apply to site activities..
vii. Coordinates emergency services.
viii. Provides site-specific training for all onsite personnel.
ix. Investigates all accidents and injuries (see Attachment I - Illness/Injury Procedure and Report Form)
x. Provides input to the PHSO regarding the need to modify, this HASP, or applicable health and safety associated documents as per site-specific requirements.

- Compliance with the requirements stipulated in this HASP is monitored by the SSO and coordinated through the TtNUS CLEAN HSM.

Note: In some cases one person may be designated responsibilities for more than one position. For NAS Pensacola, however, there will be a separate FOL and SSO given the nature of activities to be performed.

1.2 SITE INFORMATION AND PERSONNEL ASSIGNMENTS

Site Name: Naval Air Station Pensacola Address: Pensacola. Florida

Remedial Project Manager: Mark Davidson Phone Number: (803) 820-5526
(US Navy)
Navy On-Site Representative: Dave Kruzicki Phone Number: (904) 778-5620

Purpose of Site Visit: This activity is divided into a multi-task operation (see Section 4.0), including test pit excavation, soil boring (drilling), rnulti-media sampling, and other related activities.

Proposed Dates of Work: August - September 1999

Proiect Team:

TtNUS Personnel:	**Discipline/Tasks Assigned:**
Terry Hansen. P.G.	Task Order Manager (TOM)
TBD	Field Operations Leader (FOL)
Matthew M. Soltis, CIH, CSP	CLEAN Health and Safetv Manaqer (HSM)
Delwyn E. Kubeldis. CIH. CSP	Proiect Health and Safetv Officer (PHSO)
TBD	Site Safety Officer (SSO)

Non-TtNUS Personnel	**Affiliation/Discipline/Tasks Assigned**
TBD	Drilling Subcontractor(s)
TBD	Excavation Subcontractor(s)

Prepared By: Delwyn E. Kubeldis. CIH. CSP

TBD - To be determined

2.0 EMERGENCY ACTION PLAN

2.1 INTRODUCTION

This section has been developed as part of a preplanning effort to direct and guide field personnel in the event of an emergency. In the event of onsite emergencies that cannot be handled by onsite personnel, they will be evacuated to a safe place of refuge, and the appropriate emergency response agencies will be notified. Because a majority of potential emergency situations will require assistance from outside emergency responders, TtNUS and subcontractor personnel will not provide emergency response support for significant emergency events beyond our capabilities. The emergency response agencies listed in this plan are capable of providing the most effective response and are designated as the primary responders. These agencies are located within a reasonable distance from the area of operations, a factor which ensures adequate emergency response time. This emergency action plan conforms to the requirements of OSHA Standard 29 CFR 1910.38(a), as allowed in OSHA 29 CFR 1910.120(l)(1)(ii).

TtNUS will, through necessary services, include initial response measures for incidents such as:

- Incipient fire-fighting support and prevention
- Incipient spill control and containment measures and prevention
- Removal of personnel from emergency situations
- Provision of initial medical support for injury/illness requiring only first-aid level support
- Provision of site control and security measures as necessary

2.2 PRE-EMERGENCY PLANNING

Through the initial hazard/risk assessment effort, injury or illness resulting from exposure to chemical or physical hazards or fire are the most probable emergencies that can be encountered during site activities. To minimize and eliminate these potential emergency situations, pre-emergency planning activities associated with this project include the following. The SSO and/or the FOL are responsible for:

- Coordinating response actions with NAS Pensacola Emergency Services personnel to ensure that TtNUS emergency action activities are compatible with existing facility emergency response procedures.

- Establishing and maintaining information at the project staging area (support zone) for easy access in the event of an emergency. This information includes the following:

  - Chemical Inventory (for substances used onsite), with Material Safety Data Sheets.
  - Onsite personnel medical records (medical data sheets).
  - A logbook identifying personnel onsite each day.
  - Emergency notification phone numbers in all site vehicles

- Identifying a chain or command for emergency action.
- Educating site workers to the hazards and control measures associated with planned activities at the site, and providing early recognition and prevention, where possible.

It is the responsibility of the TtNUS FOL to ensure that this information is available and present at the site.

2.3 EMERGENCY RECOGNITION AND PREVENTION

2.3.1 Reconnition

Foreseeable emergency situations that may be encountered during site activities will generally be recognizable by visual observation. A clear knowledge of the signs and symptoms of overexposure to contaminates of concern may alert personnel of the potential hazards concerning themselves or their fellow workers. These potential hazards, the activities with which they have been associated, and the recommended control methods are discussed in detail in sections 5.0 and 6.0 of this document. Additionally, early recognition will be supported by periodic site surveys to eliminate any conditions that may predispose site personnel or properties to an emergency. The FOL and the SSO will constitute the site evaluation committee responsible for these periodic surveys. Site surveys will be conducted at least once a week during the initiation of this effort.

The above actions will provide early recognition for potential emergency situations. Should an incident take place, TtNUS will take defensive and offensive measures to control these situations. However, if the FOL and/or the SSO determine that an incident has progressed to a serious emergency situation, TtNUS will withdraw, and notify the appropriate response agencies.

2.3.2 Prevention

TtNUS and subcontractor personnel will minimize the potential for emergencies by ensuring compliance with the HASP, the Health and Safety Guidance Manual, applicable OSHA regulations, and through periodic site surveys of work areas.

2.4 SAFE DISTANCES AND PLACES OF REFUGE

In the event that the site must be evacuated, all personnel will immediately stop activities and report to the FOL at the place of safe refuge. Safe places of refuge will be determined prior to commencement of site activities and will be conveyed to personnel as part of the daily safety meeting conducted each morning. Upon reporting to the refuge location, personnel will remain there until directed otherwise by the TtNUS FOL. The FOL or the SSO will take a head count at this location to confirm the location of all site personnel. The site logbook will be used to take the head count. Places of refuge will ideally be selected which offer a point for communication purposes should this be required.

2.5 EVACUATION ROUTES AND PROCEDURES

Once an evacuation is initiated, personnel will proceed immediately to the designated place of refuge, unless doing so would further jeopardize the welfare of workers. In such event, personnel will proceed to a designated alternate location (to be identified) and remain there until further notification from the FOL. The use of these locations as assembly points provides communication and a direction point for emergency services, should they be needed.

Evacuation procedures will be discussed prior to the initiation of any work at the site. This shall include identifying primary and secondary evacuation routes and assembly points. Evacuation routes from the site are dependent upon the location at which work is being performed and the circumstances under which an evacuation is required. Additionally, site location and meteorological conditions (i.e., wind speed and direction) will influence the designation of evacuation routes. As a result, assembly points at NAS will be selected, and in the event of an emergency, field personnel will proceed to these points by the most direct route possible without further endangering themselves.

2.6 EMERGENCY ALERTING AND ACTION/RESPONSE PROCEDURES

Since TtNUS personnel will not always be working in the proximity of each other, hand signals, voice commands, air horns, and two-way radios (approved by NAS personnel) will comprise the mechanisms to alert site personnel of an emergency.

If an incident occurs, site personnel will initiate the following procedures:

- Initiate incident alerting procedures (if needed) verbally, by air horn, or using two-way radios.
- Evacuate nonessential personnel.
- Initiate incipient response procedures.
- Describe to the FOL (who will serve as the Incident Commander) what has occurred in as much detail as possible.

In the event that site personnel cannot control the incident through offensive and/or defensive measures, the FOL and/or the SSO will enact emergency notification procedure to secure additional outside assistance in the following manner:

- Call 911 for outside emergency service and report the emergency to the NAS Pensacola Emergency Dispatch - (850) 452-3333 (See Table 2-1)
- Give the emergency operator the location of the emergency and a brief description of what has occurred.
- Stay on the phone follow the instructions given by the operator
- The appropriate agency will be notified and dispatched

If an incident occurs at NAS Pensacola outside of designated operating areas impacting field personnel, the following procedures are to be initiated:

- Initiate an evacuation (if needed) by voice commands, hand signals, air horns, or two-way radio.
- Call Navy On-Site Representative
- Proceed to the assembly points as directed by NAS Pensacola personnel.

2.7 EMERGENCY CONTACTS

Prior to initiating field activities, all personnel will be thoroughly briefed on the emergency procedures to be followed in the event of an accident. Table 2-1 provides a list of emergency contacts and their associated telephone numbers. This table must be posted where it is readily available to all site personnel. Facility maps should also be posted showing potential evacuation routes and designated meeting areas.

TABLE 2-1

EMERGENCY CONTACTS
NAS PENSACOLA

AGENCY	TELEPHONE
EMERGENCY (outside services) (Police, Fire, and Ambulance Services)	911
NAS Pensacola - Emergency Dispatch	(850)452-3333
Navy Engineer-in-Charge B. K. Moring	(843)820-5514
Navy Environmental Coordinator Ron Joyner	(850)452-4611
Navy Hospital (Emergency Care only)	(850)505-6600
Baptist Hospital (Non-emergency Care)	(850)469-2313
TtNUS Tallahassee Office and Task Order Manager (Terry Hansen)	(850)656-5458
CLEAN Health and Safety Manager Matthew M. Soltis, CIH, CSP	(412)921-8912
Project Health and Safety Officer Delwyn E. Kubeldis, CIH, CSP	(412)921-8529
Continuum Healthcare	(800)229-3674

2.8 EMERGENCY ROUTE TO HOSPITAL

For emergency care only, non-Navy personnel are permitted to go to the Navy Hospital.

Navy Hospital
Highway 98
Pensacola, Florida
(850)505-6600

Directions to the Navy Hospital from the site are as follows:

Proceed out of NAS Main Gate (Navy Blvd) heading north to US Highway 98. Turn left (heading west) on US 98 and proceed approximately 1 mile. Hospital will be on the right (Building 2268).

A map indicating the travel route from the site to the Navy Hospital will be inserted as Figure 2-1.

Baptist Hospital (850-469-2313) will be used for all non-emergency care services. Directions to this Hospital are:

Proceed out of NAS Main Gate (Navy Blvd) heading north to Hwy 292. Turn right (heading east) on Hwy 292 until it turns into Garden Street (approx. 3 miles). Take Garden Street to intersection with "E" Street. Turn left onto "E" Street and proceed approximately 1 mile to Hospital on left.

Hospital Route Map

for NAS Pensacola and Outlying Landing Fields

Microsoft Expedia

Streets98

Copyright © 1988-1997, Microsoft Corporation and/or its suppliers. All rights resewed. Please visit our web site at http://maps.expedia.com.

2.9 DECONTAMINATION PROCEDURES/EMERGENCY MEDICAL TREATMENT

During any site evacuation, decontamination procedures will be performed only if doing so does not further jeopardize the welfare of site workers. Decontamination will not be performed if the incident warrants immediate evacuation. However, it is unlikely that an evacuation would occur which would require workers to evacuate the site without first performing the necessary decontamination procedures.

TtNUS personnel will perform removal of personnel from emergency situations and may provide initial medical support for injury/illnesses requiring only first-aid level support. Medical attention above that level will require assistance and support from the designated emergency response agencies. **If** the **emergency involves personnel exposures to chemicals, follow the steps provided in Figure 2-2.**

2.10 INJURY/ILLNESS REPORTING

If any TtNUS personnel are injured or develop an illness as a result of working on site, the TtNUS "Injury/Illness Procedure" (Attachment I) must be followed. Following this procedure is necessary for documenting all of the information obtained at the time of the incident. Also, as soon as possible Navy contact Dave Kruzicki must be informed of any incident or accident that requires medical attention.

Any pertinent information regarding allergies to medications or other special conditions will be provided to medical services personnel. This information is listed on Medical Data Sheets filed onsite. If an exposure to hazardous materials has occurred, provide information on the chemical, physical, and toxocological properties of the subject chemical(s) to medical service personnel.

FIGURE 2-2
EMERGENCY RESPONSE PROTOCOL

The purpose of this protocol is to provide guidance for the medical management of exposure situations. In the event of a personnel exposure to a hazardous substance or agent:

- Rescue, when necessary, employing proper equipment and methods.
- Give attention to emergency health problems -- breathing, cardiac function, bleeding, shock.
- Transfer the victim to the medical facility designated in this HASP by suitable and appropriate conveyance (i.e. ambulance for serious events)
- Obtain as much exposure history as possible (a Potential Exposure report is attached).
- If the exposed person is a Tetra Tech NUS employee, call the medical facility and advise them that the patient(s) is/are being sent and that they can anticipate a call from the Continuum Healthcare physician. Continuum Healthcare will contact the medical facility and request specific testing which may be appropriate. The care of the involved worker will be monitored by Continuum Healthcare physicians. Site officers and personnel should not attempt to get this information, as this activity leads to confusion and misunderstanding.
- Call Continuum Healthcare at 1-800-229-3674, being prepared to provide:
  - Any known information about the nature of the exposure.
  - As much of the exposure history as was feasible to determine in the time allowed.
  - Name and phone number of the medical facility to which the victim(s) has/have been taken.
  - Name(s) of the exposed Tetra Tech NUS, Inc. employee(s).
  - Name and phone number of an informed site officer who will be responsible for further investigations.
  - Fax appropriate MSDS to Continuum Healthcare at (770) 457-1429.
- Contact Corporate Health and Safety Department (Matt Soltis) at 1-800-245-2730.

As environmental data is gathered and the exposure scenario becomes more clearly defined, this information should be forwarded to the Continuum Healthcare Medical Director or Assistant Medical Director.

Continuum Healthcare will compile the results of all data and provide a summary report of the incident. A copy of this report will be placed in each involved worker's medical file in addition to being distributed to appropriately designated company officials. Each involved worker will receive a letter describing the incident but deleting any personal or individual comments. This generalized summary will be accompanied by a personalized letter describing the findings/results. A copy of the personal letter will be filed in the continuing medical file maintained by Continuum Healthcare.

FIGURE 2-2 (continued)
POTENTIAL EXPOSURE REPORT

Name: _____ Date of Exposure: _____

Social Security No.: _____ Age: _____ Sex: _____

Client Contact: _____ Phone No.: _____

Company Name: _____

I. Exposing Agent

Name of Product or Chemicals (if known): _____

_____

Characteristics (if the name is not known)
Solid Liquid Gas Fume Mist Vapor

II. Dose Determinants

What was individual doing? _____
How long did individual work in area before signs/symptoms developed? _____
Was protective gear being used? If yes, what was the PPE? _____
Was there skin contact? _____
Was the exposing agent inhaled? _____
Were other persons exposed? If yes, did they experience symptoms? _____

III. Signs and Symptoms (check off appropriate symptoms)

Immediately With **Exposure:**

Burning of eyes, nose, or throat
Tearing
Headache
Cough
Shortness of Breath
Chest Tightness / Pressure
Nausea / Vomiting
Dizziness
Weakness

Delayed Symptoms:

Weakness
Nausea / Vomiting
Shortness of Breath
Cough
Loss of Appetite
Abdominal Pain
Headache
Numbness / Tingling

IV. Present Status of Symptoms (check off appropriate symptoms)

Burning of eyes, nose, or throat
Tearing
Headache
Cough
Shortness of Breath
Chest Tightness / Pressure
Cyanosis
Nausea / Vomiting
Dizziness
Weakness
Loss of Appetite
Abdominal Pain
Numbness / Tingling

Have symptoms: (please check off appropriate response and give duration of symptoms)
Improved: _____ Worsened: _____ Remained Unchanged: _____

V. Treatment of Symptoms (check off appropriate response)

None: _ Self-Medicated: _____ Physician Treated: _____

3.0 SITE BACKGROUND

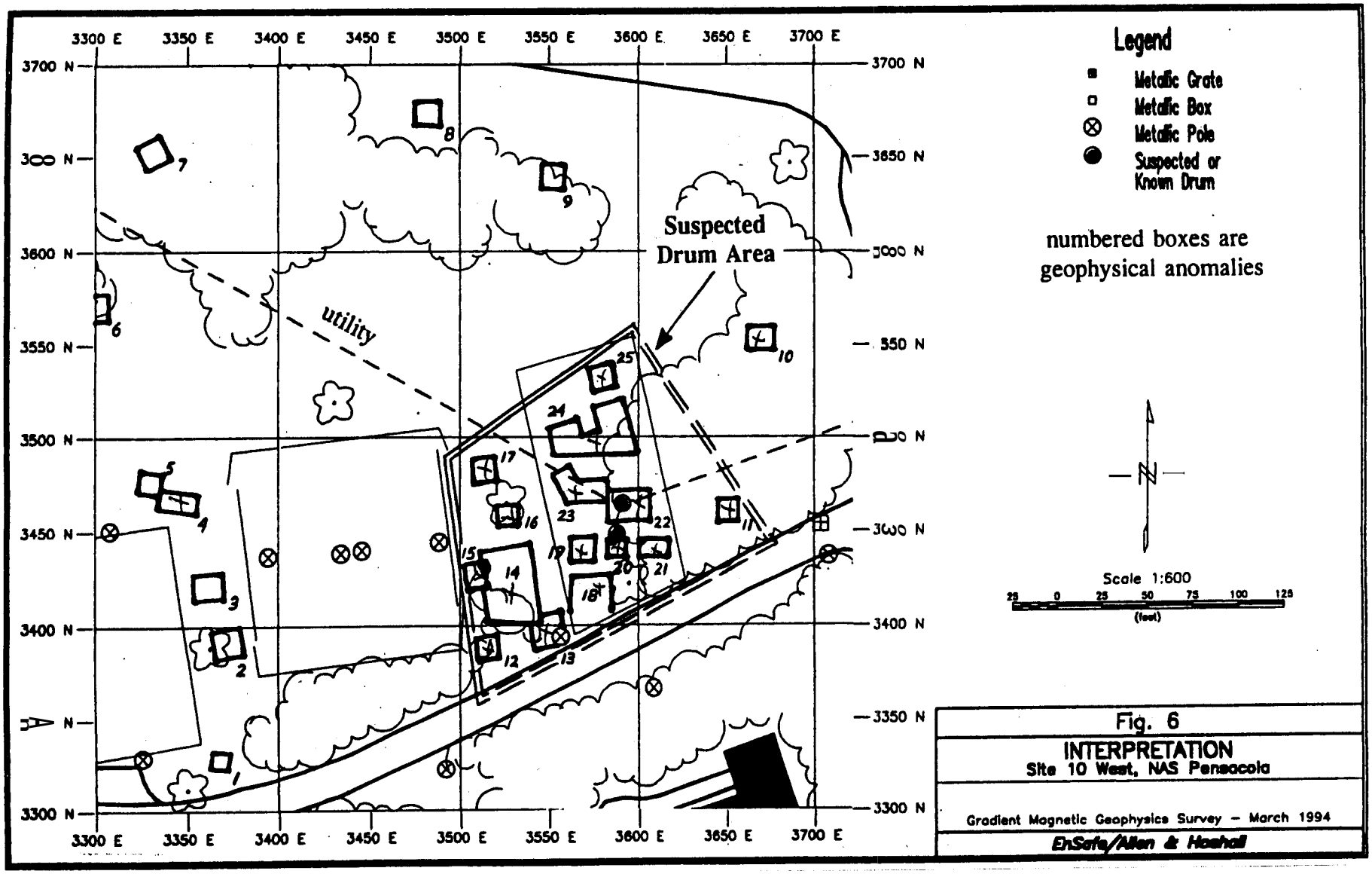
NAS Pensacola is located in Escambia County, in Florida's northwest coastal area, approximately 5 miles west of the Pensacola City limits. The approximately 5,800-acre installation was constructed in the early 1940s. Prior to construction, the facility was undeveloped and sparsely vegetated. Land use at NAS Pensacola consists of various military housing, training, and support facilities as well as large industrial complexes for major repairs and refurbishment of aircraft engines and frames. Additional details on the NAS Pensacola facility may be found in the facility administrative record.

3.1 SITE DESCRIPTION

Site 43 (see Figure 3-1) is located at the southwest comer of Murray and Taylor Roads, west of Site 10. The area is planted with grass and contains a tennis court, an unfenced basketball court, and access roads to the officers' quarters. The historical usage of the area is unknown. In December 1992, a child playing with a metal detector discovered a partially buried drum exposed at the surface just east of the tennis court. The area was fenced to prevent general access until further investigations could be conducted.

Two partially buried drums were eventually identified inside of the fenced area. One drum was in a vertical position; its end punctured revealing what appeared to be standing water in the interior. The second drum also appeared to be in a vertical position, but was not obviously punctured. A third iron object resembling a drum rim was observed between the fenced area and the tennis court. Smaller, rusted metal debris was observed at the surface, suggesting a minor disposal area. No odors, visible soil stains, or other indications of contaminant release were observed.

A geophysical investigation was conducted in March 1994 using gradient and total magnetic surveys. As a result of the investigation, an area approximately 100-foot by 120-foot was identified as a possible disposal area. The suspected size of the disposal area was larger than the original fenced area. A large section of land on the north half of the surveyed area was interpreted as free of drums. Although cultural clutter (buried utilities, metal fences, poles, buildings, etc.) precluded a definitive interpretation, magnetic anomalies typical of drums were limited to an area approximately 100 feet by 120 feet in size. The geophysical survey suggested that the disposal area was not systematic and widespread, but limited in areal dimension and the number of disposed drums. The actual number of drums disposed in the area was not determined. The report concluded that the drum disposal area, as well as several anomalies discovered outside the disposal area, should be further explored by trenching to a depth of 5 feet. Other anomalies less likely to be drums should be investigated with hand-tools. To date, no soil or groundwater investigations have been conducted in the study area.



SUSPECTED DRUM LOCATIONS

SAMPLING AND ANALYSIS PLAN FOR
PRELIMINARY SITE CHARACTERIZATION
SITE 43
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

4.0 SCOPE OF WORK

The following is a list of activities that are covered in this HASP for the CTO 0096 assessment:

- Mobilization/demobilization
- Initial On-Site Survey (i.e., Site Characterization)
- Test pit excavations
- Soil boring activities (Direct Push Technology [DPT] and hand-auger drilling)
- Excavated drum handling and sampling
- Monitoring well installation, purging, and development
- Multi-media sampling, including:
  - Soils (surface and subsurface)
  - Groundwater
  - Investigative-Derived Waste (IDW)
- Decontamination of sampling and heavy equipment
- IDW management

The above listing represents a summarization of the tasks as they may apply to the scope and application of this HASP. For more detailed description of the associated tasks, refer to the Work Plan (WP) and/or Sampling and Analysis Plan (SAP). Any tasks to be conducted outside of the elements listed here will be considered a change in scope requiring modification of this document. The TOM or a designated representative will submit all requested modifications to this document to the HSM.

5.0 TASKS/HAZARDS/ASSOCIATED CONTROL MEASURES SUMMARIZATION

Table 5-1 of this section serves as the primary portion of the site-specific HASP which identifies the tasks that are to be performed as part of the scope of work. This table will be modified and incorporated into this document as new or additional tasks are performed at the site. The anticipated hazards, recommended control measures, air monitoring recommendations, required Personal Protective Equipment (PPE), and decontamination measures for each site task are discussed in detail. This table and the associated control measures shall be changed, if the scope of work, contaminants of concern, or other conditions change.

Through using the table, site personnel can determine which hazards are associated with each task and at each site, and what associated control measures are necessary to minimize potential exposure or injuries related to those hazards. The table also assists field team members in determining which PPE and decontamination procedures to use based on proper air monitoring techniques and site-specific conditions.

A Health and Safety Guidance Manual accompanies this table and HASP. The manual is designed to further explain supporting programs and elements for other site-specific aspects as required by 29 CFR 1910.120. The Guidance Manual should be referenced for additional information regarding air monitoring instrumentation, decontamination activities, emergency response, hazard assessments, hazard communication and hearing conservation programs, medical surveillance, PPE, respiratory protection, site control measures, standard work practices, and training requirements. Many of Tetra Tech NUS SOPs are also provided in this Guidance Manual.

Safe Work Permits issued for all exclusion zone activities (See Section 9.4 and Attachment IV) will use elements defined in Table 5-1 as the primary reference. The FOL and/or the SSO completing the Safe Work Permit will add additional site-specific information. In situations where the Safe Work Permit is more conservative than the direction provided in Table 5-1 due to the incorporation of site-specific elements, the Safe Work Permit will be followed. As the project develops and more information is gained regarding the contents of buried drums, the SSO will modify the Safe Work Permits to reflect this information.

TABLE 5-1

TASKSIHAZARDSICONTROL MEASURES COMPENDIUM FOR NAVAL AIR STATION - PENSACOLA. PENSACOLA. FLORIDA

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
Excavation of test pits The purpose of this activity is to investigate the geophysical anomalies identified during a prior investigation.	Chemical hazards: The nature and extent of any site contaminants that may be present have not been determined. The historical usage of the area is also unknown. Site characterization with monitoring instruments will be conducted initially (i.e., prior to intrusive activities) and continuously during intrusive activities in an attempt Io identify contaminants. If specific site contaminants are identified they will be communicated to site personnel. A Table 6-1 will be prepared and inserted into this HASP which will include the toxicological, chemical, and physical properties of each Contaminant. 2) Transfer of Contamination into clean **areas** or onto persons. Physical *hazards:* **3)** Heavy equipment/machinery hazards (moving equipment. struck by hazards. etc.) **4)** Collapse of the excavation 5) Energized systems (contactmth underground or overhead utilities) 6) Noise in excess of 85 dBA 7) Vehicular and equipment traffic ***8)*** Strain from heavy lifting 9) Slips, trips. and fails 10) Ambient temperature extremes (heat stress) **11)** Fire/explosion **12)** Cut. abrasions, and lacerations Natural *Hazards:* **13)** Insect/animal bites and stings, poisonous plants. etc. **14)** Inclement weather	Chemical hazards: **1)** Once site Contaminants are accurately characterized, appropriate control methods will be identified and implemented. At a minimum, however, Level B PPE will be worn during all excavation activities. This level of PPE is necessary based on the unknown characteristics of intact containers. *As* a general rule. avoiding contact with contaminated media (air, water, soils, etc.) and free product will be a universal control measure. 2) Restrict the cross use of equipment and supplies between locations and activities without first going through a suitable decontamination. Physical hazards: **3)** All equipment to be employed will be: - Inspected in accordance with Federal safety and transportation guidelines, OSHA (1926.600,.601,.602), and manufacturer's design, and documented as such using Equipment Inspection Checklist provided as Anachment III. Complete the Equipment Inspection Checklist for each piece of equipment used at the site. Equipment operation will be: - Conducted by knowledgeable operators and **coordinated** by experienced ground crew, as applicable. - Coordinated by ground Crew who will verify safety of bucket position relative to ground conditions. personnel. and drums/objects. 4) Ail excavations shall be in Conformance with requirements established under **29** CFR 1926.650 - .652 concerning sloping, **shoring.** storage, and movement on and over and around trenches and excavations. - No personnel **associated** with this field **effort** will enter any excavations (including **test** pits). - All supplies, **clean** fill, vehicular traffic will be maintained at a minimum distance of **3** feet from the excavation, or 2 feet if a Sidewall restraining device is employed. - When drums or other containers are uncovered. the excavation activities shall be halted until the SSO characterizes any Site contaminants and evaluates the implications of excavating and removing the drum. - Excavations will **not** proceed any closer than 6 feet to any foundation, footer, and/or support base. - The teeth of the bucket will have a flat bar or cutting bar attached to the teeth to prevent the teeth of the backhoe from snagging an undetected utility. - No lest pit will be permitted to be left open, unanended. - Site control during excavation will be accomplished through the use of barricade tape and weighted poles and signs indicating excavation in progress **5)** All utility clearances shall be obtained prior to any excavation activities. Where the utili clearance cannot be obtained in a reasonable period. or not located, excavations shall proceed with extreme caution and proceed using cable and piping locators and other geophysical detection methods Io avoid utiiii damage and unintentional contact with buried drums or objects. 6) Hearing protection will be worn by all personnel in the immediate area of the excavator during lest pit operations. 7) Trafficand equipment considerations ate to include the following: - Establish safe zones of approach (i.e., Boom + 3 feet). - All equipment shall be equipped with movement warning systems. - Employ safety belts and follow the site traffic rules. 8) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. **9)** Preview work locations for unstable/uneven terrain. Avoid working/walking too close Io excavation and other areas of unsure footing. 10) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Addiiional information regarding heat stress concerns is provided in Anachment V of this HASP. **11)** Monitor work area with LEU02 meter. Stop work if level exceeds 10% of LEL Use spark-resistant tools and excavator bucket teeth when excavating identified flammable/combustible liquids. If any drum/container shows signs of swelling or bulging (positive pressure). it will be lel alone until the appropriate barriers and equipment can be mobilized to support relieving excess pressure. **12)** Avoid contacting sharp or jagged *edges* of containers or debris. Wear leather or cut-resistant gloves when handling excavated/sharp objects. **13)** Avoid potential nesting areas of biting/stinging insects and animals. Use commercially available insect repellents. Avoid contact with poisonous vegetation. Wear appropriate clothing. Tape ankle and mist areas Io prevent ticks, chiggers, etc.. from attaching themselves to your skin. Follow directions as specified in Section **6.3** and Anachment II of this HASP. 14) Suspend or terminate operations until directed otherwise by SSO	ontinuous moniloring will be performed during perations to ensure safe work conditions do not hange as a result of work being performed or other xternal factors. Monitoring of each excavation ctivity, in particular, will be performed in an attempt) anticipate and characterize site Contaminants. PhD Ultra or other appropriate LEU02 instrument will e used Io monitor atmospheres within the work area prior) entry and during excavation activities. When ionitoring, monitor for oxygen first, then combustible ases, then toxic atmospheres. The following action evels will be used: Oxygen readings ranging between **19.5%** Io 23.5% - continue working and monitoring. Observe workers Ior signs of oxygen deficiency. Oxygen readings < 19.5% - discontinue Site activities until levels return to background (an oxygen deficient atmosphere exists and Combustible gas readings cannot be accurately determined) **Oxygen** reading > 23.5% - discontinue work until levels return to background (an oxygen enriched atmosphere exists). LEL readings < 10% - work may continue, however elevated LEL readings indicate the presence of airborne gases or vapors that may exceed established exposure limits. Perform toxic gas monitoring using a photoionization detector (PID) w/ a 10.6 eV or higher lamp source and flame ionization detector (FID). LEL readings > 10% -discontinue work (a potentially combustible atmosphere exists) and evacuate Io a safe area. Use a PID, FID, or other appropriate instrument to monitor for vdatile compounds. Positive sustained readings above background levels in worker breathing zones requires site activities to be suspended until readings return to background levels or the contaminant of concern is identified through additional air moniloring activities determined by the SSO. Colorimetric (Drager) tubes may also be used Io further define the nature and identity of site contaminants as suggested by PID ar dor FID readings. Unless further information is learned regarding the history of the site and the nature of specific drum contents, initial characterization with colorimetric tubes will first be on a class-wide basis (petroleum hydrocarbons, halogenated compounds, etc.), followed by attempts to identify specific compounds. IOTE: Radioactive contaminants are not anticipated, owever, during this task a general screening of the spoils emoved fmm the test pit and excavated drums will be erformed. Yhere the utility clearance cannot be determined, test it excavations Shall proceed with extreme caution usin magnetometer for periodic surveys every 2 feet to a iepth of at least 10 feet.	All test pit operations will be performed in Level B protection, including the following articles: - Standard field dress (long **pants.** Sleeved shirts) - Steel toe safety shoes or work boots - Hard hat - Chemical splash suit (coated PVC, Saranex. etc.) - Sen-Contained Breathing Apparatus (SCBA) or airline respirator with emergency SCBA. (Grade D breathing air will be used to support this operation. Certification from the vendor attesting to the quality will be obtained by the FOL or SSO upon delivery). -Nitrile outer gloves with surgical style inner gloves. - Impermeable boot covers Ail joints in the ensemble (wrists, ankles. etc.) must be securely taped. Personnel must closely inspect ail PPE prior to beginning any on-site activities. Given the uncertainty associated with the content and composition of the buried drums, any **modifications** to this PPE level must be approved by the **PHSO** or HSM. Note: The Safe Work Permit(s) for this task (*see* Attachment IV) will be issued at the beginning of each day to address the tasks planned **for** that day. As part of this task. additional PPE may be assigned to reflect Site specific conditions or special considerations or conditions associated with any identified task. As Site conditions may change, the following equipment will be maintained during all on-site activities - Fire Extinguishers	Personnel Decontamination– This decontamination procedure tor Level B protection will consist of -Equipment drop - Soap/water wash and rinse of outer gloves, boots. coveralls, and SCBA - Removal or PPE in the following order Outer gloves. SCBA backpack, chemical-resistant coverall, boot cover. - Inner glove wash and rinse - SCBA face piece removal - Inner glove removal - Wash hands and face, leave contamination reduction zone - Report for any heat stress surveillance. Note: As site Contaminants are identified, this decontamination procedure may be modified Io reflect chemical, physical, or other properties associated with

TABLE 5-1

TASKSIHAZARDSICONTROL MEASURES COMPENDIUM FOR NAVAL AIR STATION - PENSACOLA, PENSACOLA, FLORIDA

Tasks/Operation/ Locations	Anticipated Hazards	RecommendedControl Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
-handling, sampling, and staging of excavated drums	***Chemical Hazards*** 1) The nature and extent of any Site contaminants that may be present have not been determined. The historical usage of the area is also unknown. Site charactenration with monitoring instruments will be conducted initially (i.e., prior to intrusive activities) and continuously during intrusive activities in an anempt to identify contaminants. If specific site contaminants are identifiedthey will be communicated to site personnel. A Table 6-1 will be prepared and inserted into this HASP which will include the toxicological, chemical, and physicalproperties of each contaminant. 2) Transfer of contamination into clean areas or onto persons. Physical***hazards*** 3) Heavy equipment/machinery hazards (moving equipment, Struck by hazards, etc.) 4) Noise in excess of 85 dBA 5) Strain from heavy lifting 6) Cuts, abrasions, and lacerations 7) Slip, trips. and falls 8) Vehicular and equipment traffic 9) Ambient temperature extremes (heat stress) Natural***Hazards*** 10) Inclement weather 11) Insect/animal bites and stings. poisonous plants, etc.	1) Once Site contaminants are accurately characterized, appropriate Control nethods will be identifiedand implemented. At a minimum. however, Level 3 PPE will be worn during all drum handling, sampling, and staging activities. rhis level of PPE is necessary based on the unknown characteristics of ntact containers. As a general rule, avoiding contact with contaminated nedia (air, water. soils, etc.) and free product will be a universal control neasure. 2) Decontaminate all equipment and supplies between boreholes and rior to leaving the site. 3) All personnel not directly Supportingthe drum removal, handling. or sampling operation will remain at least 25 feet from the point of operation. Excavated drums will be placed in DOT-approvedoverpak containers and secured on-site until analytical results are received. If the integrity of an excavated drum is compromised (cracked, punctured, etc.), then a sample will be collected from any liquid contained inside the drum. If an excavated drum contains liquids, but the integrity has not been compromised, then the drum will be sampled at a later date. Whenever possible drum handling will be kept lo a minimum. Personnel will not use picks, chisels, or other potential sparking tool to open drums. All loose clothing/protective equipment will be secured to avoid possible entanglement with the excavator Hand signals will be established prior to the commencement of excavation activities so that personnel handling drums are not contacted by excavator. 4) Hearing protection will be used during all subsurface activities. 5) Use machinery or multiple personnel for heavy lifts. Use proper lifting echniques. 6) Avoid contacting sharp or jagged edges of containers or debris. Wear eather or cut-resistant gloves when handling excavated/sharp objects. 7) Preview work locations for unstable/uneven terrain. 8) Traffic and equipment considerations are to include the following: Establish safe zones of approach (i.e. Boom + 3 feet). Personnel must wear reflective vests in traffic areas. All equipment shall be equipped with movement warning systems. All activities are to be conducted consistent with the Base requirements. 9) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding heat stress concerns is provided in Attachment V of this HASP. 10) Suspend or terminate operations until directed otherwise by SSO 11) Wear appropriate clothing and PPE. Avoid potential nesting areas and suspicious vegetation (poison ivy, poison oak, etc.). Report potential hazards to the SSO. When feasible and necessary, use commercially available insect repellents. Refer to Section 6.3 and Attachment II of this HASP or the Health and Safety Guidance Manual for additional information.	Continuous monitoring will be performed during operations to ensure safe work conditions do not change as a result of work being performed or other external factors. Monitoring of each excavation activity, in particular, will be performed in an anempt o anticipate and characterize site contaminants. A PhD Ultra or other appropriate LEU02 instrument will be used to monitor atmospheres within the work area rior to entry and during excavation activities. When nonitoring, monitor for oxygen first, then Combustible lases. then toxic atmospheres. The following action evels will be used: Oxygen readings ranging between 19.5% to 23.5% - continue working and monitoring. Observe workers for signs of oxygen deficiency. Oxygen readings < 19.5% - discontinue site activities until levels return to background (an oxygen deficient atmosphere exists and combustible gas readings cannot be accurately determined) Oxygen readings > 23.5% - discontinue work until levels return to background (an oxygen enriched atmosphere exists). LEL readings < 10% - work may continue. however elevated LEL readings indicate the presence of airborne gases or vapors that may exceed established exposure limits. Perform toxic gas monitoring using a photoionization detector (PID) w/ a 10.6 eV or higher lamp source and flame ionization detector (FID). LEL readings > 10% -discontinue work (a potentially combustible atmosphere exists) and evacuate lo a safe area. Use a PID. FID, or other appropriate instrument lo monitor for volatile compounds. Positive sustained readings above background levels in worker breathing zones requires site activities to be suspended until readings return lo background levels or the contaminant of concern is identified through additional air monitoring activities determined by the SSO. Colorimetric (Drager) tubes may also be used to further define the nature and identity of site contaminants as suggested by PID and/or FID readings. Unless further information is learned regarding the history of the site and the nature of specific drum contents, initial characterization with colorimetric tubes will first be on a class-wide basis (petroleum hydrocarbons, halogenated compounds, etc.), followed by attempts lo identify specific compounds. NOTE: Radioactive contaminants are not anticipated, however, during this task a general screening of the spoils removed from the test pit and excavated drums will be performed.	All handling, sampling, and staging of drums will be performed in Level B protection, including the following articles: - Standard field dress (long pants, Sleeved shirts) - Steel toe safety shoes or work boots - Hard hat - Chemical splash suit (coated PVC, Saranex. etc.) - Sell-Contained Breathing Apparatus (SCBA) or airline respirator with emergency SCBA. (Grade O breathing air will be used to support this operation. Certification from the vendor attesting to the quality will be obtained by the FOL or SSO upon delivery). -Nitrile outer gloves with surgical style inner gloves. - impermeable boot covers All joints in the ensemble (Wrists, ankles, etc.) must be securely taped. Personnel must closely inspect ail PPE prior to beginning any on-site activities. Given the uncertainty associated with the Content and composition of the buried drums, any modifications to this PPE level must be approved by the PHSO or HSM. Note: The Safe Work Permit(s) for this task (see Ahachment IV) will be issued at the b i n n i n g of each day to address the tasks planned for that day. As part of this task, additional PPE may be assigned to reflect site-specific conditions or special considerations or conditions associated with any identified task.	Personnel Decontamination– This decontamination procedure tor Level B protection will consist of Equipment drop Soap/water wash and rinse of outer gloves, boots, coveralls, and SCBA Removal or PPE in the following order: Outer gloves, SCBA backpack, chemical-resistant coverall, boot cover. Inner glove wash and rinse SCBA face piece removal Inner glove removal Wash hands and face, leave contamination reduction zone Report for any heat stress surveillance Note: As site contaminants are identified, this decontamination procedure may be modified lo reflect chemical, physical, or other properties associated with site contaminants.

TABLE 5-1

TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR NAVAL AIR STATION - PENSACOLA, PENSACOLA, FLORIDA

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
Soil boring activities using DPT drilling and hand-auger techniques. This task also includes monitoring well installation, purging, and development.	*Chemical* Hazards 1) The nature and extent of any Site contaminants that may be present have not been determined. The historical usage of the area is also unknown. Site characterization with monitoring instruments will be conducted initially (i.e., prior to intrusive activities) and *continuously during* intrusive *activities* in an attempt to identify contaminants. If specific Site contaminants are identified they will be communicated to site personnel. A Table 6-1 will be prepared and inserted into this HASP which will include the toxicological, chemical, and physical properties of each contaminant. 2) Transfer of contamination into clean areas or onto persons *Physical* hazards 3) Heavy equipment/machinery hazards (rotating equipment, struck by hazards. etc.) 4) Noise in excess of 85 dBA 5) Energized systems (contact with underground or overhead utilities) 6) Strain from heavy lifting 7) Slip, trips. and falls 8) Vehicular and equipment traffic 9) Ambient temperature extremes (heat stress) *Natural* Hazards 10) Inclement weather 11) Insect/animal bites and stings. poisonous plants. etc.	1) Once site contaminants are accurately characterized, appropriate control methods will be identified and implemented. At a minimum, however, Level B PPE will be worn during all boring activities. This level of PPE is necessary based on the unknown characteristics of intact containers. As a general rule. avoiding contact with contaminated media (air, water, soils, etc.) and free product will be a universal control measure 2) Decontaminate all equipment and supplies between boreholes and prior to leaving the site. 3) All equipment to be used will be - Inspected in accordance with Federal safety and transportation guidelines. OSHA (1926.600,.601,.602), and manufacturers design and documented as such using Equipment Inspection Checklist (See Anachment III of this HASP). - Operated by knowledgeable operators and ground crew. - Only manufacturer approved equipment may be used in conjunction with equipment repair procedures. In addition to the equipment considerations, the following SOPs will be employed: - All personnel not directly supporting the drilling operation will remain at least 75 feet from the point of operation. - All loose clothing/protective equipment will be secured to avoid possible entanglement. - Hand signals will be established prior to the Commencement of drilling activities. - A remote sampling device must be used to sample drill cuttings near rotating tools. - Work areas will be kept clear of clutter. - All personnel will be instructed in the location and operations of the emergency shut off device(s). This device will be tested initially (and then periodically) to insure its Operational status. - Areas will be inspected prior to the movement of direct push rigs and support vehicles to eliminate any physical hazards. This will be the responsibility of the FOL and/or SSO. 4) Hearing protection will be used during all subsurface activities. 5) All utility clearances shall be obtained prior to subsurface activities. Prior to any Subsurface investigations, the locations of all underground utilities will be identified and marked. Obtain written permit clearance prior to all subsurface investigations. 6) Use machinery or multiple personnel for heavy lifts. Use proper lining techniques. 7) Preview work locations for unstable/uneven terrain. 8) Traffic and equipment considerations are to include the following: - Establish safe zones of approach (i.e. Boom + 3 feet). - Personnel must wear reflective vests in traffic areas. - All equipment shall be equipped with movement warning systems. - All activities are to be conducted consistent with the Base requirements. 9) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids far field crews. Additional information regarding heat stress concerns is provided in Attachment V of this HASP. 10) Suspend or terminate operations until directed otherwise by SSO 11) Wear appropriate *clothing* and PPE. Avoid potential nesting areas and suspicious vegetation (poison ivy. poison oak, etc.). Report potential hazards to the SSO. When feasible and necessary use commercially available insect repellents. Refer to Anachment II of this HASP or the Health and Safety Guidance Manual for additional information on natural hazards.	Continuous monitoring will be performed during operations to ensure safe work conditions do not change as a result of work being performed or other external factors. Monitoring of each soil boring activity, in particular, will be performed in an attempt to anticipate and characterize site contaminants. A PhD Ultra or other appropriate LEU02 instrument will be used to monitor atmospheres within the work area prior to entry and during excavation activities. When monitoring. monitor far oxygen first, then combustible gases. then toxic atmospheres. The following action levels will be used: Oxygen readings ranging between 19.5% to 23.5% - continue working and monitoring. Observe workers for signs of oxygen deficiency. Oxygen readings < 19.5% -discontinue site activities until levels return to background (an oxygen deficient atmosphere exists and combustible gas readings cannot be accurately determined) Oxygen readings > 23.5% - discontinue work until levels return to background (an oxygen enriched atmosphere exists) LEL readings < 10% - work may continue. however elevated LEL readings indicate the presence of airborne gases or vapors that may exceed established exposure limits. Perform toxic gas monitoring using a photoionization detector (PID) w/ a 10.6 eV or higher lamp source and flame ionization detector (FID). LEL readings > 10% - discontinue work (a potentially combustible atmosphere exists) and evacuate to a sate area. Use a PID, FID, or other appropriate instrument to monitor for volatile compounds. Positive sustained readings above background levels in worker breathing zones requires site activities to be suspended *until readings return to background levels* or the contaminant of concern is identified through additional air monitoring activities determined by the SSC Colorimetric (Draeger) tubes may also be used to further define the nature and identity of site contaminants as suggested by PID and/or FID readings. Unless further information is learned regarding the history of the site and the nature of specific drum contents, initial characterization with colorimetric tubes will first be on a class wide basis (petroleum hydrocarbons, halogenated compounds, etc.), followed by attempts to identify specific compounds NOTE: Radioactive contaminants are not anticipated, *however, during this task a general screening of the* spoils removed from the test pit and excavated drums will be performed.	All soil boring operations in the vicinity of buried drums will be performed in Level B protection, including the following articles: - Standard field dress (long pants, Sleeved Shills) - Steel toe safety Shoes or work boots - Hard hat -Chemical splash suit (coated PVC. Saranex, etc.) - Self-Contained Breathing Apparatus (SCBA) or airline respirator with emergency SCBA. (Grade D breathing air will be used to support this operation. Certification from the vendor attesting to the quality will be obtained by the FOL or SSO upon delivery). -Nitrile outer gloves with surgical style inner gloves. - Impermeable boot covers All joints in the ensemble (wrists, ankles, etc.) must be securely taped Personnel must closely inspect all PPE prior to beginning any on-site activities. Modifications to this PPE level may occur based on the proximity of boring activities to known buried drums. Modifications, however, must be initiated by the SSO and approved by the PHSOMSM. Note: The Sate Work Permit(s) for this task (see Attachment IV) will be issued at the beginning of each day io address the tasks planned for that day. As pan of this task, additional PPE may be assigned to reflect site-specific conditions or special considerations or conditions associated Mth any identified task.	Personnel Decontamination-- This decontamination procedure for Level B protection will consist of Equipment drop Soap/water wash and rinse of outer gloves, boots, coveralls, and SCBA Removal or PPE in the following order: Outer gloves, SCBA backpack, chemical-resistant coverall. boot cover. Inner glove wash and rinse SCBA face piece removal Inner glove removal Wash hands and face leave contamination reduction zone Report for any heat stress surveillance. Vote: As site contaminants are identified. this decontamination procedure may be modified to reflect chemical, physical. or other properties associated with site contaminants.

TABLE 5-1

TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR NAVAL AIR STATION - PENSACOLA, PENSACOLA, FLORIDA

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
Multi-media sampling, ncluding groundwater and soil (surface and subsurface) rhis task also includes sampling for IDW	*Chemical* Hazards) The nature and extent of any site contaminants that may be present have not been determined. The historical usage of the area is also unknown. Site characterization with monitoring instruments will be onducted initially (i.e., prior to intrusive activities) and ontinuously during intrusive activities in an anempt to dentify contaminants. If specific site contaminants ale dentified they will be communicated to site personnel. A able 6-1 will be prepared and inserted into this HASP hich will include the toxicological, chemical. and hysical properties of each contaminant.) Transfer of contamination into clean areas *Physical hazards*) Noise in excess of 85 decibels (dBA)) Strain from heavy lifting) Heavy equipment/machinery hazards rotating/moving equipment, struck by hazards, etc.)) Slip, trips. and falls) Vehicular and equipment traffic) Ambient temperature extremes (heat stress) *Natural* Hazards) Inclement weather 0) Insect/animal bites and stings, poisonous plants. etc.	) Once site contaminants are accurately characterized, appropriate control methods will be identified and implemented. At a minimum, however, Level B PPE will be worn during all sampling in the vicinity of Level B operations. ha level of PPE is necessary based on the unknown characteristics of ntact containers. As a general rule, avoiding contact with contaminated nedia (air, water. soils, etc.) and free product will be a universal control neasure.) Decontaminate all equipment and supplies between sampling locations nd prior to leaving the site.) When sampling at the drilling and excavator locations use hearing rotection. The use of hearing protection outside of 25 feet from these ocations should be incorporated under the following condition: If you have lo raise your voice to talk to someone who is within 2 feet of your location. hearing protection must be worn.) Use machinery or multiple personnel for heavy lifts. Use proper lifting chniques.) Avoid contact moving equipment and keep hands from the point of operation. A remote sampling device must be used to sample drill cuttings near rotating tools. The equipment operator shall shutdown nachinery if the sampler is near moving machinery parts.) Preview work locations far unstable/uneven terrain.) Traffic and equipment considerations are to include the following: Establish safe zones of approach (i.e. Boom + 3 feet). Personnel must wear reflective vests in traffic areas. All equipment shall be equipped with movement waming systems. All activities are to be conducted Consistent with Base requirements.) Wear appropriate clothing lor weather conditions. Provide acceptabic shelter and liquids far field crews. Additional information regarding heat stress concerns is provided in Attachment V of this HASP.) Suspend or terminate operations until directed otherwise by SSO lo) Wear appropriate clothing and PPE. Avoid potential nesting areas and suspicious vegetation (poison ivy, poison oak, elc.). Report potential hazards to the SSO. When feasible and necessary, use commercially available insect repellents. Refer to *Attachment II* of this HASP *or the Health* and Safety Guidance Manual lor additional information on natural hazards.	It is anticipated that potential contaminant concentrations at outdoor sample locations will not present an inhalation hazard. Nonetheless, a PhD Ultra or other appropriate LEL/O2 nstrument will be used to monitor atmospheres within the work area prior to entry and during excavation activities. When monitoring, monitor lor oxygen first, then combustible gases, then toxic atmospheres. The following action levels will be used: Oxygen readings ranging between 19.5% to 23.5% - continue working and monitoring. Observe workers for signs of oxygen deficiency. Oxygen readings < 19.5% - discontinue site activities until levels return lo background (an oxygen deficient atmosphere exists and combustible gas readings cannot be accurately determined) Oxygen readings > 23.5% - discontinue work until levels return to background (an oxygen enriched atmosphere exists). LEL readings < 10%- work may continue, however elevated LEL readings indicate the presence of airborne gases or vapors that may exceed established exposure limits. Perform toxic gas monitoring using a photoionization detector (PID) w/ a 10.6 eV or higher lamp source and flame ionization detector (FID). LEL readings > 10%- discontinue work (a potentially combustible atmosphere exists) and evacuate lo a safe area. Use a PID, FID, or other appropriate instrument to monitor for volatile compounds. Positive sustained readings above background levels in worker breathing zones requires site activities to be suspended until readings return to background levels or the contaminant of concern is identified through additional air monitoring activities determined by the SSO. Colorimetric (Drager) tubes may also be used to further define the nature and identity of site contaminants as suggested by PID and/or FID readings. Unless further documentation is learned regarding the history of the Site and the nature of specific drum contents, initial [illegible] ionization with colorimetric tubes will first be on a [illegible] basis (petroleum hydrocarbons, halogenated [illegible] etc.), followed by attempts to identify specific compounds.	All sampling in the area of Level B operations will be performed in Level E protection, including the following articles: Standard field dress (long pants, Sleeved shirts) Steel toe safety shoes or work boots Hard hat Chemical splash suit (coated PVC. Saranex, etc.) Self-Contained Breathing Apparatus (SCBA) or airline respirator with emergency SCBA. (Grade O breathing air will be used to support this operation. Certification from the vendor attesting to the quality will *be* obtained by the FOL or SSO upon delivery). Nitrile Outer gloves with surgical style inner gloves. Impermeable boot covers All joints in the ensemble (wrists, ankles, etc.) must be securely taped. Personnel must closely inspect all PPE prior to beginning any an-site activities. Modifications to this PPE level may occur for sampling conducted away from Level B operations. Any modifications, however, must be initialed by the SSO and approved by the PHSOMSM. Note: The Safe Work Permit(s) for this task (see Attachment IV) will be issued at the beginning of each day to address the tasks planned *for* that day. As part of this task, additional PPE may be assigned lo reflect site-specific conditions or special considerations or conditions associated with any identified task.	Personnel Decontamination This decontamination procedure for Level B protection will consist of - Equipment drop - Soap/water wash and rinse of outer gloves, boots, coveralls, and SCBA - Removal or PPE in the following order Outer gloves, SCBA backpack, chemical-resistant coverall, boot cover. - Inner glove wash and rinse - SCBA face piece removal - Inner glove removal - Wash hands and face, leave contamination reduction zone - Report for any heat stress surveillance. Note: As site contaminants are identified, this decontamination procedure may be modified to reflect chemical, physical, or other properties associated with site contaminants.

TABLE 5-1

TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR NAVAL AIR STATION - PENSACOLA, PENSACOLA, FLORIDA

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
Mobilization/ Demobilization	*physical* Hazards , Lifting (muscle strains and pulls) , Pinches and compressions , Slip, trips, and falls , Heavy equipment/machinery hazards (rotating/moving equipment, struck by hazards, etc.) , Vehicular and equipment traffic I Ambient temperature extremes (heat stress)	) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques.) Keep any machine guarding in place. Avoid moving parts. Secure loose clothing. jewelry, or long hair that could become entangled.) Preview work locations for unstable/uneven terrain.) All equipment will be inspected in accordance with OSHA, and manufacturers design. Operated by knowledgeable operators, and knowledgeable ground crew) Traffic and equipment considerations are to include the following: Establish safe zones of approach (i.e. Boom + 3 feet). Personnel must wear reflective vests in traffic areas. All equipment shall be equipped with movement warning systems. All activities are to be conducted consistent with Base requirements) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding heat stress concerns is provided in Attachment V of this HASP.	Not required	Level D - (Minimum Requirements) - Standard field attire (Sleeved shirt: long pants) - Safety shoes (Steel toe/shank) Safety glasses - *Hardhat* (when overhead hazards exists, or *identified* as a operation requirement) - *Reflective* vest for high *traffic* areas - *Hearing* protection for high noise areas, or *as* directed on an operation by operation scenario. (items in italics are deemed optional as *conditions* or the FOL or *SSO dictate.)*	Not required
Decontamination of Sampling and Heavy Equ	*Chemical* Hazards)The nature and extent of any site contaminants that may be present have not been determined. The historical usage of the area is also unknown. Site characterization with monitoring instruments will be conducted initially (i.e., prior to intrusive activities) and continuously during intrusive activities in an attempt to identify contaminants. If specific site contaminants are identified they will be communicated to site personnel. Table 6-1 will be prepared and inserted into this HASP which Mil include the toxicological. chemical, and physical properties of each contaminant.) Decontamination fluids - Liquinox (detergent), acetone *or* isopropanol *physical* Hazards) Strains from heavy lifting) Noise in excess of 85 dBA) Flying projectiles) Vehicular and equipment traffic) Ambient temperature extremes (heat stress)) Slips. trips. and falls	) and 2) Once site contaminants are accurately *characterized, appropriate* control methods will be identified and implemented. At a minimum, however, Level B PPE will be worn during all decon activities of Level B PPE. This level of *PPE is necessary based on the unknown characteristics of intact* containers. As a general rule, avoiding contact with contaminated media (air, water. soils. etc.) and free product will be a universal control measure. Employ protective equipment to minimize contact with site *contaminants* and hazardous decontamination fluids. Obtain manufacturer's MSDS for any decontamination solvents used onsite. Use appropriate PPE as identified on MSDS. All chemicals used must be listed on the Chemical Inventory for the site, and site activities must be consistent with the Hazard Communication Section of the Health and Safety Guidance Manual (Section 5).) Use multiple persons where necessary for lining and handling sampling equipment for decontamination purposes.) Wear *hearing* protection *when* operating pressure washer.) Use eye and face protective equipment when operating pressure washer. All other personnel must be restricted from the area.) *Traffic* and *equipment* considerations are to include the following Establish safe zones of approach (i.e. Boom + 3 feet). Personnel must w a r reflective vests in traffic areas. All equipment shall be equipped with movement warning systems All activities are to be conducted consistent with Ease requirements) Wear appropriate clothing for weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding heat stress concerns is provided in Attachment V of this HASP.) Preview work locations for unstable/uneven terrain.	Use visual observation. and real-time monitoring instrumentation to ensure all equipment has been properly cleaned of contamination and dried. After decon is completed, screen equipment with a PID/FID. If any elevated readings (i.e., above background) are observed, perform decon again and rescreen. Repeat until no elevated PID/FID readings are noted.	*For Heavy Equipment* This applies to high pressure soap/water, Steam cleaning wash and rinse procedures. All decon activities conducted in the vicinity of Level B operations will be performed in Level B protection, including the following articles: - Standard field dress (long pants, Sleeved shirts) - Steel toe safety shoes or work boots - Hard hat -Chemical splash suit (coated PVC, Saranex, etc.) - Self-Contained Breathing Apparatus (SCEA) or airline respirator with emergency SCBA. (Grade O breathing air will be used to support this operation. Certification from the vendor attesting to the quality will be obtained by the FOL or SSO upon delivery). -Nitrile outer gloves with surgical style inner gloves. - Impermeable boot covers - Hearing protection (plugs or muffs) if operating pressure washer for more than 15 minutes All joints in the ensemble (wrists, ankles, etc.) must be securely taped. Personnel must closely inspect all PPE prior to beginning any on-site activities. **Modifications** to this PPE level may occur based on the proximity of baring activities to known buried drums. **Modifications**, however, must be initialed by the SSO and approved by the PHSO/HSM. *For sampling* equipment, the following PPE is required (assuming decon occurs away from Level E operations. Otherwise. follow Level E requirements): Level D Minimum requirements - - Standard field attire (Sleeved shirt; long pants) - Safety shoes (Steel toe/shank) - Nitrile Outer gloves - Safety glasses In *the* event of *overspray* of chemical *decontamination* fluids use PVC *Rainsuits* or *PE* or *PVC* coated *Tyvek* as necessary (Items in italics are deemed optional as conditions *or* the FOL or SSO *dictate.)*	**Personnel Decontamination** The decontamination *procedure for* **Level B** protection will consist of - Equipment drop - Soap/water wash and rinse of outer gloves, boots, coveralls, and SCBA - Removal or PPE in the following order: Outer gloves, SCBA backpack, chemical-resistant coverall, boot cover. - Inner glove wash and rinse - SCBA face piece removal - Inner glove removal - Wash hands and face, leave contamination reduction zone - Report for any heat stress surveillance. Note: As site contaminants *are identified*, this decontamination procedure may be modified to reflect chemical, physical, or other properties associated with *site contaminants*. **Equipment Decontamination** - All heavy equipment *decontamination will* take place at a centralized decontamination pad utilizing steam or pressure washers. Heavy equipment will have the wheels and tires cleaned along with any loose debris removed, prior to transporting to the central decontamination area. All site vehicles will be restricted access to exclusion zones, or also have their wheels/tires sprayed off as not to track mud onto the roadways servicing this installation. Roadways shall be cleared of any debris resulting from the onsite activity. **Sampling Equipment Decontamination** Sampling equipment will be decontaminated as per the requirements in the Sampling and Analysis Plan and/or Work Plan. MSDS for any decon solutions (Alconox, isopropanol, etc.) will be obtained and used to determine proper handling / disposal methods and protective measures (PPE, first-aid, etc.). All equipment used in the exclusion zone *will require a* complete decontamination between locations and prior to removal from the site. The FOL or the SSO will be responsible for evaluating equipment arriving onsite and that which is to leave the site. No equipment *will be authorized access or exit* without this evaluation.

TABLE 5-1

TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR NAVAL AIR STATION - PENSACOLA, PENSACOLA, FLORIDA

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Monitoring	Personal Protective Equipment	Decontamination Procedures
IDW management (including moving IDW drums to storage areas)	*Chemical Hazards* 1) The nature and extent of any Site contaminants that may be present have not been determined. The historical usage of the area is also unknown. Site characterization with monitoring instruments will be conducted *initially (i.e.,* prior to intrusive activities) and continuously during intrusive activities in an attempt to identify contaminants. If specific site Contaminants are identified they will he communicated to site personnel. A Table 6 1 will be prepared and inserted into this HASP which will include the toxicological, chemical, and physical properties of each contaminant. 2) Transfer of contamination into clean areas Physical hazards 3) Noise in excess of 85 dBA 4) Strains from heavy lifting 5) Pinches and compressions 6) Slip, trips, and falls 7) Vehicular and equipment traffic 8) Ambient temperature extremes (heat stress)	1) Employ real-time monitoring instrumentation, action levels, and identify PPE to control exposures to potentially contaminated media (e.g. air. water. soils). 2) Decontaminate all equipment and supplies, if they become contaminated, between locations and prior to leaving the site. 3) When working near heavy equipment, use hearing protection. 4) Use machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 5) Keep any machine guarding in place. Avoid moving palls. Secure loose clothing, jewelry, or long hair that could become entangled. 6) Preview work locations lor unstable/uneven terrain. 7) Traffic and equipment considerations are to include the following: - Establish safe zones of approach (i.e. Boom + 3 feet). - Personnel must wear reflective vests in *traffic* areas. - All equipment Shall be equipped with movement warning systems. - AH activities are to be conducted consistent with Base requirements. 8) Wear appropriate clothing lor weather conditions. Provide acceptable shelter and liquids for field crews. Additional information regarding heat stress concerns is provided in Attachment V of this HASP.	It is anticipated that potential contaminant concentrations at outdoor sample locations will not present an inhalation hazard. Nonetheless, continuous monitoring will be performed during operations to ensure Sate work conditions do not change as a result of work being Use a PID, FID, or other appropriate instrument to monitor lor volatile compounds. Positive sustained readings above background levels in worker breathing zones requires site activilies to he suspended until readings return to background levels or the contaminant of concern is identified through additional air monitoring activities determined by the SSO. Colorimetric (Drager) tubes may also be used to further define the nature and identity of site contaminants as suggested hy PID and/or FID readings. Unless further information is learned regarding the history at the site and the nature of specific drum contents, initial characterization with colorimetric tubes Will first be on a class wide basis (petroleum hydrocarbons, halogenated compounds, etc.), followed by attempts to identify specific compounds	Level D protection will be utilized for the initiation of all IDW activities. Level D - (Minimum Requirements) - Standard field attire (Sleeved shirt; long pants) - Safety shoes (Steel toe/shank) - Safety glasses - Hardhat - *Reflective vest for traffic* areas *Surface contamination disposable clothing potential exists for soiling work attire.* - *Nitrile* gloves *or* leather gloves with *surgical style inner gloves* - *Hearing protection* if near *drilling* operations or *for other* high noise areas as *directed* by the *SSO.* (items *in* italics are deemed optional *as conditions* or *the* FOL or *SSO dictate.)*	**Personnel Decontamination** Will consist of a soap/water wash and rinse for reusable protective equipment (e.g., gloves). The function will take place at an area adjacent to the operations boundary the support zone. This decontamination procedure for Level D protection will consist of *Equipment drop* Soap/water wash and rinse of reusable outer gloves, as applicable Outer coveralls, boot covers, and/or outer glove removal Removal, segregation, and disposal of non-reusable PPE in bags/containers provided Wash hands and face, leave contamination reduction zone.

TABLE 5-1

TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR NAVAL AIR STATION - PENSACOLA, PENSACOLA, FLORIDA

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Hazard Moniloring	Personal Protective Equipment	Decontamination Procedures
Initial On-Site Surveying (i.e., site characterization)	Chemical hazards: 1) The nature and extent of any site contaminants that may be present have not been determined. The historical usage of the area is also unknown. Site characterization with monitoring instruments will be conducted initially (i.e., prior to intrusive activities) and continuously during intrusive activities in an attempt to dentify contaminants. If specific Site contaminants are dentified they will be communicated to site personnel. A Table 6-1 will be prepared and inserted into this HASP which will include the toxicological, chemical, and physical properties of each contaminant. Physical hazards: 2) Slip. trips, and falls **Natural** *Hazards:* 3) Inclement weather 4) Insect/animal bites or stings, poisonous plants, etc.	1) Once Site contaminants are accurately characterized, appropriate control methods Will be identified and implemented. At a minimum. however. Level 3 PPE will be worn during all excavation activities. This level of PPE is necessary based on the **unknown** characteristics of intact containers. As a general rule, avoiding contact with contaminated media (air, water, soils, etc.) and tree product Will be a universal control measure. 2) Preview work locations and site lines for uneven and unstable terrain Clear necessary vegetation, establish temporary means for traversing hazardous terrain (i.e., rope ladders. etc.) 3) Suspend or terminate operations Until directed otherwise by SSO 4) Wear appropriate clothing and PPE. Avoid **potentia** nesting areas and suspicious vegetation (poison ivy, poison oak, etc.). Report potential hazards to the SSO. When feasible and necessary, use commercially available insect repellents. Refer to Anachment I of this HASP or the Health and Safely Guidance Manual for additional information on natural hazards	Continuous monitoring will **be** performed during operations to ensure sate work **conditions** do not **change** as a result **of** work being performed **or** other **external** factors. A PhD Ultra or omer appropriate LEL/O2 instrument will be used lo monitor atmospheres within the work area prior lo entry and during excavation activities. When monitoring, monitor for oxygen first, then combustible gases, then toxic atmospheres. The following action levels will be used: Oxygen readings ranging between 19.5% to 23.5% - continue working and monitoring. Observe workers lor signs of oxygen deficiency. Oxygen readings < 19.5% - discontinue site activities until levels return to background (an oxygen deficient atmosphere exists and combustible gas readings cannot *be* accurately determined) Oxygen readings > 23.5% - discontinue work until levels return to background (an oxygen enriched atmosphere exists). LEL readings < 10% - work may continue, however elevated LEL readings indicate the presence of airborne gases *or* **vapors** that may exceed established exposure limits. Perform toxic gas monitoring using a photoionization detector (PID) w/ a 10.6 eV or higher lamp source and flame ionization detector (FID). LEL readings > 10% - discontinue work (a potentially combustible atmosphere exists) and evacuate lo a safe area. Use a PID, FID, or other appropriate instrument to monitor for volatile compounds. Positive sustained readings above background levels in worker breathing zones requires site activities to be suspended until readings return to background levels or the contaminant of concern is identified through additional air monitoring activities determined by the SSO. Colorimetric (Drager) tubes may also be used to further define the nature and identity of Site contaminants as suggested by PID and/or FID readings. Unless further information is learned regarding the history of the site and the nature of specific drum contents. initial characterization with colorimetric tubes Will first be on a class-Wide basis (petroleum hydrocarbons, halogenated compounds. etc.), followed by attempts to **identify** specific compounds. Radioactive contaminants are not anticipated. However, during this task a general screening of the soils removed from the test pit and excavated drums will be performed.	All initial on-site survey operations will *be* performed in Level B protection, including the following articles: - Standard field dress (long pants, Sleeved shirts) - Steel toe safety shoes or work boots - Hard hat - Self Contained Breathing Apparatus (SCBA) or airline respirator with emergency SCBA. (Grade D breathing air will be used lo support this operation. Certification from the vendor attesting to the quality will *be* obtained by the FOL or SSO upon delivery). - Nitrile outer gloves with surgical style inner gloves. - Impermeable boot covers All joints in the ensemble (wrists, ankles. etc.) **must be** securely taped. Personnel must closely inspect all PPE prior to beginning any **on-site** activities. Given the uncertainly associated with **the** content and **composition** ot the buried **drums,** any **modifications** to this PPE level **must** be approved by **the** PHSO or HSM. Note: The Safe Work Permit(s) tor this task (*see* Anachment IV) Will be issued at the beginning of each day lo address the tasks planned for that day. As part of this task, additional PPE may be assigned lo reflect site-specific conditions or special considerations or conditions associated With any identified **task.**	**Personnel Decontamination** The decontamination procedure for **Level B** protection will consist of - Equipment drop - Soap/water wash and rinse of outer gloves, boots, coveralls, and SCBA - Removal or PPE in the following order Outer gloves, SCBA backpack, chemical-resistant coverall, boot cover. - Inner glove wash **and** rinse - SCBA face piece removal - Inner glove removal - Wash hands and face, leave contamination reduction zone - Report lor any heal stress surveillance Note: As site contaminants are identified, this decontamination procedure may be modified to reflect chemical, physical, or other properties associated with site contaminants.

6.0 HAZARD ASSESSMENT

The following section provides information regarding the chemical, physical, and natural hazards associated with the site to be investigated and the activities that are to be conducted as part of the scope of work.

6.1 CHEMICAL HAZARDS

As discussed in Section 3.1 (Site Description), the historical usage of the area and the contents of buried drums are unknown. However, the site was open to military and non-military personnel up until the detection of the drums without report of incident or illness. One of the drums found was observed in a vertical position; its end punctured revealing what appeared to be standing water in the interior. No odors, visible soil stains, or other indications of contaminant release were observed. As the chemicals hazards of the site are unknown, initial and subsequent site characterization activities will be followed in an attempt to identify site contaminants.

6.1.1 Initial On-site Survey

At the commencement of the on-site phase of the project, and prior to conducting any intrusive activities (test pitting, drilling, etc.), the SSO will conduct a comprehensive site screening survey in an attempt to qualify and quantify any detectable site contaminants. Wearing PPE identified in Table 5-1 for Initial On-Site Survey, the SSO and an additional team member will:

- Enter the fenced area and visually observe the site for signs of actual or potential contaminants or other suspect conditions, such as stressed vegetation, dead animals, or noticeable ground stains.

- Monitor the air at areas of actual or potential contamination to qualify and/or quantify airborne contaminants. In performing this monitoring the SSO will use a Photoionization Detector (PID) and a Flame Ionization Detector (FID) to screen for volatile organic compounds. A Lower Explosive Limit/Oxygen (LEL/O2) Meter and Radiation Survey Meter will also be used to screen the area. Sustained detections above background will be interpreted by the SSO and supplemental monitoring (if warranted) will be conducted. Supplemental monitoring may include the use of colorimetric tubes and chemical-specific instruments, such as a halide meter, hydrogen sulfide detector, carbon monoxide monitor, and/or mercury meter. See Section 7 (Air Monitoring) and Table 5-1 for further discussion on monitoring instruments and Action Levels for this task.

The SSO will be responsible for further identifying and characterizing detected concentrations of airborne contaminants using appropriate instrumentation. This exercise will be conducted to determine the specific nature of detected site contaminants, and to identify under what circumstances PPE can be modified. The SSO will be guided by and follow prudent industrial hygiene and safety practices regarding the determination of risk associated with detected site contaminants. Only after this assessment has been made will personnel be permitted to conduct further site activities.

If the SSO is able to identify and characterize detectable site contaminants, he/she will be responsible for developing information on the contaminants (with the assistance of the PHSO, as needed) such as chemical, physical, and toxicological data. This information will be shared with site personnel. This information may also be developed based on the analytical results of samples submitted to an off-site laboratory, although this approach will result in considerable delay in communicating this information to site personnel. As the project progresses and new contaminants are identified, additional information will be supplied to personnel accordingly.

6.1.2 Risk Identification

Once the presence and concentrations of site contaminants and health hazards have been identified, the risks associated with these substances will be identified by the SSO (with the assistance of the PHSO, as needed). In performing this task the SSO will refer to standard reference sources (OSHA, ACGIH, etc.) for data and guidance on permissible levels of exposure, flammability, etc. Particular emphasis will be place on issues specific to site activities, such as potential skin/eye absorption and irritation of site contaminants. The SSO will use the hazard assessment to refine Action Levels and PPE identified in Table 5-1 whenever possible. The PHSO or HSM, however, must approve all modifications to the PPE ensembles. Site personnel will be informed of the results of this risk identification task.

6.1.3 Intrusive Tasks Near Buried Drums

Even if some site contaminants can be identified during the initial on-site survey task, it is recognized that site conditions and information on potential contaminants may change quickly as intrusive activities progress. It is this uncertainty that drives the conservative use of Level B PPE during test pit excavation, drum sampling, and other intrusive tasks. The SSO will continuously monitor all intrusive tasks in the area of the buried drums to better characterize site contaminants, detect previously unknown contaminants, identify appropriate control measures, and modify PPE ensembles (as appropriate). The SSO will use the instruments and equipment previously applied during the initial on-site survey to conduct continuous site characterization.

6.1.4 Other Intrusive Tasks Awav from Buried Drums

Some project tasks of an intrusive nature will be conducted in areas away from the buried drums or will involve activities of a less hazardous nature than intrusive activities directly involving buried drums. These less hazardous yet still intrusive activities include monitoring well installation, groundwater sampling, and soil sampling (from hand-augers). Although significant concentrations of site contaminants would not be expected during these tasks, the SSO will nonetheless continuously monitor these tasks to better characterize site contaminants, detect previously unknown contaminants, identify appropriate control measures, and modify PPE ensembles (as appropriate). The SSO will use the instruments and equipment previously applied during the initial on-site survey to conduct continuous site characterization.

6.2 PHYSICAL HAZARDS

In addition to any chemical hazards that are identified through the site characterization process discussed in Section 6.1, the following physical hazards may be present during the performance of the site activities.

- Ambient temperature extremes (heat stress)
- Heavy equipmentlmachinery hazards (rotating/moving equipment, struck by hazards, etc.)
- Slips, trips, and falls
- Collapse of the excavation
- Energized systems (contact with underground or overhead utilities)
- Strain from heavy lifting
- Vehicular and equipment traffic
- Cuts, abrasions, and lacerations
- Pinch and compressions
- Noise in excess of 85 decibels (dBA)
- Fire/explosion (from flammable/combustible liquids or solids potentially buried in drums)
- Flying projectiles

Each of these physical hazards is discussed in the Health and Safety Guidance Manual. Additionally, information on these physical hazards and their associated control measures (as applicable to each site task) are discussed in Table 5-1. Specific discussion on some of these physical hazards is presented in the following subsections.

6.2.1 Heavy equipment/machinery hazards (rotating/moving equipment, struck by hazards, etc.)

Often the hazards associated with excavating and drilling operations are the most dangerous to be encountered during site activities. The **SSO** will discuss safe excavating and drilling procedures as part of site-specific training and/or during daily safety meetings using Safe Work Permits (Figure 10-1) presented in this HASP. The following rules will apply to all excavating and drilling operations:

- Site personnel will be aware of the location and operation of this equipment.
- Each drill rig must be equipped with emergency stop devices which will be tested daily to ensure that they are operational.
- Long handled shovels or equivalent shall be used to clear cuttings from the borehole and rotating equipment.
- Site personnel collecting samples from the excavator bucket will coordinate sample acquisition with the excavator operator

Additional requirements during excavating and drilling activities are discussed in Table 5-1

6.2.2 Ambient Temperature Extremes (heat stress)

Overexposure to high ambient temperatures (heat stress) will likely exist during performance of this work given the geographic location and the use of Level B PPE. Work performed when ambient temperatures exceed 70°F may result in varying levels of heat stress (heat rash, heat cramps, heat exhaustion, and/or heat stroke) depending on variables such as wind speed, humidity, and percent sunshine, as well as physiological factors such as metabolic rate and skin moisture content. Additionally, workload and level of protective equipment will affect the degree of exposure. Site work will be conducted during cooler periods of the day (e.g., night) whenever possible and personnel will be encouraged to drink plenty of fluids to replace those lost through perspiration. Additional information such as Work-Rest Regimens and personnel monitoring may be found in Attachment V of this HASP and Section 4.0 of the Health & Safety Guidance Manual. The SSO will recommend additional heat stress control measures as they are deemed necessary per ACGIH guidelines.

6.2.3 Miscellaneous Hazards Associated with Drum/Containers

A number of the potential physical hazards identified are associated with handling, sampling, and staging of drumslcontainers that have been excavated from Site 43. Specifically, these physical hazards include:

- Slips, trips, and falls
- Cuts, abrasions, and lacerations
- Strain from heavy lifting
- Fire/explosion (from flammable/combustible liquids or solids potentially buried in drums)

A Drum/Container Management Plan (see Attachment VI) has been prepared which addresses these hazards by prescribing methods and techniques to safely handle, sample, and stage drumslcontainers. This Plan includes a sampling procedure and guidance on inspecting, opening, and moving drumslcontainers.

6.3 NATURAL HAZARDS

Insectlanimal bites and stings, poisonous plants, and inclement weather are natural hazards that may be present given the location of activities to be conducted. In general, avoidance of areas of known infestation or growth will be the preferred exposure control for insectslanimals and poisonous plants. Specific discussion on principle hazards of concern follows:

6.3.1 Insectlanimal Bites and Stings

Various insects and animals may be present and should be considered. For example, fire ants present a unique situation when working outdoors in Florida. Their aggressive behavior and their ability to sting repeatedly can pose a unique health threat. The sting injects a venom that causes an extreme burning sensation. Pustules form which can become infected if scratched. Allergic reactions of people sensitive to the venom include dizziness, swelling, shock and in extreme cases unconsciousness and death. People exhibiting such symptoms should see a physician. Fire ants can be identified by their habitat. They build mounds in open sunny areas sometimes supported by a wall or shrub. The mound has no external opening. The size of the mound can range from a few inches across to some which are in excess of two feet or more in height and diameter. When disturbed they defend it by swarming out and over the mound, even running up grass blades and sticks.

Also, areas to be investigated could be prime nesting and/or hiding locations for snakes and other insects.. Personnel should avoid reaching into areas that are not visibly clear of snakes or insects. Snake chaps will

be worn in areas of known or anticipated snake infestation. All site personnel who are allergic to stinging insects such as bees, wasps, and hornets must be particularly careful since severe illness and death may result from allergic reactions. As with any medical condition or allergy, information regarding the condition must be listed on the Medical Data Sheet and the FOL and SSO notified.

There are various areas throughout the U.S. where Lyme Disease is endemic. Fortunately, Florida is not one of these areas. Nonetheless, personnel should be aware of the hazards of tick bites and Lyme Disease. The longer a disease carrying tick remains attached to the body, the greater the potential for contracting the disease. Wearing long sleeved shirts and long pants (tucked into boots). As well as performing frequent body checks will prevent long term attachment. Site first aid kits should be equipped with medical forceps and rubbing alcohol to assist in tick removal. For information regarding tick removal procedures, and symptoms of exposure consult Attachment II of this HASP or Section 4.0 of the Health and Safely Guidance Manual.

An Office of Natural Resources or similar entity on Base should be contacted for further direction on the hazards and precautions of naturally occurring wildlife and insects.

6.3.2 Inclement Weather

Project tasks under this Scope of Work will be performed outdoors and near water. As a result, inclement weather may be encountered. In the event that adverse weather conditions arise (electrical storms, hurricanes, etc.), the FOL and/or the SSO will be responsible for temporarily suspending or terminating activities until hazardous conditions no longer exist.

7.0 AIR MONITORING

This section presents requirements for the use of real-time air monitoring instruments during site activities. It establishes the types of instruments to be used. Information on specific instrumentation for specific tasks, the frequency of which they are to be used, techniques for their use, Action Levels for upgrading/downgrading levels of protection, and contaminants can be found in Table 5-1 of this document. Methods for instrument maintenance and calibration are discussed in Section 10 of the Health and Safety Guidance Manual.

7.1 INSTRUMENTS AND USE

The information provided in this section addresses the use of real-time monitoring instrumentation during on-site activities. These instruments will be used primarily for site characterization to identify contaminants, and to monitor source points and worker breathing zone areas. Action Levels are discussed in Table 5-1 as they may apply to a specific task or location. This approach (coupled with the use of PPE and the observance of the other control requirements presented in this HASP) has been selected to identify site contaminants and minimize the potential for personnel exposures to hazardous concentrations of airborne contaminants.

7.1 1 Flame Ionization Detector (FID) and Photoionization Detector (PID)

In order to accurately identify and characterize any site contaminants that may be present, a PID and a FID will be used during initial on-site characterization and other site activities (particularly intrusive activities involving buried drums). Both instruments are necessary to effectively monitor for a broad range of contaminants and, where possible, further define or narrow down the nature of specific compounds. These instruments will be used to monitor potential source areas such as test pits and drums/containers, and to screen the breathing zones of employees during site activities. These instruments have been selected because of their capability of detecting organic gases and vapors and some inorganic gases and vapors. It is possible that in some cases the chemicals of concern will not be effectively detected using a FID or PID, so emphasis will be placed on engineering controls and PPE to control hazards. Refer to Table 5-1 for specific monitoring requirements and Action Levels.

Prior to the commencement of any field activities, the background levels of the site must be determined and noted. Daily background readings will be taken away from any areas of potential contamination. These readings, any influencing conditions (weather, temperature, etc.), location, and other pertinent information will be documented in the field operations logbook and on any corresponding activities sheet (Boring log, sample log sheet, etc.).

7.1.2 LEL/O2 or PhD Ultra Multi Gas Detector

An LEU02 meter (e.g., PhD Ultra Multi Gas Detector) will also be used to characterize and monitor the work area. This instrument will be used to evaluate the potential for Immediately Dangerous to Life or Health (IDLH), flammable, oxygen deficient, and other hazardous atmospheres. Acceptable site entry conditions, appropriate PPE requirements, and recommended control measures will be determined based on the results of monitoring for flammables and oxygendeficient atmospheres. Refer to Table 5-1 for specific monitoring requirements and Action Levels.

7.1.3 Colorimetric Tubes

Colorimetric (Drager) tubes may also be used to further define and characterize the identity of site contaminants identified using the PID or FID. Unless additional information is learned regarding the history of the site and the nature of specific drum contents, site characterization involving colorimetric tubes will first be on a class-wide basis (petroleum hydrocarbons, halogenated compounds, etc.). The results of this class-wide measurement will be used to narrow potential site contaminants to identify specific compounds. The Drager flowchart for determining unknown substances will be used in this regard. The monitoring requirements and Actions Levels will depend on the compounds identified, and will be added to Table 5-1 once they are determined.

7.1.4 Radiation Survey Meter

It is unlikely that radiological hazards are associated with the buried drums at Site 43 given the mission of NAS Pensacola. Nonetheless, recognizing the uncertain nature of the site history and specific contents of buried drums, a radiation survey meter will be used during initial site characterization and during intrusive activities to identify radiological hazards. Each uncovered drum will be screened, and workers will be periodically monitored for indications of radiological hazards. The radiological survey instrument to be used will be a Ludlum Model 2 Survey Meter, a Geiger-Mueller pancake probe, or other comparable instrument. Readings greater than 50 microroentgens/hour will be used as the Action Level,

7.1.5 Hazard Monitoring Frequency

Table 5-1 presents the frequencies that hazard monitoring will be performed as well as the Action Levels that will initiate the use of modified levels of protection. The SSO may decide to increases these frequencies based on instrument responses and site observations. The frequency at which monitoring is performed will not be reduced without the prior consent of the PHSO or HSM.

7.2 INSTRUMENT MAINTENANCE AND CALIBRATION

Hazard monitoring instruments will be maintained and pre-field calibrated by the TtNUS Equipment Manager. Operational checks and/or field calibration will be performed on all instruments each day prior to their use. Field calibration will be performed on instruments according to manufacturer's recommendations (for example, the PID must be field calibrated daily and an additional field calibration must be performed at the end of each day to determine any significant instrument drift). These operational checks and calibration efforts will be performed in a manner that complies with the employees health and safety training, the manufacturer's recommendations, and with the applicable manufacturer standard operating procedure (copies of which can be found in the Health & Safety Guidance Manual which will be maintained on site for reference). All calibration efforts must be documented. Figure 7-1 is provided for documenting these calibration efforts. This information may instead be recorded in a field operations logbook, provided that all of the information specified in Figure 7-1 is recorded. This required information includes the following:

- Date calibration was performed
- Individual calibrating the instrument
- Instrument name, model, and serial number
- Any relevant instrument settings and resultant readings (before and after) calibration
- Identification of the calibration standard (lot no., source concentration, supplier)
- Any relevant comments or remarks

FIGURE 7-1

DOCUMENTATIONOF FIELD CALIBRATION

SITE NAME: _____ PROJECT NO.: _____

Date of Calibration	Instrument Name and Model	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		

8.0 TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

8.1 INTRODUCTORY/REFRESHER/SUPERVISORY TRAINING

This section is included to specify health and safety training and medical surveillance requirements for both TtNUS and subcontractor personnel participating in site activities.

8.1.1 Requirements for TtNUS Personnel

All TtNUS personnel must complete 40 hours of introductory hazardous waste site training prior to performing work at the NAS Pensacola facility. Additionally, TtNUS personnel who have had introductory training more than 12 months prior to site work must have completed 8 hours of refresher training in the past 12 months before being cleared for site work. In addition, 8-hour supervisory training in accordance with 29 CFR 1910.120 (e)(4) will be required for site supervisory personnel.

Documentation of TtNUS introductory, supervisory, and refresher training as well as site-specific training will be maintained at the project. Copies of certificates or other official documentation will be used to fulfill this requirement.

8.1.2 Requirements for Subcontractors

All TtNUS subcontractor personnel must have completed introductory hazardous waste site training or equivalent work experience as defined in OSHA Standard 29 CFR 1910.120 (e). Additionally, personnel who have had the introductory training more than 12 months ago, are required to have 8 hours of refresher training meeting the requirements of 29 CFR 1910.120(e)(8) prior to performing field work at the NAS Pensacola facility if required. TtNUS subcontractors must certify that each employee has had such training by sending TtNUS a letter, on company letterhead, containing the information in the example letter provided as in Figure 8-1 and by providing copies of certificates for all subcontractor personnel participating in site activities.

FIGURE 8-1
TRAINING LETTER

The following statements must be typed on company letterhead and signed by an officer of the company and accompanied by copies of personnel training certificates:

LOGO
XYZ CORPORATION
555 E. 5th Street
Nowheresville, Kansas 55555

Month, day, year

Mr. Terry Hansen
Tetra Tech NUS, Inc.
Task Order Manager
Ellis Building, Suite 220
1311 Executive Center Drive
Tallahassee, Florida, 32301

Subject: HAZWOPER Training for NAS Pensacola, Pensacola, Florida

Dear Mr. Hansen:

As an officer of XYZ Corporation, I hereby state that I am aware of the potential hazardous nature of the subject project. I also understand that it is our responsibility to comply with all applicable occupational safety and health regulations, including those stipulated in Title 29 of the Code of Federal Regulations (CFR), Parts 1900 through 1910 and Part 1926.

I also understand that Title 29 CFR 1910.120, entitled "Hazardous Waste Operations and Emergency Response," requires appropriate level of training for certain employees engaged in hazardous waste operations. In this regard, I hereby state that the following employees have had 40 hours of introductory hazardous waste site training or equivalent work experience as requested by 29 CFR 1910.120(e) and have had 8 hour of refresher training as applicable and as required by 29 CFR 1910.120(e)(8) and that site supervisory personnel have had training in accordance with 29 CFR 1910.120(e)(4).

LIST FULL NAMES OF EMPLOYEES AND THEIR SOCIAL SECURITY NUMBERS HERE.

Should you have any questions, please contact me at (555) 555-5555

Sincerely,

(Name and Title of Company Officer)

Enclosed: Training Certificates

8.2 SITE-SPECIFIC TRAINING

TtNUS will provide site-specific training to all TtNUS employees and subcontractor personnel who will perform work on this project. Site-specific training will also be provided to all personnel (U.S. Department of Defense, EPA, etc.) who may enter the site to perform functions that may or may not be directly related to site operations. Site-Specific training will include:

- Names of designated personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on site
- Use of personal protective equipment
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- Contents of the Health and Safety Plan
- Emergency response procedures (evacuation and assembly points)
- Incipient response procedures
- Review of the contents of relevant Material Safety Data Sheets

Site-specific documentation will be established through the use of Figure 8-2. All site personnel and visitors must sign this document upon receiving site-specific training.

8.3 MEDICAL SURVEILLANCE

8.3.1 Medical Surveillance Requirements for TtNUS Personnel

All TtNUS personnel participating in project field activities will have had a physical examination meeting the requirements of TtNUS's medical surveillance program and will be medically qualified to perform hazardous waste site work using respiratory protection.

Documentation for medical clearances will be maintained in the TtNUS Jacksonville office and made available, as necessary.

FIGURE 8-2

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing remedial investigation activities at NAS Pensacola, Pensacola, Florida and that I have received site-specific training which included the elements presented below:

- Names of designated personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on site
- Use of personal protective equipment
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- Contents of the Health and Safety Plan
- Emergency response procedures (evacuation and assembly points)
- Incipient response procedures
- Review of the contents of relevant Material Safety Data Sheets

My signature below indicates that I have been given the opportunity to ask questions and that all of my questions have been answered to my satisfaction, and that the dates of my training and medical surveillance indicated below are accurate.

Name (Printed and Signature)	Site-Specific Training Date	40-Hour Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Medical Exam

8.3.2 Medical Surveillance Requirements for Subcontractors

Subcontractors are required to obtain a certificate of their ability to perform hazardous waste site work and to wear respiratory protection. The "Subcontractor Medical Approval Form" provided in Figure 8-3 shall be used to satisfy this requirement, providing it is properly completed and signed by a licensed physician.

Subcontractors who have a company medical surveillance program meeting the requirements of paragraph (9 of OSHA 29 CFR 1910.120 can substitute "Subcontractor Medical Approval Form" (See Figure 8-3) with a letter, on company letterhead, containing all of the information in the example letter presented in Figure 8-4 of this HASP.

8.3.3 Requirements for All Field Personnel

Each field team member (including subcontractors) and visitors entering the exclusion zone(s) shall be required to complete and submit a copy of Medical Data Sheet found in the TtNUS Health and Safety Guidance Manual. This shall be provided to the SSO, prior to participating in site activities. The purpose of this document is to provide site personnel and emergency responders with additional information that may be necessary in order to administer medical attention.

8.4 SUBCONTRACTOR EXCEPTIONS

Subcontractors who will not enter the exclusion zone during operation, and whose activities involve no potential for exposure to site contaminants, will not be required to meet the requirements for training/medical surveillance other than site-specific training as stipulated in Section 8.2. This exception may only be granted by the CLEAN HSManager (i.e., Matt Soltis).

FIGURE 8-3

SUBCONTRACTOR MEDICAL APPROVAL FORM

For employees of _____
Company Name

Participant Name: _____ Date of Exam: _____

Part A

The above-named individual has:

1. Undergone a physical examination in accordance with OSHA Standard 29 CFR 1910.120, paragraph (9 and found to be medically -

   ( ) qualified to perform work at the NAS Pensacola, work site
   ( ) not qualified to perform work at the NAS Pensacola, work site

   and,

2. Undergone a physical examination as per OSHA 29 CFR 1910.134(b)(10) and found to be medically -

   ( ) qualified to wear respiratory protection
   ( ) not qualified to wear respiratory protection

My evaluation has been based on the following information, as provided to me by the employer.

( ) A copy of OSHA Standard 29 CFR 1910.1 20 and appendices.
( ) A description of the employee's duties as they relate to the employee's exposures.
( ) A list of known/suspected contaminants and their concentrations (if known).
( ) A description of any personal protective equipment used or to be used.
( ) Information from previous medical examinations of the employee which is not readily available to the examining physician.

Part B

I, _____, have examined _____
Physician's Name (print) Participant's Name (print)
and have determined the following information:

FIGURE 8-3
SUBCONTRACTOR MEDICAL APPROVAL FORM
PAGE TWO

1. Results of the medical examination and tests (excluding finding or diagnoses unrelated to occupational exposure):

_____
_____
_____

2. Any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health:

_____
_____
_____

3. Recommended limitations upon the employee's assigned work:

_____
_____
_____

I have informed this participant of the results of this medical examination and any medical conditions which require further examination of treatment.

Based on the information provided to me, and in view of the activities and hazard potentials involved at the NAS Pensacola work site, this participant

( ) may
( ) may not

perform his/her assigned task.

Physician's Signature _____

Address _____

Phone Number _____

NOTE: Copies of test results are maintained and available at:

_____
Address

FIGURE 8 4

MEDICAL SURVEILLANCE LETTER

The following statements must be typed on company letterhead and signed by an officer of the company:

LOGO
XYZ CORPORATION
555 E. 5th Street
Nowheresville, Kansas 55555

Month, day, year

Mr. Terry Hansen
Tetra Tech NUS, Inc.
Task Order Manager
Ellis Building, Suite 220
1311 Executive Center Drive
Tallahassee, Florida, 32301

Subject: HAZWOPER Training for NAS Pensacola, Pensacola, Florida

Dear Mr. Hansen:

As an officer of XYZ Corporation, I hereby state that the persons listed below participate in a medical surveillance program meeting the requirements contained in paragraph (9 of Title 29 of the Code of Federal Regulations (CFR) Part 1910.120, entitled "Hazardous Waste Operations and Emergency Response. I further state that the persons listed below have had physical examinations under this program within the past 12 months and that they have been cleared, by a license physician, to perform hazardous waste site work and to wear positive- and negative-pressure respiratory protection. I also state that, to my knowledge, no person listed below has any medical restriction that would preclude him/her from working at the NAS Pensacola facility.

LIST OF FULL NAMES OF EMPLOYEES AND THEIR SOCIAL SECURITY NUMBERS HERE.

Should you have any questions, please contact me at (555) 555-5555

Sincerely,

(Name and Title of Company Officer)

9.0 SITE CONTROL

This section outlines the means by which TtNUS will delineate work zones and use these work zones in conjunction with decontamination procedures to prevent the spread of contaminants into previously unaffected areas of the site. It is anticipated that a three-zone approach will be used during work at this site: exclusion zone, contamination reduction zone, and support zone. It is also anticipated that this control measure will be used to control access to site work areas. Use of such controls will restrict the general public from accessing operations, minimize the potential for the spread of contaminants, and protect individuals who are not cleared to enter the work areas.

9.1 EXCLUSION ZONE

The exclusion zone will be the areas of known or anticipated buried drums, those areas of the site with known or suspected contamination, and any other areas identified as a result of site characterization and monitoring. For administrative convenience and until otherwise determined that hazards are more localized, the exclusion zone will at a minimum be the area within the fenced portions of Site 43. This area may be expanded or minimized based on the results of site and perimeter monitoring. Identified exclusion zones will be delineated using barrier tape, cones and /or drive poles, and postings to inform and direct facility personnel.

9.1.1 Exclusion Zone Clearance

A pre-startup site visit will be conducted by members of the field team in an effort to identify proposed subsurface investigation locations, conduct utility clearances, and provide up-front notices concerning scheduled activities within the facility. In all cases, no subsurface activities will proceed without utility clearance. In the event that a utility is struck during a subsurface investigative activity, the emergency numbers provided in Table 2-1 will be notified.

9.2 CONTAMINATION REDUCTION ZONE

The contamination reduction zone (CRZ) will be a buffer area between the exclusion zone and any area of the site where contamination is not suspected. This area will also serve as a focal point in supporting exclusion zone activities. This area will be delineated using barrier tape, cones, and postings to inform and direct facility personnel. Decontamination will be conducted at a central location. All equipment potentially contaminated will be bagged and taken to that location for decontamination.

9.3 SUPPORT ZONE

The support zone for this project will include a staging area where site vehicles will be parked, equipment will be unloaded, and where food and drink containers will be maintained. In all cases, the support zones will be established at areas of the site where exposure to site contaminants would not be expected during normal working conditions or foreseeable emergencies.

9.4 SAFE WORK PERMITS

All exclusion zone work conducted in support of this project will be performed using Safe Work Permits to guide and direct field crews on a task by task basis. An example of the Safe Work Permit to be used is illustrated in Figure 9-1. Partially completed Permits for the work to be performed are included in Attachment IV. The daily meetings conducted at the site will further support these work permits. This effort will ensure all site-specific considerations and changing conditions are incorporated into the planning effort. All permits will require the signature of the FOL and SSO.

Use of these permits will provide the communication line for reviewing protective measures and hazards associated with each operation. This HASP will be used as the primary reference for selecting levels of protection and control measures. The work permit will take precedence over the HASP when more conservative measures are required based on specific site conditions. In support of this HASP, site-specific Hazard Communication, Respiratory Protection, PPE, and other programs will be developed and implemented prior to commencing site activities. The information and guidance in these documents will be reviewed with personnel during site-specific training.

FIGURE 9-1
SAFE WORK PERMIT

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General **Job** Scope (To be filled in by person performing work)

I. Work limited to the following (description, area, equipment used): _____

II. Names: _____

III. Onsite Inspection conducted ☐ Yes ☐ No Initials of Inspector _____

TtNUS NAS Pensacola

SECTION II: General Safety Requirements (To be filled in by permit issuer)

IV. Protective equipment required

Level D ☐ Level B ☐
Level C ☐ Level A ☐
Detailed on Reverse

Respiratory equipment required

Full face APR	☐	Escape Pack	☐
Half face APR	☐	SCBA	☐
SUA-PAC SAR	☐	Bottle Trailer	☐
Skid Rig	☐	None	☐

Modifications/Exceptions: _____

V. Chemicals of Concern | Action Level(s) | Response Measures

_____ _____ _____
_____ _____ _____

VI. Additional Safety Equipment/Procedures

Hardhat	☐ Yes	☐ NO	Hearing Protection (Plugs/Muffs)	☐ Yes	☐ No
Safety Glasses	☐ Yes	☐ No	Safety belt/harness	☐ Yes	☐ No
Chemical/splash goggles	☐ Yes	☐ No	Radio	☐ Yes	☐ No
Splash Shield	☐ Yes	☐ No	Barricades	☐ Yes	☐ No
Splash suits/coveralls	☐ Yes	☐ No	Gloves (Type)	☐ Yes	☐ No
Steel toelshank Workboots	☐ Yes	☐ No	Work/rest regimen	☐ Yes	☐ No

Modifications/Exceptions: _____

VII. Procedure review with permit acceptors

	Yes	NA		Yes	NA
Safety shower/eyewash (Location & Use)	☐	☐	Emergency alarms	☐	☐
Procedure for safe job completion	☐	☐	Evacuation routes	☐	☐
Contractor tools/equipment inspected	☐	☐	Assembly points	☐	☐

VIII. Equipment Preparation

	Yes	NA
Equipment drained/depressured	☐	☐
Equipment purged/cleaned	☐	☐
Isolation checklist completed	☐	☐
Electrical lockout required/field switch tested	☐	☐
Blinds/misalignments/blocks & bleeds in place	☐	☐
Hazardous materials on walls/behind liners considered..	☐	☐

IX. Additional Permits required (Hot work, confined space entry, excavation etc.) ☐ Yes ☐ No
If yes, *fill* out appropriate *section(s)* on safety *work permit* addendum

X. Special instructions, precautions: _____

Permit Issued by: _____ Permit Accepted by: _____
Job Completed by: _____ Date: _____

9.5 SITE VISITORS

Site visitors for the purpose of this document are identified as representing the following groups of individuals:

- Personnel invited to observe or participate in operations by TtNUS
- Regulatory personnel (DOD, OSHA, etc.)
- Southern Division Navy Personnel
- Other authorized visitors

It is not anticipated that this operation will result in a large number of site visitors. However, as some visitors can reasonably be expected, the following requirements will be enforced:

- All site visitors will be routed to the FOL, who will sign them in to the field logbook. Information to be recorded in the logbook will include the individual's name (proper identification required), who they represent, and purpose for the visit.

- All site visitors will be required to produce the necessary information supporting clearance onto the site. This includes information attesting to applicable training (40-hours of HAZWOPER training required for all Southern Division Navy personnel) and medical surveillance, as stipulated in Section 8 of this document. In addition, to enter the site's operational zones during planned activities, all visitors will be required to first go through site-specific training covering the topics stipulated in Section 8.2 of this document.

NOTE: All site visitors will be escorted at all times while at the site.

Following this, the site visitor will be permitted to enter the site and applicable operational areas. All visitors are required to observe the protective equipment and site restrictions in effect at the area of their visit. Any and all visitors not meeting the requirements as stipulated in this plan for site clearance will not be permitted to enter the site operational zones during planned activities. Any incidence of unauthorized site visitation will cause all onsite activities to be terminated until that visitor can be removed. Removal of unauthorized visitors will be accomplished with support from the Base Contact, if necessary. At a minimum, the Navy On-site Representative will be notified of any unauthorized visitors.

9.6 SITE SECURITY

Site security will be accomplished using TtNUS field personnel. TtNUS will retain complete control over active operational areas. As this activity takes place at Navy facilities open to public access, and along public highways, the first line of security will take place using traffic permit restrictions, exclusion zone barriers, and any existing barriers at the sites to restrict the general public. The buried drum area is currently fenced which provides a further line of site security. Another line of security will take place at the work site referring interested parties to the FOL or designee. The FOL will serve as a focal point for all non-project interested parties, and serve as the final line of security and the primary enforcement contact.

9.7 SITE MAP

Once the areas of contamination, access routes, topography, and dispersion routes are determined, a site map will be generated and adjusted as site conditions change. When possible, these maps will be posted to illustrate up-to-date collection of contaminants and adjustment of zones and access points.

9.8 BUDDY SYSTEM

Personnel engaged in on site activities will practice the "buddy system" to ensure the safety of all personnel involved in this operation.

9.9 MATERIAL SAFETY DATA SHEET (MSDS) REQUIREMENTS

TtNUS and subcontractor personnel will provide MSDSs for all chemicals brought on site. The contents of these documents will be reviewed by the SSO with the user(s) of the chemical substances prior to any actual use or application of the substances on site. A chemical inventory of all chemicals used on site will be developed using the Health and Safety Guidance Manual. The MSDSs will then be maintained in a central location (i.e., temporary office) and will be available for anyone to review upon request.

9.10 COMMUNICATION

As personnel will be working in proximity to one another during field activities, a supported means of communication between field crews members will not be necessary. During site-specific and SCBA/Airline training, personnel will be reminded of some of the difficulties and issues associated with communicating while wear breathing air apparatus. External communication will be accomplished by using the telephones at predetermined and approved locations. External communication will primarily be used for the purpose of resource and emergency resource communications.

10.0 SPILL CONTAINMENT PROGRAM

10.1 SCOPE AND APPLICATION

It is anticipated that quantities of bulk potentially hazardous materials (greater than 55-gallons) may be handled during some of the site activities conducted as part of the scope of work. Independent of the contents of any drums/containers that are excavated, at a minimum Investigative-Derived Wastes (IDW) will be produced. Depending on the nature and identity of site contaminants that are identified, spills of drums/containers may constitute a danger to human health or the environment. As site contaminants are identified and characterized, the Spill Management Program will be modified to reflect the nature of the contaminants. Further discussion regarding specific spill containment actions and procedures are presented in the Drum/Container Management Plan included as Attachment VI.

10.2 POTENTIAL SPILL AREAS

Potential spill areas will be periodically monitored in an ongoing attempt to prevent and control further potential contamination of the environment. Currently, limited areas are vulnerable to this hazard including:

- Resource deployment
- Waste transfer
- Central staging

Excavated drums/containers will be labeled with the site name and address and the date the container was excavated. Samples will be collected and analyzed to characteriied the material and determine appropriate additional actions. Once drums of IDW have been characterized they can be removed from the staging area and disposed of in accordance with Federal, State and local regulations. Non-IDW drums will remain at the site for further action.

10.3 LEAK AND SPILL DETECTION

Areas where drums or other containers are handled, sampled, and stored will be periodically inspected during working hours to visually determine if containers are leaking. If a liquid leak is detected, the contents will be transferred into a new container using a hand pump. The leak will then be collected and contained using absorbents such as Oil-dry, vermiculite, or sand. The absorbents will be stored at the vulnerable areas in a conspicuously marked drum. This used absorbent material will also be containerized for disposal pending analysis. All inspections will be documented in the project logbook.

10.4 PERSONNEL TRAINING AND SPILL PREVENTION

All personnel will be instructed in the procedures for incipient spill prevention, containment, and collection of hazardous materials in the site-specific training. The FOL and the SSO will serve as the Spill Response Coordinators for this operation, should the need arise.

10.5 SPILL PREVENTION AND CONTAINMENT EQUIPMENT

The following represents the minimum equipment which will be maintained at the staging area at all times for the purpose of supporting this Spill Prevention/Containment Program.

- Sand, clean fill, vermiculite, or other noncombustible absorbent (oildty)
- Drums (55-gallon U.S. DOT 17-E or 17-H)
- Shovels, rakes, and brooms
- Hand operated drum pump with hose
- Labels
- Drum Patch kit

10.6 SPILL CONTROL PLAN

This section describes the procedures the TtNUS field crew members will employ upon the detection of a spill or leak.

1. Notify the SSO or FOL immediately upon detection of a leak or spill. Activate emergency alerting procedures for that area to remove all non-essential personnel.

2. Employ the personal protective equipment stored at the staging area. Take immediate actions to stop the leak or spill by plugging or patching the container or raising the leak to the highest point in the vessel. Spread the absorbent material in the area of the spill, covering it completely.

3. Transfer the material to a new vessel; collect and containerize the absorbent material. Label the new container appropriately. Await analyses for treatment and disposal options.

4. Recontainerize spills, including top cover impacted by the spill. Await test results for treatment or disposal options.

It is not anticipated that a spill will occur that the field crew cannot handle. Should this occur, notification of the appropriate Emergency Response agencies will be carried out by the FOL or SSO in accordance with the procedures discussed in Section 2.0 of this HASP.

11.0 CONFINED-SPACE ENTRY

It is not anticipated, under the proposed scope of work, that confined space and permit-required confined space activities will be conducted. Therefore, personnel under the provisions of this HASP are not allowed, under any circumstances, to enter any confined spaces. A confined space is defined as an area which has one or more of the following characteristics:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry).
- Is not designed for continuous employee occupancy.

A Permit-Required Confined Space is one that:

- Contains or has a potential to contain a hazardous atmosphere.
- Contains a material that has the potential to engulf an entrant.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.
- Contains any other recognized, serious, safety or health hazard.

For further information on confined space, consult the Health and Safety Guidance Manual or call the PHSO. If confined space operations are to be performed as part of the scope of work, detailed procedures and training requirements will have to be addressed.

12.0 MATERIALS AND DOCUMENTATION

The TtNUS FOL shall ensure the following materials/documents are taken to the project site and used when required.

- A complete copy of this HASP
- Health and Safety Guidance Manual
- Incident Reports
- Medical Data Sheets
- Material Safety Data Sheets for all chemicals brought on site, including decon solution, fuels, sample preservations, calibration gases, etc.
- Follow-up Reports (to be completed by the FOL)
- A full size OSHA Job Safety and Health Poster
- Training/Medical Surveillance Documentation Form (blank)
- First-Aid Supply Usage Form
- Emergency Reference Form (Section 2.0, extra copy for posting)

12.1 MATERIALS TO BE POSTED AT THE SITE

The following documentation is to be posted at the site for quick reference purposes. In situations where posting these documents is not feasible, (such as no office trailer), these documents should be separated and immediately accessible.

Chemical Inventory Listing - This list represents all chemicals brought on site, including decontamination solutions, sample preservations, fuel, etc.. This list should be posted in a central area.

Material Safety Data Sheets (MSDS) - The MSDSs should also be in a central area accessible to all site personnel. These documents should match all the listings on the chemical inventory list for all substances employed on site. It is acceptable to have these documents within a central folder and the chemical inventory as the table of contents.

The OSHA Job Safety & Health Protection Poster - this poster, as directed by 29 CFR 1903.2 (a)(1), should be conspicuously posted in places where notices to employees are normally posted. Each FOL shall ensure that this poster is not defaces, altered, or covered by other material.

Site Clearance Posting - This list is found within the training section of the HASP (See Figure 8-2). This list identifies all site personnel, dates of training (including site-specific training), and medical surveillance. The lists indicates not only clearance but also status. If personnel do not meet these requirements, they do not enter the site while site personnel are engaged in activities.

Emergency Phone Numbers and Directions to the Hospital(s) - This list of numbers and directions will be maintained at all phone communications points and in each site vehicle.

Medical Data Sheets/Cards - Medical Data Sheets will be filled out by on site personnel and filed in a central location. The Medical Data Sheet will accompany any injury or illness requiring medical attention to the medical facility. a copy of this sheet or a wallet card will be given to all personnel to be carried on their person.

Hearing Conservation Standard (29 CFR 1910.95) - this standard will be posted anytime hearing protection or other noise abatement procedures are employed.

Personnel Monitoring - All results generated through personnel sampling (levels of airborne toxins, noise levels, etc.) will be posted to inform individuals of the results of that effort.

Placards and Labels - Where chemical inventories have been separated because of quantities and incompatibilities, these areas will be conspicuously marked using DOT placards and acceptable (Hazard Communication 29 CFR 1910.1200(f)) labels.

The purpose, as stated above, is to allow site personnel quick access to this information. Variations concerning location and methods of presentation are acceptable, providing the objection is accomplished.

13.0 GLOSSARY

ACGIH	American Conference of Governmental Industrial Hygienists
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action - Navy
CNS	Central Nervous System
CTO	Contract Task Order
CZR	Contamination Reduction Zone
DOD	United States Department of Defense
eV	electron Volts
FDOT	Florida Department of Transportation
FOL	Field Operations Leader
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSM	Health and Safety Manager
IDLH	Immediate Dangerous to Life or Health
IDW	Investigative-Derived Wastes
LEULFL	Lower Explosive Limit / Lower Flammable Limit
MSDA	Material Safety Data Sheets
N/A	Not Available
NAS	Naval Air Station
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicity Program
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
PEL	Permissible Exposure Limit
PID	Photoionization Detector
PPE	Personal Protective Equipment
SAP	Sampling and Analyses Plan
SOPS	Standard Operating Procedures
SSO	Site Safety Officer
TBD	To be determined
TLV	Threshold Limit Value
TOM	Task Order Manager
TWA	Time-Weighted Average
WP	Work Plan

ATTACHMENT I

INJURY/ILLNESS PROCEDURE AND REPORT FORM

CASE NO. _____

TETRA TECH NUS, INC.

INJURY/ILLNESS PROCEDURE
WORKER'S COMPENSATION PROGRAM

WHAT YOU SHOULD DO IF YOU ARE INJURED OR DEVELOP AN ILLNESS AS A RESULT OF YOUR EMPLOYMENT:

- If injury is minor, obtain appropriate first aid treatment.
- If injury or illness is severe or life threatening, obtain professional medical treatment at the nearest hospital emergency room.
- If incident involves a chemical exposure on a project work site, follow instructions in the Health & Safety Plan.
- Immediately report any injury or illness to your supervisor or office manager. In addition, you must contact your Human Resources representative, Marilyn Diethom at **(412) 921-8475,** and the Corporate Health and Safety Manager, Matt Soltis at **(412) 921-8912** within **24** hours. You will be required to complete an Injury/Illness Report (attached). You may also be required to participate in a more detailed investigation from the Health Sciences Department.
- If further medical treatment is needed, The Hartford Network Referral Unit will furnish a list of network providers customized to the location of the injured employee. These providers are to be used for treatment of Worker's Compensation injuries subject to the laws of the state in which you work. Please call Marilyn Diethom at **(412) 921-8475** for the number of the Referral Unit.

ADDITIONAL QUESTIONS REGARDING WORKER'S COMPENSATION:

Contact your local human resources representative, corporate health and safety coordinator, or Corporate Administration in Pasadena, California, at **(626) 351-4664.**

Worker's compensation is a state-mandated program that provides medical and disability benefits to employees who become disabled due to job related injury or illness. Tetra Tech, Inc. and its subsidiaries (Tetra Tech or Company) pay premiums on behalf of their employees. The type of injuries or illnesses covered and the amount of benefits paid are regulated by the state worker's compensation boards and vary from state to state. Corporate Administration in Pasadena is responsible for administering the Company's worker's compensation program. The following is a general explanation of worker's compensation provided in the event that you become injured or develop an illness as a result of your employment with Tetra Tech or any of its subsidiaries. Please be aware that the term used for worker's compensation varies from state to state.

WHO IS COVERED:

All employees of Tetra Tech, whether they are on a full-time, part-time or temporary status, working in an office or in the field, are entitled to worker's compensation benefits. All employees must follow the above injury/illness reporting procedures. Consultants, independent contractors, and employees of subcontractors are **not** covered by Tetra Tech's Worker's Compensation plan.

CASE NO. _____

WHAT IS COVERED:

If you are injured or develop an illness caused by your employment, worker's compensation benefits are available to you subject to the laws of the state you work in. Injuries do not have to be serious; even injuries treated by first aid practices are covered and must be reported. Please note that if you are working out-of-state and away from your home office, you are still eligible for worker's compensation benefits.

CASE NO. _____

TETRA TECH NUS, INC.
INJURY/ILLNESS PROCEDURE
WORKER'S COMPENSATION PROGRAM

To: Corporate Health and Safety Manager
Human Resource Administrator

Prepared by: _____

Position: _____

Project Name: _____

Office: _____

Project No. _____

Telephone: _____

Information Regarding Injured or Ill Employee:

Name: _____

Office: _____

Home address: _____

Gender: M ☐ F ☐ No. of dependents: _____

_____

Marital status: _____

Home telephone: _____

Date of birth: _____

Occupation (regular job title): _____

Social Security No.: _____

Department: _____

Date of Accident: _____

Time of Accident: _____

Location of Accident Was place of accident or exposure on employer's premises Yes ☐ No ☐

Street address: _____

City, state, and zip code: _____

county: _____

Narrative Description of How Accident Occurred: (Be specific. Explain what the employee was doing and how the accident occurred.)

TETRA TECH, INC.
INJURY/ILLNESS REPORT

Did employee die? Yes ☐ No ☐
Was employee performing regular job duties? Yes ☐ No ☐
Was safety equipment provided? Yes ☐ No ☐
Was safety equipment used? Yes ☐ No ☐
Note: Attach any police reports or related diagrams to this accident report.

Witness(es):
Name:
Address:
Telephone:

Describe the Illness or Injury and Part of Body Affected:

Name the Object or Substance which Directly Injured the Employee:

Medical Treatment Required:	Lost Work Days:
☐ No ☐ Yes ☐ First Aid Only	☐ No. of Lost Work Days _____
Physician's Name: _____	Last Date Worked _____
Address: _____	Time Employee Left Work _____
Hospital or Office Name: _____	Date Employee Returned to Work _____
Address: _____	☐ No. of Restricted Work Days _____
_____	☐ None
Telephone No.: _____	

Corrective Action(s) Taken by Unit Reporting the Accident:

Corrective Action Still to be Taken (by whom and when):

Name of Tetra Tech employee the injury or illness was first reported to: _____

Date **of** Report: _____ Time of Report: _____

Project or Office Manager				
Site Safety Coordinator				
Injured Employee				

To be completed by Human Resources:

Date of hire: Hire date in current job:

Wage information: $ per (hour, day, week, or month)

Position at time of hire:

Shift hours:

State in which employee was hired:

Status: ☐ Full-time ☐ Part-time Hours per week: Days per week:

Temporary job end date:

To be completed during report to workers' compensation insurance carrier:

Date reported: Reported by:

TeleClaim phone number:

TeleClaim account number:

Location code:

Confirmation number:

Name of contact:

Field office of claims adjuster:

ATTACHMENT II

TICK CONTROL
AND
LYME DISEASE

TICK CONTROL
AND
LYME DISEASE

The Occurrence of Lyme disease has become a worldwide problem since its identification in 1976. This disease is characteristically recognized as being transmitted by ticks, which may be encountered by field personnel while working at this site. As a result, this discussion has been included with this Health and Safety Plan to provide for adequate recognition, evaluation, and control efforts to minimize the Occurrence and effects of this potential hazard.

The discovery of Lyme disease is credited to Dr. Allen Steere of Yale University Medical School, and is named after the community where it was (reportedly) first encountered, Lyme, Connecticut. This disease can be transmitted to man through the bite of ticks that are infected with a cork screw-shaped microbe (spirochete). The spread of this disease has been so rapid that in 1984 it surpassed Rocky Mountain Spotted fever as the most common tick-borne disease in the United States. In this country, most of the incidents of this disease have been recorded in the Northeast, and the tick species most commonly attributed with its spread is the deer tick.

Recognition

This hazard potential exists primarily in the spring and summer months, as these are the seasons that tick populations and activity flourish. In fact, 90 percent of the reported cases have occurred from early June through September. Also, this concern exists primarily in heavily vegetated areas. Therefore, recognition of these factors can aid in the awareness and control of this threat.

To aid in the recognition and identification of these insects, an example illustration of the tick species common to the region where this site is located has been included with this discussion. This species (the American Dog tick) is common in the eastern half of the United States, and typically exists in areas covered with grass or underbrush. These insects will attach themselves to animals (including man) that pass through the area and rub against them. After finding a host, the tick inserts its mouthparts and sucks blood until it is fully engorged. This requires a time period of three to twelve days, then the tick will drop off. In addition to Lyme disease concerns, this tick has also been identified as a transmitter of Rocky Mountain Spotted Fever, and the organisms of tularemia and possibly relapsing fever. The wounds left by tick bites can be painful, and can also have a paralyzing effect commonly referred to as tick paralysis.

The earliest symptom of the onset of this disease is the occurrence of an unusual red skin rash. This is commonly the first indication since it has been evidenced that many persons who have contracted this disease were, in fact, unaware that they had been bitten. This rash can appear at the site of the bite anywhere from several days to a few weeks after the bite. It typically starts as a small red spot, and then expands as the spirochetes expand from the bite location. Rash sizes can vary, but have been most commonly associated in a 2 to 3 inch diameter size range. This rash will fade (with or without treatment) after a few weeks. Close inspection is necessary to detect this symptom as the rashes are easy to miss because they're often very faint. Body sites where rashes frequently occur include the thigh areas, groin, and armpits. Also, it is not uncommon for a rash to develop in more than one place.

Other early symptoms include profound fatigue, a stiff neck, and flu-like symptoms such as headache, chills, fever, and muscle aches. Recognition of the onset of any of these symptoms is important since tick bites do not always produce a rash. If left untreated, the disease will progress to its second stage within weeks or months after the infection. This stage involves affects to the heart and nervous system. A common second stage symptom is a paralysis on one or both sides of the face. Others include severe headache, encephalitis, or meningitis. The third and final stage involves the development of chronic inflammatory arthritis, which can occur up to a year or more after the bite.

Evaluation

Evaluation of this hazard potential principally involves field personnel performing close self-inspections for the presence of ticks each time they leave the site. This should involve careful examination, especially of the individuals' heads. Personnel should be aware that when a tick attaches itself to its host, it inserts its entire head under the surface of the skin.

Control

Control of this threat involves several components. First, field personnel must be aware of the climate and area conditions which are commonly associated with being conducive to tick infestation. Second, when working in or walking through potential infested areas, personnel must ensure that they do not have exposed body parts (i.e. at least long sleeved shirts and long pants, particularly when protective coveralls are not worn). In heavily vegetated areas where infestation is likely, Tyvek coveralls will be required to minimize this hazard potential. Also, several commercial products have been demonstrated as being effective in repelling ticks. Examples include Permanone, Off!, and Cutter. These types of repellents will be used at the direction and discretion of the Tetra Tech NUS Health and Safety Officer, and only in accordance and observation of manufacturer's recommendations. In most instances, however, such repellents are typically applied to the outside surfaces of clothing (and not directly onto the skin), and should be applied also to shoe tops, socks, pants cuffs, and other areas most susceptible to ticks.

Tick Removal

In the event that a tick is discovered to be attached to a member of the field team, timely removal of the insect is critical to reducing the potential for contracting the disease. According to available information and research, there is apparently a grace period of at least a few hours from the time of the bite before the tick transmits the microbe (the spirochetes are not present in the mouth parts of the tick). However, the incident of a tick bite is frequently unnoticed, and the discovery of the tick may not occur until after this suspected grace period has already elapsed. Therefore, timely removal is very important. The preferred method of tick removal is to pull it out using tweezers or small forceps. In this method, the tick should be grasped as close to the mouth as possible, and then pulled steadily upward. Care must be exercised so as not to pull in a jerking motion as this can result in the head becoming detached. After the tick has been removed, disinfect the bite with rubbing alcohol or povidone iodine (Betadine). The tick must not be handled as the microbes can enter the body through any breaks in intact skin. The bite should be checked occasionally for at least a two-week period to see if a rash forms. If it does, medical attention must be promptly sought.

In order to provide for proper and timely response to the occurrence of a tick bite, the SSO will ensure that the site First Aid kit is properly equipped with medical forceps and rubbing alcohol, in addition to the standard kit contents. Also, an adequate supply of commercial insect (tick) repellents will be maintained on-site, and all personnel will be trained in its proper application and will be required to use it, at the direction of FOL.

ATTACHMENT III

EQUIPMENT INSPECTION CHECKLIST

EQUIPMENT INSPECTION

COMPANY:_____ UNIT NO._____

FREQUENCY: Inspect daily, document prior to use and as repairs are needed.

Inspection Date: ____/____/____ Time: _____ Equipment Type:_____
(e.g., bulldozer)

	Good	Need Repair	N/A
Tires or tracks	☐	☐	☐
Hoses and belts	a	a	a
Cab, mirrors, safety glass	☐	☐	☐
- Turn signals, lights, brake lights, etc. (front/rear) for equipment approved for highway use?	a	a	a
- Is the equipment equipped with audible back-up alarms and back-up lights?	☐	☐	☐
Horn and gauges	a	☐	☐
Brake condition (dynamic, park, etc.)	☐	☐	a
Fire extinguisher (Type/Rating -_____)	☐	☐	☐
Fluid Levels:			
- Engine oil	☐	a	☐
- Transmission fluid	a	☐	☐
- Brake fluid	☐	☐	☐
- Cooling system fluid	a	a	a
- Windshield wipers	a	a	☐
- Hydraulic oil	a	☐	☐
Oil leak/lube	☐	a	☐
Coupling devices and connectors	☐	D	☐
Exhaust system	a	☐	a
Blade/boom/ripper condition	☐	a	☐
Accessways: Frame, hand holds, ladders, walkways (non-slip surfaces), guardrails?	☐	☐	a
Power cable and/or hoist cable	☐	☐	☐
Steering (standard and emergency)	a	☐	☐

Safetv **Guards:**	Yes	No
– Around rotating apparatus (belts, pulleys, sprockets, spindles, drums, flywheels, chains) all points of operations protected from accidental contact?_____	a	☐
– Hot pipes and surfaces exposed to accidental contact?_____	☐	a
– All emergency shutoffs have been identified and communicated to the field crew?_____	a	☐
– Have emergency shutoffs been field tested? _____	☐	a
– Results?_____	☐	☐
– Are any structural members bent, rusted, or otherwise show signs of damage?_____	a	a
– Are fueling cans used with this equipment approved type safety cans?_____	a	a

- Have the attachments designed for use (as per manufacturer's recommendation) with this equipment been inspected and are considered suitable for use? _____ a a

Portable Power Tools:

- Tools and Equipment in Safe Condition? _____ ❒ ❒
- Saw blades, grinding wheels free from recognizable defects (grinding wheels have been sounded)? _____ ❒ ❒
- Portable electric tools properly grounded? _____ ❒ ❒
- Damage to electrical power cords? _____ ❒ ❒
- Blade guards in place? _____ ❒ ❒
- Components adjusted as per manufacturers recommendation? _____ ❒ ❒

Cleanliness:

- Overall condition (is the decontamination performed prior to arrival on-site considered acceptable)? _____
- Where was this equipment used prior to its arrival on site? _____
- Site Contaminants of concern at the previous site? _____
- Inside debris (coffee cups, soda cans, tools and equipment) blocking free access to foot controls? _____

Operator Qualifications (as applicable for all heaw equipment):

- Does the operator have proper licensing where applicable, (e.g., CDL)? _____
- Does the operator, understand the equipments operating instructions? _____
- Is the operator experienced with this equipment? _____
- Does the operator have emotional and/or physical limitations which would prevent him/her from performing this task in a safe manner? _____
- Is the operator 21 years of age or more? _____

Identification:

- Is a tagging system available, for positive identification, for tools removed from service? ___

Additional Inspection Required Prior to Use On-Site

	Yes	No
Does equipment emit noise levels above 90 decibels?	❒	❒
If so, has an 8-hour noise dosimetry test been performed?	a	a

- Results of noise dosimetry: _____
- Defects and repairs needed: _____
- General Safety Condition: _____
- Operator or mechanic signature: _____

Approved for Use: ❒ Yes ❒ No

_____
Site Safety Officer Signature

ATTACHMENT IV

SAFE WORK PERMITS

SAFE WORK PERMIT FOR
MULTI-MEDIA SAMPLING

SAFE WORK PERMIT FOR MULTI-MEDIA SAMPLING

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope

I. Work limited to the following (description, area, equipment used): Multi-media sampling, including groundwater and soil (surface and subsurface). This task also includes sampling for IDW.

II. Required Monitoring Instruments: FID and PID. LEL/O2, and radiation survey meter. Colorimetric tubes may also be used as necessary to identify and characterized site contaminants.

III. Field Crew: _____

IV. On-site Inspection conducted ☐ Yes ☐ No Initials of Inspector _____

TtNUS NAS Pensacola

SECTION II: General Safety Requirements (To be filled in by permit issuer)

IV. Protective equipment required

Level D ☐ Level B ☒
Level C ☐ Level A ☐
Detailed on Reverse

Respiratory equipment required

Full face APR	O	Escape Pack	☐
Half face APR	☐	Airline/SCBA	☒
SKA-PACSAR	☐	Bottle trailer	☐
Skid Rig	☐	None	☐

Modifications/Exceptions: Until monitoring can indicate otherwise, initial sampling will be performed in Level B to include sleeved shirt and long pants. safety shoes, hardhat chemical splash protection, airline/SCBA, nitrile outer gloves with surgical-style inner gloves, impermeable boot covers.

V.

Chemicals of Concern	Action Level(s)	Response Measures
	0 2 levels <19.5% or >23.5%	Suspend site activities and
	LEL levels 4 0 % or >10%	report to an unaffected area.

VI. Additional Safety Equipment/Procedures

Hard-hat	☒ Yes	☐ No	Hearing Protection (Plugs/Muffs)	☒ Yes	☐ No
Safety Glasses	☐ Yes	☒ No	Safety belt/harness	☐ Yes	☒ No
Chemical/splash goggles	☐ Yes	☒ No	Radio	☐ Yes	☒ No
Splash Shield	☐ Yes	☒ No	Barricades	☐ Yes	☒ No
Splash suits/coveralls	☒ Yes	☐ No	Gloves (Type - Nitrile)	☒ Yes	☐ No
Steel toe Work shoes or boots	☒ Yes	☐ No	Work/rest regimen	☒ Yes	☐ No

Modifications/Exceptions: Tape joints (wrists. ankles, etc.) and inspect PPE before beginning on-site activities. Work/rest regimen to be determined by SSO & site personnel

VII. Procedure review with permit acceptors

	Yes	NA		Yes	NA
Safety shower/eyewash (Location & Use)	☐	☐	Emergency alarms	☒	☐
Procedure for safe job completion	☒	☐	Evacuation routes	☒	☐
Contractor tools/equipment/PPE inspected	☐	☐	Assembly points	☒	☐

VIII. Equipment Preparation

	Yes	NA
Equipment drained/depressurized	☐	☐
Equipment purged/cleaned	☐	☐
Isolation checklist completed	O	n
Electrical lockout required/field switch tested	☐	☐
Blinds/misalignments/blocks & bleeds in place	☐	☐
Hazardous materials on walls/behind liners considered	☐	☐

IX. Additional Permits required (Hot work, confined space entry, excavation etc.) ☐ Yes ☐ No

If yes, complete permit required or contact Health Sciences, Pittsburgh Office

X. Special instructions, precautions: _____

Permit Issued by: _____ Permit Accepted by: _____

SAFE WORK PERMIT FOR
INITIAL ON-SITE SURVEY (SITE CHARACTERIZATION)

SAFE WORK PERMIT FOR
INITIAL ON-SITE SURVEY (SITE CHARACTERIZATION)

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General **Job** Scope

I. Work limited to the following (description, area, equipment used): Initial site entry and survey to characterize site contaminants.

II. Required Monitoring Instruments: FID and PID, LEL/O2, and radiation survey meter. Colorimetric tubes may also be used as necessary to identify and characterized site contaminants.

III. Field Crew: _____

IV. On-site Inspection conducted ☐ Yes ☐ No Initials of Inspector _____

TtNUS NAS Pensacola

SECTION II: General Safety Requirements (To be filled in by permit issuer)

IV. Protective equipment required

Level D ☐ Level B ☒
Level C ☐ Level A ☐
Detailed on Reverse

Respiratory equipment required

Full face APR	☐	Escape Pack	☐
Half face APR	☐	Airline/SCBA	☒
SKA-PACSAR	☐	Bottle trailer	☐
Skid Rig	☐	None	☐

Modifications/Exceptions: Minimum requirement include sleeved shirt and long pants, safety shoes, hardhat chemical splash protection, airline/SCBA, nitrile outer gloves with surgical-style inner gloves, impermeable boot covers. Hearing protection when working around operatinn equipment.

V.

Chemicals of Concern	Action Level(s)	Response Measures
	0 2 levels <19.5% or >23.5%	Suspend-site activities and
	LEL levels <10% or >10%	report to an unaffected area.

VI. Additional Safety Equipment/Procedures

Hard-hat	☒ Yes	☐ No	Hearing Protection (Plugs/Muffs)	☒ Yes	☐ No
Safety Glasses	☐ Yes	☒ No	Safety belt/harness	☐ Yes	☒ No
Chemical/splash goggles	☐ Yes	☐ No	Radio	☐ Yes	☒ No
Splash Shield	☐ Yes	☒ No	Barricades	☐ Yes	☒ No
Splash suits/coveralls	☒ Yes	☐ No	Gloves (Type - Nitrile)	☒ Yes	☐ No
Steel toe Work shoes or boots	☒ Yes	☐ No	Work/rest regimen	☒ Yes	☐ No

Modifications/Exceptions: Tape joints (wrists, ankles, etc.) and inspect PPE before beginning on-site activities. Work/rest regimen to be determined by SSO 8 site personnel

VII. Procedure review with permit acceptors

	Yes	NA		Yes	NA
Safety shower/eyewash (Location & Use)	☐	☐	Emergency alarms	☒	☐
Procedure for safe job completion	☒	☐	Evacuation routes	☒	☐
Contractor tools/equipment/PPE inspected	☐	☐	Assembly points	☒	☐

VIII. Equipment Preparation

	Yes	NA
Equipment drained/depressurized	☐	☐
Equipment purged/cleaned	☐	☐
Isolation checklist completed	☐	☐
Electrical lockout required/field switch tested	☐	☐
Blinds/misalignments/blocks 8 bleeds in place	☐	☐
Hazardous materials on walls/behind liners considered	☐	☐

IX. Additional Permits required (Hot work, confined space entry, excavation etc.) ☐ Yes ☐ No
If yes, complete permit *required or* contact Health Sciences, Pittsburgh Office

X. Special instructions, precautions: _____

Permit Issued by: _____ Permit Accepted by: _____

SAFE WORK PERMIT FOR EXCAVATION OF TEST PITS

SAFE WORK PERMIT FOR EXCAVATION OF TEST PITS

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope

I. Work limited to the following (description, area, equipment used): Excavation of test pits for the purpose of investigating geophysical anomalies. Buried drums will be excavated as part of this task.

II. Required Monitoring Instruments: FID and PID. LEL/O2, and radiation survey meter. Colorimetric tubes may also be used as necessary to identify and characterized site contaminants.

III. Field Crew: _____

IV. On-site Inspection conducted ☐ Yes ☐ No Initials of Inspector _____

TtNUS NAS Pensacola

SECTION II: General Safety Requirements (To be filled in by permit issuer)

IV. Protective equipment required

Level D ☐ Level B ☒
Level C ☐ Level A ☐
Detailed on Reverse

Respiratory equipment required

Full face APR ☐
Half face APR ☐
SKA-PACSAR ☐
Skid Rig ☐
Escape Pack ☐
Airline/SCBA (XI
Bottle trailer ☐
None ☐

Modifications/Exceptions: Minimum requirement include sleeved shirt and long pants, safety shoes, hardhat chemical splash protection. airline/SCBA, nitrile outer gloves with surgical-style inner gloves, impermeable boot covers. Hearing protection when working around operating equipment.

V.

Chemicals of Concern	Action Level(s)	Response Measures
	0 2 levels <19.5% or >23.5%	Suspend site activities and
	LEL levels <10% or >10%	report to an unaffected area.

VI. Additional Safety Equipment/Procedures

Hard-hat	☐ Yes	☐ No	Hearing Protection (Plugs/Muffs)	☒ Yes	☐ No
Safety Glasses	☐ Yes	☒ No	Safety belt/harness	☐ Yes	☒ No
Chemical/splash goggles	☐ Yes	☒ No	Radio	☐ Yes	☒ No
Splash Shield	☐ Yes	☒ No	Barricades	☐ Yes	☒ No
Splash suits/coveralls	☒ Yes	☐ No	Gloves (Type - Nitrile)	☒ Yes	☐ No
Steel toe Work shoes or boots	☒ Yes	☐ No	Work/rest regimen	☒ Yes	☐ No

Modifications/Exceptions: Tape ioints (wrists. ankles, etc.) and inspect PPE before beginning on-site activities. Work/rest regimen to be determined bv SSO & site personnel

VII. Procedure review with permit acceptors

	Yes	NA		Yes	NA
Safety shower/eyewash (Location & Use)	☐	☐	Emergency alarms	☒	☐
Procedure for safe job completion	☐	☐	Evacuation routes	☒	☐
Contractor tools/equipment/PPE inspected	☐	☐	Assembly points	☒	☐

VIII. Equipment Preparation

	Yes	NA
Equipment drained/depressurized	☐	☐
Equipment purged/cleaned	☐	☐
Isolation checklist completed	☐	☐
Electrical lockout required/field switch tested	☐	☐
Blinds/misalignments/blocks & bleeds in place	☐	☐
Hazardous materials on walls/behind liners considered	☐	☐

IX. Additional Permits required (Hot work, confined space entry, excavation etc.) ☐ Yes ☐ No
If yes, complete *permit* required or contact Health Sciences, Pittsburgh Office

X. Special instructions, precautions: Follow the attached SOP for test pit operations.

Permit Issued by: _____ Permit Accepted by: _____

ATTACHMENT V

HEAT STRESS

HEAT STRESS

Because many of the project tasks will be conducted in Level B PPE, some physically demanding field work is expected, and work is scheduled to take place during warmer months or periods, heat related disorders are a potential problem. Discussed below are the common heat-related disorders and the recommended actions to prevent heat stress.

Heat Related Disorders

Heat Rash

Also known as prickly heat, this condition affects the skin. It occurs in situations where the skin remains wet most of the time. The sweat ducts become plugged and a skin rash soon appears.

Signs and Symptoms

- Skin rash will appear on affected areas of the body.
- Tingling or prickling sensation will be felt on the affected areas.

Heat Cramps

Heat cramps are muscle pains, usually in the lower extremities, the abdomen, or both, that occur after profuse sweating with accompanying salt depletion. Heat cramps most often afflict people in good physical condition, who overwork in conditions of high temperature and humidity. Untreated, heat cramps may progress to heat exhaustion.

Signs and Symptoms

- Cramps in the extremities and abdomen that begin suddenly during vigorous activity. Heat cramps can be mild with only slight abdominal cramping and tingling in the extremities, but more commonly present intense and incapacitating pain in the abdomen and extremities.
- Respiration rate will increase, decreasing after the pain subsides.
- Pulse rate will increase
- Skin will be pale and moist.
- Body temperature will be normal
- Generalized weakness will be noted as the pain subsides.
- Loss of consciousness and airway maintenance are seldom problems with this condition.

Treatment for heat cramps is aimed at eliminating the exposure and restoring the loss of salt and water.

Heat Exhaustion

Heat exhaustion is a more severe response to salt and water loss, as well as an initial disturbance in the body's heat-regulations system. Like heat cramps, heat exhaustion tends to occur in people

working in hot environments. Heat exhaustion may progress to heat stroke. Treatment for heat exhaustion is similar in principle to that for heat cramps.

Signs and Symptoms

- Heat exhaustion may be accompanied present by a headache, fatigue, dizziness, or nausea with occasional abdominal cramping. More severe cases of heat exhaustion may result in partial or complete temporary loss of respiration and circulation.
- Sweating will be profuse.
- Pulse rate will be rapid and weak.
- Respiration rate will be rapid and shallow.
- The skin will be pale and clammy
- The body temperature will be normal or decreased.
- The person could be irritable and restless.

Heat Stroke

Heat stroke is caused by a severe disturbance in the body's heat-regulating system and is a profound emergency. The mortality rate for heat stroke ranges from 25 to 50 percent. It is most common in men over 40, especially alcoholics. It can also occur to people of any age having too much exposure to the sun or prolonged confinement in a hot atmosphere. Heat stroke comes on suddenly. As the sweating mechanism fails, the body temperature begins to rise precipitously, reaching 106°F (41°C) or higher within 10 to 15 minutes. If the situation is not corrected rapidly, the body cells – especially have very vulnerable cells to the brain–are literally cooked, and the central nervous system is irreversibly damaged. The treatment for heat stroke is aimed at maintaining vital functions and causing as rapid a decrease of body temperature as possible.

Signs and Symptoms

- The person's pulse will be strong and bounding.
- The skin will be hot, dry, and flushed.
- The worker may experience headache, dizziness, and dryness of mouth
- Seizures and coma can occur.
- Loss of consciousness and airway maintenance problems can occur.

These are only guidelines for heat related emergencies. Actual training in emergency medical care or basic first aid is recommended.

Controlling Heat Stress

The **SSO** shall visually monitor personnel to note for signs of heat stress. Field personnel will also be instructed to observe for symptoms of heat stress and methods on how to control it. One or more of the following control measures can be used to help control heat stress:

- Provide adequate liquids to replace lost body fluids. Personnel must replace water and salt lost from sweating. Personnel must be encouraged to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement.

- Replacement fluids can be commercial mixes such as Gatorade®.
- Establish a work regime that will provide adequate rest periods for cooling down. This may require additional shifts of workers.
- Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments.
- Breaks are to be taken in a cool rest area (77°F is best). Personnel shall not be assigned other tasks during rest periods
- Personnel shall remove impermeable protective garments during rest periods.
- Personnel shall be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress.

The heat stress of personnel onsite may be monitored utilizing biological monitoring.

One of the following biological monitoring procedures may be utilized by the SSO to monitor heat stress concerns.

- Heart rate (HR) shall be measured by the pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33 percent), while the length of rest period stays the same. If the pulse rate is 100 beats/minute at the beginning of the next rest period, the following work cycle should be shortened by 33 percent. The length of the initial work period will be determined by using the table below.

PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES

	Work Load		
Work-Rest Regimen	Light	Moderate	Heavy
Continuous	80.0°F	80.0°F	77.0°F
75% Work - 25% Rest, Each Hour	87.0°F	82.4°F	78.6°F
50% Work - 50% Rest, Each Hour	88.5°F	85.0°F	82.2°F
25% Work - 75% Rest, Each Hour	90.0°F	88.0°F	86.0°F

- Body temperature shall be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99°F. If it does, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. However, if the oral temperature exceeds 99.7°F at the beginning of the next rest period, the following work cycle shall be further shortened by 33 percent. OT should be measured at the end of the rest period to make sure that it has dropped below 99°F. At no time shall work begin with the oral temperature above 99°F.

NOTE: External temperatures in excess of those stated above shall be regarded as inclement weather. Work continuation, termination, or alteration of the work schedule will be at the discretion of the FOL or SSO.

ATTACHMENT VI

DRUM/CONTAINER MANAGEMENT PLAN

DRUM/CONTAINER MANAGEMENT PLAN

1.0 INTRODUCTION

Accidents may occur during handling of drums and other hazardous waste containers. Hazards include detonations, fires, explosions, vapor generation, and physical injury resulting from sudden pressure releases, moving heavy containers by hand and working around stacked drums, heavy equipment, and deteriorated drums. While these hazards may always be present, proper work practices such as minimizing drum handling, and using equipment or procedures that isolate workers from hazardous substances, can minimize the risks to site personnel.

This plan defines practices and procedures for safe handling of drums and other hazardous waste containers. It is intended to aid the Task Order Manager in setting up a waste container handling program. Information contained in this plan was obtained from the NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985), and OSHA 29 CFR 1910.120 (j), Handling drums and containers.

2.0 INSPECTION

The appropriate procedures for handling drums/containers depend on the contents. Thus, prior to any handling, drumslcontainers should be visually inspected to gain as much information as possible about their contents. The inspection should include looking for the following items:

- Symbols, words, or other marks on the drum indicating that its contents are hazardous, (e.g., radioactive, explosive, corrosive, toxic, flammable).
- Symbols, words, or other marks on a drum/container indicating that it contains discarded laboratory chemicals, reagents, or other potentially dangerous materials in small-volume individual containers.
- Signs of deterioration such as corrosion, rust, and leaks.
- Drum type (see Table 2-1 "Special Drum Types"). Drums and containers which do not meet these definitions will be addressed accordingly.
- Configuration of the drumhead (see Table 2-2)

Conditions in the immediate vicinity of the drums may provide information about drum contents and their associated hazards. Monitoring shall be conducted around the drums/containers using instruments for measuring atmospheric concentrations of contaminants (radiation survey meter, organic vapor monitors [PID and FID], and/or a LEL/O_2 meter).

The results of this survey can be used to classify the drums into preliminary hazard categories, for example:

- Radioactive
- Leaking/deteriorated
- Bulging
- Explosive/shock sensitive

- Contains small-volume individual containers of laboratory waste or other dangerous materials.
- Non-hazardouswaste

Note: This preliminary assessment is impacted by the limitation of the instruments employed.

As a precautionary measure, personnel should assume that unlabelled drums contain hazardous materials until their contents are characterized. Also, they should keep in mind that drums are frequently mislabelled, particularly drums that are reused. Thus, a drum's label may not accurately describe its contents.

TABLE 2-1

SPECIAL DRUM TYPES AND THEIR ASSOCIATED HAZARDS

Polyethyleneor **PVC -** Lined Drums	Often contain strong acids or bases. If the lining is punctured, the substance may quickly corrode the steel, resulting in a significant leak or spill.
Exotic Metal Drums (Aluminum, nickel, stainless steel, steel, or other unusual metal)	Very expensive drums that usually contain an extremely dangerous material.
Single-Walled Drums Used as a **Pressure** Vessel	These drums have fittings for both product filling and placement of an inert gas, such as nitrogen. May contain reactive, flammable, or explosive substances.
Laboratoty **Packs**	Used for disposal of expired chemicals and process samples form university laboratories, hospitals, and similar instiutions.

TABLE 2-2

INFORMATION PROVIDED BY DRUMHEAD CONFIGURATION

CONFIGURATION	INFORMATION
Whole lid of drum is removable	Designated to contain solid material.
Drum lid has a bung	Designated to contain a liquid.
Contains a liner	May contain a highly corrosive or otherwise hazardous material.

3.0 PLANNING

Since several hazards are associated with drum handling, every step of the operation should be carefully planned, based on all the information available at the time. The results of the preliminary inspection can be used to determine: (1) if any hazards are present and the appropriate response, and (2) which drums need to be moved in order to be opened and sampled.

3.1 Sampling

Excavated drums will be placed in DOT-approved overpak containers and secured on-site until analytical results of the soil samples are received. Whenever possible, excavated materials will be returned to the

appropriate excavation. If the integrity of an excavated drum is compromised (cracked, punctured, etc.), then a sample will be collected from any liquid contained inside of the drum. If an excavated drum contains liquids, but the integrity has not been compromised, then the drum will be sampled at a later date. If necessary, drums that are deteriorated or otherwise breached and contain liquids, sludges, or semi-solids, will be sampled through opportunistic routes such as holes or other openings. Once containers or overpaks have been opened to permit sample acquisition they will be resealed upon completion of the sampling.

4.0 HANDLING

The purpose of handling the drumslcontainers is to: (1) respond to any obvious problems that might impair worker safety, such as radioactivity, leakage, or the presence of explosive substances, (2) unstack and orient drums for sampling, and (3) if necessary, to organize drums into different areas on site to facilitate characterization and remedial action. Drumlcontainer movement for sample acquisition in support of this operation will be held to a minimum whenever possible.

Since accidents occur frequently during drum/container handling (particularly initial handling), drumlcontainer movement will be minimized. Prior to drumlcontainer mobilization, all personnel will be warned about the potential hazards associated with movement and handling of the drum/container. In all phases of drum/container management, personnel should be alert for new information about potential hazards.

The following procedures will be used to maximize worker safety during drum handling and movement:

- Train personnel in proper lifting and moving techniques to prevent back injuries.
- Have overpaks and spill material ready before any attempt is made to move drums.
- Before moving anything, determine the most appropriate sequence in which the various drums and containers should be moved.
- Exercise extreme caution in handling drumslcontainers that are not intact and tightly sealed.

4.1 Spill Management

Bulk hazardous materials (over 55-gallons) may be handled during some of the site activities conducted as part of the scope of work. Independent of the contents of any drumslcontainers that are excavated, at a minimum Investigative-Derived Wastes (IDW) will be produced. Depending on the nature and identity of site contaminants that are identified, spills of drumslcontainers may constitute a danger to human health or the environment. As site contaminants are identified and characterized, the Spill Management Plrogram will be modified to reflect the nature of the contaminants.

4.1.1 Potential Spill Areas

To prevent and control further potential contamination of the environment, vulnerable areas to this hazard include

- the area surrounding the drums/containers.
- areas used for staging area.
- the handling, loading and unloading areas.

4.1.2 55-Gallon Drums

All drums containing liquids or solids which require overpacking and/or transfer of its contents will be staged, as necessary, within a lined berm capable of holding a maximum of drums contents plus volumes reduced caused by the displacement of the drums approximately 110% of the total capacity. Rainwater capture inside the lined area will be allowed to evaporate providing it does not exceed 1% of the bermed areas capacity.

4.1.3 Leak and Spill Detection

The early detection of potential spills or leaks will be accomplished through the initial inspection to identify deteriorated drums/containers. If a leak is detected the drum contents will be transferred using a hand pump into a new 55-gallon drum. The leak will be collected and contained using absorbents such as Oil-dry, vermiculite, or sand, stored at the staging area in a drum conspicuously marked. This material too, will be containerized for disposal pending analyses. All inspections will be documented in the Project logbook.

4.1.4 Personnel Training and Spill Prevention

All personnel will be instructed on the procedures for spill prevention, containment, and collection of hazardous materials in the site specific training. The FOL and the ***SS0*** will serve as the Spill Response Coordinator for this operation should the need arise.

4.1.5 Spill Prevention and Containment Equipment

The following represents the minimum equipment which will be maintained at the staging area at all times for the purpose of supporting this Spill Prevention/Containment Program.

- Sand, clean fill, vermiculite, or other noncombustible absorbent (oil-dry);
- Drums (55-gallon U.S. DOT **17-E** or 17-H)
- Shovels, rakes, and brooms
- Hand operated drum pump with hose
- Labels
- Drum Patch kit

4.1.6 Spill Control Plan

This section describes the procedures the TtNUS field crew members will employ upon the detection of a spill or leak.

1. Notify the SSO or FOL immediately upon detection of a leak or spill. Activate emergency alerting procedures for that area to remove all non-essential personnel.

2. Employ the personal protective equipment stored at the staging area. Take immediate actions to stop the leak or spill by plugging or patching the container or raising the leak to the highest point in the vessel. Spread the absorbent material in the area of the spill, covering it completely.

3. Transfer the material to a new vessel; collect and containerize the absorbent material. Label the new container appropriately. Await analyses for treatment and disposal options.

4. Recontainerize spills, including top cover impacted by the spill. Await test results for treatment or disposal options.

It is not anticipated that a spill will occur that the field crew cannot handle. Should this occur, notification of the appropriate Emergency Response agencies will be carried out by the FOL or SSO

Overpack drums (larger drums in which leaking or damaged drums/containers are placed for storage or shipment) and an adequate volume of absorbent will be kept near areas where minor spills may occur.

4.2 Drums Containing Radioactive Waste

It is not anticipated that any drums located at Site 43 will contain radioactive waste. However, due to the uncertainty associated with the site, all containers encountered will be screened as part of the monitoring activity. If any drums/containers are identified that have radiation levels significantly above background level (> 50 microroentgens/hour), immediately contact the PHSO or HSM.

4.3 Drums that May Contain Explosive or Shock-Sensitive Waste

It is not anticipated to encounter explosive or shock sensitive waste material. However, if a drum is suspected to contain explosive or shock-sensitive waste as determined by visual inspection, this drum/container will be barricaded and left alone until specialized equipment and assistance may be obtained before handling.

4.4 Bulging Drums

Pressurized drums are extremely hazardous. This condition is not anticipated, however where pressurized drums/containers are encountered they will be handled in the same manner as explosive or shock sensitive materials.

4.5 Leaking, Open, and Deteriorated Drums

As discussed under Section 3.1, excavated drums will be placed in DOT-approved overpak containers and secured on-site until analytical results of the soil samples are received. If the integrity of an excavated drum is compromised (cracked, punctured, etc.), then a sample will be collected from any liquid contained inside of the drum. If an excavated drum contains liquids, but the integrity has not been compromised, then the drum will be sampled at a later date. Leaking, open, and/or deteriorated drums may not be able to be moved without rupture or compromising the integrity of the drums.

All drums/containers used as part of this operation shall meet or exceed the appropriate DOT, OSHA, or EPA regulations for the wastes containeriied. These drumslcontainers will be staged at a predetermined location.

5.0 OPENING

Drums/containers will be opened and sampled during this site operation. However, drums/containers of a suspicious nature will be handled at a later time once incidental drums/containers can be removed and conditions for specialized operations structured. Procedures for opening drums/containers are the same,

regardless of where the drums are opened. To enhance the efficiency and safety of drum-opening personnel, the following procedures will be instituted:

- Personnel will use supplied-air respiratory protection, preferably airline respirators with a bank of air cylinders located outside the work area which supply air to the operators via airlines and escape SCBA.

- Site control will keep nonessential personnel at a safe distance from the drums/containers being opened. Drums/containers of a suspicious nature will be handled remotely where possible. Controls for drum opening equipment, monitoring equipment, and fire suppression equipment will be placed at an accessible distance to support the operation.

Use the following remote-controlled devices will be employed for high hazard drum opening operations:

- Pneumatically operated impact wrench to remove drum bungs.
- Hydraulically or pneumatically operated drum piercers.
- Backhoes equipped with bronze spikes for penetrating drum tops in large-scale operations.

- Personnel will not use picks, chisels, or other potential sparking media to open drums.

- If any drum/container shows signs of swelling of bulging (positive pressure), it will be left alone until the appropriate barriers and equipment can be mobilized to support relieving excess pressure prior to opening.

- Monitor the air continuously during drum/container opening exercises. Place probes of monitoring equipment (PID, FID, and LEUO,) as close as possible to the source of contaminants.

- Open exotic metal drums and polyethylene or polyvinyl chloride-lined (PVC-lined) drums through the bung by removal or drilling. Exercise extreme caution when manipulating these containers.

- Do not open or sample individual containers within laboratory packs.

- Reseal open bungs and drill openings as soon as possible with new bungs or plugs to avoid explosions and/or vapor generation. If an open drum cannot be resealed, place the drum into an overpak. Plug any openings in pressurized drums with pressure-venting caps set at a 5-psi release to allow venting of vapor pressure.

- All drum/container opening will be done so using spark proof tools with all potential ignition sources removed. Emergency Fire Extinquishers and First-Aid equipment will be staged at the support vehicle.

- Decontaminate equipment after each use to avoid mixing incompatible wastes.

- Employees shall not stand or work from atop any drum/container.

6.0 SAMPLING

Drum sampling can be one of the most hazardous activities to worker safety and health because it presents direct contact with unidentified wastes. Prior to collecting a sample, the following steps have been executed to minimize the potential hazards involved in this operation.

- Research background information about the waste.

- Determined how the drums/containers should be sampled.

- Select the appropriate sampling device(s) and container(s).

- Developed a sampling plan which includes the number, volume, and locations of samples to be taken.

- Develop Standard Operating Procedures for opening drums/containers, sampling, and sample packaging and transportation.

- The SSO is part of the sampling team, and will offer assistance, based on available information about the waste and site conditions, the appropriate actions, personal protection modifications to be used during sampling and decontamination activities. Guidelines for PPE usage have been established as part of this HASP.

When manually sampling from a drum, use the following techniques:

- Of the two men team to perform the sampling, one will open the drum/container, and perform the initial monitoring, while the sampling team member maintains a safe distance. Both members will participate in the closure of the drums/containers.

- Cover drum tops with plastic sheeting or other suitable non-contaminated materials to avoid excessive contact with the drum tops.

7.0 CHARACTERIZATION

The goal of characterization is to obtain the data necessary to determine how to safely and effectively package, transport, and manage the waste for treatment and/or disposal. If wastes are bulked, they must be sufficiently characterized to determine which of them can be safely combined. As a first step in obtaining these data, standard tests should be used to classify the wastes into general categories, including auto reactives, water reactives, inorganic acids, organic acids, heavy metals, pesticides, cyanides, inorganic oxidizers, and organic oxidizers. In some cases further analysis should be conducted to more precisely identify the waste materials. A complete and detailed description of the analysis may be obtained from the Sampling and Analysis Plan.

8.0 STAGING

Every attempt will be made to minimize drum handling until characterization. Staging involves a trade-off between the increased hazards associated with drum movement and the decreased hazards associated with the enhanced organization and accessibility of the waste materials.

One staging area will be created to support this operation should it be required. It is not anticipated this staging area will be used as the reconnaissance indicated all drums/containers were accessible and therefore movement would not be required.

9.0 BULKING

Wastes that have been characterized are often mixed together and placed in bulk containers for shipment to treatment or disposal facilities. This increases the efficiency of transportation. Bulking will only be performed after thorough waste characterization.

SAFE WORK PERMIT FOR
HANDLING, SAMPLING, AND STAGING OF DRUMS

SAFE WORK PERMIT FOR
HANDLING, SAMPLING, AND STAGING OF DRUMS

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope

I. Work limited to the following (description, area, equipment used): Handling, sampling, and staging of excavated drums.

II. Required Monitoring Instruments: FID and PID, LEL/O2, and radiation survey meter. Colorimetric tubes may also be used as necessary to identifv and characterized site contaminants.

III. Field Crew: _____

IV. On-site Inspection conducted ☐ Yes ☐ No Initials of Inspector _____
TtNUS NAS Pensacola

SECTION II: General Safety Requirements (To be tilled in by permit issuer)

IV. Protective equipment required

Level D ☐	Level B ☒	Full face APR	☐
Level C ☐	Level A ☐	Half face APR	☐
Detailed on Reverse		SKA-PACSAR	☐
		Skid Rig	☐

Respiratory equipment required

Escape Pack	☐
Airline/SCBA	☒
Bottle trailer	☐
None	☐

Modifications/Exceptions: Minimum requirement include sleeved shirt and long pants, safetv shoes, hardhat chemical splash protection, airline/SCBA, nitrile outer gloves with surgical-style inner gloves, impermeable boot covers. Hearing protection when working around operating equipment.

V.

Chemicals of Concern	Action Level(s)	Response Measures
	0 2 levels <19.5% or >23.5%	Suspend site activities and
	LEL levels <10% or >10%	report to an unaffected area.

VI. Additional Safety Equipment/Procedures

Hard-hat	☒ Yes	☐ No	Hearing Protection (Plugs/Muffs)	☒ Yes	☐ No
Safety Glasses	☐ Yes	☒ No	Safety belt/harness	☐ Yes	☒ No
Chemical/splash goggles..	☐ Yes	☒ No	Radio	☐ Yes	☒ No
Splash Shield	☐ Yes	☒ No	Barricades	☐ Yes	☒ No
Splash suits/coveralls	☐ Yes	☐ No	Gloves (Type - Nitrile)	☐ Yes	☐ No
Steel toe Work shoes or boots	☒ Yes	☐ No	Work/rest regimen	☒ Yes	☐ No

Modifications/Exceptions: Tape joints (wrists. ankles. etc.) and inspect PPE before beainning on-site activities. Work/rest regimen to be determined bv SSO & site personnel

VII. Procedure review with permit acceptors

	Yes	NA		Yes	NA
Safety showerleyewash (Location & Use)	☐	☐	Emergency alarms	☒	☐
Procedure for safe job completion	☒	☐	Evacuation routes	☐	☐
Contractor tools/equipment/PPE inspected	☐	☐	Assembly points	☒	☐

VIII. Equipment Preparation

	Yes	NA
Equipment drained/depressurized	☐	☐
Equipment purged/cleaned	o	n
Isolation checklist completed	☐	☐
Electrical lockout required/field switch tested	n	o
Blinds/misalignments/blocks & bleeds in place	☐	☐
Hazardous materials on walls/behind liners considered	☐	☐

IX. Additional Permits required (Hot work, confined space entry, excavation etc.). ☐ Yes ☐ No
If yes, complete *permit* required *or* contact Health Sciences, *Pittsburgh* Office

X. Special instructions, precautions: Follow Drum/Container Management Plan (Attachment VI) of HASP.

Permit Issued by: _____ Permit Accepted by: _____

APPENDIX D

Comprehensive Long-Term Environmental Action
Draft Investigation-DerivedWaste Plan
NAS Pensacola
Pensacola, Florida

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION DRAFT INVESTIGATION-DERIVED WASTE PLAN NAVAL AIR STATION PENSACOLA, FLORIDA

SOUTHNAVFACENGCOM
CONTRACT NUMBER:
N62467-89-D-0318
CTO-036

Prepared for:

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN)
NAVAL SUPPORT ACTIVITY
NAVAL AIR STATION
PENSACOLA, FLORIDA

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June 10, 1994

Release of this document requires the prior notification of the Commanding Officer of the Naval Air Station, Pensacola, Florida.

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List of Abbreviations

The following lists contains many of the acronyms, initials, abbreviations, and units of measure used in this report.

AOC	area of contamination
ARARs	applicable or relevant and appropriate requirements
AWQC	ambient water quality criteria
CAA	Clean Air Act
CAMU	Corrective Action Management Unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COLIWASA	Composite Liquid Waste Samplers
CLEAN	Comprehensive Long-Term Environmental Action Navy
cm	centimeters
CWA	Clean Water Act
DE	Disposable Equipment
DOT	Department of Transportation
E/A&H	EnSafe/Allen & Hoshall
FDEP	Florida Department of Environmental Protection
ft^3	Cubic Feet
gpm	gallons per minute
HSWA	Hazardous and Solid Waste Amendments
IDW	Investigation-Derived Waste
IR	Installation Restoration
IWTP	Industrial Wastewater Treatment Plant
JP	Jet Propulsion
LDR	Land Disposal Restrictions
MCL(s)	Maximum Contaminant Level(s)
MCLG	Maximum Contaminant Level Goals
ml	milliliter
MTRs	Minimum Technological Requirements
NAS	Naval Air Station
NCP	National Contingency Plan
NPL	National Priorities List
OD	Outside Diameter
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
POL	Petroleum Oils and Lubricants
POTW	Publicly Owned Treatment Works
PPE	Personal Protective Equipment
ppm	Parts Per Million or milligrams per kilogram
PSC	Potential Source of Contamination

QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RT	Regulatory Threshold
SDWA	Safe Drinking Water Act
SMP	Site Management Plan
SOP/QAM	Standard Operating Procedures and Quality Assurance Manual
svocs	Semivolatile Organic Compounds
TBC	To-be-considered
TCLP	Toxicity Characteristic Leaching Procedure
TRPHs	Total Recoverable Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
TSD	Treatment, Storage, or Disposal
TU	Temporary Unit
USEPA	United States Environmental Protection Agency
vocs	Volatile Organic Compounds

1.0 INTRODUCTION

The following discussion outlines the manner in which investigation-derived waste (IDW) will be managed to comply with all applicable or relevant and appropriate requirements (ARARs). IDW generated during the investigations will likely include soil produced during the advancement of hand auger borings and soil borings and the installation of monitoring wells; groundwater derived from developing and purging of monitoring wells; disposable personal protective equipment and sampling utensils; decontamination fluids generated from the cleaning of personal protective equipment, sampling equipment, and drilling equipment. As the generator of the IDW, the Navy will be responsible for the ultimate treatment, storage, or disposal of all IDW. E/A&H will provide technical assistance to the Navy during the management of all IDW.

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2.0 IDENTIFICATION OF ARARS

The National Contingency Plan (NCP) requires IDW handled at National Priorities List (NPL) sites, including federal facilities to meet all ARARs to the extent practicable considering the situation's urgency. The NCP is codified at 40 Code of Federal Regulations (CFR) Part 300. Likewise, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 120(a)(4) requires investigation and remediation activities at non-NPL federal facilities to meet the substantive requirements of applicable state laws.

21 ARARs Defined

Applicable requirements are standards or criteria promulgated under federal law that specifically address a hazardous substance, pollutant contaminant, remedial action, location, or other circumstance at a project site (USEPA 1988a). Resource Conservation and Recovery Act (RCRA) requirements *are* applicable when a waste generated at a CERCLA site meets the definition of a solid hazardous waste.

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Relevant and appropriate requirements are standards or criteria promulgated under federal or state laws that are suited to a particular site because they address site scenarios sufficiently similar to those on which the regulations *are* based. Identifying ARARs first dictates determining whether they *are* both relevant and appropriate. This evaluation compares a number of site-specific factors with those addressed in the statutory or regulatory requirements. Factors considered include the hazardous substances present at the site, physical site features, *or* the type of remedial action. A given requirement might be relevant, but not appropriate, for the project site. Therefore, such a requirement would not be an ARAR for the site. When a requirement is deemed both relevant and appropriate in a given case, this requirement must be complied with to the same degree as if it were applicable. An example of a relevant and appropriate requirement is the use of maximum contaminant levels (MCLs) as cleanup standards for water. The MCLs *are* not applicable, because the Navy is not using the contaminated water to supply

drinking water. However, MCLs are relevant and appropriate because the water may be treated for potential use as drinking water in the future.

To-be-considered (TBC) criteria are federal- or state-issued guidance or non-promulgated advisories that are not legally binding and do not have the status of potential ARARs. In many circumstances, TBC criteria will be reviewed along with ARARs in determining an IDW level that sufficiently protects human health or the environment. This review will occur before selecting an IDW management option.

There are several types of ARARs, including chemical-specific, action-specific, and location-specific ARARs. Chemical-specific ARARs are usually health- or risk-based numerical values or methodologies applied to site-specific conditions. These values establish an acceptable concentration of a chemical substance that may be found in or discharged to the ambient environment. MCLs are examples of chemical-specific ARARs. Action-specific ARARs are technology- or activity-based requirements or limitations on actions taken with respect to hazardous substances. An example of an action-specific ARAR is an emissions limit on a chemical constituent for incineration to treat contaminated soil. Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they occur in special locations. Location standards for RCRA facilities are location-specific ARARs when a new waste management unit is created to treat or dispose of waste at a CERCLA site.

Federal environmental laws and regulations that are potential ARARs for IDW at CERCLA sites include RCRA, including the Land Disposal Restrictions (LDR) and Corrective Action Program; the Toxic Substances Control Act (TSCA), the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA), and the Clean Air Act (CAA). State and local environmental laws and regulations also may serve as ARARs. State regulations may have a great impact on how IDW

is managed, since states may promulgate more stringent requirements than the federal requirements for many programs, including the solid and hazardous waste program.

Although CERCLA exempts response actions conducted entirely onsite from permit requirements, the United States Environmental Protection Agency (USEPA) does require that the substantive issues are addressed if the containerized IDW is RCRA hazardous waste (USEPA 1988a). RCRA hazardous IDW containerized and stored onsite should be properly disposed of within a regulatory timeframe. However if the regulatory timeframe cannot be met, storage does not require a permit. Actions that take place offsite are subject to all permitting requirements.

2.2 Resource Conservation and Recovery Act

RCRA was passed by Congress in 1976 to meet three goals: (1) to protect human health and the environment, (2) to reduce waste and conserve energy and natural resources, and (3) to reduce or eliminate the generation of hazardous waste as expeditiously as possible. The Hazardous and Solid Waste Amendments (HSWA) of 1984 significantly expanded RCRA's scope by adding new corrective action requirements, LDRs, and minimum technological requirements (MTRs) (USEPA 1988b).

RCRA is the most important federal ARAR for managing IDW, because it specifically regulates solid waste disposal and all aspects of transportation, treatment, storage, and disposal of hazardous waste. RCRA is applicable to management of IDW at CERCLA sites if the IDW is stored or disposed of offsite. If IDW is stored onsite, then the IDW must be managed to comply with RCRA to the extent practical.

RCRA has 10 subtitles addressing specific waste management activities. Two of these subtitles and their implementing regulations may be ARARs for IDW handling: Subtitle C (Hazardous Waste Management) and Subtitle D (Solid Waste Management). The regulations are codified in 40 CFR Parts 260 through 272.

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RCRA was developed first and foremost as a prevention-oriented program, with a primary objective to prevent new releases resulting in contaminated sites. Following this objective, stringent standards were developed to ensure human health and the environment were protected from such ongoing waste management. The Subtitle C regulations are specified as uniform, national standards with which all RCRA-regulated facilities must comply. These standards generally are very stringent because they must ensure an adequate level of protection nationally. The standards must prevent or minimize environmental releases over a wide range of hazardous waste types, environmental conditions, operational contingencies, and other factors. The HSWA amendments strengthened the RCRA prevention program by adding the LDRs and MTRs that have become central features of the RCRA prevention program. These features added incentives to generators to minimize the amounts of waste being created by providing technology-based standards for hazardous waste treatment, in the case of LDRs, and land-based disposal units design, in the case of MTRs.

Under RCRA Subtitle C, wastes are hazardous on the basis of their source or method of generation ("listed" wastes) or their chemical constituents or characteristics ("characteristic" wastes). The hazardous waste identification rules are codified in 40 CFR Part 261. For example, 1,1,1-trichloroethane is a listed waste when it is a spent solvent. Based on the "contained-in" interpretation, soil, groundwater, and other investigation wastes containing this listed waste also would be considered hazardous (USEPA 1986). Characteristic hazardous wastes include those wastes with one or more characteristics of ignitability, corrosivity, reactivity, and toxicity. Determining whether a waste is hazardous may be based on knowledge of the IDW and associated suspected or known contamination, rather than by *direct* testing (USEPA 1991). The IDW generator may choose to characterize the waste as hazardous or non-hazardous based on the site history and environmental data for the surrounding area, without actually collecting a sample of the waste and testing it for hazardous waste parameters.

221 Land Disposal Restrictions

With respect to managing IDW, the LDR program is one of the most significant provisions of RCRA. The LDR program, defined in RCRA Section 3004 and codified in 40 CFR Part 268, establishes technology-based standards that must be met before placing hazardous waste into land disposal units, which include landfills, surface impoundments, waste piles, and other land-based units. Hazardous waste generators must notify receiving hazardous waste facilities that a waste is restricted from land disposal. Certification is required for all restricted wastes that meet LDR treatment standards when the waste is land disposed.

For the purpose of managing IDW, land disposal occurs when any of the following activities take place:

- Wastes from different areas of contamination (AOC) are consolidated and disposed of in one AOC.

- Wastes are moved outside an AOC for storage or treatment and are returned to the same or a different AOC.

- Wastes are excavated from an AOC, removed to a separate unit such as a tank, surface impoundment or incinerator that is within the AOC, and then are redeposited into the AOC (USEPA 1991).

The concept of an AOC can be used to determine whether LDRs apply to a given situation; however, this concept applies only to contaminated soil or sediment from the site. Contaminated personal protective equipment (PPE), disposable equipment (DE), extracted ground water, or decontamination fluids that may be generated by investigation activities at the site are not exempted from LDRs if disposed of within an AOC. USEPA has not yet issued a regulatory definition of the term "AOC," but the preamble to the NCP (55 FR 8760) states "USEPA

generally equates the CERCLA area of contamination with a single RCRA land-based unit, usually a landfill." It is further noted that "under RCRA the term 'landfill' could include a non-discrete land area on or in which there is generally dispersed contamination."

LDRs limit the constituent concentrations of wastes that may be disposed in land units (such as landfills and surface impoundments). An important consideration in evaluating the applicability or relevance and appropriateness of LDRs is whether land disposal of hazardous IDW will occur as a result of the proposed storage or disposal method. Based on the delineation of an AOC, LDRs are not ARARs when uncontained hazardous IDW (soil or sediment) is handled as follows:

- Capped in place
- Treated in situ
- Processed within the AOC to improve structural stability
- Left in place, moved, or stored within a single AOC unit

LDRs prohibit storing restricted hazardous waste beyond specified time limits, unless the purpose is to accumulate sufficient quantities to promote proper disposal, treatment, or recovery. However, under CERCLA there is no time limit for storing IDW in the AOC until a final disposal option is selected in the record of decision (ROD).

All LDRs must be followed to the extent practical if hazardous IDW cannot be held within the delineated AOC. For example, if leaving hazardous IDW within the AOC would significantly increase risk to human health and the environment through the potential of fire, explosion, toxicity, or other hazard, then the IDW should be managed at an offsite RCRA Subtitle C hazardous waste treatment, storage, or disposal (TSD) facility.

2.2.2 Corrective Action Program

In addition to the prevention-oriented provisions of RCRA, the HSWA corrective action program created a very different mandate: cleaning up releases from solid waste management units at more than 4,000 RCRA TSD facilities. While implementing these requirements and through its experience with the Superfund program, USEPA found that Subtitle C requirements, when applied to remediation wastes, could be a disincentive to more protective remedies. These requirements also provided very limited flexibility in choosing the most practical remedy at a specific site. In response to this, USEPA created two types of waste management units, the Corrective Action Management Unit *(CAMU)* and the Temporary Unit *(TU)*, as a mechanism for providing more regulatory flexibility at remediation sites conducted under the auspices of RCRA while maintaining a standard of environmental protection.

CAMUs

CAMUs are land-based units that *can* be used to manage wastes during site remediation. CAMUs provide two primary advantages:

- Placing remediation wastes into or within a *CAMU* does not constitute land disposal of hazardous wastes, so that LDR standards are not triggered.

- Consolidating or placing remediation wastes into or within a *CAMU* does not constitute creating a unit subject to MTRs.

Although CAMUs are permitted by the USEPA, they must comply with state and local regulations. Currently, there are no permitted CAMUs.

TUs

TUs are for short-term operation of tanks and container storage units used to treat or store remediation wastes for investigations conducted under RCRA. These units may only be used

for remediation wastes, and they must be located at the facility where the remediation is occurring. TUs do not include incinerator, non-tank thermal treatment devices, or units regulated under 40 CFR Part 264 Subpart X (miscellaneous units). The corrective action regulations for temporary units allow an alternative design, operating, or closure standard to be applied rather than the standards that normally apply to permitted facilities. Wastes can be stored in a TU for up to one year, with extensions available on a case-by-case basis.

2.3 Toxic Substances Control Act

Congress passed TSCA in 1976 to establish requirements and authorities for identifying and controlling toxic chemical hazards to human health and the environment. While the majority of regulations promulgated under TSCA address chemical manufacturing, the law also covers managing and disposing wastes containing polychlorinated biphenyls (PCBs) in 40 CFR Part 761 and asbestos in 40 CFR Part 763. These regulations potentially affect IDW management in at least two ways:

- Non-hazardous IDW under RCRA that contains PCBs at concentrations greater than specified limits must be managed at facilities permitted under TSCA. Incineration is the most common option for wastes containing 50 parts per million (ppm) PCBs or greater.

- Non-hazardous IDW with PCB concentrations less than 50 ppm are generally not regulated under TSCA, although some states regulate these wastes as hazardous.

2.4 Clean Water Act

The CWA, developed in 1977, provides site-specific pollutant discharge limitations and performance standards for specific industries to protect surface water quality. During an investigation, the most likely situation where the CWA will be applicable involves indirectly discharging IDW water to a Navy owned treatment works (NOTW), publicly owned treatment works (POTW), or a wastewater treatment plant for treatment (USEPA 1991). A less likely

situation may involve direct discharge, either onsite or offsite, to surface water. The CWA also regulates criteria for selecting POTWs and sets ambient water quality criteria (AWQC) to protect human health and aquatic life. Regulations under the CWA are codified in 40 CFR Parts 121 through 136.

2.5 Safe Drinking Water Act

The SDWA which was enacted in 1974 and most recently amended in 1986, mandates the USEPA establish regulations to protect human health from contaminants in drinking water. Regulations for the SDWA are codified in 40 CFR Parts 141 through 149. The legislation authorizes national drinking water standards and a joint federal-state system for assuring compliance with those standards.

USEPA has developed two sets of drinking water standards, referred to as primary and secondary standards, to protect human health and to ensure the aesthetic quality of drinking water, respectively (USEPA 1988b). *Primary* standards consist of contaminant-specific standards, known as maximum contaminant levels (MCLs). These are set as close as feasible to MCL goals (MCLGs), which are purely health-based. Secondary drinking water standards *are* guidelines regulating the aesthetic quality of water supplies, such as clarity and odor, and are not enforceable at the federal level. At a minimum, states must enforce the federal MCLs. In some cases, states establish and enforce secondary standards equal to or more stringent than USEPA's.

Under Section 1424(e) of SDWA, an aquifer identified as the sole or principal source of drinking water for any area may be designated as a "sole source aquifer". No commitment of federal financial assistance may be made for any project that may contaminate a sole source aquifer *so* as to create a significant public health hazard. No IDW disposal actions should occur that could affect a sole source aquifer without considering MCLs and the ARARs.

3.0 GENERATION OF INVESTIGATION-DERIVED WASTE

Activities that may generate IDW during operations at installation restoration (IR) sites include preliminary site investigations, removal actions, and remedial investigations. IDW may include drilling muds, soil cuttings, purged groundwater, decontamination fluids, DE, and PPE.

3.1 Sources of IDW

Table 3-1 summarizes all sites to be investigated and lists the known or suspected contaminants for each site.

Table 3-1
Summary of Investigation-Derived Waste Sources

Source (Site)	Site Name	Known or Suspected Contaminants
1	Sanitary Landfill	Metals, TRPHs, VOCs, PAHs, phenols
2	Waterfront Sediments	Metals, TRPHs, VOCs, PAHs
3	Crash Crew Training Area	Metals, TRPHs, VOCs, PAHs, phenols
4	Army Rubble Disposal Area	Unknown
5	Borrow Pit	Unknown
6	Fort Redoubt Rubble Disposal Area	Unknown
7	Firefighting School	POLs
8	Rifle Range Disposal	Solid waste, paper
9	Navy Yard Disposal Area	Metals, TRPHs, PAHs
10	Commodore's Pond	Metals, TRPHs, PAHs, phenols
11	North Chevalier Disposal Area	Metals, TRPHs, VOCs, PAHs, phenols
12	Scrap Bins	Metals, TRPHs, PAHs, phenols, PCBs
13	Magazine Point Rubble Disposal Area	TRPHs, VOCs, PAHs, phenols
14	Dredge Spoil Fill Area	Metals, TRPHs, VOCs, PAHs, phenols
15	Pesticide Rinsate Disposal Area	Metals, TRPHs, VOCs, PAHs, pesticides
16	Brush Disposal Area	Metals
17	Transformer Storage Yard	Metals, TRPHs, PAHs, VOCs, PCBs
18	PCB Spill Area	Metals, TRPHs, PAHs, VOCs, PCBs
22	Refueler Repair Shop	Aviation Gas, JP with lead

Table 3-1 (Continued)
Summary of Investigation-Derived Waste Sources

Source (Site)	Site Name	Known or Suspected Contaminants
24	DDT Mixing Area	DDT with diesel fuel
25	Radium Spill Site	Radioactive Waste
26	Supply Department Outside Storage	Industrial Waste, Oils
27	Radium Dial Shop	Radium, phosphors
28	Transformer Accident	Transformer Oil
29	Soil South of Building 3460	Metals, TRPHs, PAHs, VOCs
30 and formerly PSC 31	Buildings 649 and 755, Building 648	Metals, TRPHs, VOCs, PAHs, phenols
32, 33, 35	Industrial Wastewater Treatment Plant	Metals, VOCs, SVOCs
34	Solvent North of Building 3557	Metals, TRPHs, PAHs, phenols
36	Industrial Waste Sewer	Metals, TRPHs, PAHs, phenols
38	Building 71	Metals, VOCs, PCBs
39	Oak Grove Campground	Debris, POL, broken clay, coal, cleaning solutions
40	Bayou Grande	Unknown
41	NAS Pensacola Wetlands	Unknown

PSC = Potential Source of Contamination
TRPHs = Total Recoverable Petroleum Hydrocarbons
VOCs = Volatile Organic Compounds
PAHs = Polynuclear Arometic Hydrocarbons
PCBs = Polychlorinated Biphenyls
SVOCs = Semivolstile Organic Compounds
POL = Petroleum, Oils and Lubricants
JP = Jet Propulsion

Source: U.S. Navy 1993

Field activities performed during the site investigations that may generate IDW typically include some or all of the following:

Activity	Waste Type
Monitoring Well Installation	Soil cuttings, decontamination fluids, drilling mud, PPE, DE
Monitoring Well Development	Development water, silt, decontamination fluids, PE, DE
Groundwater Sampling	Purge water, decontamination fluids, PPE, DE
soil Boring	Soil cuttings, drilling mud, decontamination fluids, PPE, DE
Soil Excavation/Trenching	Soil cuttings, decontamination fluids, PPE, DE
soil sampling	Soil cuttings, decontamination fluids, PPE, DE
Sediment Sampling	Sediment, decontamination fluids, PPE, DE
Surface Water Sampling	Decontamination fluids, PPE, DE
Aquifer Testing	Development water, decontamination fluids, PPE, DE
Radiation Monitoring	PPE, DE

The wastes described above may be regulated as hazardous for the purposes of storage, treatment, or disposal. Section 4 describes how this determination will be made and bow IDW will be characterized. Once the IDW is characterized, a decision may be made on properly managing the waste. In addition to the waste types listed above, general refuse may be created during field activities, including packaging materials, broken or cut-off well screen, and casing. Typically, this refuse is managed as non-hazardous material and disposed of accordingly.

3.2 IDW Volume Estimates

Various field activities conducted in an investigation may create IDW. Estimated typical volumes of IDW generated from field activities are shown below.

- Screening: Screening studies typically include soil-gas, soil-probe, geophysical surveys, and water level measurements. These activities may generate several 55-gallon drums of decontamination fluid, PPE, DE and groundwater during the course of the initial studies.

- Drilling: Drilling an 8-inch-outside-diameter (OD) soil boring will generate a minimum of 0.35 cubic feet (ft^3) or 2.6 gallons of soil cuttings per linear foot of borehole. A 25-foot soil boring therefore would generate approximately 9.0 ft^3, or 65 gallons, of soil cuttings (approximately 1.25 55-gallon drums). Table 3-2 shows the relationship between the diameter of the borehole and the potential volume of soil cuttings generated. Larger diameter soil borings will generate proportionately larger quantities of soil. Additional quantities of soil should be expected due to its expansion following removal from the borehole (known as bulking) and slough created during drilling, especially if poorly consolidated materials are encountered. The bulking is estimated to increase soil cutting volume by 30 percent. Soil cuttings from drilling typically will be placed into 55-gallon containers.

Table 3-2
Volume of Soil Cuttings Generated for Typical Diameter Boreholes

Hole Diameter (inches)	Undisturbed Volume of Soil per Linear Foot of Hole		Volume of Loose Soil per Lineal Foot of Hole	
	Gallons	Ft^3	Gallons	Ft^3
6.0	1.5	0.20	2.0	0.26
8.0	2.6	0.35	3.4	0.46
10.0	4.0	0.54	5.2	0.70
12.0	5.8	0.78	7.5	1.01

NOTES:
1 ft^3 = 7.5 gallons (approximately)
1 Gallon = 0.134 ft^3 (approximately)

- **Well Development or Purging and Groundwater Sampling:** The volume of groundwater from monitoring well development and groundwater sampling depends on a number of variables, including the turbidity of the groundwater, well diameter, length of screened interval, diameter of the saturated filter pack, and porosity of the material used as filter packing.

  Complete well development requires removing of well drilling relics to establish proper flow conditions and until field parameters have stabilized. Table 3-3 shows the estimated water volumes for various well screen diameters and borehole diameters, assuming a 30 percent porosity within the filter pack.

Table 3-3
Volume of Water Generated for a Typical Well Casing and Borehole Combination

Well Casing/Boring Diameter (inches)	Volume of Water Generated per Lineal Foot of Hole (gallons)
2/8	0.9
4110	1.2
4112	2.2

For example, a 4-inch well with a 10-inch borehole would contain approximately 1.2 gallons of fluid per foot of saturated zone. If no additional construction water was used and only three volumes of water were pumped for the development of 15 feet of saturated material, the well would produce approximately 54 gallons of fluid.

For hollow-stem drilling, additional water typically is used for flowing sand conditions. For normal well construction, minimal additional water would be used. Additional water would be generated during later purging and sampling and would be specific to the conditions for the well. The water generated during these activities typically will be placed in 55-gallon containers or in portable storage tanks.

- Aquifer testing: Aquifer tests which may be conducted at the Naval Air Station Pensacola may generate large quantities of groundwater, depending on the hydraulic properties of individual screened formations. A well installed in a formation with a high transmissivity will sustain a higher pumping rate and generate greater quantities of water. A typical test would be 1.5 to 2 times the expected withdrawal rate for the recovery system. It is anticipated withdrawal rates for NAS Pensacola will range from approximately 10 gallons per minute to 250 gallons per minute. With large volumes such as this, it will be necessary to use 20,000-gallon portable tanks to store water these tests generate. This water may undergo treatment at the onsite IWTP or be transported to an offsite facility. Slug tests typically will generate a small-to-moderate volume of decontamination fluid. In some instances, it may be possible to store fluids from several different aquifer tests in one container.

- **Trenching and Subsurface** Exploration: For trenching or other large-volume excavations, it will be necessary to store the wastes in large covered roll-off bins or on an appropriate liner material and to cover it. If possible, and when appropriate and

approved by the regulatory agencies, the best option may be to return the materials to the excavation.

- **PPE, DE, and Decontamination Fluid:** The volume of IDW generated as PPE, DE, and decontamination fluids during each field activity depends on a number of site-specific factors and therefore will vary in quantity. Site-specific factors include the USEPA health and safety work level (Level D, Level C, or Level B), number and type of field activities per site, and total number of sites being investigated. PPE waste volumes typically will account for one-half of a 55-gallon container per day for a crew of four. Decontamination fluid will vary from a few gallons per day for decontaminating monitoring instruments to several hundred gallons per day for large equipment such as drilling rigs.

4.0 CHARACTERIZING INVESTIGATION-DERIVED WASTE

Identifying and characterizing IDW should begin in the planning stages of field activities. First, it must be determined if the IDW contains CERCLA hazardous substances, and whether these hazardous substances constitute either RCRA hazardous wastes or contaminants regulated under other statues. The origin of the waste must be determined as well as the chemical contaminants and their concentrations. Typically, sampling data obtained from site characterization or investigation activities provide an initial determination of whether a waste is hazardous. If necessary, IDW is sampled and submitted for TCLP analysis to provide additional information and to determine specific hazardous waste characteristics. Environmental samples relevant to IDW are soil samples (for soil cuttings and excavated soil) and groundwater samples (for purge water and development water).

The Navy as *"Generator"* of the waste retains all responsibility for characterizing the containerized waste as hazardous or non-hazardous according to 40 Code of Federal Regulations (CFR) 260. The Navy characterizes its waste in accordance with NAS Pensacola Instruction 5090.1B Hazardous Waste *Management* Program (NAS Pensacola 1994).

4.1 RCRA Hazardous Wastes and CERCLA Hazardous Substances

Some CERCLA hazardous substances are RCRA hazardous waste. PCBs also are considered CERCLA hazardous substances. Identification of RCRA hazardous waste and PCB-contaminated IDW is essential for making storage and disposal decisions. The presence of RCRA hazardous wastes invoke special considerations. The RCRA program recognizes two general classes of waste at the federal level: hazardous and non-hazardous. Solid wastes are defined by RCRA to be hazardous either by being a listed waste, determined by the wastes's origin or by its contaminant concentrations.

4.2 RCRA Listed Hazardous Waste

The E/A&H site manager is responsible for identifying any potential listed hazardous wastes that may be present at the site. The site manager establishes the site's history and use, and determines whether activities there generate, or have generated, listed hazardous wastes. Examples of activities that may generate listed wastes include use of solvents, rinsing and management of pesticide containers, electroplating, dry cleaning, and wood treatment. USEPA provides guidance in the level of effort required to establish whether Listed waste activities are involved at investigation sites. USEPA states that "at many CERCLA sites no information exists on the source of the wastes nor are references available citing the date of disposal. The U.S. Navy should use available site information, manifests, storage records, and vouchers in an effort to ascertain the source of these contaminants. When this documentation is not available, the U.S. Navy may assume that the wastes are not listed RCRA hazardous wastes, unless further analysis or information becomes available which allows the lead agency to determine that the wastes *are* listed RCRA hazardous wastes" (USEPA 1990).

Once it has been determined that a listed waste is involved at a field activity site, the environmental analytical data should be reviewed to determine if the IDW contains any hazardous constituent found in the RCRA listed waste. USEPA's "contained-in" policy states that media such as soil and groundwater containing a listed hazardous waste must be managed as such until they no longer contain that waste. There is no established policy on how to determine when the media no longer contains the listed hazardous waste. Usually this determination is made on a case-by-case basis. Two aspects should be considered for managing IDW: whether the waste also may be hazardous for characteristics (as described in Section 4.3) and whether the *cost* of additional analytical work will offset the cost of managing the waste as a listed hazardous waste. In addition to identifying potential listed criteria, IDW also should be evaluated for characteristic hazardous waste criteria, as described in Section 4.3.

4.3 RCRA Characteristic Hazardous Waste

Characteristic hazardous wastes are based on general criteria. In order for a waste to be considered a characteristic hazardous waste, it must exhibit one or more of the following properties, as defined in 40 CFR 5261.21 through 5262.24:

- Ignitability
- Corrosivity
- Reactivity
- Toxicity
  - Heavy Metals
  - Volatile Organic Compounds
  - Semivolatile Organic Compounds
  - Pesticides and Herbicides

IDW does not usually exhibit the characteristics of ignitability, corrosivity, or reactivity due to the waste's nature and matrix. Typically, IDW waste consists of low concentrations of contaminants in soil and water. The quantities of these contaminants typically are insufficient to cause the soil or water to exhibit any of the characteristics of ignitability, corrosivity, or reactivity.

The characteristic for toxicity is based on the waste's leaching characteristics. The Toxicity Characteristic Leaching Procedure (TCLP) simulates the effect of hazardous constituents leaching from a waste; USEPA bases regulatory limits to protect human health and the environment on the TCLP test. Reviewing environmental data to initially screen the IDW helps eliminate some or all of the toxicity characteristics. USEPA provides that if a total analysis demonstrates the individual constituents are not present in the waste, or they are present but at such low concentrations that the appropriate regulatory levels could not possibly be exceeded, the TCLP need not be run (40 CFR Part 261, Appendix II). IDW to be left onsite should not containerized or tested.

4.4 CERCLA Hazardous Substances

If the IDW does not contain RCRA "hazardous waste", it should be determined if the IDW contains other CERCLA hazardous substances. CERCLA hazardous substances include, in addition to RCRA hazardous wastes, substances, elements, compounds, solutions, or mixtures designated as hazardous under CERCLA or under the authority of another ARAR including TSCA, CWA, CAA, and SDWA. CERCLA hazardous substances *are* listed in 40 CFR Part 302.4, Table 302.4.

5.0 SAMPLING AND ANALYSIS

Sampling and analyzing IDW will be conducted when corresponding environmental sample data are not available or when details are needed about the waste. Sampling of soil or sediment IDW may occur as the waste is generated (i.e., as the boring is advanced) or may be collected from the containerized waste. All samples collected for waste analysis should be representative of the waste being sampled. Therefore, the samples should be composited. If the soil or sediment IDW is to be disposed of offsite, samples for TCLP analysis may be collected during advancement of the soil boring or from the containerized waste. If the IDW is to be disposed of within the AOC, sampling is not required. Guidelines for collecting representative samples are contained in Chapter 9 of Test *Methods for Evaluating Solid* Waste (USEPA 1986). Sampling methods are detailed in Appendix A.

5.1 Completing a Waste Profile

IDW is characterized through knowledge of the waste, review of environmental data correlating to the waste, or sampling and analyzing the waste itself. This characterization leads to a waste profde summarizing all the information available on the IDW. The waste profde is required for shipping any IDW to offsite facilities. It should be completed for all wastes generated in investigation activities as an accurate record of the waste identification, source, and characteristics. The profde also *can* describe wastes that are generated consistently and have similar or identical characteristics. For example, if a site investigation is conducted over many months and soil cuttings are generated consistently over that period, one waste profde may be completed to describe all the soil cuttings, even though they may be shipped offsite at different times throughout the investigation. Once that profde is approved, it may be used for subsequent shipments of the same waste without completing and approving a new profde. Appendix B includes the waste profde form.

Completing all 11 sections of the profile ensures all necessary information is obtained to properly manage the waste. Each blank on the profile form should be filled in, even if the appropriate response is "not applicable" or a zero value. The sections cover these subjects:

- Generator Information
- Waste Description
- Transportation Information
- Physical Properties
- Toxicity Characteristics
- Total Metals
- Other Solvent Constituents
- Chemical Composition
- Additional Information and Comments
- Technical Review
- Generator Certification

In most cases, environmental data gathered during the site investigation will be used to characterize the associated IDW. This process allows the IDW to be characterized more quickly and minimizes the sampling and analysis of IDW by providing an initial review of potential hazardous waste categories that may apply.

Once the waste profile has been completed, it will be signed by the Navy installation environmental coordinator. The waste profile then will be used for obtaining approval for treatment or disposal at offsite TSD facilities and for evaluating possible onsite treatment and disposal options.

5.2 Management of Disposable PPE and Equipment

Disposable PPE and DE will be managed according to the type of activity and concentration of contamination encountered with the equipment. In general, most PPE and DE will be managed as non-hazardous solid waste, particularly if little contact occurs with the sampling media and low concentrations of contaminants are involved. The IDW should be placed in plastic bags and transferred to an onsite industrial dumpster, whose contents is routinely disposed of in an municipal landfill. A second option is to transport the IDW to a suitable offsite municipal solid waste landfill.

Contaminated PPE and DE used in collection of samples from known highly contaminated areas will be placed in 55-gallon drums, accurately labeled as discussed in Section 5.6 and stored at a container storage area. PPE and DE will be stored until adequate characterization is complete for the site or for the containerized PPE and DE. The environmental sampling results from the sites where the IDW was generated will be reviewed when available. PPE and DE that is contaminated with listed hazardous waste will be managed as hazardous waste, and will be characterized in a manner consistent with the media being sampled.

5.3 Management of Empty Drums

Empty drums may be generated in rare cases, such as when IDW is consolidated onsite to minimize the number of containers shipped to offsite waste management facilities. Empty drums also may be generated when IDW is removed from containers for onsite treatment or disposal. Federal regulations require empty containers that held hazardous waste to be emptied to the maximum extent practicable before further management. In addition, if the container was used for an acutely hazardous waste, it must be decontaminated via triple rinsing before further management (40 CFR 261.7[3]).

Federal regulations exempt empty containers from regulation as hazardous waste. However, in order to retain the exemption, the empty container must be managed in one of the following ways:

- Dispose of it at an approved solid waste management facility, if **5-gallon** capacity or less.
- Reclaim its scrap value onsite or ship the container to a reclaimer for its scrap value.
- Recondition or remanufacture the container onsite for subsequent reuse, or ship it to reconditioner or remanufacturer.
- Ship the container to a supplier or another intermediate collection location for accumulation before managing the container.

6.0 STORAGE

Specific IDW storage requirements depend on a number of factors, including the auspices under which the investigation is being conducted, location of the storage area, the length of storage, the type of storage unit, the type of waste, and the regulatory status of the storage unit. Storage of non-hazardous waste and designated waste in drums and portable tanks is not regulated by USEPA.

Storage of hazardous waste is regulated on the federal and state levels, with four options discussed further:

- Accumulation within the AOC
- Storage in a TU
- Accumulation for up to 90 days from the date of generation
- Storage in a unit that meets permitted facility standards

Selection of an applicable option may be dependent on:

- State laws and interpretations
- Applicable statutes under which the investigation is being conducted
- Site-specific issues

The location of IDW storage may be within the AOC or at another location of the installation. It is important to carefully consider the location chosen for IDW storage, since it may affect the applicability of some RCRA requirements such as LDRs and MTRs. IDW is generally stored in a manner meeting the requirements for hazardous waste storage until environmental data or other information prove otherwise. Typically, IDW is accumulated within the AOC or at a centralized storage area that complies with RCRA requirements for storing both solid and hazardous IDW.

6.1 Accumulation within the AOC

Accumulation of IDW within the AOC is appropriate for investigations conducted under CERCLA. In addition, if IDW is merely being moved within the AOC, land disposal is not considered to have occurred, therefore LDRs are not triggered. An evaluation of the IDW handling technique must be conducted to determine if the technique constitutes land disposal. Activities which constitute land disposal are detailed in Section 2.2.1 Land Disposal Restrictions. If IDW cannot be deposited within the AOC, IDW handling and disposal must comply with all LDRs to the extent practical.

6.2 Storage in a Temporary Unit

TUs are appropriate for investigations conducted under RCRA. Storing waste in a TU provides the greatest flexibility for design and operation of the storage unit. A temporary storage unit may be established for containers or tanks and may be placed either within or outside an AOC. A TU's major advantage is that IDW may be stored for up to one year, and waste may be removed from the TU and placed back into the AOC for treatment or disposal without triggering LDRs or MTRs. TUs must be administratively created with regulatory agency input. Design of a TU must consider:

- Length of time the unit will operate
- Type of unit
- Volumes of wastes to be managed
- Physical and chemical characteristics of the wastes to be managed there
- Potential for releases
- Hydrogeological and other relevant environmental conditions at the facility that may influence the migration of any potential releases
- Potential for exposure of humans and environmental receptors if releases were to occur

Specific design and operating requirements for accumulation storage areas and permitted storage units may be used as guidelines in developing temporary storage units. It is important to determine whether the TU will reside within an AOC, and the specific AOC should be identified in site-specific plans for the TU.

63 Accumulation of Containers for Less Than *90* Days

Generators may accumulate RCRA hazardous waste in container storage areas or storage tanks for up to 90 days before shipment to an offsite management facility. These storage areas and tanks are commonly called accumulation storage units. This storage option is somewhat flexible in terms of design due to the limited storage time involved. However, 90 days is not always sufficient to adequately characterize the waste before shipment offsite. This storage option is inappropriate for long-term storage of IDW.

Accumulation container storage areas must meet specific design and operational requirements outlined in 40 CFR §262.34(a) and R.61-79.262 Subpart C, which include the following:

- Containers must be in good condition and compatible with the waste placed inside them.
- Containers must be kept closed, except when waste is being added or removed from them, and they must be managed in such a way as to prevent rupture or leakage.
- Containers must be marked as hazardous waste and with the accumulation start date, composition and physical state of the waste, hazardous properties of the waste, and the name and address of the generator.
- Inspection of the accumulation storage unit must be conducted and recorded at least weekly.
- Personnel handling the containers must receive initial and annual training on operating and maintaining the accumulation storage unit.
- A contingency plan must be developed and emergency equipment provided for the accumulation storage unit.

- The accumulation storage unit must be closed to meet the RCRA closure performance standard.

In addition to these requirements. E/A&H recommends providing the following measures when possible:

- If the accumulation storage unit is not within the AOC, the unit should be constructed with a concrete or asphalt base, depending on the type and quantity of waste stored, and should have berms around the perimeter. Existing concrete and asphalt pads often are appropriate for storage.
- The accumulation storage unit should be covered, or adequate capacity should be provided to handle runon and precipitation.
- Liquids from runon, precipitation, or spills should be collected promptly from the accumulation storage unit and managed appropriately.

Accumulation storage units do not require administrative action to create; the generator simply must establish the storage area and maintain adequate documentation demonstrating compliance with the operating requirements.

6.4 Storage of Containers to Meet Permitted Facility Standards

The last storage option for IDW is to use an existing permitted storage facility or create a storage area meeting all the design specifications and operating requirements applicable to permitted facilities. The requirements for permitted facilities were developed to allow longer storage of a variety of wastes generated at industrial facilities, and these requirements are the most stringent under RCRA. Unless using an existing permitted storage facility, this option provides the least amount of flexibility because the requirements are extensive and very specific. However, this option also provides the greatest amount of storage time, with no pre-established limits on time a waste may be stored. While CERCLA allows onsite storage units of this type

to be exempt from permitting standards, the substantive requirements still must be met. These requirements for container storage areas are summarized below:

- General Standards
  - Waste analysis plan for characterizing each hazardous waste stored at the facility
  - Facility security
  - Location standards for flood zones and seismically sensitive areas
  - Annual personnel training
- Emergency preparedness
  - Develop a contingency plan for emergencies
  - Provide adequate communication and alarm systems for emergencies
  - Personnel training in emergency response
  - Procedures for managing ignitable, reactive, and incompatible wastes
- Design
  - Impermeable containment base free of cracks and gaps
  - Containment adequate for 10 percent of total waste capacity or largest container, whichever is greater
  - Additional containment adequate to contain a 25-year, 24-hour storm event, or a method to prevent runon and runoff of storm water and precipitation
- Operation
  - Weekly inspections
  - Removing accumulated liquids in the containment system within 24 hours
  - Separating incompatible wastes
- Closure
  - Develop closure plan subject to agency approval
  - Oversight by independent registered professional engineer
  - Certify to regulators the adequacy of closure

6.5 Inspections and Storage Inventory Log

All storage areas (TU, 90-day accumulation, and units meeting permitted facility standards) should be inspected at least weekly. A standard inspection form is included in Appendix C which shows the items to be inspected, discrepancies noted, and corrective actions taken. Container storage inspections should cover the following areas:

- Condition of containers
- Adequacy and completeness of labels
- Evidence of leaks and spills
- Adequate aisle space
- Loading and unloading areas
- Emergency equipment

In addition to completing weekly inspections, an inventory of containers should be maintained that reflects the following information:

- Number of containers currently in storage
- Date each container was generated
- Dates, manifest numbers, and destination facilities for IDW shipped to offsite management facilities
- Dates and disposition information for IDW disposed of onsite

Inventory information for small quantities of IDW may be maintained in the field logbook for the site. An inventory log may be used to track larger quantities of IDW from multiple sites. An inventory form is included as Appendix D. Inventory information should be updated at least weekly, and the inventory should be physically checked against the containers in storage at the time of inspection.

6.6 Container Labeling

Identifying marks and labels will be required on each waste container. The generating personnel must clearly mark each container with contrasting lettering. All empty drums will be marked as empty to avoid question of their contents. E/A&H has instituted the use of CERCLA IDW labels as shown in Figure 6-1. These labels will provide the base personnel with all the pertinent information they need to complete the inspection records state and federal regulations require. The labels will show the site location, date media was introduced in the drum, location designator, and type of media. Each location designator will be composed of five to six characters, the first two will represent the site identification number at NAS Pensacola (for example "30", represents site 30). The third character represents the waste origin (for example "S" for soil boring, "G" for monitoring well). If the monitoring well is temporary, the fourth digit will be used for the temporary designation of "R." The fourth digit may also designate the depth of the permanent monitoring well (i.e., "S" for shallow, "I" for intermediate, "D" for deep). The fourth and fifth characters may represent the matrix serial identification number, which is a unique location number assigned to the origin. For example a drum of purge water collected from Site 30, shallow monitoring well number 12 would have the location designator 30GS12. These labels will be filled out by the E/A&H personnel on the specific site and attached to the full and sealed drums. Drum labels will be placed on the side of the drum, not on the lid, to reduce weathering and to prevent the possibility of interchanging labels if lids are reused. If labels are not available, the following action will be accepted: The drums containing waste will be marked with a contrasting paint pen or grease pencil as CERCLA IDW, identifying the site location, date media was introduced in the drum, location designator, and type of media to allow the appropriate analysis to be traced to the correct drum of waste. All old markings on recycled drums shall be painted over with black spray paint to avoid confusion with the new labels or markings.

All labeling information for each drum will be entered into the field logbook. After the drum's contents are characterized, as described in Section 4, the labels will be updated to reflect the

Figure **6-1** **Drum** Label

NAVY CLEAN
ENSAFE/ALLEN
& HOSHALL

ENSAFE/ALLEN & HOSHALL
5720 SUMMER TREES DR. SUITE 8
MEMPHIS, TENNESSEE 38134
(901) 383-9115

SITE _____ DATE _____

LOCATION
DESIGNATOR _____ MEDIUM _____

appropriate classification of wastes and the logbook will be updated. Drums containing hazardous IDW will be labeled using a paint pen or grease pencil "HAZARDOUS WASTE - Florida Law Prohibits Improper Storage or Disposal" in accordance with 40 CFR Part 172 and the applicable state regulations. Drums containing non-hazardous IDW will be labeled using a paint pen or grease pencil "NON HAZARDOUS WASTE".

6.7 Use of Portable Storage Tanks

Portable storage tanks often are used to accumulate and store liquid IDW such as groundwater or storm water runoff. USEPA regulates these portable tanks as containers for storage onsite. Storage tanks should be labeled in the same manner as for containers. However, the portable tanks must comply with federal Department of Transportation (DOT) specification and labeling if they will be used to transport liquids to offsite facilities.

6.8 Repackaging and Overpacking Containers

Repackaging or overpacking containers may become necessary if they become damaged or weathered and no longer are suitable for use. Repackaging involves transferring the waste from the damaged drum into a new container, whereas overpacking involves placing the damaged drum into a larger container. When repackaging or overpacking occurs, the new container must be labeled identically, and a note should be made in the field logbook or storage inventory log of the change in packaging or drum size.

7.0 TREATMENT AND/OR DISPOSAL OF IDW

The Navy as *"Generator"* of the waste retains all responsibility for disposal of the containerized waste. The Navy disposes of its hazardous waste in accordance with NAS Pensacola Instruction 5090.1B Hazardous Waste *Management Program* (NAS Pensacola 1994).

Once the IDW has been characterized, treatment and disposal options that appropriately manage the waste may be considered. The options available at a particular installation depend on:

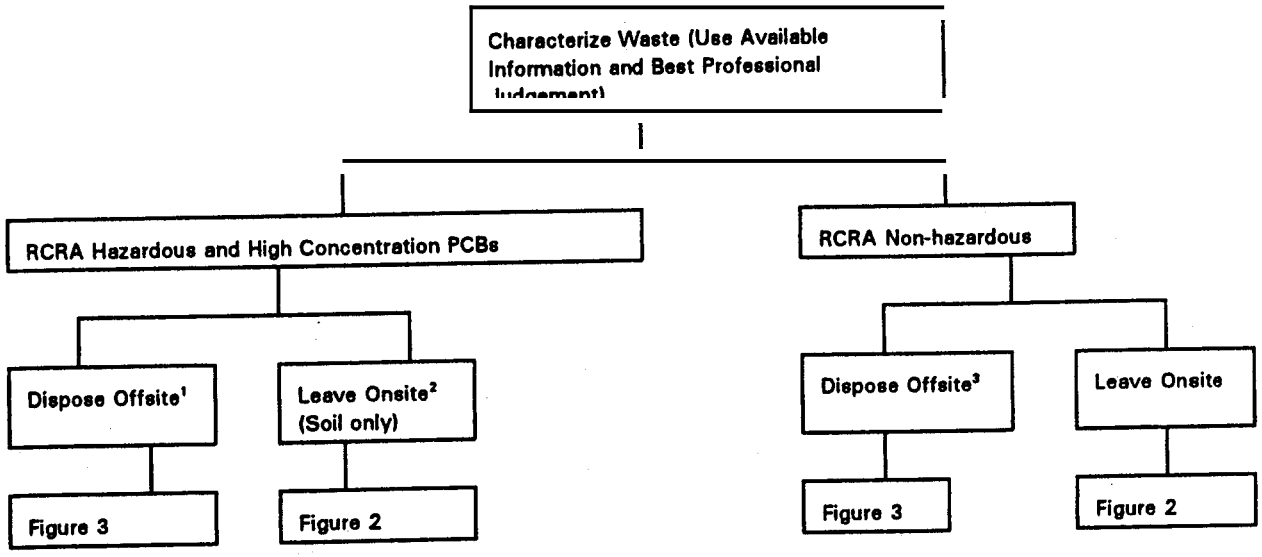
- Availability of onsite management facilities, such as industrial wastewater treatment plants, NOTWs, bioremediation facilities, and other treatment technologies that may have been developed for other cleanup sites.

- Availability of a POTW with the capability to treat wastewater from the installation.

- Site conditions and regulatory approval for disposal of non-hazardous soil back onto the site where generated.

A decision tree for selecting the best approach for IDW management is provided in Figure 7-1, 7-2, and 7-3. If the IDW is to remain onsite, then the onsite branch, Figure 7-2, shows the steps and choices for the different types of IDW. If the IDW is to leave the site, the offsite branch, Figure 7-3, shows the steps and choices for the different types of IDW. The waste management options addressed in this section include managing aqueous wastes at installation wastewater treatment plants, NOTWs, and at POTWs. Solid IDW may be disposed of at an offsite facilities or returned to the site from which it was generated. In addition, IDW may be used onsite in pilot-scale treatability studies.

Figure 7-1
IDW Management Decision Tree



Source: Modified from USEPA 1991

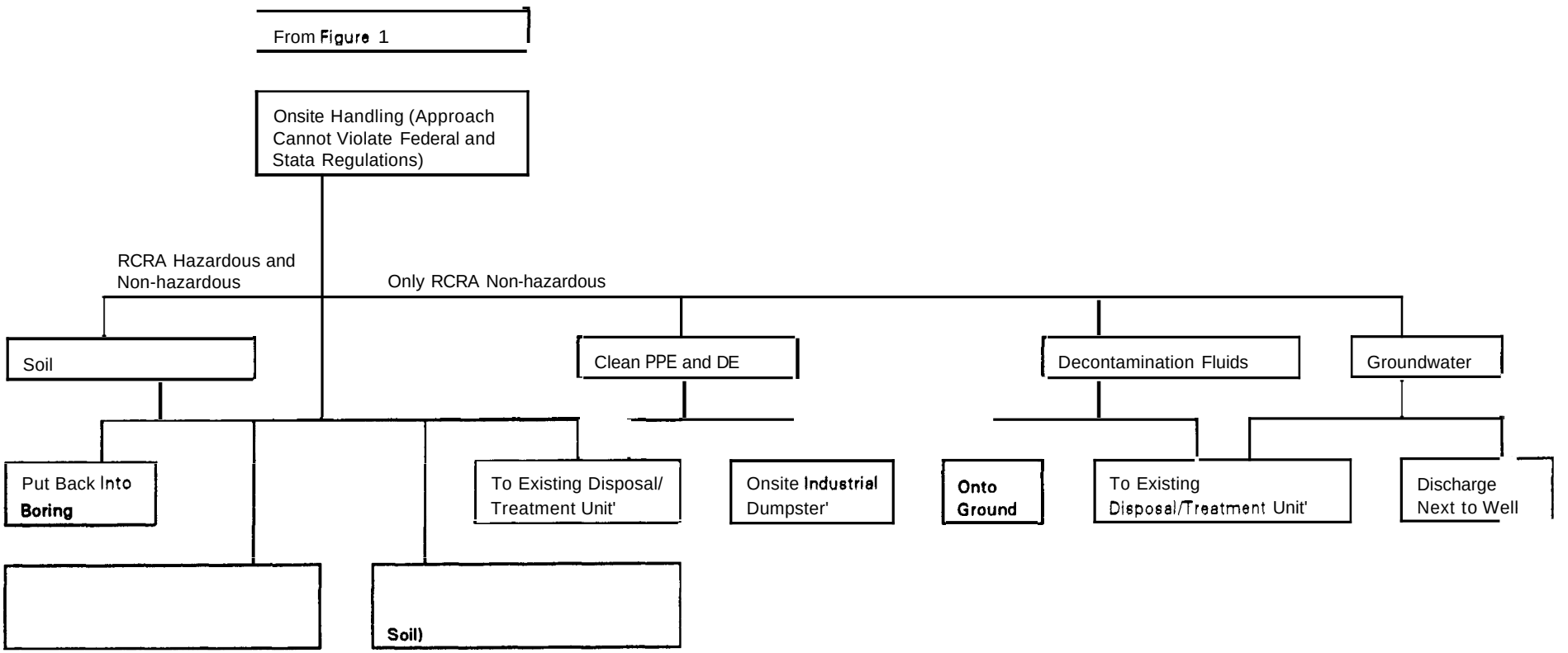
Notes:

1 Soil cuttings, groundwater, and decontamination fluids creating increased hazards should be disposed of offsite.

2 If not prohibited by other legally enforceable requirements such as state ARARs

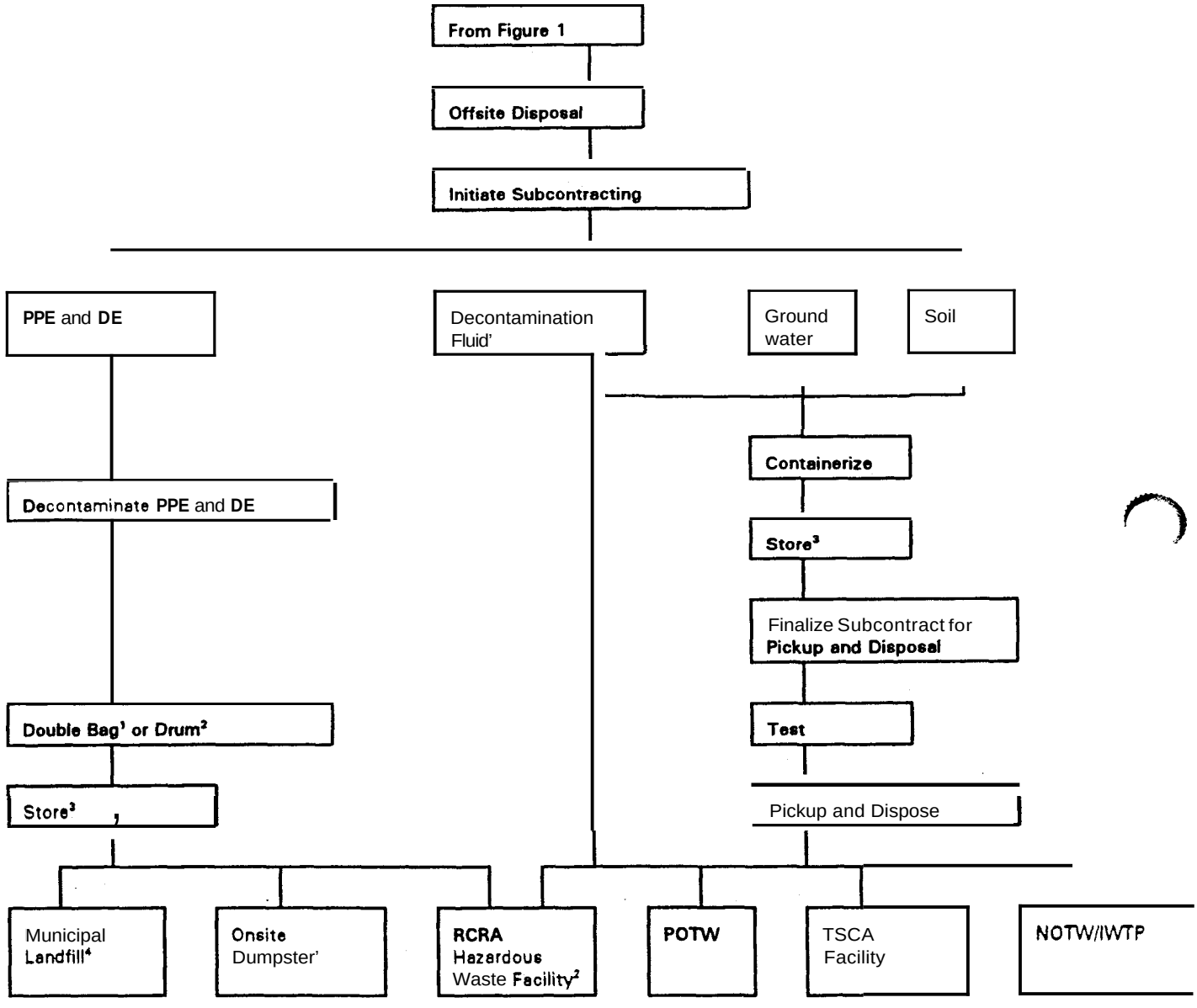
3 Justified only when a RCRA non-hazardous waste is a state hazardous waste and state requires waste removal, or if leaving the waste onsite would significantly affect human health and the environment

Figure 7-2
Onsite Handling of IDW



Notes:
1 Clean PPE and DE may also go to the nearest landfill
2 If the receiving unit meats the offsite policy acceptability criteria

Figure 7-3
Offsite Handling of IDW



Source: Modified from **USEPA 1991**

Notes:

1 Only RCRA non-hazardous waste
2 Only RCRA hazardous waste generated in quantities greater than 100 kg/month when sent offsite
3 In accordance with accumulation requirements for RCRA hazardous wastes
4 Only if the conditionally exempt small quantity generator exception applies
5 If the conditionally exempt smell quantity generator exception applies, offsite disposal of decontamination fluids may not require subcontracting

7.1 Offsite Handling

Offsite handling of IDW would involve using a subcontractor to haul and dispose of the IDW at an offsite facility which complies with the applicable regulations for the type of waste. Generally, this approach allows for the most technologically advanced disposal option. However, there *are* several disadvantages to offsite handling which include:

- increased costs
- loss of control over the fate of the IDW while retaining liability
- potential for spills during transportation
- finding a suitable disposal facility
- reluctance of states to accept waste generated out-of-state

7.1.1 Management of Aqueous Liquids at Installation Treatment Plants

Aqueous liquids such as well purge water, well development water, and decontamination Liquids often *can* be treated at available installation wastewater treatment plants. Based on the completed waste profile, the IDW *can* be evaluated to determine if it meets the acceptance criteria under the wastewater treatment plant's discharge permit. This evaluation usually consists of comparing the waste contaminants to the chemical constituents the plant is permitted to manage. Accepting and discharging the IDW to the wastewater treatment plant typically is coordinated with the installation environmental coordinator and plant personnel. If the waste is restricted under the LDR program, a special notification must be completed and submitted to the wastewater treatment plant when the waste is transferred (40 CFR §268.7[1[[6]). A certificate of disposal or their receipt should be obtained from the wastewater treatment plant after the IDW has been accepted, and this document should be filed with the waste profile, along with a copy of the LDR notification.

In addition to IWTPs, NOTWs are permitted to accept wastewater for treatment. However, NOTWs may be subject to different regulations. If this option is selected for use, notification and coordination with Base environmental personnel will be required.

7.1.2 Management of Aqueous Liquids at POTWs

Many POTWs are permitted to accept wastewater for treatment under special discharge permits issued for occasional or one-time discharges. These permits may often be obtained with the data used to complete the waste profile. The process of obtaining a special discharge permit is more formal than obtaining approval; however, the turnaround time for approval is typically just two to four weeks. If the waste is restricted under the LDR program, a special notification must be completed and submitted to the POTW when the waste is shipped or transferred (40 CFR §268.7[a][6]). A certificate of disposal or other receipt should be obtained from the POTW after IDW has been accepted, and this document should be filed with the waste profile, along with copies of the LDR notification.

7.1.3 Use of Investigation-Derived Waste in Pilot-Scale Treatability Studies

IDW may often be used beneficially onsite in pilot-scale treatability studies. At the federal level, samples undergoing treatability studies at laboratories and testing facilities are exempt from hazardous waste regulation, as long as USEPA and the Florida Department of Environmental Protection (FDEP) are notified and certain record-keeping and management standards are met (40 CFR 261.4[e] and [f]).

Before conducting a treatment study, any IDW intended for such use should be stored in accordance with applicable regulation, in properly labeled and marked containers.

7.2 Onsite IDW Handling and Management Options

Onsite handling of IDW is a cost effective approach to handling IDW. If IDW is RCRA non-hazardous soil or water, it may be left onsite unless a state ARAR or community concerns, require offsite disposal. IDW to be left onsite should not be containerized or tested. The onsite handling options for RCRA non-hazardous IDW are listed below.

- soil
  - Spread around the well
  - Return to boring
  - Put the IDW into a pit within the AOC
  - Dispose at the site's TDU

- Groundwater
  - Pour onto ground next to well
  - Dispose at the site's TDU

- Decontamination Fluids
  - Pour onto ground
  - Dispose at the site's TDU

- Decontaminated PPE and DE
  - Double bag and dispose at the site, or in an municipal landfill
  - Dispose at the site's TDU

If the IDW is RCRA hazardous soil that poses no immediate danger to human health and the environment, it may remain onsite within the delineated AOC. proximity to residents and workers must be considered before using this disposal option. Onsite disposal of RCRA hazardous soil involves:

- Delineating the AOC
- Determining pit locations close to the borings within the AOC
- Covering hazardous IDW in the pits with the surficial soil

3

8.0 IDW MANAGEMENT ORGANIZATION

The Navy will have ultimate authority and responsibility for managing and disposing of the IDW E/A&H generates on its behalf. Interim status for hazardous waste container storage facilities on the military base has been granted under RCRA statues and regulations. This allows all wastes to be managed in accordance with subtitles C and D of RCRA and with the state solid waste regulations. The Navy, E/A&H, and subcontractor personnel will implement the IDW management plan. E/A&H and its subcontractor personnel will be responsible for properly containerizing and labeling the waste and collecting samples for laboratory analysis. The Navy will be responsible for managing the waste inventory at waste accumulation areas, laboratory analysis, characterizing the waste as hazardous or non-hazardous (after analytical information is returned from the laboratory), loading of waste for offsite transfer, and for the transporting the waste to a properly permitted waste management facility.

8.1 E/A&H Site Manager

The E/A&H site manager will be responsible for properly containerizing IDW including:

- Notifying the site IDW coordinator of any new waste.
- Properly labeling the containers per Section 6 of this plan when accumulation is initiated.
- Establishing IDW accumulation area(s) at each site.

8.2 E/A&H IDW Coordinator

The E/A&H IDW coordinator will be responsible for assisting the Navy in managing IDW accumulation areas and accumulation areas associated with the investigation, however the Navy will retain ultimate responsibility for the waste management system. His responsibilities include:

- Supervising daily waste management at all generating points.
- Ensuring hazardous waste containers are properly labeled and stored in an appropriate manner and incompatible waste are segregated.
- Maintaining drum inventory logs or forms.
- Ensuring overall compliance with this plan.

8.3 Navy Environmental Coordinator (IDW Manager)

The Navy manages the hazardous waste in accordance with NAS Pensacola Instruction 5090.1B *Hazardous Waste Management Program* (NAS Pensacola 1994). The Navy environmental coordinator (IDW manager) will be responsible for the entire IDW management system. He will be responsible for informing E/A&H IDW Coordinator of any changes in procedures or policy concerning the handling, storage, and disposal of IDW.

9.0 REFERENCES

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Appendix A
Sampling and Analysis Procedures

1.0 IDW SAMPLING METHODS

The basic objective of the IDW sampling program is to produce a set of samples representative of the IDW media under investigation and suitable for subsequent analysis. This attachment describes the methods and materials to be used for sampling IDW generated at Navy installations. Under many circumstances, the sampling and testing performed for the investigation will be sufficient to classify the IDW and no additional sampling will be necessary. When additional sampling is required to characterize the waste, it is important that quality control (QC) sampling is performed to assess the accuracy and precision of the sampling program. QC sampling methods should be the same as those stated in the approved work plan.

Sampling accuracy is usually achieved by using a random sampling technique. Sampling precision is achieved by collecting the appropriate number of samples and by maximizing the physical size of the samples.

A simple random sampling strategy will be employed for most solid waste cases where it is determined additional samples are required to characterize the IDW. The rationale for using this type of sampling method is that typically little or no information is known about the distribution of the chemical contaminants within the waste. For most solid IDW, distinct strata within the containers are not identified and various in composition or stratification may have occurred at unknown and random depths.

Simple random sampling is a type of probability sampling relying on mathematical and statistical theories. In simple random sampling all locations or portions of the IDW have an equal chance of being sampled. For simple random sampling, the appropriate number of samples to be collected is estimated by finding the regulatory threshold (RT) for the contaminants of concern and by estimating the sample mean (X) and variance (s).

Simple random sampling may be used for liquid IDW thought to be homogeneous. Stratified random sampling may be used for liquid IDW sampling where the contaminants of concern are thought to stratify due to their density relative to the other liquids. Stratified random sampling

is different from simple random sampling in that the Xs are calculated for each stratum in the population and then integrated into the overall estimates of those statistics. Systematic random sampling may also be used for instances where there are recognized trends or cycles associated with the contaminants in the IDW. Cases where systematic random sampling may be used include drums with floating or sinking products.

It is also likely that if the waste is to be disposed of to a treatment, storage, or disposal unit (TSDF), the TSDF's operators will want to perform their own waste characterization. Therefore, it is important to contact the potential TSDF before performing sampling and laboratory analysis of the IDW to avoid duplication of efforts and costs. Potential TSDFs for the IDW should be contacted following environmental sampling. Their requirements regarding acceptable laboratory analyses change as do the wastes that they are accepting and the rates that they charge. Transportation requirements and costs should be determined before shipping.

The sampling method selected for each of the IDW media will, in part, depend on the potential contaminants of concern as shown by site history or analytical results of the field sampling program. The generation of additional decontamination fluids through IDW sampling should be minimized and should be a factor considered in the final choice of sampling technique. Care should be exercised to avoid using sampling devices plated with chrome or other materials that might contaminate the sample.

The description of sampling methods for containerized media is divided into three sections that address (1) soil and sludge, (2) containerized liquid, and (3) containerized PPE. If required, wipe sampling will be used to analyze the surface of drums, DE, and PPE.

1.1 Soil and Sludge Sampling

Available options for sampling devices suitable for soil and sludge (or sediment) sampling include scoops, thin-walled tube samplers, hand augers, and core samplers. The use of a scoop and a 100 centimeters (cm) long sampling trier is the recommended method for sampling containerized soil and sludge. However, site-specific conditions may necessitate a variety of

sampling options, and therefore all of these sampling methods will be discussed. The presence of rocks, debris, or other sampling-specific considerations may complicate sampling and preclude the use of or require modification to some of these sampling devices.

When sampling a previously sealed vessel, the presence of a bottom sludge should be checked. This is easily accomplished by measuring the depth to apparent bottom and then comparing it to the known interior depth. Methods for sampling a bottom sludge are described in the following sections. Sludge developing in 55-gallon drums can also be collected by employing glass tubes used for the liquid portion of the sample.

1.1.1 Shovel, Spades, and Scoops

Collection of soil and sludge samples can be accomplished with tools such as spades, shovels, and scoops. The recommended and most direct method of collecting surface samples for subsequent analysis is with the use of a spade and scoop. This method is limited somewhat to sampling at the near surface. Samples from depths greater than 50 cm may become very labor-intensive. Samples collected for volatile organic compound (VOC) analysis will be placed directly into the analytical bottle. Samples collected for other analyses will be composited in a stainless steel bowl and then placed into the analytical bottles.

1.1.2 Thin-Walled Tube Sampler and Hand Corers

The thin-walled tube sampler is, as its name implies, a metal tube generally 2.5 to 7.5 cm in diameter and 30 to 60 cm long. The tube is forced into the soil or sludge and then extracted. Friction will usually hold the sample material in the tube during extraction. A variety of interchangeable cutting tips facilitates penetration with reduced sample disturbance. Thin-walled tube samplers are available in various types and construction materials and are suitable for moist, dry, sandy, or heavy-duty applications.

Sampling soil or sludge can also be accomplished with a hand corer. This device is essentially the same type of thin-walled tube sampler described above. It is modified by the addition of a handle to facilitate driving the corer and a check valve on top to prevent washout during retrieval

through an overlying water layer. Hand auguring devices can be used in conjunction with a thin-walled tube sampler. In this manner, a thin-walled tube sampler can be used to sample both from the surface or to the bottom of a 55-gallon drum. However, the presence of rocks or the collapse of the auger hole generally prohibits sampling at depth.

1.2 Aqueous Liquid Sampling

Beakers, glass tubes, bailers, and extended bottle samplers and composite liquid waste samplers (COLIWASA) are potential devices used to sample containerized liquid media. Site-specific conditions may necessitate a variety of sampling options, and therefore all of these methods will be discussed. Samples from drums can also be readily collected by merely submerging a sample bottle.

1.2.1 Beakers

The use of a sampling device such as a beaker, either disposable or constructed or glass, Teflon, or stainless steel, is the recommended method for sampling containerized liquids. The device typically has a capacity of at least 500 milliliters (ml) to provide an adequate sample volume for analysis and to minimize the number of times the liquid will be distributed, thus reducing agitation of any sediment layer. Large sample volumes required for some analyses will require submerging the beaker several times to obtain the appropriate volume. A stainless steel beaker with pour spout and handle works well. It is easily cleaned and considerably less expensive than Teflon.

122 Bailers

Liquid samples from open containers, such as 55-gallon drums, may be collected. Bailers may also be used to collect liquid samples from containers such as drums or tanks. The major disadvantages to using bailers are splash hazards, and the need for decontamination of reusable bailers, and the generation of waste when using disposable bailers.

1.2.4 Composite Liquid Waste Samplers

The composite liquid waste samplers (COLIWASA) is designed to permit representative sampling of the complete water column from drums or other containerized liquid media. This type of sampler is used when contaminants of different densities such as oil and water are potentially present in the containerized liquid. It consists of a 152-cm long by 4-cm ID section of tubing with a neoprene stopper at one end. The stopper is attached to a rod running the length of the tube and terminating with a locking mechanism at the other end. Manipulation of the locking mechanism opens and closes the sampler by raising and lowering the neoprene stopper. The major drawbacks associated with using the COLTWASA include the difficulty of decontamination and cost. The sampler is difficult to decontaminate in the field and high in cost relative to alternative procedures such as glass tubes. The COLTWASA should only be used when multiphase wastes are suspected.

1.3 Wipe Sampling

Wipe samples are used to assess surface pesticide/PCB contamination and are applicable for the analysis of drums containing used PPE and DE. The terms "wipe sample," "swipe sample," and "smear sample" have all been used synonymously. For purposes of this section, the sample will be termed "wipe sample". Wipe samples will adhere to requirements for soil sample preservation and holding times. Wipe samples will be collected in accordance with the following procedures.

Before *Sampling:*

1. Don personal protective equipment as required in the site-specific HASP.
2. Mark the 10-cm sample site with a decontaminated template or a ruler.
3. Write a detailed description of the area to be sampled including a sketch of the sampling area in the field logbook.
4. Prepare all sampling equipment for the sampling event.

During Sampling:

5. Remove the cap from the sampling vial.

6. Remove the hexane- or deionized water-soaked gauze or swab from the sampling vial with stainless steel forceps or tongs.
7. Immediately begin wiping the sampling area twice, from left to right and then from top to bottom.
8. Return the gauze or swab to the sample vial. If using a gauze, fold the gauze so the side used in sampling is not exposed.
9. Cap the sample vial.

After Sampling:

10. Label the vial and record the sampling details on the sampling forms. Complete the chain-of-custody forms in accordance with Section 12 of the *CSAP*.

QA/QC samples will be collected at the frequency presented in Section 15 of the *CSAP*. In addition, a hexane- or deionized water-soaked gauze will be submitted as a QA sample.

Appendix B

Waste Profile Forms and Instruction

PROFILE NUMBER_____
Completed by_____
Date_____
Reviewed by_____

INVESTIGATION-DERIVED WASTE PROFILE

Complete one form for each waste stream generated at each site. See instructions attached for detailed information about this form.

GENERATOR INFORMATION

Facility Name _____
Site Name _____
Address _____
_____
City _____ State — Zip _____

USEPA ID Number_____
Technical Contact _____
Phone_____
Fax _____
CTO Number_____

WASTE DESCRIPTION

Waste Description_____
Source Code/Process _____
Waste Form Code/Category of Waste _____
Special Handling Instructions_____
Is this waste regulated by USEPA or FDEP? _____ Waste codes _____ CLIN_____

LDR Subcategory	_____	_____	_____	_____
Numerical Standard per 1268.417	_____	_____	_____	_____
Numerical Standard per 1268.437	_____	_____	_____	_____
Technology-Based Standard 5268.427	_____	_____	_____	_____

TRANSPORTATION INFORMATION

DOT Proper Shipping Name_____
DOT Hazard Class_____ UN/NA_____ RQ _____
Packaging Description _____

PHYSICAL PROPERTIES

Color _____
Odor _____

Liquid Layering _____
Physical State _____

	Avg.	Min.	Max.
pH	_____	_____	_____
Specific Gravity	_____	_____	_____
flash point	_____	_____	_____
(Method):	_____	_____	_____
BTU/lb	_____	_____	_____

Viscosity _____
Yard-Pound Factor _____ %YD = LB

%Halogens_____
% Liquid _____
% Sludge _____
% Solid _____
%Water_____

Acid Reactive	Y	N	Biological	Y	N	Corrosive	Y	N
Dioxin	Y	N	Explosive	Y	N	Flammable	Y	N
Oxidizer	Y	N	Pesticide	Y	N	Herbicide	Y	N
Poison	Y	N	Pumpable	Y	N	Pyrophoric	Y	N
Radioactive	Y	N	RCRA Reactive	Y	N	Shock Sensitive	Y	N
Wastewater	Y	N	Water Reactive	Y	N	Other _____		

TOXICITY CHARACTERISTICS

USEPA Waste Code	Contaminant	Level (mg/L)	Federal Regulated Level
	Aldrin	_____	
	Antimony	_____	
D004	Arsenic	_____	5.0
	Asbestos	_____	
D005	Barium	_____	100.0
D018	Benzene	_____	0.5
	Beryllium	_____	
D006	Cadmium	_____	1.0
D019	Carbon Tetrachloride	_____	0.5
D020	Chlordane	_____	0.03
DO21	Chlorobenzene	_____	100.0
D022	Chloroform	_____	6.0
D007	Chromium (Total)	_____	
	Chromium (Trivalent	_____	
	Chromium (Hexavalent)	_____	
	Cobalt	_____	
	Copper	_____	
D023	o-Cresol	_____	200.0
D024	m-Cresol	_____	200.0
D025	p-Cresol	_____	200.0
DO16	2.4-D	_____	10.0
	DDT, DDE, DDD	_____	
D027	1,4-Dichlorobenzene	_____	7.5
D028	1,2-Dichloroethane	_____	0.5
D029	1,1-Dichloroethylene	_____	0.7
	Dieldrin	_____	
D030	2.4-Dinitrotoluene	_____	0.13
	Dioxin (2,3,7,8, - TCDD)	_____	
D012	Endrin	_____	0.02
	Fluoride salts	_____	
D031	Heptachlor (& its epoxide)	_____	0.008
D032	Hexachlorobenzene	_____	0.13
D033	Hexaclorobutadiene	_____	0.5
D034	Hexachloroethane	_____	3.0
	Ketone	_____	
D008	Lead	_____	5.0
	Lead components, organic	_____	
D013	Lindane	_____	0.4
D009	Mercury	_____	0.2
D014	Methoxychlor	_____	10.0
D035	Methyl ethyl ketone	_____	200.0
	Mirex	_____	
	Molybdenum	_____	
	Nickel	_____	
D036	Nitrobenzene	_____	2.0
D037	Pentachlorophenol	_____	100.0
D038	Pyridine	_____	5.0
D010	Selenium	_____	1.0
DO11	Silver	_____	5.0
D039	Tetrachloroethylene	_____	*0.7*
	Thallium	_____	
D015	Toxaphene	_____	0.5
D017	2,4,5-TP (Silvex)	_____	1.0
D040	Trichloroethylene	_____	0.5
D041	2,4,5-Trichlorophenol	_____	100.0
D042	2,4,6-Trichlorophenol	_____	2.0
	Vanadium	_____	
D043	Vinyl chloride	_____	*0.2*
	Zinc	_____	
	PCB	_____	

TOTAL METALS

Metals (ppm)	Avg.	Min.	Max.	Metals (ppm)	Avg.	Min.	Mar.
Aluminum	___	___	___	Iron	___	___	___
Antimony	___	___	___	Lead	___	___	___
Arsenic	___	___	___	Mercury	___	___	___
Barium	___	___	___	Molybdenum	___	___	___
Beryllium	___	___	___	Nickel	___	___	___
Cadmium	___	___	___	Selenium	___	___	___
Chromium VI	___	___	___	Silver	___	___	___
Chromium III	___	___	___	Thallium	___	___	___
Cobalt	___	___	___	Vanadium	___	___	___
Fluoride	___	___	___	Zinc	___	___	___

CHEMICAL COMPOSITION

Chemical Name	Avg.	Min.	Max.	Circle one
_____	___	___	___	% PPM PPB
_____	___	___	___	% PPM PPB
_____	___	___	___	% PPM PPB
_____	___	___	___	% PPM PPB
_____	___	___	___	% PPM PPB
_____	___	___	___	% PPM PPB
_____	___	___	___	% PPM PPB
Water	___	___	___	% PPM PPB

ADDITIONAL INFORMATION AND COMMENTS

Attached documentation: _____

GENERATOR CERTIFICATION

I hereby certify, as an authorized representative of the generator named on Page w of this Waste Profile, that the information provided in this and all attached documents is true and correct; reveals any and all known or suspected hazards involving the handling, transportation, treatment, storage and disposal of this waste; and no willful misrepresentations or omissions have been made. I further certify and warrant that this identification is the result either of an analysis of a representative sample obtained and analyzed in accordance with the sampling end testing procedures specified by the U.S. Environmental Protection Agency or by applying knowledge of the process generating the specific waste being offered.

Generator's Signature _____ Title _____ Date _____

Instructions for Completing the Investigation-Derived Waste Profile

1. ***General Information.*** The mailing address of the generator and the site where the waste will be picked up should be indicated. The USEPA Identification Number for the site must be provided, unless the generator is a conditionally-exempt small quantity generator.

2. ***Waste Description.*** This Section contains some general information about the waste, including how it was generated.

USEPA hazardous waste codes are also included in this section. Waste codes are selected according to whether the waste contains any listed hazardous waste or whether the waste itself exhibits a characteristic of hazardous waste. There is a hierarchy for assigning waste codes which *can* be reviewed in detail in 40 CFR Part 261 of the federal hazardous waste regulation. Here's a simple explanation:

a. If the remediation site is associated with a specific industrial process, first look under the Kcode listing in 40 CFR §261.32 to determine if any of the generating processes match the activities previously conducted at the site. If so, the waste gets the K-code and go on to step "d" to assign characteristic codes. If the process is not described in the Kcode list, go to step "b". There are very few specific industrial processes that would result in such IDW at Navy facilities.

b. If the remediation site is associated with a non-specific industrial process that was not listed under the K-codes, look under the F-code listings in 40 CFR §261.31 to determine if any of the generating processes match the activity and contaminants at the site. If so, the waste gets the appropriate F-code, and then continue to step "d" to assign characteristic codes. If the process is not described in the F-code list, go to step "d". Some common F-code activities include use of solvents, wood treatment activities, and electroplating operations.

c. If the remediation site is associated with the release of a commercial product, off-specification species or out-of-date product, look under the P-code and U-code listings in 40 CFR §261.33 for a match to the contaminants found at the site. P-code sates are acutely toxic, and U-code waste are listed for chronic toxicity, reactivity, or ignitability. A common activity which results in this type of waste is a pesticide storage area where containers were rinsed or where releases occurred. Don't forget to check the lists for common synonyms of the chemical. The CAS number may also be used to review the list of waste codes. If the waste does not match any of the chemicals in this list, go to step "J".

d. If the waste doesn't fall into any of the categories listed above, you must consider the characteristic waste categories listed in 40 CFR Part 261. Subpart C. There are four categories of characteristics, known as D-code wastes: ignitable, corrosive, reactive and toxic. A waste may exhibit one or more of these characteristics. The only way to determine whether a waste is regulated as a characteristic waste is to take a sample and analyze it for the characteristic, or to use other analytical data to determine if it exhibits one or more characteristics. If the waste does not fall into any of the categories listed in steps "a" through "c" and does not exhibit a hazardous characteristic, it is not regulated as hazardous waste, although it may be regulated as designated waste.

Characteristic waste codes regulated under federal regulations are assigned according to the type of characteristic exhibited.

3. ***Transportation Information.*** This section is for completing the proper U.S. Department of Transportation shipping name, hazard class and UNMA number. In addition, the reportable quantity (RQ) for the waste is shown here. DOT information is available in 40 CFR Part 172, and RQ information is available in 40 CFR Part 302.

4. ***Physical Properties.*** Important physical characteristics arc described in this section of the profile, including many of the characteristics to be used for verifying the waste identification when the waste is picked up by E/A&H's waste management contractor.

5. ***Toxicity Characteristics.*** This section of the profile contains a comprehensive listing of chemical constituents that arc regulated by USEPA. Their corresponding D-codes are shown in the list, as is the regulated level for each chemical. This section of the form should be completed even if the waste is listed as a Kcode, F-code, P-code or

U-code. It is usually based on an analytical report for the waste. If a sample will be collected for toxicity characteristic analysis, the constituents selected for analysis should be based on a review of available corresponding environmental data, known activities at the site, and possible management methods for the waste.

6. Total ***Metals.*** Information on total metals is usually required for waste streams requiring certain types of treatment. For example, an inorganic sludge that exhibits a toxicity Characteristic for cadmium and lead (D006 and D008) may be chemically stabilized to meet LDR treatment standards before it *is* landfilled. Usually this type of treatment consists of "fixing" the waste in a concrete-like material. In order to ensure that the required USEPA treatment standards will be met, the treatment company needs information on the total quantity of cadmium and lead in the waste so that it *can* develop the proper "recipe" for the waste and stabilizer.

7. ***Chemical Composition.*** All the components of tbe waste are listed, along with a range of their concentration. It is important that the average concentrations add up to 100%, so that all the components are represented. A composition listing for a typical solvent/water waste stream is on the following page.

Chemical Name	Avg.	Min.	Max.	Conc.
Xylenol	3	2	4	%
Ethyl Acetate	5	4	6	%
Methanol	1	1	2	%
Ethanol	1	1	2	%
Hexone (Methyl Isobutyl Ketone)	1	1	2	%
Aliphatic Naphtha (carrier)	69	50	70	%
Water	20	10	55	%
Total Composition	100	N/A	N/A	%

8. ***Additional Information and Comments.*** This section is for explaining any special conditions or handling required for the waste. In addition, this section should list the supporting documentation attached to tbe profile to support the waste characterization.

9. ***Generator Certification.*** The generator certification should be signed by the environmental coordinator for the Navy installation where the waste is generated.

Appendix C
Sample Storage *Area* Inspection Form

ACCUMULATION STORAGE UNIT
GENERAL INSPECTION - WEEKLY

INSPECTED BY: _____ _____ __/__/__ _____
Inspector' name (print) Signature Date Time

REVIEWED BY: _____ _____ __/__/__ _____
Manager's name (print) Signature Date Time

EQUIPMENT/AREA	SAT	UNSAT	COMMENTS
FACILITY PROPER			
Evacuation Routes			
Access (Unobstructed)			
Emergency exits unlocked at start of day			
Pavement/curbing			
No evidence of leakage, spillage, or accumulated liquid .			
Access Road			
Access (Unobstructed)			
Condition (No holes, depressions, or debris)			
SECURITY DEVICES			
Fences			
Condition (No damage or corrosion).			
Gates			
Condition (No damage or corrosion)			
Operation (Swing or slide freely)			
Access (Unobstructed)			
Padlocks			
Present at each gate			
Operation			
Warning Signs			
Presence (Maximum 75 feet apart)			
Legibility (From a minimum 25 feet apart)			
SAFETY AND EMERGENCY EQUIPMENT			
Emergency Shower/Eye Wash Stations			
Adequate supply of eyewash solution			
Handle operation			
Water Pressure, volume, and flow			
Identification signs (Present, legible, and in satisfactory condition)			
Access (Unobstructed)			

Appendix D
Drum Inventory Form

EnSafe/Allen & Hoshall

Investigation Derived Waste: Drum Inventory

Project Name:			Project Number:		
Client:			Site No.:		
Survey Date:			Surveyor:		
	Boring/Well No.	Contents	Date Generated	# Drums	Comments
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

APPENDIX E

Field Forms

Figure 1

DRUW/CONTAINER CHARACTERIZATION SHEET

Site Name:	Date:	Project #:
Project Description:	Drum #	Field Crew/Role:

Drum Size	Drum Type	Head Configuration	Identifiable markings:
Unknown	steel	Ring top (no bungs)	Sketch drum/container position
30 gallon	Aluminum	Ring top (bungs)	
55 gallon	Plastic	closed top	
80 Gallon	Glass	Unknown	
Other (Specify)	Metal/Other (Specify Type)	Other (Specify)	

Estimated Volume:

General condition of the drum/container:

Can it be handled/moved and re-staged or over-packed?

Screening Data		Drum Contents (Indicate % if mixture of more than one media)	
Radioactivity		Solids Classification	Liquids Viscosity
mR Background	mR		
PID eV Lamp	ppm	Trash	Other
ppm (background)			
FID ppm (background)	ppm	Drum Contents (Color)	
Combustibility	%LEL %O2	Unknown	Red
Draeger Multi-test		Cream	Yellow
Air Reactive	Δ Temp	Clear	Amber
Water Reactive	Δ Temp	White	Purple
Water solubility	Yes No % Partial	Gray	Black
Flammable	Yes No	Orange	Brown
pH		Green	Other:
Cyanide	ppm (Draeger Tube over Water Bath)	Greenish Blue	

Area surrounding drums/containers (stressed vegetation, distribution pathways):

Comments:

S e e Attached Safe Work Permit for Protective/Hazard Control Measures

See Attached Drum/Container Inventory

Low Flow Purge Data Sheet

Well No.: _____

PROJECT: _____ DATE: _____
PROJECT NUMBER: _____ WEATHER: _____
SITE: _____ PERSONNEL: _____

Well Screen Depth: _____ ft.
Initial Water Level: _____ @ _____ hrs.

Pump Type/Material: _____
Pump Intake Depth: _____

Tide Cycle: [ ] High @ _____
[ ] Low @ _____

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Temp °C	pH	p Con mS/cm	DO mg/L	Turbidity NTU	Salinity %	Eh mV	Comments

Remarks: _____

Low Flow Purge Data Sheet

Well No.: _____

PROJECT: _____ DATE: _____
PROJECT NUMBER: _____ WEATHER _____
SITE: _____ PERSONNEL: _____

Well Screen Depth: _____ / _____ ft.
Initial Water Level: _____ @ _____ hrs.

Pump Type/Material: _____
Pump Intake Depth: _____

Tide Cycle: [ ] High @ _____
[1 Low @ _____
[ ] Not Affected

Total Purge Volume= _____ (gal / L) Drawdown + Tubing Volume= _____ (gal / L)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Temp °C	pH	p Con mS/cm	DO mg/L	Turbidity NTU	Salinity %	Eh mV	Comments

Remarks: _____

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)*	Depth to Free Produc (feet)*	Depth to Water (feet)*	Thickness of Free Produc (feet)*	Groundwater Elevation (feet)*	Comments

* All measurements to the nearest 0.01 foot

Page ____ of ____

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	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO	Salinity	Eh mV
Method:								

PURGE DATA

Date:	Volume	pH	S.C.	Temp (°C)	Turbidity	DO	Salinity	
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Diameter:	2							
Well Casing Material:	3							
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):

SOIL 8 SEDIMENT SAMPLE LOG SHEET

Project Site Name: _____
Project No.: _____

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

Sample ID No.: _____
Sample Location: _____
Sampled Bv: _____
C.O.C. No.! _____

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

;RAB SAMPLE DATA:

late:	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
ime:			
lethod:			
lonitor Reading (ppm):			

:OMPOSITE SAMPLE DATA:

)ate:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
lethod:				
lonitor Readings Range in pprn):				

;AMPLE COLLECTION INFORMATION:

Analvsis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

MULTIPLE SAMPLE LOG SHEET

PAGE___ OF___

[] SURFACE SOIL [] SEDIMENT
[] SUBSURFACE SOIL [] LAGOON/ POND
[] OTHER _____

SIGNATURE(S): _____

PROJECT NAME: _____
PROTECT NUMBER: _____

LOCATION: _____

SAMPLE No.	SAMPLE METHOD	DEPTH (Ft.)	DATE	TIME	SAMPLED BY	CONCENTRATION (L)LOW (H)HIGH	(G) GRAB (C) COMPOSITE	TOTAL No. OF CONTAINERS	ANALYSES							SOIL DESCRIPTION

REMARKS:	LABORATORY:	COC No.:

3

WELL DEVELOPMENT SHEET

ROJECT SITE NAME: _____ SITE/LOCATION _____
PROJECT NUMBER: _____ WELL ID.: _____
WEATHER: _____ DATE: _____
STATIC WATER LEVEL: _____ PERSONNEL: _____
TOTAL WELL DEPTH: _____ WELL TYPE: [PVC], [S.S.], or
ONE CASING VOLUME: _____ OTHER _____
START TIME: _____ MEASURING DEVICE: _____
END TIME: _____ ADJUSTMENT FACTOR: _____

[ ] DOMESTIC WELL, [ ] MONITORING WELL, [ ] OTHER _____

METHOD & REMARKS _____

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)

NOTE All measurements to neared 0 01 toot measured from top of well nser pipe unless otherwise noted

ADDITIONAL COMMENTS: _____

SIGNATURE(s): _____ PAGE — OF —

SURFACE WATER SAMPLE LOG SHEET

Page___ of

Project Site Name: _____
Project No.: _____

[] Stream
[] Spring
[] Pond
[] Lake
[] Other: _____
[] QA Sample Type: _____

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

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

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Date:	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Time:								
Depth:								
Method:								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

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:	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time:	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date:	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Diameter & Material	2							
Type:	3							
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):

MONITORING WELL DEVELOPMENT RECORD

Well:_____
Site :_____
Date Installed: _____
Date Developed:_____
Dev. Method:_____
Pump Type:_____

Depth to Bottom (ft): _____
Static Water Level Before(ft):_____
Static Water Level After (ft):_____
Screen Length (ft):_____
Specific Capacity:_____
Casing ID (in): _____

Site Geologist: _____
Drilling Co.: _____
Project:_____
Project Number:_____
Sheet No._____ Of _____

Time	Estimated Sediment Thickness (ft)	Cumulative Water Volume or Pumping Rate (gallons/gpm)	Water Level Reading (ft. below TOC)	Temperature (units____)	pH	Specific Conductance (microsiemens/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)

FLORIDA

Form Title: Petroleum or Petroleum Products Water Sampling Log
Effective Date: September 13, 1997

Petroleum or Petroleurn Products
Water Sampling Log

FDEP FACILITY NO.:	WELL NO.:	SAMPLE ID:	DATE: / /
SITE NAME:	SITE LOCATION:		

PURGE DATA

WELL DIAMETER (in):	TOTAL WELL DEPTH (ft):	DEPTH TO WATER (ft):	WELL CAPACITY (gal/ft):

1 WELL VOLUME (gal) = (TOTAL WELL DEPTH - DEPTH TO WATER) x WELL CAPACITY =

= (-) x =

PURGE METHOD:	PURGING INITIATED AT:	PURGING ENDED AT:
	PURGE RATE (gpm):	TOTAL VOLUME PURGED (gal):

WELL VOLS. PURGED	CUMUL. VOLUME PURGED (gal)	pH	TEMP. (°C)	COND. (µmhos)	COLOR	ODOR	APPEARANCE	OTHER

SAMPLED BY / AFFILIATION	SAMPLER(S) SIGNATURE(S)	
SAMPLING METHOD(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:

FIELD DECONTAMINATION: Y N | FIELD-FILTERED: Y N | DUPLICATE: Y N

SAMPLE CONTAINER SPECIFICATIONS			SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD
NO.	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOLUME ADDED IN FIELD (ml)	FINAL pH	

REMARKS:

MATERIAL CODES: AG = AMBER GLASS; CG = CLEAR GLASS; HDP = HIGH DENSITY POLYETHYLENE; O = OTHER (SPECIFY)

WELL CAPACITY: 1.25" = 0.06 gal/ft; 2" = 0.16 gal/ft; 4" = 0.65 gal/ft; 6" = 1.47 gal/ft; 8" = 2.61 gal/ft; 12" = 5.88 gal/ft

NOTE: this does not constitute all the information required by Chapter 62-160, F.A.C.

SOUTHERN DIVISION - NAVFACENGCOM
MONITORING WELL DEVELOPMENT RECORD

Well:_____
Site :_____
Date Installed: _____
Date Developed:_____
Dev. Method:_____
Pump Type:_____

Depth to Bottom (ft) _____
Static Water Level Before(ft):_____
Static Water Level After (ft):_____
Screen Length (ft):_____
Specific Capacity:_____
Casing ID (in): _____

Responsible Professional: _____
Drilling Co.: _____
Project:_____
Project Number:_____
Sheet No._____ of _____

Time	Estimated Sediment Thickness (ft)	Cumulative Water Volume (gallons)	Water Level Reading (ft. below TOC)	Temperature (units_____)	pH	Specific Conductance (microsiemens/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)

SOUTHERN DIVISION - NAVFACENGCOM
CERTIFICATE OF CONFORMANCE

Well Designation: _____
Site Name: _____
Date Installed: _____
Project Name: _____

Responsible Professional: _____
Drilling Company: _____
Driller: _____
Project Number: _____

Material	Brand/Description	Source/Supplier	Sample Collected ?
Well Casing			
Well Screen			
End Cap			
Drilling Fluid			
Backfill Material			
Annular Filter Pack			
Bentonite Seal			
Annular Grout			
Surface Cement			
Protective Casing			
Paint			
Rod Lubricant			
Compressor Oil			

To the best of my knowledge, I certify that the above described materials were used during installation of this monitoring well.

Signature of Responsible Professional: _____

SOUTHNAVFAC

LOG OF BORING

Page of

PROJECT NO:	PROJECT NAME:
PROJECT LOCATION:	DATE DRILLED:
DRILLING COMPANY:	SURFACE ELEVATION: *Feet*
DRILLING METHOD:	BORING DIAMETER: *Inches*
DRILLING RIG:	GEOLOGIST:

DEPTH feet	SAMPLE NUMBER	BLOWS/FT.	PID (ppm) Sample	B. Zone	Borehole	Drill B. Z.	GRAPHIC LOG	USCS/RQD	GEOLOGIC DESCRIPTION Density/Consistency, Hardness, Color	WELL DIAGRAM
5										
10										
20										
25										
30										
35										

JOB NUMBER

SHEET _____ OF _____

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D'	MOISTURE	ODOR	UNFILTER	FILTERED	CORRECT	DEPTH	USCS OR ASTM CODE	LITHOLOGIC DESCRIPTION :
												PROJECT: NO. BORING NO.
										1		
										2		
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										0		
										1		
										2		
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										0		

SOUTHNAVFAC

WELL ABANDONMENT FORM

Facility Name:_____

Site Name:_____

Site Number:_____ Date(s) Abandoned:_____

Well Number:_____ Well Depth:_____

Well Diameter:_____ Screen Length:_____

Well Location:_____

Reason for Abandonment:_____

_____

Abandonment Contractor:_____

Method of Abandonment[1]:

Grout in Place:_____ Pull and Grout:_____

Overdrill and Grout:_____ Other (Explain):_____

_____

Type and Amount of Grout and Date(s):_____

_____

Final Surface Conditions:_____

_____

Additional Notes/Comments:_____

_____

Inspected by (Contractor):_____ Date:_____

Approved by (Navy Representative:_____ Date:_____

(1) Note that abandonment may be subject to state and local requirements in addition to federal requirements. These requirements should be incorporated into the abandonment process, and additional information provided in the Additional Notes/Comments section of this form.

APPENDIX F

Quality Assurance Project Plan
Site 43
NAS Pensacola
Pensacola. Florida

QUALITY ASSURANCE PROJECT PLAN

PRELIMINARY SITE CHARACTERIZATION
FOR
SITE 43
NAVAL AIR STATION – PENSACOLA
PENSACOLA, FLORIDA

Submitted by:
Tetra Tech NUS, Inc.
661 Andersen Drive, Foster Plaza 7
Pittsburgh, Pennsylvania 15220

APRIL 1999

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

In support of:

"CLEAN" CONTRACT NUMBER N62467-94-D-0888

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PITTSBURGH, PENNSYLVANIA

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ACRONYMS / ABBREVIATIONS

ASTM	American Society for Testing and Materials
TtNUS	Tetra Tech NUS, Inc.
BFB	Bromofluorobenzene
CLEAN	Comprehensive Long-Term Environmental Action, Navy
COC	Chain of Custody
CompQAP	Tetra Tech NUS, Inc. FDEP Comprehensive Quality Assurance Plan
CTO	Contract Task Order
CVAA	Cold Vapor Atomic Absorption
DFTPP	Decaflourotriphenylphosphine
DQO	Data Quality Objective
FDEP	Florida Department of Environmental Protection
FID	Flame Ionization Detector
FOL	Field Operations Leader
FTMR	Field Task Modification Request
GC	Gas Chromatograph
GFAA	Graphite Furnace Atomic Absorption
HASP	Health & Safety Plan
ICP	Inductively Coupled Plasma
LCS	Laboratory Control Sample
MS	Mass Spectrometer
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NFESC	Naval Facilities Engineering Service Center
NIST	National Institute of Science and Technology
NAS – Pensacola	Naval Air Station Pensacola
PARCC	Precision, Accuracy, Representativeness, Comparability, Completeness
PEM	Performance Evaluation Mixture
PQL	Practical Quantitation Limit
QA	Quality Assurance
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QC	Quality Control
RDL	Required Detection Limit
REDOX	Oxidation-Reduction Potential
RQL	Required Quantitation Limit
RPD	Relative Percent Difference
SOP	Standard Operating Procedure
SOW	Statement of Work
TAL	Target Analyte List
TCL	Target Compound List
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
%R	Percent Recovery

1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared by Tetra Tech NUS, Inc (TtNUS) on behalf of the United States Navy Southern Division Naval Facilities Engineering Command and the Naval Air Station Pensacola (NAS-Pensacola), Pensacola, Florida, under the Comprehensive Long-Term Environmental Action Navy (CLEAN III) Contract Number N62467-94-D-0888, Contract Task Order (CTO) 096. The QAPP and other associated documents, including the TtNUS Florida Department of Environmental Protection (FDEP) approved Comprehensive Quality Assurance Plan (CompQAP) No. 980038, dated August 24, 1998, Preliminary Site Characterization Sampling and Analysis Plan (SAP), prepared by TtNUS, dated April 1999 and the Health and Safety Plan (HASP), constitute the project planning documents for the Preliminary Site Characterization (PSC) to be performed at site 43, Pensacola, Florida.

This QAPP presents the organization, objectives, planned activities, and specific Quality Assurance/Quality Control (QNQC) procedures associated with the PSC. Specific protocols for sampling, sample handling and storage, chain-of-custody, and laboratory and field analyses are described within this document. All QNQC procedures are structured in accordance with applicable technical standards, the Naval Facilities Engineering Service Center (NFESC) guidance document "Navy Installation Restoration Laboratory Quality Assurance Guide (February 1996), and United States Environmental Protection Agency (USEPA) Region IV and FDEP requirements, regulations, guidance, and technical standards.

1.2 FACILITY DESCRIPTION

A description of site 43 at NAS-Pensacola, including its location, size and borders, site conditions, natural and man-made features, and zones of investigation, is provided in Section 1.3 of the **SAP.**

1.3 PROJECT OBJECTIVES

This section discusses the overall project objectives; the anticipated target parameters and intended data uses for both field and laboratory analytical data.

1.3.1 Overall Project Objectives

The overall objectives of the work will be to perform a **PSC** of the groundwater, surface soil, and subsurface soil located at site 43. Project objectives are discussed in more detail in Section 1.2 of the **SAP.**

1.3.2 Proiect Target Parameters and Intended Data Uses

This section discusses the field and laboratory analytical information to be generated during the course of the PSC. Field parameters and intended data uses are discussed in Section 1.3.2.1. Laboratory parameters and intended data uses are discussed in Section 1.3.2.2.

1.3.2.1 Field Parameters

Field parameters will include those parameters associated with groundwater sampling and analysis. All field measurements will be completed using simple field instrumentation or field test kits.

Field parameters including pH, specific conductance, turbidity and temperature will be completed for all groundwater samples. These measurements will be used to support monitoring well purging of stagnant water from well casings. Specific conductance, turbidity and pH will also be used as general indicators of water quality. Turbidity will be measured using a Turbidity meter. The remaining field parameters will be measured using a meter with a flow-through cell. Further details regarding field-sampling methods are provided in Section 7.5 of TtNUS' CompQAP.

1.3.2.2 Laboratory Parameters

The analytical methods to be used for analysis of the NAS-Pensacola samples have been selected based on existing analytical data from previous investigations. The suite of analyses for the NAS-Pensacola PSC includes Target Compound list (TCL) volatiles, TCL semivolatiles, TCL pesticides/PCBs, and Target Analyte List (TAL) metals. These parameters will be used to evaluate the nature and extent of contamination, to evaluate contaminant migration pathways and likely source areas to potential receptors. Tables 1-1 through 1-4 provide a summary of all target analytes and associated Required Quantitation Limits (RQL) for organics, Required Detection Limits (RDL) for metals, and typical Practical Quantitation Limits (PQLs) for all remaining parameters. Analytical methods are further discussed in Section 7.0 of this QAPP.

1.4 SAMPLE NETWORK DESIGN AND RATIONALE

The sample network design and rationale is discussed in detail in Section 3.2 of the SAP. Figures displaying all proposed sampling locations are provided in Section 3.2 of the SAP.

1.5 PROJECT SCHEDULE

The project schedule is discussed in Section 7.0 of the project SAP

TABLE 1-1

ANALYTICAL DETECTION LIMITS – TCL VOLATILES
NAS-PENSACOLA, PENSACOLA, FLORIDA

Parameter		
	Solid Samples	Groundwater Samples
Volatile Organic Compounds	µg/kg	µg/L
Acetone	10	5
Benzene	10	1
Bromochloromethane	10	1
Bromodichloromethane	10	1
Bromoform	10	1
Bromomethane	10	▮
2-Butanone	10	5
Carbon disulfide	10	1
Chlorobenzene	10	1
Chloroethane	10	1
Chloroform	10	1
Chloromethane	10	1
Dibromochloromethane	10	1
1,2-Dibromo-3-chloropropane	10	1
1,2-Dibromoethane	10	1
▮2-Dichlorobenzene	10	▮
1,3-Dichlorobenzene	10	1
1.4-Dichlorobenzene	10	1
1,1-Dichloroethane	10	▮
▮2-Dichloroethane	10	1
1,1-Dichloroethene	10	1
cis-1,2-Dichloroethene	10	1
trans-1,2-Dichloroethene	10	1
1,2-Dichloropropane	10	1
cis-1,3-Dichloropropene	10	1
trans-1,3-Dichloropropene	10	▮
Ethylbenzene	10	1
2-Hexanone	10	5
4-Methyl-2-pentanone	10	5
Methylene chloride	10	2
Styrene	10	1
1,1,2,2-Tetrachloroethane	10	1
1,1,1-Trichloroethane	10	1
1,1,2-Trichloroethane	10	1
Trichloroethene	10	1
Tetrachloroethene	10	1
Toluene	10	1
Vinyl chloride	10	1
Xylenes (total)	10	1

▮ RQL Required Minimum Quantitation Limit.

TABLE 1-2

ANALYTICAL DETECTION LIMITS – TCL SEMIVOLATILE ORGANICS
NAS-PENSACOLA, PENSACOLA, FLORIDA
PAGE 1 OF 2

Parameter	RQL(1)	
	Solid Samples	Groundwater Samples
Semivolatile Organic Compounds	µg/kg	µg/L
Acenaphthene	330	10
Acenaphthylene	330	10
Anthracene	330	10
Benzo(a)anthracene	330	10
Benzo(a)pyrene	330	10
Benzo(b)fluoranthene	330	10
Benzo(g,h,i)perylene	330	10
Benzo(k)fluoranthene	330	10
Bis(2-chloroethoxy)methane	330	10
Bis(2-chloroethyl)ether	330	10
Bis(2-ethylhexyl)phthalate	330	5
4-Bromophenyl-phenylether	330	10
Carbazole	330	10
4-Chloro-3-methylphenol	330	10
4-Chloroaniline	330	10
2-Chloronaphthalene	330	10
2-Chlorophenol	330	10
4-Chlorophenyl-phenylether	330	10
Chrysene	330	10
Dibenz(a,h)anthracene	330	10
Dibenzofuran	330	10
3,3'-Dichlorobenzidine	330	10
Diethylphthalate	330	10
Di-n-butylphthalate	330	10
Di-n-octylphthalate	330	10
4,6-Dinitro-2-methylphenol	830	25
2,4-Dinitrophenol	830	25
2,4-Dinitrotoluene	330	10
1,2-Dichlorobenzene	330	10
1.3-Dichlorobenzene	330	10
1,4-Dichlorobenzene	330	10
2,4-Dichlorophenol	330	10

1 RQL Required Minimum Quantitation Limit.

TABLE 1-2

ANALYTICAL DETECTION LIMITS – TCL SEMIVOLATILE ORGANICS
NAS-PENSACOLA, PENSACOLA, FLORIDA
PAGE 2 OF 2

Parameter	RQL(1)	
	Solid Samples	Groundwater Samples
Semivolatile Organic Compounds	µg/kg	µg/L
Dimethylphthalate	330	10
2,4-Dimethylphenol	330	10
2,6-Dinitrotoluene	330	10
Fluoranthene	330	10
Fluorene	330	10
Hexachlorobenzene	330	10
Hexachlorobutadiene	330	10
Hexachlorocyclopentadiene	330	10
Hexachloroethane	330	10
Indeno(1,2,3-cd)pyrene	330	10
Isophorone	330	10
2-Methylnaphthalene	330	10
2-Methylphenol	330	10
4-Methylphenol	330	10
Naphthalene	330	10
2-Nitroaniline	330	25
3-Nitroaniline	830	25
4-Nitroaniline	830	25
Nitrobenzene	830	10
2-Nitrophenol	330	10
4-Nitrophenol	330	25
N-nitroso-di-n-propylamine	330	10
N-nitrosodiphenylamine	330	10
2,2'-Oxybis(1-chloropropane)	330	10
Pentachlorophenol	830	25
Phenanthrene	330	10
Phenol	330	10
Pyrene	330	10
1,2,4-Trichlorobenzene	330	10
2,4,5-Trichlorophenol	830	25
2,4,6-Trichlorophenol	330	10

1 RQL Required Minimum Quantitation Limit.

TABLE 1-3

ANALYTICAL DETECTION LIMITS – TCL PESTICIDES
NAS-PENSACOLA, PENSACOLA, FLORIDA
PAGE 1 OF 1

Parameter	RQL(1)	
	Solid Samples (2)	Groundwater Samples (3)
Pesticides	µg/kg	µg/L
Aldrin	1.7	0.05
alpha-BHC	1.7	0.05
alpha-Chlordane	17	0.05'
beta-BHC	1.7	0.1
4,4'-DDE	3.3	0.1
4,4'-DDD	3.3	0.1
4,4'-DDT	3.3	0.1
delta-BHC	1.7	0.05
Dieldrin	3.3	0.1
Endosulfan I	1.7	0.05'
Endosulfan II	3.3	0.05'
Endosulfan sulfate	3.3	0.1*
Endrin	3.3	0.1'
Endrin aldehyde	3.3	0.
Endrin ketone	3.3	0.1
gamma-BHC (Lindane)	1.7	0.2
gamma-Chlordane	1.7	0.05'
Heptachlor	1.7	0.05'
Heptachlor epoxide	1.7	0.1*
Methoxychlor	17	0.4'
Toxaphene	170	1.0*

1 RQL Required Minimum Quantitation Limit

2 Solid (soil) samples

3 FDEP Groundwater Guidance Concentrations, Revised 8/13/97 (F.A.C. 62-520)

* PQL Listed which is < MCL

TABLE 1-4

ANALYTICAL DETECTION LIMITS - TAL METALS
NAS-PENSACOLA, PENSACOLA, FLORIDA

Parameter	RDL[1]	
	Groundwater Samples	Solid Samples
Target Analyte List Metals	µg/L	µg/kg
Iron	25	5
Aluminum	200	40
Antimony	60	12
Arsenic	10	2
Barium	200	40
Beryllium	5	1
Cadmium	5	1
Calcium	5000	1000
Chromium (total)	10	2
Cobalt	50	10
Copper	25	5
Lead	3	0.6
Magnesium	5000	1000
Manganese	15	3
Mercury	0.2	0.1
Nickel	40	8
Potassium	5000	1000
Selenium	5	1
Silver	10	2
Sodium	5000	1000
Thallium	10	2
Tin	10	2
Vanadium	50	10
Zinc	20	4

1 RDL Required Minimum Detection Limit

2.0 PROJECT ORGANIZATION

The project organization for the NAS-Pensacola preliminary site characterization is discussed in Section 3.1.2.1 of the **SAP.**

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective for this project is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide results, which are legally defensible in a court of law. Intended data uses are described in Section 1.3.2 of this QAPP. Specific procedures for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal quality control, audits, preventive maintenance of field and laboratory equipment, and corrective action are described in other sections of this QAPP.

The PARCC parameters (precision, accuracy, representativeness, comparability, and completeness) are qualitative and/or quantitative statements regarding the quality characteristics of the data used to support project objectives and ultimately, environmental decisions. These parameters are discussed in the remainder of this section. Specific routine procedures used to assess the quantitative parameters (precision, accuracy, and completeness) are provided in Section 12.0.

3.1 PRECISION

3.1.1 Definition

Precision is a measure of the amount of variability and bias inherent in a data set. Precision describes the reproducibility of measurements of the same parameter for samples under similar conditions. The equation for determining precision is provided in Section 12.2.

3.1.2 Field Precision Objectives

Field duplicates for aqueous matrix samples will not be required. In lieu of taking duplicate measurements and using independent QC check standards, more frequent continuing calibrations will be performed. Field precision is further discussed in Section 7.5 of TtNUS' CompQAP.

3.1.3 Laboratory Precision Objectives

Laboratory precision QC samples are analyzed at a frequency of 5 percent (i.e., one quality control sample per 20 environmental samples). Laboratory precision is measured via comparison of calculated RPD values and Precision Control Limits specified in the analytical method or by the laboratory's QA/QC Program.

With the exception of low-concentration volatiles analysis, precision for volatile and semivolatile organic analyses will be measured via the RPDs for matrix spike/matrix spike duplicate (MS/MSD) samples. The analytical method for low-concentration volatile analysis does not require a specific QC sample to monitor precision, the calibration requirements of the method (i.e., specific limits of precision for the calibration standards) do ensure that a sufficient level of precision is achieved. (Calibration is further discussed in Section 6.0.) Precision for metals analysis will be measured via RPDs for laboratory duplicates. Table 3-1 presents precision control limits for MS/MSD RPDs for organics. Table 3-2 presents precision control limits for laboratory duplicate RPDs for metals. Precision for the remaining parameters (i.e., natural attenuation and miscellaneous parameters) will typically be measured via the RPD results for laboratory duplicate samples. Internal laboratory control limits for precision, which are typically set at three times the standard deviation of a series of RPDs, will be used for evaluation of precision for these parameters.

3.2 ACCURACY

3.2.1 Definition

Accuracy is the degree of agreement between the observed value and an accepted reference value. The equation for determining accuracy is provided in Section 12.1.

3.2.2 Field Accuracv Obiectives

The determination of accuracy in the field is not required. In lieu of taking duplicate measurements and using independent QC check standards, more frequent continuing calibrations will be performed. Field accuracy is further discussed in Section 7.5 of TtNUS' CompQAP.

3.2.3 Laboratory Accuracv Obiectives

Accuracy in the laboratory is measured through the comparison of a spiked sample result against a known or calculated value expressed as a percent recovery (%R). Percent recoveries are derived from the analysis of known amounts of compounds spiked into deionized water [i.e., laboratory control sample (LCS) analysis], or into actual samples (i.e., surrogate or MS analysis). LCS analyses measure the accuracy of laboratory operations. Surrogate and MS analyses measure the accuracy of laboratory operations as affected by matrix. LCS and/or MS analyses are performed with a frequency of one per

TABLE 3-1

PRECISION CONTROL LIMITS (RPDs)[1]
MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLES, VOLATILE AND SEMIVOLATILE ORGANIC ANALYSIS
NAS-PENSACOLA, PENSACOLA, FLORIDA

Chemical	Solid Samples	Aqueous Samples
1,1-Dichloroethene	22	22
Trichloroethene	24	24
Benzene	21	21
Toluene	21	21
Chlorobenzene	21	21
Phenol	35	42
2-Chlorophenol	50	40
1,4-Dichlorobenzene	27	28
N-Nitroso-di-n-propylamine	38	38
1,2,4-Trichlorobenzene	23	28
4-Chloro-3-methyl phenol	33	42
Acenaphthene	19	31
4-Nitrophenol	50	50
2,4-Dinitrotoluene	47	38
Pentachlorophenol	47	50
Pyrene	36	31
gamma-BHC (Lindane)	50	50
Heptachlor	31	31
Aldrin	43	43
Dieldrin	38	38
Endrin	45	45
4,4'-DDT	50	50

1 RPD - Relative Percent Difference as described in Section 12.0.
2 CLP SOW OLM03.2.

TABLE 3-2

PRECISION CONTROL LIMITS (RPDs)[1]
LABORATORY DUPLICATE SAMPLES
METALS ANALYSIS[2]
NAS-PENSACOLA, PENSACOLA, FLORIDA

Chemical	Aqueous Samples	Solid Samples
METALS		
Aluminum	20	35
Antimony	20	35
Arsenic	20	35
Barium	20	35
Beryllium	20	35
Cadmium	20	35
Calcium	20	35
Chromium (total)	20	35
Cobalt	20	35
Copper	20	35
Iron	20	35
Lead	20	35
Magnesium	20	35
Manganese	20	35
Mercury	20	35
Nickel	20	35
Potassium	20	35
Selenium	20	35
Silver	20	35
Sodium	20	35
Thallium	20	35
Tin	20	35
Vanadium	20	35
Zinc	20	35

1 RPD - Relative Percent Difference as described in Section 12.0.
2 CLP SOW ILM04.0

twenty associated samples of like matrix. Surrogate spike analysis is performed for all chromatographic organic analyses. Laboratory accuracy is assessed via comparison of calculated %Rs with Accuracy Control Limits specified in the analytical method or by the laboratory's QA/QC Program.

Accuracy for volatile and semivolatile organic analysis will be measured via the %Rs for surrogate spikes and MS/MSDs. Accuracy for metals analysis will be measured via %Rs for MSs and LCSs. Table 3-3 presents control limits for LCS and surrogate spike recoveries for low-concentration volatiles. Tables 3-4 and 3-5 present control limits for matrix and surrogate spike recoveries, respectively, for organics. Tables 3-6 and 3-7 present control limits for MS and LCSs, respectively, for metals. Accuracy for the remaining parameters will typically be measured via %Rs for MSs and/or LCSs. Internal laboratory control limits for accuracy, which are typically set at three times the standard deviation of a series of %R values, will be used for evaluation of accuracy for these parameters.

3.3 COMPLETENESS

Completeness is a measure of the amount of usable, valid analytical data obtained, compared to the amount expected to be obtained. Completeness is typically expressed as a percentage. The equation for completeness is presented in Section 12.3.

The ideal objective for completeness is 100 percent (i.e., every sample planned to be collected is collected; every sample submitted for analysis yields valid data). However, samples can be rendered unusable during shipping or preparation (e.g., bottles broken or extracts accidentally destroyed), errors can be introduced during analysis (e.g., loss of instrument sensitivity, introduction of ambient laboratory contamination), or strong matrix effects can become apparent (e.g., extremely low matrix spike recovery).

These instances result.in data that do not meet QC criteria. Based on these considerations, 95 percent is considered an acceptable target for the data completeness objective. If critical data points are lost, resampling and/or reanalysis might be required.

As further discussed in Section 9.2, one hundred percent of the laboratory data for the NAS-Pensacola PSC will be reviewed. Data rejected as a result of the review process will be treated as unusable data.

TABLE 3-3

ACCURACY CONTROL LIMITS (%R)[1]
LABORATORY CONTROL SAMPLE AND SURROGATE SPIKE
VOLATILE ORGANIC ANALYSIS[2]
NAS-PENSACOLA, PENSACOLA, FLORIDA

Chemical	Aqueous Samples
Vinyl chloride	60-140
Carbon tetrachloride	60-140
1,2-Dichloropropane	60-140
Trichloroethene	60-140
1,1,2-Trichloroethane	60-140
Benzene	60-140
cis-1,3-Dichloropropene	60-140
Bromoform	60-140
Tetrachloroethene	60-140
1,2-Dibromoethane	60-140
1,4-Dichlorobenzene	60-140
SURROGATE SPIKE	
Bromoflourobenzene	80-120

1 %R - Percent Recovery as described in Section 12.0.
2 CLP SOW OLM03.2

TABLE 3-4

ACCURACY CONTROL LIMITS (%R)[1]
MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLES
VOLATILE AND SEMIVOLATILE ORGANIC ANALYSIS[2]
NAS-PENSACOLA, PENSACOLA, FLORIDA

Chemical	Solid Samples	Aqueous Samples
VOLATILE ORGANICS		
1,1-Dichloroethene	59-172	NA
Trichloroethene	62-137	NA
Benzene	66-142	NA
Toluene	59-139	NA
Chlorobenzene	60-133	NA
SEMIVOLATILE ORGANICS		
Phenol	26-90	12-110
2-Chlorophenol	25-102	27-123
1,4-Dichlorobenzene	28-104	36-97
N-Nitroso-di-n-propylamine	41.126	41-116
1,2,4-Trichlorobenzene	38-107	39-98
4-Chloro-3-methylphenol	26-103	23-97
Acenaphthene	31-137	46-118
4-Nitrophenol	11-114	10-80
2,4-Dinitrotoluene	28-89	24-96
Pentachlorophenol	17-109	9-103
Pyrene	35-142	26-127
gamma-BHC (Lindane)	46-127	46-127
Heptachlor	35-130	35-130
Aldrin	34-132	34-132
Dieldrin	31-134	31-134
Endrin	42-139	42-139
4,4'-DDT	23-134	23-134

1 %R - Percent Recovery as described in Section 12.0
2 CLP SOW OLM03.2

TABLE 3-5

ACCURACY CONTROL LIMITS (%R)[1]
SURROGATE SPIKES
VOLATILE AND SEMIVOLATILE ORGANIC ANALYSIS[2]
NAS-PENSACOLA, PENSACOLA, FLORIDA

Chemical	Aqueous Samples	Solid Samples
VOLATILE ORGANICS		
Toluene-d8	NA	84-138
Bromofluorobenzene	NA	59-113
1,2-Dichloroethane-d4	NA	70-121
Nitrobenzene-d5	35-114	23-120
2-Fluorobiphenyl	43-116	30-115
Terphenyl-d14	33-141	18-137
Phenol-d5	10-110	24-113
2-Fluorophenol	21-110	24-121
2,4,6-Tribromophenol	10-123	19-122
2-Chlorophenol-d4	33-110[3]	20-130[3]
1,2-Dichlorobenzene-d4	16-110[3]	20-130[3]
Tetrachloro-m-xylene	60-150	60-150
Decachlorobiphenyl	60-150	60-150

1 %R - Percent Recovery as described in Section 12.0.
2 CLP SOW OLM03.2
3 Advisory limits only.

TABLE 3-6

ACCURACY CONTROL LIMITS (%R)[1]
MATRIX SPIKE SAMPLES
METALS ANALYSIS"
NAS-PENSACOLA, PENSACOLA, FLORIDA

Chemical	Aqueous Samples	Solid Samples
Aluminum	75-125	NS[3]
Antimony	75-125	75-125
Arsenic	75-125	75-125
Beryllium	75-125	75-125
Cadmium	75-125	75-125
Calcium	NS	NS
Chromium (total)	75-125	75-125
Cobalt	75-125	75-125
Copper	75-125	75-125
Iron	75-125	NS
Lead	75-125	75-125
Magnesium	NS	NS
Manganese	75-125	75-125
Mercury	75-125	75-125
Nickel	75-125	75-125
Potassium	NS	NS
Selenium	75-125	75-125
Silver	75-125	75-125
Sodium	NS	NS
Thallium	75-125	75-125
Tin	75-125	75-125
Vanadium	75-125	75-125
Zinc	75-125	75-125

1 %R - Percent Recovery as described in Section 12.0.
2 CLP SOW ILM04.0

TABLE 3-7

ACCURACY CONTROL LIMITS (%R)[1]
LABORATORY CONTROL SAMPLES
METALS ANALYSIS"')
NAS-PENSACOLA, PENSACOLA, FLORIDA

Chemical	Aqueous Samples	Solid Samples
Aluminum	80-120	80-120
Antimony	80-120[3]	80-120
Arsenic	80-120	80-120
Barium	80-120	80-120
Beryllium	80-120	80-120
Cadmium	80-120	80-120
Calcium	80-120	80-120
Chromium	80-120	80-120
Cobalt	80-120	80-120
Copper	80-120	80-120
Iron	80-120	80-120
Lead	80-120	80-120
Magnesium	80-120	80-120
Manganese	80-120	80-120
Mercury	80-120	80-120
Nickel	80-120	80-120
Potassium	80-120	80-120
Selenium	80-120	80-120
Silver	80-120[3]	80-120
Sodium	80-120	80-120
Thallium	80-120	80-120
Tin	80-120	80-120
Vanadium	80-120	80-120
Zinc	80-120	80-120

1 Recovery as described in Section 12.0.
2 CLP SOW ILM04.0
3 Advisory Limits

3.4 REPRESENTATIVENESS

3.4.1 Definition

Representativeness is an expression of the degree to which the data accurately and precisely depict the actual characteristics of a population or environmental condition existing at an individual sampling point. Use of standardized sampling, handling, analytical, and reporting procedures ensures that the final data accurately represent actual site conditions.

3.4.2 Measures to Ensure Representativeness of Field Data

Representativeness is dependent upon the proper design of the sampling program. It will be satisfied by ensuring that the PSC SAP is followed and that proper sampling techniques are used. The sampling network for the NAS-Pensacola PSC was designed to provide data representative of site conditions. During development of this network, consideration was given to past waste disposal practices, existing analytical data, and physical setting and processes. The rationale of the sampling network is discussed in detail in Section 4.0 of the SAP.

3.4.3 Measures to Ensure Representativeness of Laboratorv Data

Representativeness in the laboratory data is ensured by using the proper analytical procedures, meeting sample-holding times, and analyzing and assessing duplicate samples.

3.5 COMPARABILITY

3.5.1 Definition

Comparability is defined as the confidence with which one data set can be compared to another (e.g., between sampling points; between sampling events). Comparability is achieved by using standardized sampling and analysis methods, and data reporting formats (including use of consistent units of measure). Additionally, consideration is given to seasonal conditions and other environmental variations that could influence data results.

3.5.2 Measures to Ensure Comparability of Field Data

Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the DMP is followed and that proper sampling techniques are used. It is also dependent on recording field measurements using the correct units. Field measurement units are further discussed in Section 9.1.1.

3.5.3 Measures to Ensure Comparability of Laboratory Data

Planned analytical data will be comparable when similar sampling and analytical methods are used and documented. Results will be reported in units that ensure comparability with previous data and with current state and Federal standards and guidelines. Laboratory measurement units are further discussed in Section 9.1.2.

3.6 LEVEL OF QUALITY CONTROL EFFORT

Trip blank, rinsate blank, method blank, field and laboratory duplicate, laboratory control, and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs.

External QC measures (i.e., field quality control samples) consist of field duplicates, trip blanks, and equipment rinsate blanks. Information gained from these analyses further characterizes the level of data quality obtained to support project goals. Each of these types of field quality control samples undergo the same preservation, analysis, and reporting procedures as the related environmental samples. Each type of field quality control sample is discussed below.

Field duplicates are either two samples collected independently at a sampling location (e.g., surface water), or a single sample homogenized and split into two portions. [When volatile organic compounds (VOCs) are to be analyzed, the VOC sample aliquots are containerized first to avoid loss of constituents, and then the remaining sample matrix is homogenized.] Field duplicates are collected and analyzed for all chemical constituents to measure the precision of the sampling and analysis methods employed. The level of the QC effort will be one field duplicate for every 5 to 9 samples and then 10% of the number of additional investigative samples.

Trip blanks, consisting of analyze-free water, will be submitted to the laboratory to provide the means to assess the quality of the data resulting from the field-sampling program. Trip blanks only pertain to samples collected for VOC analysis. Trip blanks are used to assess the potential for contamination of samples to be analyzed for VOCs by contaminant migration into sample containers during sample

shipment and storage. Trip blanks are prepared by the laboratory prior to the sampling event, shipped to the site with the sample containers, and kept with the investigative samples throughout the sampling event. They are then packaged for shipment with other VOC samples and sent for analysis. There should be one trip blank included in each sample-shipping container that contains samples for VOC analysis. At no time after trip blank preparation are their sample containers to be opened before they reach the laboratory. Trip blanks are further discussed in Section 9.0 of TtNUS' CompQAP.

Equipment rinsate blanks are obtained under representative field conditions by collecting the rinse water generated by running analyte-free water through sample collection equipment after decontamination and prior to use. At least one equipment blank will be collected per day, per matrix. If pre-cleaned, dedicated, or disposable sampling equipment is used, one rinsate blank per type of equipment used must be collected as a "batch blank." Rinsate blanks are analyzed for the **same** chemical constituents as the associated environmental samples. Equipment blanks are further discussed in Section 9.0 of TtNUS' CompQAP.

Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures. Laboratory duplicate samples are analyzed for inorganic parameters to check for sampling and analytical reproducibility. MSs provide information about the effect of the sample matrix on the digestion and measurement methodology. All MSs for organic analyses are performed in duplicate and, as previously defined, are referred to as MS/MSD samples.

MS/MSD samples are investigative samples. Aqueous MS/MSD samples must be collected at triple the volume for VOCs and extractable organics. One MS/MSD sample will be collected/designated for every 20 or fewer investigative samples per sample matrix (i.e., groundwater, surface water).

The level of QC effort for analytical testing will conform to the appropriate analytical methods, as specified in Tables 7.1 of this QAPP.

4.0 SAMPLING PROCEDURES

Field sampling procedures for the NAS-Pensacola PSC are discussed in TtNUS' CompQAP. In addition, the TtNUS' CompQAP and the SAP addresses the following sampling procedures and field investigation tasks:

- Groundwater-level measurements - Section 4.2.5.4 TtNUS CompQAP
- Monitoring well purging - Section 4.2.5.5 TtNUS CompQAP
- Sample containers, preservatives, and volume requirements – Appendix C
- Field measurements - Section 7.5 TtNUS CompQAP
- Decontamination procedures - Section 4.1 TtNUS CompQAP
- Investigation derived waste - Section 3.1.3.12 SAP
- Sample identification system - Section 3.1.3.9 SAP
- Sample packaging and shipping procedures - Section 4.4.3.2 TtNUS CompQAP
- Field quality control samples - Section 9.1.1 TtNUS CompQAP
- Recordkeeping – TtNUS SOP SA-6.3 (Appendix B)

5.0 CUSTODY PROCEDURES

Custody is one of several factors, which is necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files. Final evidence files, including all originals of laboratory reports and purge files, are maintained under document control in a secure area. A sample or evidence file is under custody if:

- the item is in the actual physical possession of an authorized person, or;
- the item is in view of the person after being in his or her possession, or;
- the item was placed in a secure area to prevent tampering; or
- the item is in a designated and identified secure area with access restricted to authorized personnel only.

The chain-of-custody (COC) report is a multi-part, standardized form used to summarize and document pertinent sample information, such as sample identification and type, matrix, date and time of collection, preservation, and requested analyses. Furthermore, through the sequential signatures of various sample custodians (e.g., sampler, airbill number, laboratory sample custodian), the COC report documents sample custody and tracking. A "Cradle-to-Grave" sample tracking will be employed. Custody procedures apply to all environmental and associated field quality control samples obtained as part of the data collection system.

5.1 FIELD CUSTODY PROCEDURES

The FOL (or designee) is responsible for the care and custody o the samples collected until they are relinquished to the analyzing laboratory or entrusted to a commercial overnight courier. COC reports are completed for each sample shipment. The reports are filled out in a legible manner, using waterproof ink, and are signed (and dated) by the sampler. Pertinent notes, such as whether the sample was field filtered, or whether the sample is suspected to be high in contaminant concentration, are also indicated on the COC report. Information similar to that contained in the COC report is also provided on the sample label, which is securely attached to the sample bottle. COC report forms and sample labels will be supplied by the laboratory subcontractor. In accordance with NFESC guidelines, samples for chemical constituent analysis must be sent (for next-day receipt) to the laboratory within 24-hours of collection.

Full details regarding sample COCs (including use of custody seals and sample shipment protocols) are contained in TtNUS Standard Operating Procedure (SOP) SA-6.1, which is provided as Appendix A. TtNUS SOP SA-6.3, also provided as Appendix B, discusses maintenance of site logbooks, site notebooks, and other field records. Additionally, each of the various sampling SOPs incorporated into this QAPP contains a section that addresses relevant sample documentation (i.e., completion of sample logsheets, etc.). All sample records are eventually docketed into the TtNUS project central file.

5.2 LABORATORY CUSTODY PROCEDURES

When samples are received at the laboratory, the laboratory's sample custodian examines each cooler's custody seals to verify that they are intact and that the integrity of the environmental samples has been maintained. The sample custodian then signs the COC report. The custodian then opens the cooler and measures its internal temperature. The temperature reading is noted on the accompanying COC report. The sample custodian then examines the contents of the cooler. Sample container breakages or discrepancies between the COC report and sample label documentation is recorded. With the exception of samples for volatile analysis, the pH of chemically preserved samples is checked using Hydrion paper and recorded. All problems or discrepancies noted during this process are to be promptly reported to the TtNUS Project Manager. Inter-laboratory COC procedures and specific procedures for sample handling, storage, disbursement for analysis, and remnant disposat will be followed as specified by the subcontract laboratory's SOPs and/or QA Plan.

5.3 FINAL EVIDENCE FILES

The TtNUS central file will be the repository for all documents, which constitute evidence relevant to sampling and analysis activities as described in this QAPP. TtNUS is the custodian of the evidence file and maintains the contents of these files, including all relevant records, reports, logs, field notebooks, photographs, subcontractor reports and data reviews in a secure, limited access location and under custody of the TtNUS facility manager. The control file will include at a minimum:

- field logbooks
- field data and data deliverables
- photographs
- drawings
- soil boring logs
- laboratory data deliverables
- data validation reports
- data assessment reports

- progress reports, QA reports, interim project reports, etc.
- all custody documentation (chain-of-custody forms, airbills, etc.)

Upon completion of the contract, all pertinent files will be relinquished to the custody of the United States Navy.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

All instrumentation used to perform chemical measurements must be properly calibrated prior to use in order to obtain valid and usable results. The requirement to properly calibrate instruments prior to use applies equally to field instruments as it does to fixed laboratory instruments. Field instrument calibration is discussed in Section 6.1. Laboratory instrument calibration is discussed in Section 6.2.

6.1 FIELD INSTRUMENT CALIBRATION

Field instrument calibration is discussed in Section 7.5 of TtNUS CompQAP.

6.2 LABORATORY INSTRUMENT CALIBRATION

Calibration procedures for a specific laboratory instrument will consist of initial calibration (generally 3 to 5 points), initial calibration verification (inorganic methods only), and continuing calibration verification. In all cases, the initial calibration will be verified using an independently prepared calibration verification solution. The frequency of calibration will be performed according to the requirements of the specific methods.

All standards used to calibrate analytical instruments must be obtained from the National Institute of Standards and Technology (NIST) or through a reliable commercial supplier with a proven record for quality standards. All commercially supplied standards must be traceable to NIST reference standards, where possible, and appropriate documentation will be obtained from the supplier. In cases where documentation is not available, the laboratory will analyze the standard and compare the results to an USEPA-supplied known or previous NIST-traceable standard.

The calibration procedures and frequencies used by the subcontract laboratory will comply with the applicable analytical method. Brief descriptions of calibration procedures for major instrument types follow.

6.2.1 GC/MS Volatile Organic Compound Analvses

For volatile organic compounds, the gas chromatograph/mass spectrometer (GC/MS) system will be tuned and calibrated in accordance with the appropriate analytical. A bromofluorobenzene (BFB) instrument performance check (tuning check) must be run prior to the initial and each continuing calibration and must meet all method-specified criteria before analysis may continue. Initial calibration is required before any samples are analyzed and must include a blank and a minimum of five different

concentrations as specified in the method. A BFB tuning check and a continuing calibration check, including the mid-range standard and a blank must be performed at the beginning of each 12-hour shift during which analyses are performed.

6.2.2 GC/MS Semivolatile Organic Compound Analvses

For semivolatile organic compounds, the GC/MS system will be tuned and calibrated in accordance with the appropriate analytical method. A decafluorotriphenyl phosphine (DFTPP) instrument performance check (tuning check) must be run prior to the initial and each continuing calibration and must meet all method-specified criteria before analysis may continue. Initial calibration is required before any samples are analyzed and must include a blank plus five different concentrations as specified in the method. A DFTPP tuning check and a continuing calibration check, including the mid-range standard and a blank must be performed at the beginning of each 12-hour shift during which analyses are performed.

6.2.3 Metals Analyses

6.2.3.1 Inductively Coupled Argon Plasma (ICP) Analyses

Inductively coupled plasma (ICP) spectrometry systems will be calibrated for the analysis of metals in accordance with the appropriate analytical method. Initial calibration is required each day before any samples are analyzed and consists of a calibration blank and at least one standard. The standard must be within the demonstrated linear range of the instrument. The linear range is verified quarterly. Following initial calibration, an initial calibration verification sample (obtained from a different source than the solutions used for calibration), an initial calibration blank, and an interference check sample are analyzed. A continuing calibration verification sample and a continuing calibration blank are run every 2 hours or every 10 samples, whichever occurs first. A continuing calibration verification sample, a continuing calibration blank, and an interference check sample are also run after analysis of the last sample. The initial calibration verification standard, continuing calibration verification standard, and interference check sample each contain analytes of interest at different concentrations. In addition, a standard prepared at a concentration of two times the quantitation limit is analyzed at the beginning and end of each sample analysis run or a minimum of twice per 8-hour period. Linearity spanning the range of analysis is verified using this combination of standards. All calibration standards contain acids at the same concentrations as the sample digestates.

6.2.3.2 Atomic Absorption Analyses

Graphite furnace and cold vapor atomic absorption (GFAA and CVAA) analyses will be calibrated in accordance with the appropriate analytical method. Initial calibration is required each day before any samples are analyzed and consists of a calibration blank and at least three calibration standards (at least four standards for mercury) covering the range of concentrations of interest. The correlation coefficient of the regression of concentration versus response should be 0.995 or greater. Immediately following initial calibration, an initial calibration verification sample (obtained from a different source than the solutions used for calibration) and an initial calibration blank are analyzed. A continuing calibration verification sample and a continuing calibration blank are run every two hours or every ten samples, whichever occurs first. A continuing calibration verification sample and a continuing calibration blank are also run after analysis of the last sample.

6.2.4 Miscellaneous Parameters

Calibration and standardization requirements for the analysis of the remaining parameters will be performed as specified in the applicable analytical methods. Analytical methods are further discussed in Section 7.0 of this **QAPP.**

7.0 ANALYTICAL AND MEASUREMENT PROCEDURES

Samples will be subjected to field and laboratory parameter measurement as necessary based on the sample location under investigation. The analytical program for environmental samples collected at each anticipated location is provided in Section 3.2 of the SAP.

Chemical/physical parameters to be measured using field instrumentation include; temperature, specific conductance, pH, and turbidity (groundwater samples only). Measurement of field parameters and calibration of field instruments are discussed in Section 7.5 of TtNUS' CompQAP.

The analytical laboratory responsible for the chemical analyses must NFESC-approved, will be certified by the Florida Department of Health – Division of Laboratory Certification for all analyses that are requested by TtNUS and will be required to have a current FDEP approved CompQAP.

All groundwater samples for volatiles analysis will be analyzed in accordance with current CLP methods. All samples for organics and metals and Inorganics Analysis will be analyzed in accordance with current CLP and SW-846 methods, where appropriate. Table 7-1 provides a summary of the laboratory analytical methods for the NAS – Pensacola PSC.

A complete list of the target compounds/analytes, RQLs, RDLs, and estimated PQLs is provided in Section 1.3.2.2 of this QAPP. Data generated through use of the EPA method protocols will be reported to the RQL for organics analysis and the RDL for inorganics analysis. Analytes which are positively identified and which can be quantitated at concentrations below the RQURDL will be reported as specified in the appropriate analytical method. All environmental data generated through use of non-CLP methods will be reported to the analyte's PQL. An analyte's PQL is an expression of the method detection limit with consideration given to required adjustments to ensure that the precision and accuracy requirements of the method are attainable. The PQLs provided in the tables in Section 1.3.2.2 are estimated since these values may vary based on the laboratory.

Quantitation and detection limits will also be adjusted, as necessary, based on dilutions and sample volume.

TABLE 7-1

SUMMARY OF ORGANIC AND INORGANIC ANALYTICAL PROCEDURES
NAS – PENSACOLA, PENSACOLA, FLORIDA

Analytical Parameter	Analytical Method
TCL Volatile Organics	CLP SOW OLM03.2
TCL Semivolatile Organics	CLP SOW OLM03.2
TCL Pesticides/PCBs	CLP SOW OLM03.2
TAL Inorganics (metals/cyanide)	CLP SOW ILM04.0

8.0 INTERNAL QUALITY CONTROL CHECKS

Field-related QC checks were discussed in Section 3.0 of this QAPP and in Section 9.1.1 of TtNUS' CompQAP. This section provides additional information regarding internal quality control checks for the field and the laboratory.

8.1 FIELD QUALITY CONTROL CHECKS

QC procedures for field measurements will include calibrating the instruments as discussed in Section 7.5 of TtNUS' CompQAP. Assessment of field sampling precision and bias will be made by collection of field duplicates and rinsate blanks for laboratory analysis as discussed in Section 3.6 of this QAPP.

8.2 LABORATORY QUALITY CONTROL CHECKS

The subcontract laboratory will have a QC program that ensures the reliability and validity of the analyses performed at the laboratory. Internal quality control procedures for analyses will comply with the applicable analytical method requirements.

Several internal laboratory QC checks are briefly discussed in the remainder of this section.

Laboratory method blanks are prepared and analyzed in accordance with the analytical method employed to determine whether contaminants originating from laboratory sources have been introduced and have affected environmental sample analyses. A method blank generally consists of an aliquot of analyte-free water that is subjected to the same preparation and analysis procedures as the environmental samples undergoing analysis. With the exception of recognized volatile and semivolatile common laboratory contaminants (i.e., methylene chloride, acetone, 2-butanone, and phthalate esters) detected, method blanks must not contain levels of target analytes above the reported detection limits (above 2.5X the RQL for methylene chloride and above 5X the RQL for acetone, 2-butanone, and phthalate esters). Under no circumstances are laboratory method blank contaminant values subtracted from environmental sample analysis results.

Matrix spike analysis for organic fraction analyses is performed in duplicate as a measure of laboratory precision. For inorganic analyses, one matrix spike analysis and one **laboratory duplicate** analysis are performed for every 20 environmental sample analyses of like matrix. With the exception of VOC MSD analyses, laboratory duplicates are prepared by thoroughly mixing and splitting a sample aliquot into two portions and analyzing each portion following the same analytical procedures that are used for the

environmental sample analyses. For VOC MSD analyses, a second sample aliquot is used for analysis in order to avoid VOC constituent loss through the homogenization process. The field crew provides extra volumes of sample matrices designated for laboratory quality control analyses, as required. As discussed in Section 3.0 of this QAPP, control limits for MS and laboratory duplicate analyses.

Surrogates are organic compounds (typically brominated, fluorinated, or isotopically labeled) which are similar in nature to the compounds of concern, and which are not likely to be present in environmental media. Surrogates are spiked into each sample, standard, and method blank prior to analysis, and are used only in organic chromatographic analysis procedures as a check of method effectiveness. As discussed in Section 3.0, surrogate recoveries are evaluated against control limits specified in the associated method, where applicable or laboratory-derivedcontrol limits.

Laboratory control samples serve to monitor the overall performance of each step during the analysis, including the sample preparation. Laboratory control sample analysis will be performed for low-concentration volatiles, metals, and as required by the applicable analytical. Aqueous LCS results must fall within the control limits specified in the analytical method, where applicable, or established by the laboratory. Aqueous LCSs shall be analyzed utilizing the same sample preparations, analytical methods, and QA/QC procedures as employed for the samples.

Internal standard performance criteria ensure that volatile and semivolatile GC/MS analysis sensitivity and response are stable during every analytical run. Internal standard area counts for samples and blanks must not vary by more than a factor of two (- 50% to + 100%) from the associated 12-hour calibration standard (±40% for low-concentration volatile analysis). The retention time of the internal standards in samples and blanks must not vary by more than +30 seconds from the retention time of the associated 12-hour calibration standard (±20 seconds for low-concentrationvolatile analysis).

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

This section describes the procedures to be used for data reduction, review, and reporting for NAS – Pensacola PSC. All data generated during the course of the PSC will be maintained in hardcopy format by TtNUS in the Naval Facilities Engineering Command Southern Division designated central files located in TtNUS' Pittsburgh office.

In addition to the central files, photocopies of all hardcopy data (as well as electronic data) will be maintained in the Chemistry/Toxicology/Risk Assessment Department database records files located in TtNUS' Pittsburgh, Pennsylvania office. Upon completion of the contract, all files will be relinquished to the Navy.

9.1 DATA REDUCTION

Data reduction will be completed for both field measurements and laboratory-generated analytical data. Field data reduction will be relatively limited versus the degree of laboratory data reduction required for the project. Reduction of both field data and laboratory data are discussed in the remainder of this section.

9.1.1 Field Data Reduction

Field data will be generated through on-site water quality testing for general indicator parameters including pH, specific conductance, turbidity, and temperature.

The field parameters will be recorded in the site logbook and on sample logsheets immediately after the measurements are taken and later encoded in the NAS – Pensacola database for presentation in the Report. If an error is made in the logbook, the error will be legibly crossed out (single-line strikeout), initialed and dated by the field member, and corrected in a space adjacent to the original (erroneous) entry. No calculations will be necessary to reduce these data for inclusion in Report. Field data will be entered in the electronic database manually, and the entries will be verified by an independent reviewer to make sure that no "transcription" errors occurred.

Field measurements will be recorded and reported in the following units:

- Hydronium ion concentration (standard pH units)
- Temperature (degrees Celsius)
- Specific Conductance (millimhos)
- Turbidity (Nephelometric turbidity units)

Standard pH units as specified above are the negative logarithm (base 10) of the hydronium ion concentration in moles/liter.

9.1.2 Laboratory Data Reduction

Laboratory data reduction of analytical results generated via CLP and non-CLP methods will be completed in accordance with the applicable analytical methods.

Laboratory analytical data will be reported using standard concentration units to ensure comparability with regulatory standards/guidelines and previous analytical results. Reporting units for aqueous matrices for the classes of chemicals under consideration are as follows:

Groundwater samples:

- Volatile and semivolatile organics - µg/L
- Metals - µg/L

Field Quality Control sample results will be included in the database for the NAS – Pensacola PSC. Specifically, the analytical results for field duplicates, trip blanks, and rinsate blanks will be provided. The results for field QC samples will be considered during the course of data review (in concert with laboratory method blanks) to eliminate false positive results according to the 5- and IO-times rules specified in the National Functional Guidelines for Organic and Inorganic Data Review. The results for laboratory QC samples such as method blanks will not be presented in the Report database. In addition, only the original (unspiked) sample results for MS/MSD samples will be provided in the database.

9.2 DATA VALIDATION

Validation of field measurements and laboratory analytical data are discussed in this section. Validation of field data will be limited to real time "reality" checks whereas laboratory analytical data will be reviewed. Review of laboratory analytical data is discussed in Section 9.2.2.

9.2.1 Field Measurement Data Validation

Field measurements will not be subjected to a formal data validation process. However, field technicians will ensure that the equipment used for field measurement is performing accurately via calibration as discussed in Section 7.5 of TtNUS' CompQAP. As described in Section **9.1.1,** all field data entered into the electronic database will be independently reviewed for transcription errors.

9.2.2 Laboratory Data Review

One hundred percent of the laboratory data will be reviewed. Review of analytical data will be completed by the TtNUS Chemistry Department located in TtNUS' Pittsburgh, Pennsylvania office. Final review and approval of validated deliverables will be completed by the Department's Data Validation Coordinator.

Data review will be completed to ensure that the data are of evidentiary quality. Particular emphasis will be placed on holding time compliance, spike recoveries, and blank results. The inorganic data will be reviewed in accordance with USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review and organic data will be reviewed in accordance with the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. The analytical results for non-CLP parameters will be reviewed versus the applicable analytical methods.

9.3 DATA REPORTING

9.3.1 Field Measurement Data Reporting

Field data will be reported in the units discussed in Section **9.1.1.** The Report will include a comprehensive database including all field measurements (specifically pH, specific conductance, temperature, and turbidity). Field measurements will be transferred from the site logbook or sample logsheets to the electronic database manually and will be reviewed for accuracy by an independent reviewer. Transcription of field measurements to the electronic database will be completed shortly after completion of the field investigation and prior to receipt of laboratory analytical data.

All records regarding field measurements (i.e., field logbooks, sampling logbooks, and sample logsheets) will be placed in TtNUS' Southern Division central files upon completion of the field effort. Entry of these results in the database will require removal of these results from the files. Outcards will be used to document the removal of any such documentation from the files (date, person, subject matter). Field measurement data will be reported in an appendix of the Report at a minimum and may also be reported

in summary fashion if they are indicative of the presence of contamination (e.g., high specific conductance readings).

9.3.2 Laboratory Data Reporting

Data reported by the laboratory will be in accordance with the reporting format identified and described in TtNUS' analytical Statement of Work for the contracted laboratory. All pertinent quality control data including method blanks, standards analysis, calibration information, etc. will be provided for CLP and non-CLP analyses. Case narratives will be provided for each Sample Delivery Group.

All environmental and field QC sample results (trip blanks, field duplicates, rinsate blanks) will be included in the Report as an appendix. The database will include pertinent sampling information such as sample number, sampling date, general location, depth, and survey coordinates (if applicable). Sample-specific detection limits will be reported for nondetected analytes. Units will be clearly summarized in the database and will conform to those identified in Section 9.1.2. The analytical data may also be reported in summary fashion within the body of the Report text in tabular and graphic fashion.

Data will be handled electronically pursuant to the electronic deliverable requirements specified in TtNUS' Basic Ordering Agreement with analytical laboratories. This agreement requires the analytical laboratories to provide data in both hardcopy and electronic form. The original electronic diskettes and the original hardcopy analytical data are maintained in TtNUS' Southern Division central files as received.

Data review will be completed using the hard copy data. Upon completion of validation of a Sample Delivery Group and review by the Data Validation Coordinator, review qualifiers will be entered in the electronic database and will be subjected to independent review for accuracy. During this review process, the electronic data base printout will also be contrasted with the hard copy data to ensure that the hard copy data and electronic data are consistent.

In addition, a summary of the data validation qualifiers for all project samples will be prepared. This summary will include a list of chemicals identified as laboratory and/or field QC blank contaminants, holding time exceedences, samples exhibiting field duplicate/replicate imprecision as well as affected chemicals, rejected results and associated specific causes, and general causes of estimated results. This summary will facilitate the preparation of a summary of the data review results and completeness assessment for inclusion in the Report.

10.0 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits will be performed periodically to ensure that work is being implemented in accordance with the approved Project Plans and in an overall satisfactory manner. Such audits will be performed by various personnel and will include evaluation of field, laboratory, data review, and data reporting processes. Examples of pertinent audits are as follows:

- The FOL will supervise and check daily that the field measurements are made accurately, equipment is thoroughly decontaminated, samples are collected and handled properly, and fieldwork is documented accurately and neatly.

- Performance and system audits of the laboratory will be performed regularly by a Navy Contractor (internal), and in accordance with the Laboratory Quality Assurance Plan (internal).

- Data validators will review (on a timely basis) the chemical analytical data packages submitted by the laboratory. The data validators will check that the data were obtained through use of an approved methodology, that the appropriate level of QC effort and reporting was conducted, and whether or not the results are in conformance with QC criteria. On the basis of these factors, the data validator will generate a report describing data limitations, which will be reviewed internally by the Data Validation Coordinator prior to submittal to the Project Manager.

- A formal audit of the field sampling procedures may be conducted by the TtNUS Quality Assurance Manager (QAM) or designee in addition to the auditing that is an inherent part of the daily project activities. The purpose of this audit is to ensure that sample collection, handling, and shipping protocols, as well as equipment decontamination and field documentation procedures, are being performed in accordance with the approved Project Plans and SOPs.

- A sample tracking system will be employed for all environmental samples. This system will allow for early detection of errors made in the field or by the laboratory so that necessary adjustments can be made while the field crew is mobilized.

- The Project Manager will maintain contact with the FOL and Data Validation Coordinator to ensure that management of the acquired data proceeds in an organized and expeditious manner. Similarly, the Project Manager will interface with the Modeling Coordinators, as applicable.

11.0 PREVENTIVE MAINTENANCE PROCEDURES

Measuring equipment used in environmental monitoring or analysis for the NAS – Pensacola PSC shall be maintained in accordance with the manufacturer's operation and maintenance manuals. Equipment and instruments shall be calibrated in accordance with the procedures, and at the frequency, discussed in Section 6.0 (Calibration Procedures and Frequency). Preventive maintenance for field and laboratory equipment is discussed in the remainder of this section.

11.1 FIELD EQUIPMENT PREVENTIVE MAINTENANCE

TtNUS has established a program for the maintenance of field equipment to ensure the availability of equipment in good working order when and where it is needed. This program consists of the following elements:

- The TtNUS equipment manager keeps an inventory of the equipment in terms of items (model and serial number), quantity, and condition. 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 also maintains the equipment manual library.

- The FOL 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 and TtNUS SOPs before being taken to the job site and during field activities.

- During calibration, an appropriate maintenance check is performed on each piece of equipment. Any problems encountered while operating the instrument will be recorded in the field logbook including a description of the symptoms and corrective actions taken.

- If problem equipment is detected or should require service, the equipment should be logged, tagged, and segregated from equipment in proper working order. Use of the instrument will not be resumed until the problem is resolved.

11.2 LABORATORY INSTRUMENT PREVENTIVE MAINTENANCE

Proper maintenance of laboratory instruments and equipment is essential to ensuring their readiness when needed. Dependent on manufacturer's recommendations, maintenance intervals are established for each instrument. All instruments must be labeled with a model number and serial number, and a maintenance logbook must be maintained for each instrument. Personnel must be alert to the maintenance status of the equipment they are using at all times.

11.2.1 Major Instruments

Table 11-1 provides a summary of preventive maintenance procedures typically performed for key analytical instruments. Maintenance of key instruments is sometimes covered under service contracts with external firms. These contracts provide for periodic routine maintenance to help guard against unexpected instrument downtime. The contracts also provide for quick response for unscheduled service calls when malfunctions are observed by the operator.

The use of manufacturer recommended grades or better of supporting supplies and reagents is also a form of preventive maintenance. For example, gases used in the various gas chromatographs and metals instruments should be of sufficient grade to minimize fouling of the instrument. The routine use of septa, chromatographic columns, ferrules, AA furnace tubes, and other supporting supplies from reputable manufacturers will assist in averting unnecessary periods of instrument downtime.

11.2.2 Refrigerators/Ovens

The temperatures of refrigerators used for sample storage and drying ovens will be monitored a minimum of once daily. The acceptable range for refrigerator temperatures is 4°C ±2°C. Required temperatures of ovens will vary based on the analytical methods for which the ovens are used. The temperatures will be recorded on temperature logs. The logs will contain the following information at a minimum:

- Date
- Temperature
- Initials of person performing the check

Maintenance of the logs is typically the responsibility of the sample custodian. However, assignment of responsibilities for temperature monitoring to specific personnel does not preclude the participation of other laboratory personnel. If unusual temperature fluctuations are noted, it is the responsibility of the

observer to immediately notify the person in charge of the discrepancy before the condition of the samples is compromised.

Unstable or fluctuating temperatures may be indicative of malfunctions in the cooling or heating system. On the other hand, the instability may be due to frequent opening of the door. Regardless of the cause, such an observation must be investigated, and modifications must be made to access procedures or repairs to equipment must be made to prevent jeopardizing the integrity of the samples.

TABLE 11-1

TYPICAL PREVENTIVE MAINTENANCE FOR KEY ANALYTICAL INSTRUMENTS
NAS – PENSACOLA, PENSACOLA, FLORIDA

Instrument	Preventive Maintenance	Maintenance Frequency
GC/MS	Volatiles: Bake oven, replace septum, checks carrier gas. Semivolatiles: Replace the septum, clean injection port, replace liner, bake oven, check carrier gas, clean the source. Replace solvent washes and clean syringe.	As required. As required. Daily.
GC	Replace solvent washes and clean syringe. Clip column, clean injection port, replace liner, and bake oven.	Daily. As required.
ICP	Change sample introduction tubing, clean nebulizer, clean spray chamber, clean torch, manual profile, and automatic profile optics.	As required.
GFAA	Clean contact cylinders, replace/clean tube, check lamp alignment.	As required.
CVAA	Change sample introduction tubing, change drying cell, re-zero detector.	As required.
Spectrophotometer	Check that cuvette has no scratch on its surface. Turn power off at the end of the day and warm up for at least one hour before use.	Daily. Daily
TOC Analyzer	Refresh phosphoric acid. Clean catalyst. Replace water in IC chamber.	Biweekly. As required. Biweekly.

12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

Compliance with the QC objectives outlined in Section 3.0 will be monitored via two separate mechanisms. Precision and accuracy will be assessed through data. Compliance with the completeness objectives for field and laboratory data/measurement will be calculated by hand (field measurements) and electronically via a database subroutine (laboratory data). Information necessary to complete the precision and accuracy calculations will be provided in electronic and hardcopy form by the subcontract laboratory. Equations to be used for the precision, accuracy, and completeness assessment are outlined in the remainder of this section.

12.1 ACCURACY ASSESSMENT

To assure the accuracy of the analytical procedures, a minimum of 1 of every 20 samples is spiked with a known amount of the analyte or analytes to be evaluated. The spiked sample is then analyzed. The increase in concentration of the analyte observed in the spiked sample, because of the addition of a known quantity of the analyte, compared to the reported value of the same analyte in the unspiked sample determines the percent recovery. Control charts are plotted for each commonly analyzed compound and kept on matrix-specific and analyte-specific bases. The %R for a spiked sample is calculated according to the following formula:

$$\%R = \frac{\text{Amount in Spiked Sample} - \text{Amount in Sample}}{\text{Known Amount Added}} \times 100\%$$

12.2 PRECISION ASSESSMENT

Duplicate samples (for inorganic analyses) and MSD samples (for organic analyses) are prepared and analyzed at a minimum frequency of 1 per every 20 environmental samples. Duplicate samples are prepared by dividing an environmental sample into equal aliquots.

MSD samples are prepared by dividing an environmental sample into equal aliquots and then spiking each of the aliquots with a known amount of analyte. The duplicate samples are then included in the analytical sample set. The splitting of the sample allows the analyst to determine the precision of the preparation and analytical techniques associated with the duplicate samples. The RPD between the sample (or spike) and duplicate (or duplicate spike) is calculated and plotted. The RPD is calculated according to the following formula:

$$RPD = \frac{\text{Amount in Sample} - \text{Amount in Duplicate}}{0.5\ (\text{Amount in Sample} + \text{Amount in Duplicate})} \times 100\%$$

12.3 COMPLETENESS ASSESSMENT

Completeness is the ratio of the number of valid sample results to the total number of sample results expected to be obtained for the project as a whole. Following the completion of the analytical testing and data validation, the percent completeness will be calculated by the following equation:

$$\text{Completeness} = \frac{(\text{number of valid measurements})}{(\text{number of measurements planned})} \times 100\%$$

The results of the data validation process and the completeness assessment will be summarized in the Report using the summary format discussed in Section **9.3.2** and an electronic database subroutine.

13.0 CORRECTIVE ACTION

Under TtNUS' QA/QC program, it is required that any and all personnel noting conditions adverse to quality report these conditions immediately to the Project Manager and QAM. The personnel reporting adverse conditions are charged with performing root-cause analyses and implementing appropriate corrective action in a timely manner. It is ultimately the responsibility of the QAM to document all findings and corrective actions taken and to monitor the effectiveness of the corrective measures performed.

13.1 FIELD CORRECTIVE ACTION

Field nonconformances or conditions adverse to quality must be identified and corrected as quickly as possible so that work integrity or quality of product is not compromised. The need for corrective action may arise based on deviations from Project Plans and procedures, adverse field conditions, or other unforeseen circumstances. Corrective action needs may become apparent during the performance of daily work tasks or as a consequence of internal or external field audits.

Corrective action may include resampling and may involve amending previously approved field procedures. If warranted by the severity of the problem (e.g., if a change in the approved Project Plan documents or SOPs is required), the Navy will be notified in writing via a Field Task Modification Request (FTMR), and Navy (in conjunction with USEPA Region IV and FDEP) approvals will be obtained. The FOL is responsible for initiating FTMRs; an FTMR will be initiated for all deviations from the Project Plan documents, as applicable. An example of an FTMR is provided as Figure 13-1. Copies of all FTMRs will be maintained with the onsite project planning documents and will be placed in the final evidence file.

Minor modifications to field activities such as a slight offset of a boring location will be initiated at the discretion of the FOL, subject to onsite approval by NAS – Pensacola personnel. Approval for major modifications (e.g., elimination of a sampling point) must be obtained via an FTMR.

FIGURE 13-1

TETRA TECH NUS, INC.
FIELD TASK MODIFICATION REQUEST FORM

_____	_____	_____
Client Identification	Project Number	FTMR Number

To_____Location_____Date_____

Description:

_____
_____
_____
_____

Reason for Change:

_____
_____
_____
_____

Recommended Disposition:

_____
_____
_____
_____

_____
Field Operations Leader (Signature, if applicable) Date

Disposition:

_____
_____
_____
_____

_____
Project Manager (Signature, if required) Date

_____
Distribution:
Program Manager
Quality Assurance Officer
Project Manager
Field Operations Leader

Others as required_____
_____
_____
_____

13.2 LABORATORY CORRECTIVE ACTION

In general, laboratory corrective actions are warranted whenever an out-of-control event or potential out-of-control event is noted. The specific corrective action taken depends on the specific analysis and the nature of the event. Generally, the following occurrences alert laboratory personnel that corrective action may be necessary:

- QC data are outside established warning or control limits;
- Method blank analyses yield concentrations of target analytes above acceptable levels;
- Undesirable trends are detected in spike recoveries or in duplicate RPDs;
- There is an unexplained change in compound detection capability;
- Inquiries concerning data quality are received; and
- Deficiencies are detected by laboratory QA staff audits or from performance evaluation sample test results.

Corrective actions are typically documented for out-of-control situations on a corrective action form. Using a corrective action form, any employee may notify the QA/QC Officer of a problem. The QNQC Officer generally initiates the corrective action by relating the problem to the appropriate Laboratory Manager and/or Internal Coordinator, who then investigates or assigns responsibility for investigating the problem and its cause. Once determined, an appropriate corrective action is approved by the QNQC Officer. Its implementation is verified and documented on the corrective action form and is further documented through audits.

13.3 CORRECTIVE ACTION DURING DATA REVIEW AND DATA ASSESSMENT

The need for corrective action may become apparent during data review, interpretation, or presentation activities, or problems may be identified as a result of oversight findings. The performances of rework, instituting a change in work procedures, or providing additional/refresher training are possible corrective actions relevant to data evaluation activities. The Project Manager will be responsible for approving the implementation of corrective action.

14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

QA reports to management will be provided in three primary formats during the course of the NAS – Pensacola PSC. Data validation letter reports will be prepared on a Sample Delivery Group-specific basis and will summarize QA issues for the subcontract laboratory data. In addition, written weekly reports summarizing accomplishments and QNQC issues during the field investigation will be provided by the FOL. Finally, monthly progress reports are provided by the Project Manager. In addition, a summary of data review qualifiers and a completeness assessment for all project samples will be included in the Report.

14.1 CONTENTS OF PROJECT QUALITY ASSURANCE REPORTS

The contents of the specific QA reports are as follows. The data validation reports address all major and minor laboratory noncompliances as well as noted sample matrix effects. In the event that major problems occur with the analytical laboratory (e.g., holding time exceedences or calibration noncompliances, etc.) the Data Validation Coordinator will notify the Project Manager, the Technical Program Manager, and the Laboratory Services Coordinator. Such notifications (if necessary) are typically provided via internal memoranda and are placed in the project file. Such reports contain a summary of the noncompliance, a synopsis of the impact on individual projects, and recommendations regarding corrective action and compensational adjustments. Corrective actions are initiated at the program level.

The FOL will provide the Project Manager with weekly reports regarding accomplishments, deviations from the DMP, upcoming activities, and a QA summary during the course of the field investigation. In addition, monthly project review meetings are held for all active Navy CLEAN III projects. Issues discussed at the project review meeting include all aspects of budget and schedule compliance, and QNQC problems. The Project Manager provides a monthly progress report to the Navy, which addresses the project budget, schedule, accomplishments, planned activities, required revisions of the QAPP, and QNQC issues and intended corrective actions.

14.2 INDIVIDUALS RECEIVING/REVIEWING QUALITY ASSURANCE REPORTS

Data review QA Reports are provided to the Project Manager for inclusion in the project files. In the event that major problems are observed for a given laboratory, the Program Manager, Deputy Program Manager, QA Manager, Project Manager, and Laboratory Services Coordinator are provided with copies of the QA report. Weekly field progress reports are provided to the Project Manager. Monthly progress

reports are provided to the Navy CLEAN III Program Manager and the Navy CLEAN III Contracting Officers Technical Representative.

APPENDIX G

Response to FDEP Comments
Site 43
NAS Pensacola
Pensacola, Florida

CTO 96

Department of
Environmental Protection

Jeb Bush
Governor

Twin Towers Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David 8. Struhs
Secretary

May 27, 1999

Mr. Bill Hill
Code 1851
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
P.O. Box 190010
North Charleston, South Carolina 29419-9010

RE: Sampling and Analysis Plan for Preliminary Site Characterization Study, Site 43, Naval Air Station, Pensacola, Florida

Dear Mr. Hill:

I have completed the technical review of the above referenced document dated April, 1999 (received April 26, 1999). I have the following comments which should be addressed in the final document.

1. Section 1.1, Facility Background, Second and third sentences: Please clarify which portion of the facility is being referred to in these sentences since NAS Pensacola actually occupies an area of approximately 5,800 acres some of which were developed in the last century.

2. Figure 1, Facility Location Map: This figure is adequate for its intent; however, it should be noted that portions of this figure are outdated since the construction of new facilities in the former Chevalier Field area.

3. Figures 2-1 and 2-2, Total Magnetic Field Survey and Magnetic Gradient Survey: The black and white copies of these figures are difficult to interpret. It would have been more helpful to have a color copy of the original figure in this document.

4. Section 3.1.3.3.1, Shallow Well Installation: Why does the fine sand seal need to be at least 4 feet thick?

5. Table 6-1, Site Characterization Report: Will the report format also include a section for test pit

results, and appendices for the test pit logs and soil sample analytical data?

6. Section 8.0, References: The U. S. Geological Survey Topographic Quadrangle for Lillian Florida-Alabama is not applicable to this document. The Fort Barrancas, FL Quadrangle is the correct map for NAS Pensacola.

If I can be of any further assistance with this matter, please contact me at (850) 921-9989.

Sincerely,

Joseph F. Fugitt, P.G.
Remedial Project Manager

cc: Ron Joyner, NAS Pensacola
Gena Townsend, USEPA Region IV
Terry Hansen, Tetra Tech NUS, Inc., Tallahassee
Tom Lubozynski, FDEP Northwest District

TJB TJB JJC JJC ESN ESN

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FDEP comment #1.

Section 1.1, Facility Background, Second and third sentences: Please clarify which portion of the facility is being referred to in these sentences since NAS Pensacola actually occupies an area of approximately 5,800 acres some of which were developed in the last century.

Response:

The sentence will be changed to reflect the correct acreage number of approximately 5,800 acres. Additionally, the reference in the HASP will also be corrected.

FDEP comment #2.

Figure 1, Facility Location Map: This figure is adequate for its intent; however, it should be noted that portions of this figure are outdated since the construction of new facilities in the former Chevalier Field area.

Response:

The comment is noted. A more up-to-date map will be used in the report of investigation.

FDEP comment #3.

Figures 2-1 and 2-2, Total Magnetic Field Survey and Magnetic Gradient Survey: The black and white copies of these figures are difficult to interpret. It would have been more helpful to have a color copy of the original figure in this document.

Response:

Currently the colored versions of these figures are unavailable. If they can be located, they will be included in the report of the investigation.

FDEP comment #4.

Section 3.1.3.3.1, Shallow Well Installation: Why does the fine sand seal need to be at least 4 feet thick?

Response:

The text has been corrected to state at least a 1 foot thick fine sand seal will be placed on top of the coarse sand.

FDEP comment #5

Table 6-1, Site Characterization Report: Will the report format also include a section for test pit results, and appendices for the test pit logs and soil sample analytical data?

Response:

Table 6-1 the Site Characterization Report format will be revised to include test pitting methodology in section 4.1, and a section on the test pitting and soil sampling results. The appendix containing the lithologic logs will include any logs from the test pitting and an appendix containing the Soil analytical results will be added.

FDEP comment #6:.

Section 8.0, References: The U. S. Geological Survey Topographic Quadrangle for Lillian Florida-Alabama is not applicable to this document. The Fort Barrancas, FL Quadrangle is the correct map for NAS Pensacola.

Response:

The reference will be changed to reflect the correct USGS topographic quadrangle.