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WORK PLAN FOR SUPPLEMENTAL SITE ASSESSMENT UNDERGROUND STORAGE TANK SITE 18 (UST18) NAS PENSACOLA FL

10/1/2005

TETRA TECH

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

CONTRACT NUMBER N62467-04-D-0055

Work Plan
for
Supplemental Site Assessment
Of
Underground Storage Tank (UST)
Site 18

Naval Air Station Pensacola
Pensacola, Florida

Contract Task Order 0005

October 2005

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

TETRA TECH NUS, Inc.

WORK PLAN
FOR
SUPPLEMENTAL SITE ASSESSMENT
OF
UNDERGROUND STORAGE TANK (UST) SITE 18

NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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Naval Facilities Engineering Command
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OCTOBER 2005

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ACRONYMS AND ABBREVIATIONS

bls	Below Land Surface
BTEX	Benzene, Toluene, Ethylbenzene, Total Xylenes
°C	Celsius
CH2MHILL	CH2M Hill Constructors, Inc
CLEAN	Comprehensive Long-Term Environmental Action Navy
COC	Contaminant of Concern
CTO	Contract Task Order
DCA	Dichloroethane
DOT	Department of Transportation
DPT	Direct Push Technology
EDB	Ethylene Dibromide
EPA	United States Environmental Protection Agency
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FID	Flame Ionization Detector
FL-PRO	Florida Petroleum Range Organics
FOL	Field Operations Leader
GAG	Gasoline Analytical Group
GCTL	Groundwater Cleanup Target Level
H_2SO_4	Sulfuric Acid
HASP	Health and Safety Plan
HCl	Hydrochloric Acid
HDPE	High Density Polyethylene
HNO_3	Nitric Acid
HSA	Hollow-Stem Auger
IDW	Investigative Derived Waste
KAG	Kerosene Analytical Group
LNAPL	Light Non-Aqueous Phase Liquid
MTBE	Methyl tertiary-butyl ether
N	Nitrogen
NAD83	North American Datum 1983
NAS	Naval Air Station
NAVD88	North American Vertical Datum 1988
NELAC	National Environmental Laboratory Accreditation Conference
NO_2	Nitrite

ACRONYMS AND ABBREVIATIONS (CONTINUED)

NO_3	Nitrate
O.D.	Outside Diameter
ORC®	Oxygen Release Compound
OVA	Organic Vapor Analyzer
PAH	Polynuclear Aromatic Hydrocarbon
PO_4	Total Phosphorous
PVC	Polyvinyl Chloride
SC	Specific Conductance
SOP	Standard Operating Procedure
SSAR	Supplemental Site Assessment Report
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TOM	Task Order Manager
TRPH	Total Recoverable Petroleum Hydrocarbon
TtNUS	Tetra Tech NUS, Inc.
µg/L	Microgram per Liter
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This Work Plan has been prepared by Tetra Tech NUS, Inc. (TtNUS) under the Comprehensive Long-term Environmental Action Navy (CLEAN) Contract Number N62467-04-D-0055 Contract Task Order (CTO) 0005. This Work Plan is designed to guide an assessment, which will supplement previous site assessment activities and continue to monitor the natural attenuation of contaminants in groundwater beneath the Underground Storage Tank (UST) Site 18 at Naval Air Station (NAS) Pensacola, Pensacola, Florida.

1.1 SITE BACKGROUND

UST Site 18 is located within NAS Pensacola in Escambia County, Florida and occupies approximately 900 feet (ft) by 2,300 ft of open land along the southwestern border of Forrest Sherman Field. The site is bordered on the east by Aircraft Runway 19, to the north by a paved taxiway, to the west by scattered brush and woods, and to the south by an open field. A site vicinity map is included as Figure 1-1. A site features map of UST Site 18 is included as Figure 1-2.

Between 1955 and 1997, the UST Site 18 area was used to train firefighters for aircraft crash responses, using available fuel as a combustion source. Historically, approximately 30 to 50 gallons of fuel were poured into unlined pits or onto various pieces of equipment during training exercises, and ignited to simulate aircraft crashes. However, the district fire chief reported that up to 700 gallons of fuel may have been used per event. The northernmost pit, which was lined and filled with water, contained a mock aircraft cockpit. Several other burn pits contained miscellaneous pieces of equipment, including a fuel trailer, various airplane parts, and metal and non-metallic debris of unknown, but presumably of aircraft origin. Most recently, only the northernmost pit was used for fire training. Fire training ceased at UST Site 18 in May 1997.

A contamination assessment followed by in-situ soil landfarming was performed at UST Site 18. Reportedly, soils remaining at UST Site 18, after the landfarming activities were completed, are below Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTLs) (CH2MHill, 2002). Subsequent groundwater monitoring has shown contaminant levels in the groundwater. In 2004, injection of Oxygen Release Compound (ORC®) was conducted to assess its effectiveness in reducing contaminant levels in groundwater. Following the completion of the ORC® injection and four quarters of groundwater monitoring, elevated concentrations of volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), and total recoverable petroleum hydrocarbons (TRPH) continue to exceed the FDEP Groundwater Cleanup Target Levels (GCTLs). Concentrations of VOCs, specifically regulated petroleum hydrocarbons, also exceeded the FDEP Natural Attenuation Default Criteria.

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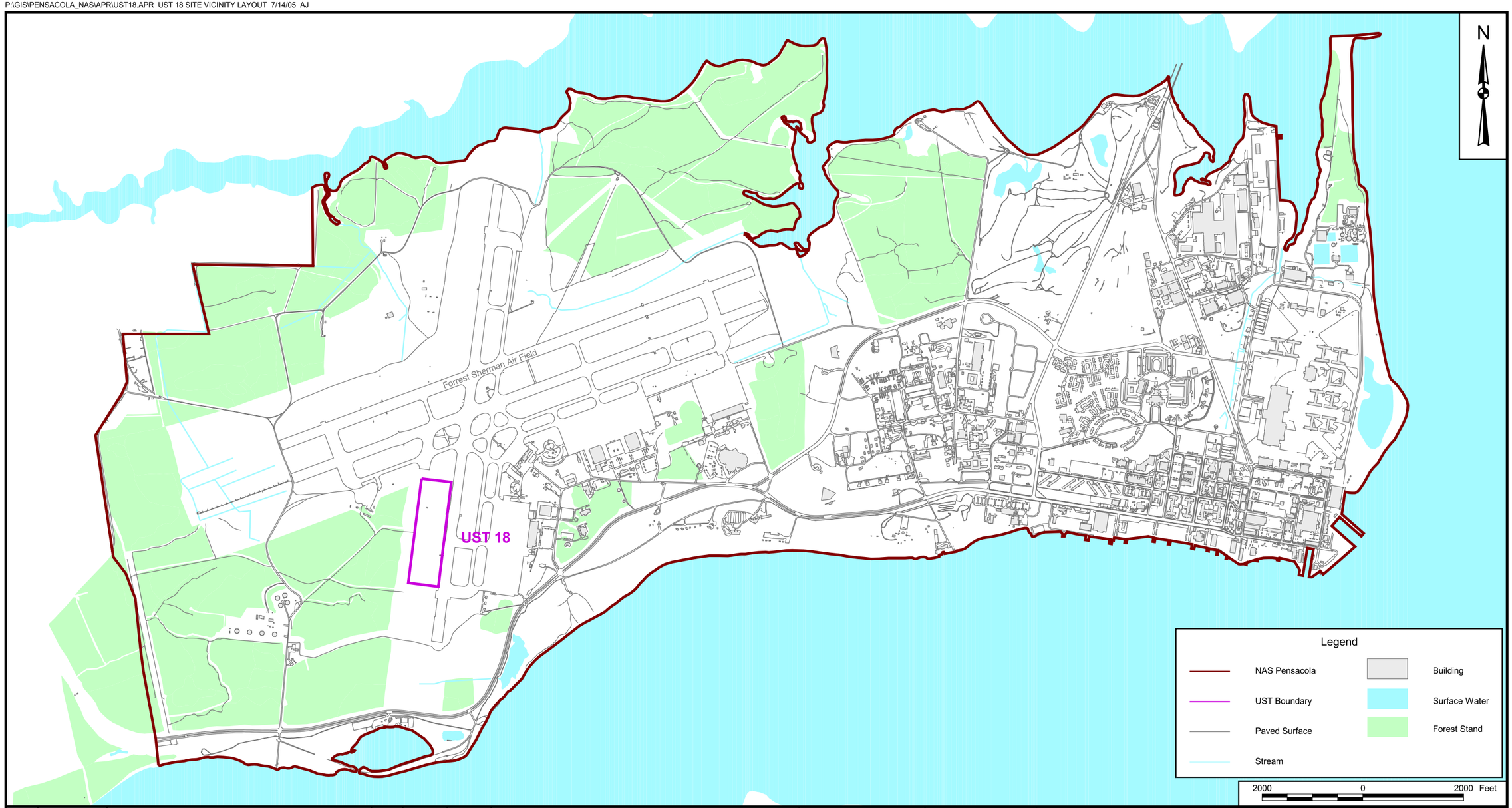

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A. JANOCHA	7/14/03
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S. ROME	8/1/05
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SITE VICINITY MAP
UST SITE 18
NAS PENSACOLA
PENSACOLA, FL

CONTRACT NO.	00140
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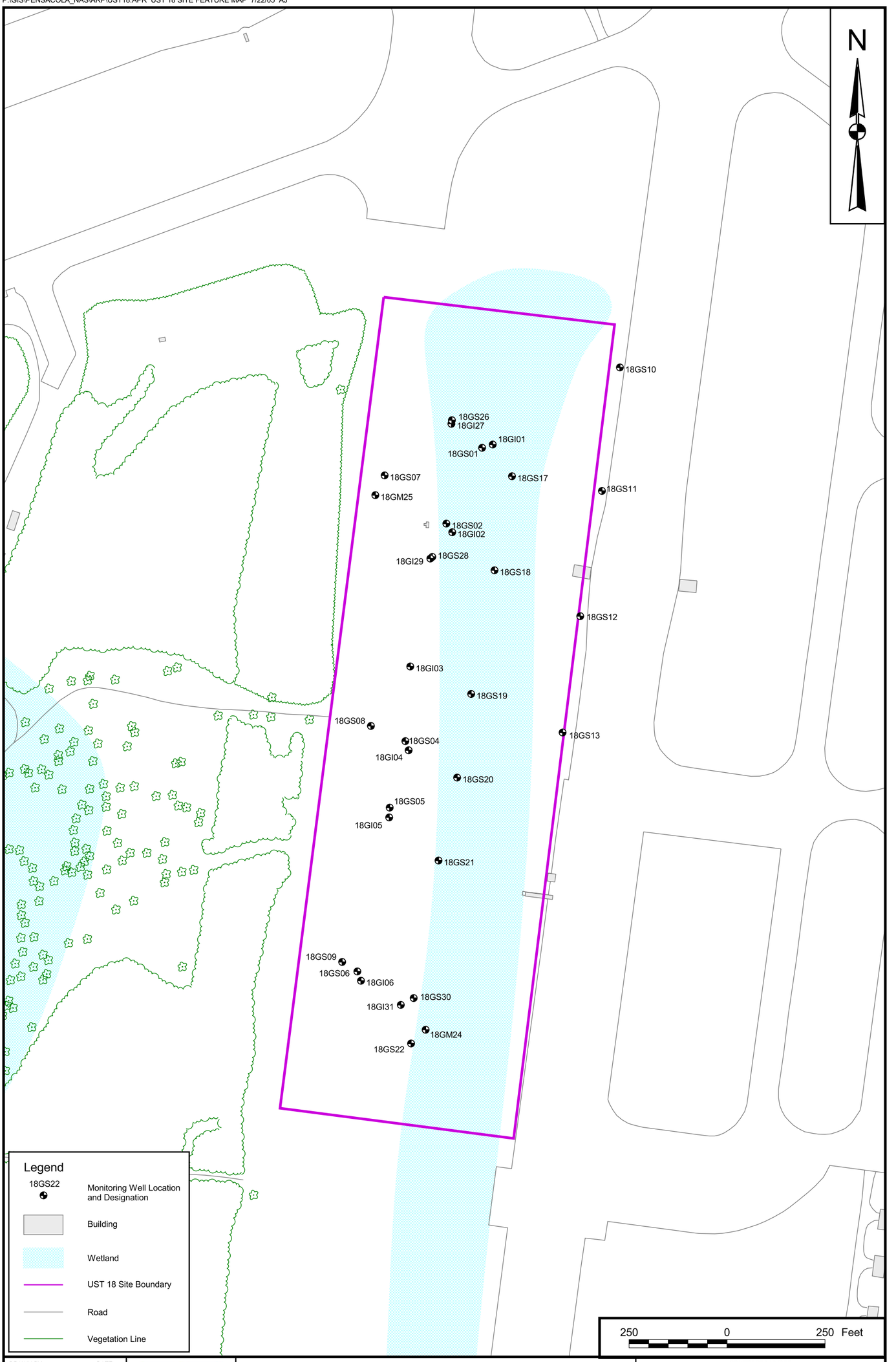
FIGURE 1 - 1	0

P:\GIS\PENSACOLA_NAS\ARP\UST18.APR UST 18 SITE FEATURE MAP 7/22/05 AJ



DRAWN BY A. JANOCHA	DATE 10/06/03	SITE FEATURES MAP UST SITE 18 NAS PENSACOLA PENSACOLA, FLORIDA	CONTRACT NUMBER 00140
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In addition, free product has been detected in monitoring wells 18GS05 and 18GS26 indicating the potential for a continuing source at the site.

1.2 SUMMARY OF CONTAMINATION

Previous assessment activities have documented soil and groundwater contamination at the site. As stated above, soil contamination was the focus of the landfarming remediation (CH2MHill, 2002); however contaminated groundwater remains at the site. The contamination is fuel related and is understood to be primarily from the fire training activities located within the southern and northern areas of the site. Analytical results from previous sampling events indicate concentrations of benzene, toluene, ethylbenzene, and total xylenes (BTEX), PAHs, TRPH, and lead have exceeded FDEP GCTLs from December 2000 through the last quarterly sampling event conducted in December 2004. Historical groundwater elevation and contaminant concentration maps are included in Appendix A.

As stated above, site contaminants of concern (COCs) were generally encountered in four distinct groundwater plumes, which appear to be associated with hydrocarbon burn pits used during historical site training operations. Two larger groundwater plumes are located in the northern and southern portions of site, with the two remaining smaller groundwater plumes located in the central portion of the site. Horizontal extent of these groundwater plumes is identified on historical Figure 1-2 (Appendix A); however, portions of these groundwater plumes remain undefined.

Limited vertical sampling of the contaminant plume indicates contamination extends to at least 50 ft below land surface (bls), which was the maximum depth sampled. All COCs, except toluene, were detected in excess of GCTLs in the three groundwater samples (DPT002, DPT010, and DPT013) collected at 19 ft bls. Benzene, 2-methylnaphthalene, and total xylenes were detected at concentrations exceeding their respective GCTLs in the samples (DPT002 and DPT010) collected at 34 ft bls. Total xylenes were present in excess of its GCTL [20 micrograms per liter (µg/L)] at a depth of 50 ft bls in both deep groundwater samples (DPT002 and DPT010). Total xylenes concentrations for DPT002 and DPT010 were 34.1 µg/L and 46.2 µg/L, respectively. Based on the analytical results from DPT002 and DPT010, it is likely the contamination is present down to the confining aquifer layer, a low permeability clay layer, reportedly located between 50 and 60 ft bls (Ensafe/Allen and Hoshall, 1996)].

In addition, light non-aqueous phase liquid (LNAPL) was detected in monitoring wells 18GS05 and 18GS26 during previous groundwater assessments. Monitoring Well 18GS05 is located near the center of the site and LNAPL was encountered during the first two monthly monitoring events conducted during landfarming remediation (CH2M Hill, 2002). Monitoring Well 18GS26 is located in the northwest portion of the site and LNAPL was detected during the fourth quarter sampling event (TtNUS, 2004). Although

LNAPL has been infrequently detected in these monitoring wells, the potential for LNAPL contamination does appear to exist at the site.

2.0 FIELD OPERATIONS AND ENVIRONMENTAL SAMPLING

2.1 PROPOSED SITE ACTIVITIES

In general, field activities required to complete the supplemental site assessment at UST Site 18 include:

- Conducting mobilization/demobilization activities.
- Assessing soil and groundwater quality within the potential LNAPL Source Area.
- Conducting a Supplemental Groundwater Sampling event via Direct Push Technology (DPT).
- Installing and developing groundwater monitoring wells.
- Collecting and submitting approximately 10 soil and 80 groundwater samples to a fixed-based laboratory.

TtNUS will also oversee surveying activities to be conducted at UST Site 18.

2.2 MOBILIZATION/DEMOBILIZATION

Following approval of this work plan, TtNUS will procure the required subcontractors and begin mobilization activities. Mobilization/demobilization activities include the following:

- Obtain utility clearance and excavation permit in the proposed boring areas.
- Mobilize subcontractors, equipment, and materials to the site.
- Prepare a site-specific Health and Safety Plan (HASP)
- Conduct daily health and safety “tailgate” meetings with site personnel.
- Arrange an area to perform decontamination procedures.
- Demobilize equipment and materials from the site.
- Perform general site clean-up and removal of trash.
- Investigative Derived Waste (IDW) Management.

The Field Operations Leader (FOL) will coordinate the mobilization/demobilization activities. These activities include initiating and conducting equipment inventories to ensure equipment is available; purchasing and leasing equipment as required; staging equipment for efficient loading and transport to the site, and after each field activity is completed. IDW Management is detailed in Section 2.14.

Prior to the commencement of field operations, the appropriate TtNUS personnel will become familiar with the site-specific HASP and the respective Safe Work Permits included in the HASP. Prior to daily field events, TtNUS will conduct a mandatory health and safety tailgate meeting. Subcontractors present for the field activities will be included in the meeting. Documentation of pertinent topics and personnel in

attendance will be maintained by the TtNUS site health and safety officer. A copy of the revised HASP may be reviewed upon request.

2.3 LNAPL SOURCE AREA INVESTIGATION

2.3.1 LNAPL Soil Assessment

TtNUS will advance a minimum of 8 soil borings via DPT in the immediate vicinity and downgradient (east) of monitoring wells 18GS05 and 18GS26 to define horizontal and vertical extent of the potential LNAPL source area (as indicated earlier, previous assessments confirmed the presence of LNAPL in these wells). Eight initial proposed DPT locations and Monitoring Wells 18GS05 and 18GS26 are shown on Figure 2-1. DPT soil boring nomenclature will be represented by the letters "DPT" and a sequential, three digit number beginning with DPT057 (i.e., DPT057, DPT058, etc.). DPT boring locations will begin approximately 25 ft in each Cardinal Direction from the respective well and in 10 ft horizontal increments thereafter. Prior to advancing DPT borings, the two aforementioned monitoring wells will be sounded with an oil/water interface probe to measure any potential thickness (in 0.010 ft) of LNAPL in groundwater.

In general, each DPT soil boring will be advanced to a depth of 15 to 20 ft bls in the vicinity of the 18GS05 and 18GS26. DPT soil samples will be collected using 2.125-inch O.D. 4- or 5-ft long stainless steel macrocore sampler containing an acetate liner. Continuous soil samples will be collected beginning at 4 ft bls and continuing in 4 or 5-ft vertical intervals to the bottom of the borehole. Each soil sample will be visually inspected for changes in lithology and potential LNAPL, and screened in two foot intervals using an organic vapor analyzer (OVA) equipped with a flame ionization detector (FID) from land surface (i.e., soil removed during post hole digging will be screened) to the top of the water table (approximately 2 to 7 ft bls). Soil vapor analyses will be performed in accordance with the headspace screening method described in Chapter 62-770.200(2), FAC.

An OilScreenSoil™ test kit will be used to conduct LNAPL soil screening efforts. The OilScreenSoil™ test kit requires a small aliquot (approximately 50 milliliters) of suspect petroleum or LNAPL contaminated soil to be added to a sterile plastic test bottle. Analyte free water is then added to the test bottle and the contents are shaken vigorously. A rapidly dissolving cube containing Sudan IV soluble dye and a fluorescing green water soluble dye is located on the inner cap of the bottle. Once shaken, the dyes are allowed to mix with the suspect sample. The Sudan IV dye stains LNAPL red, while the green dye colors the water to provide a visual contrast.

If evidence of hydrocarbon contamination is present [i.e., elevated FID readings (greater than 50 parts per million per Chapter 62-770.200(19), FAC), or strong visual or olfactory evidence of hydrocarbon

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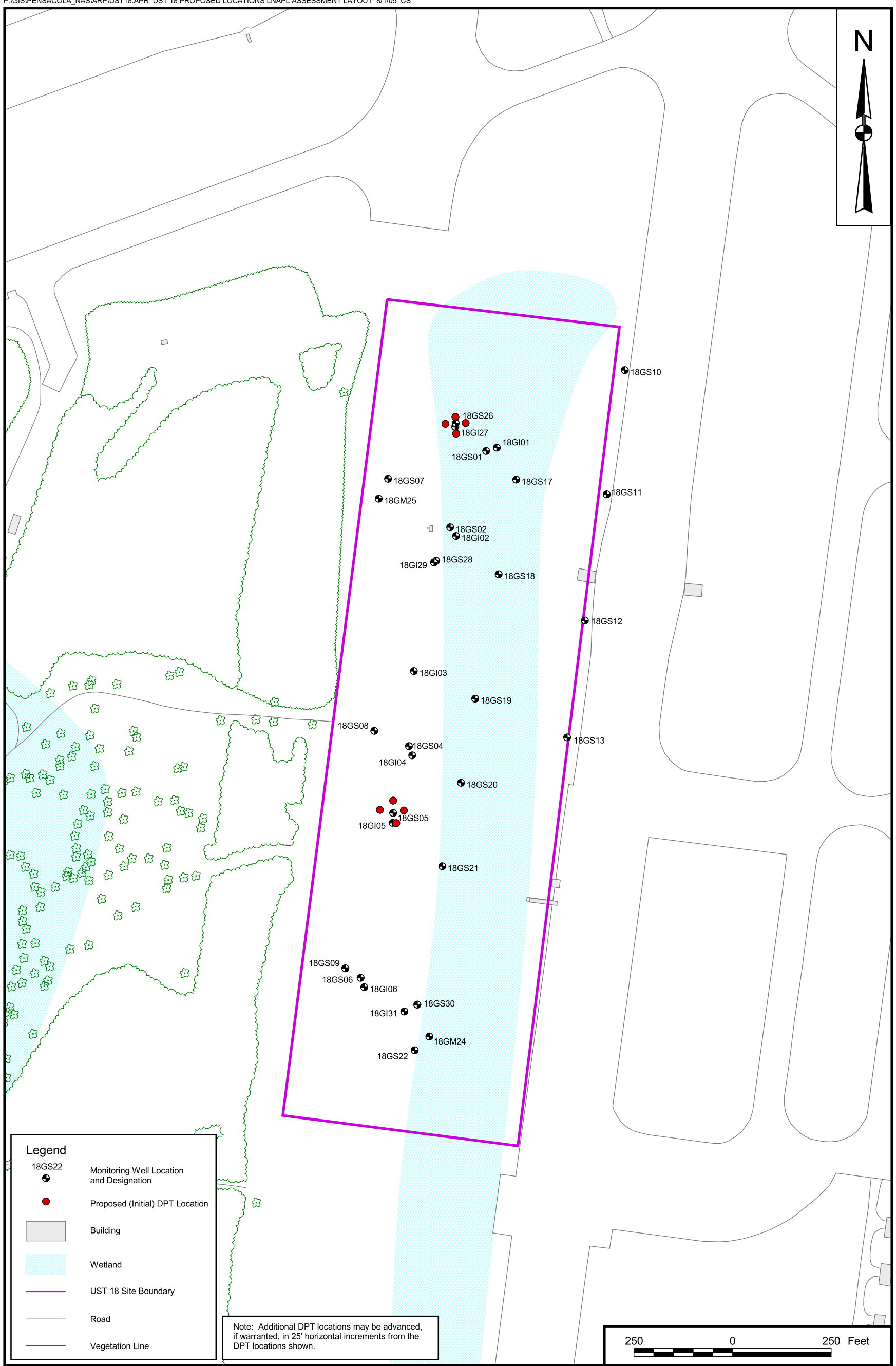

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PROPOSED DPT LOCATIONS FOR LNAPL ASSESSMENT

UST SITE 18

NAS PENSACOLA

PENSACOLA, FLORIDA

CONTRACT NUMBER: 00140	
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contamination (e.g., odor and staining)], the boring will be advanced until evidence of contamination is no longer observed.

To assist in defining vertical extent, soil samples will be collected from the top and bottom of any encountered contaminated intervals. Soil samples will also be collected from intervals exhibiting evidence of hydrocarbon contamination (e.g., elevated FID readings, odor and staining). Select soil samples will be submitted to an onsite National Environmental Laboratory Accreditation Conference (NELAC) certified mobile laboratory for analysis of BTEX and methyl tertiary-butyl ether (MTBE) by United States Environmental Protection Agency (EPA) Method 8260B.

Eight confirmatory soil samples will also be collected and submitted to a fixed-based laboratory for analyses of the parameters listed in the Gasoline Analytical and Kerosene Analytical Groups (GAG and KAG) as defined in Table B of Chapter 62-770, FAC. Soil sampling procedures will be conducted in accordance with FDEP Standard Operating Procedures (SOPs) 001/01: FS3000: Soil Sampling and FS1000: General Sampling Procedures. Soil displaced during the investigation will be appropriately disposed per the Comprehensive Long-Term Environmental Action Draft Investigation – Derived Waste Plan, NAS Pensacola, Florida (Ensafe/Allen & Hoshall, 1994).

2.3.2 LNAPL Groundwater Assessment

TtNUS will install a minimum of 8 temporary piezometers in select DPT soil boring locations to evaluate the presence of LNAPL, if any, and document measured LNAPL thickness to 0.01 ft in groundwater. Piezometer nomenclature will be the letters “PZ” and a sequential three digit number (PZ001, PZ002, etc.). Piezometer locations will be based upon field and analytical data obtained during the LNAPL soil assessment. In general, one piezometer will be placed in select boreholes to assess upgradient, downgradient and cross gradient plume axes. Each piezometer will be constructed using a 1.25-inch to 2.0-inch O.D., schedule 40 polyvinyl chloride (PVC) with 10 ft of 0.10-inch slotted screen and 4-inch PVC end-cap or well point located at the bottom of each borehole. Completion materials (i.e., sand, bentonite, cement) may retard or prevent the infiltration of groundwater into the piezometers, and as a result, will not be used during installation. Piezometers will be allowed a minimum of 24 hours to collect groundwater via infiltration from the shallow aquifer zone. Prior to sampling, each piezometer will be sounded with an oil/water interface probe to confirm the presence of LNAPL, if any, and measure the potential LNAPL thickness. One groundwater sample from each piezometer will be submitted to a NELAC certified onsite mobile laboratory for analysis of BTEX and MTBE by EPA Method 8260B. Groundwater sampling procedures are detailed in Section 2.5.2. Peizometers will be removed following sampling activities.

2.4 SUPPLEMENTAL GROUNDWATER ASSESSMENT

Although previous assessments have identified dissolved phase hydrocarbon contamination in groundwater at UST Site 18, horizontal and vertical extent of dissolved phase hydrocarbon contamination remains undefined in portions of the aforementioned groundwater contamination plumes. To address this data gap, TtNUS has designed a two-pronged field approach to assess groundwater contamination: a) conduct a DPT groundwater assessment to delineate the vertical and horizontal extent of the groundwater contaminant plumes, and b) simultaneously, collect groundwater samples from existing monitoring wells to supplement DPT groundwater analytical data and identify any additional areas warranted for DPT groundwater assessment. Proposed DPT sample locations are depicted on Figure 2-2 and Figure 2-3. Historical DPT groundwater analytical data is included in Appendix A.

2.4.1 DPT Groundwater Assessment

TtNUS will collect groundwater samples from approximately 50-55 DPT locations. Proposed DPT locations are depicted on Figures 2-2 and 2-3. Groundwater samples will be collected from depth intervals of 10, 20, 30, 40 and the top surface of the low permeability clay layer (i.e., 50 to 60 ft bls) and submitted to a NELAC certified onsite mobile laboratory for analysis of BTEX and MTBE by EPA Method 8260B. DPT groundwater samples will be collected using a DPT Hydropunch® groundwater sampling system (or appropriate equivalent) in conjunction with a peristaltic pump, sterile Teflon® and medical-grade silicon tubing. In general, the DPT groundwater sampling system consists of 2.125-inch O.D. steel drive rods, which are hammer driven via DPT to the desired sampling depth. When the desired sampling depth is reached, a mill-slotted (0.02-inch) well point, 1.5 ft in length, is attached to an appropriate length of Teflon® tubing and lowered through the inner core of the DPT drive rod to the bottom of the borehole. To minimize sediment loading, the screened interval for each sample will be placed approximately one foot from the bottom of each DPT borehole. Groundwater samples will be collected using a peristaltic pump attached to the opposite end of the tubing. Groundwater will be purged using the peristaltic pump until the water is relatively sediment free, with turbidity less than 10 Nephelometric turbidity units, when possible. New tubing will be used between each discrete sampling location and depth. Groundwater sampling procedures are detailed in Section 2.5.2.

If hydrocarbon contamination is observed along the top surface of the low permeability clay layer, appropriate field documentation will be made, but the surface of the clay layer will not be penetrated via DPT to avoid the potential for cross contamination.

In addition, a maximum of 10 confirmatory groundwater samples will also be submitted to a fixed-based laboratory for GAG/KAG analyses. A summary of DPT groundwater sampling activities is provided on Table 2-1.

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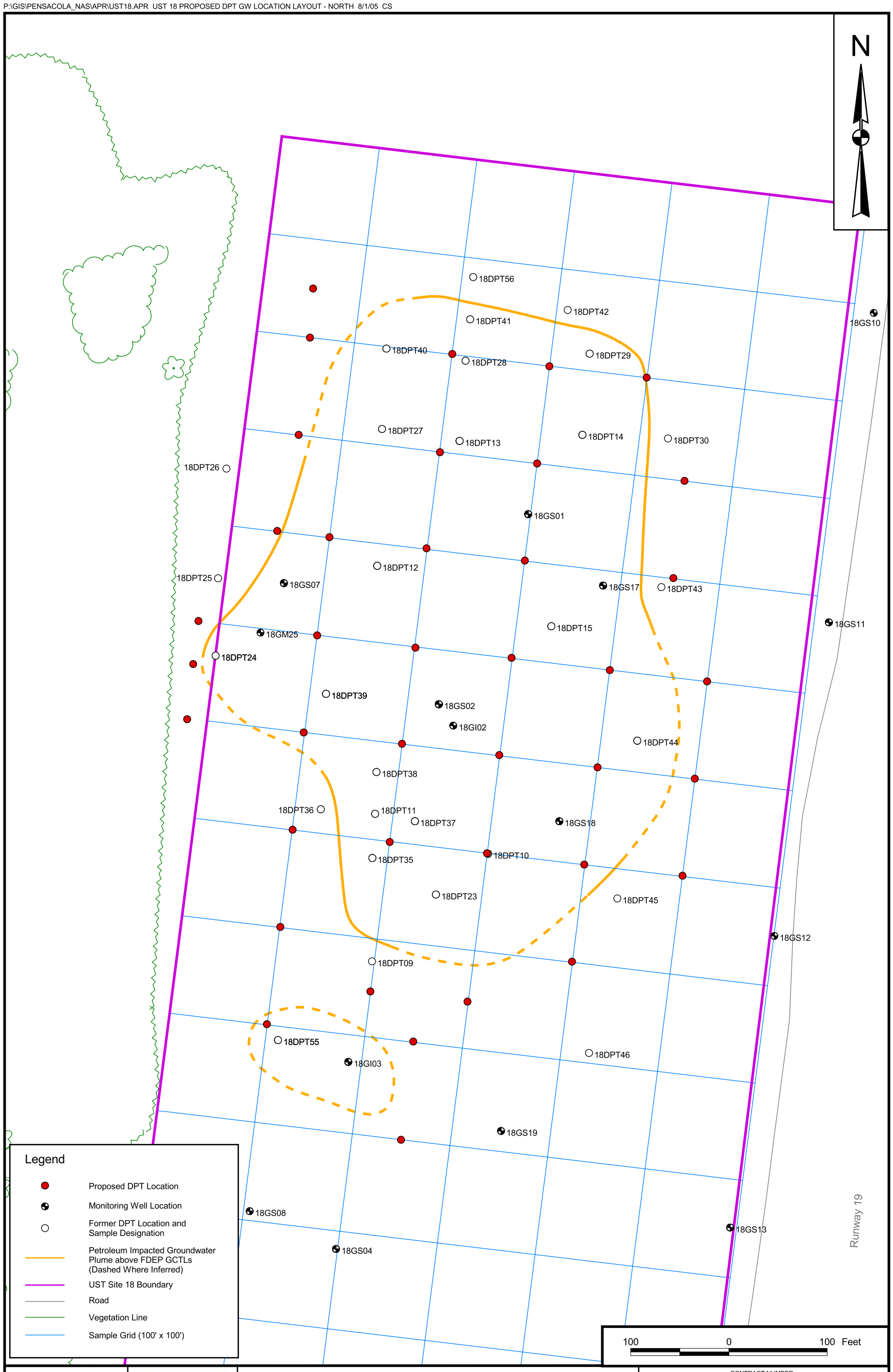

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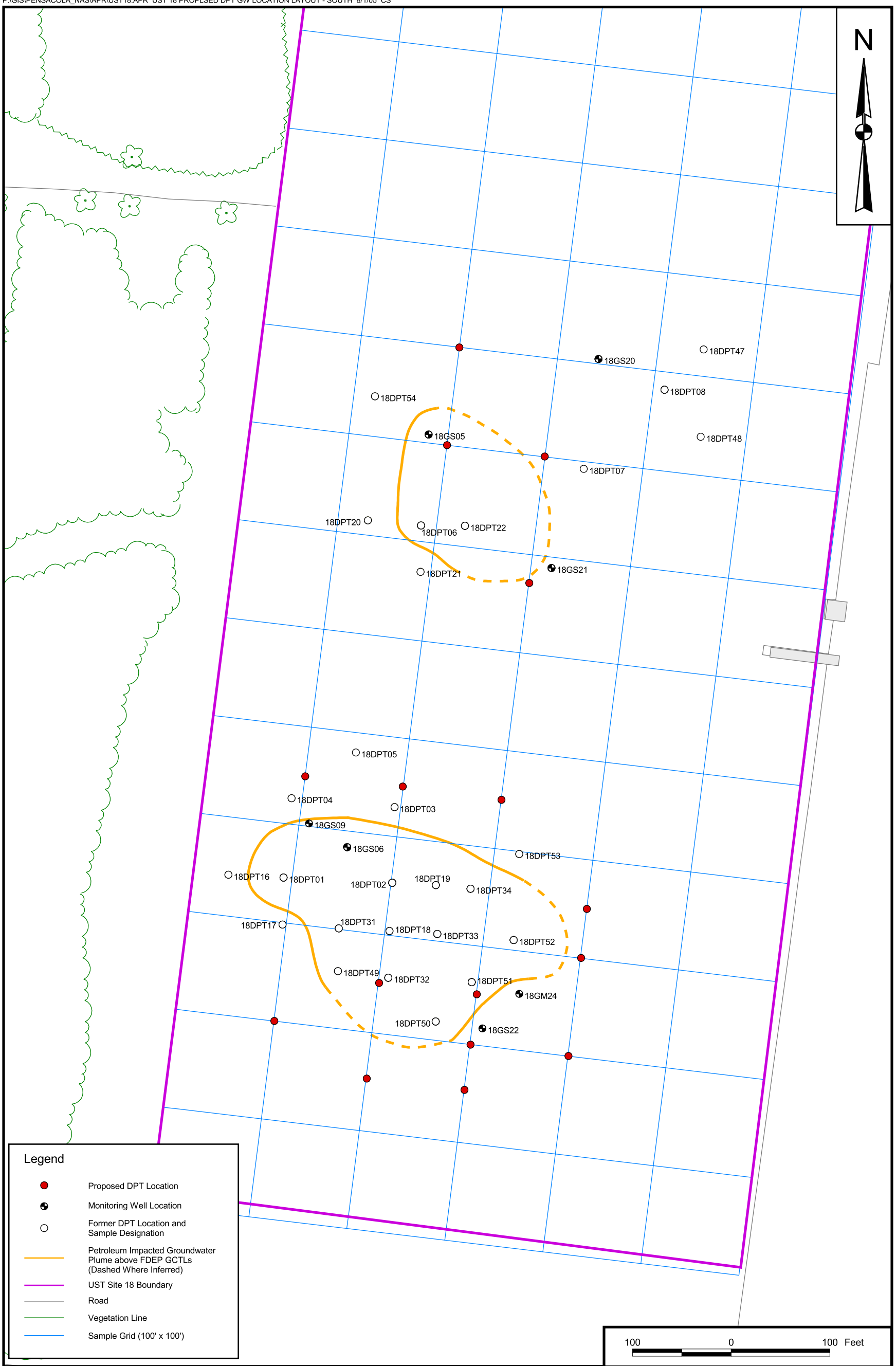

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COST/SCHEDULE-AREA			APPROVED BY: — DATE: —
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TABLE 2-1 SUMMARY OF SUPPLEMENTAL GROUNDWATER SAMPLING ACTIVITIES		
Field Activity	**Approximate Number of Sample Locations**	**Groundwater Sample Interval(s) (ft bls)[1]**
DPT Groundwater Assessment	50 to 55	10,20,30,40,and 50[1].
Monitor Well Groundwater Assessment	34	Well specific

[1] Assumed top surface of low permeability clay, sample may be collected greater than 50 ft' bls, if the top surface of the clay layer is located at depths greater than 50 ft bls.

2.4.2 Monitor Well Groundwater Assessment

TtNUS will collect groundwater samples from the existing 34 monitoring wells to a) provide background information to correlate to fixed base analytical results, and b) determine if additional DPT groundwater assessment is warranted during the field event. Groundwater samples will be submitted to an onsite NELAC certified mobile laboratory for analysis of BTEX and MTBE by EPA Method 8260B. Groundwater sampling procedures are detailed in Section 2.5.2. As indicated above, additional groundwater samples will be submitted to a fixed-based laboratory in a separate field event for KAG/GAG analyses.

2.5 MONITORING WELL INSTALLATION

Based on information obtained during the DPT assessment, TtNUS will advance approximately 30 groundwater monitoring wells at UST Site 18 via Hollow-Stem Auger (HSA) method. TtNUS anticipates advancing approximately 15 shallow monitoring wells to 13 to 15 ft bls, 10 intermediate monitoring wells to 30 to 35 ft bls, and 5 deep monitoring wells completed directly above the low permeability clay layer (50 to 60 ft bls). Shallow and deep monitoring wells will be constructed of 2-inch O.D., Schedule-40 PVC with 10 ft of 0.10-inch slotted screen and 4-inch PVC end-cap or well point located at the bottom of each well. Intermediate monitoring wells will be constructed of 2-inch O.D., Schedule-40 PVC with 5 ft of 0.10-inch slotted screen and 4-inch PVC end-cap. The annular space of each well screen will be filled with 20-30 or 40-65 fine silica sand (i.e., choke sand) to 2 ft above the well screen. At a minimum, 2 ft of hydrated medium bentonite chips will be placed above the well screen. For shallow wells, a 1-1.5 ft choke sand interval followed by 1.5 to 2 ft bentonite interval and, where possible, a 1 to 2 ft grout interval will be used. For deep and intermediate wells, the remaining annular space above the bentonite interval will be grouted with neat Type I Portland Cement i.e. (no additives) to the surface. A locking cap and a 6- or 8-inch traffic-rated flush mount with bolted lid will be placed level with the ground surface, around the wellhead. A 2-ft by 2-ft by 4-inch framed concrete pad will be constructed

around each flush mount. After well construction is complete, each well will be developed in accordance with FDEP SOP 001/01 FS2200. Lithologic, well construction and well development information will be documented in the designated field forms and the field logbook. IDW Management is detailed in Section 2.14. Copies of these field forms are included in Appendix B.

2.5.1 Surveying

The 30 newly installed and 34 existing monitoring wells will be surveyed by a Florida licensed land surveyor. Horizontal datum should be surveyed in feet relative to the Florida State Plane Coordinate System, Florida State Plane North [North American Datum 1983 (NAD83)] and shall be third order (Urqhart L.C., 1962). The horizontal survey should include any prominent site features (i.e., well and sample locations, road intersections, paved areas, etc.). Vertical datum should be referenced to North American Vertical Datum 1988 (NAVD88) with ground elevations accurate to 0.1 ft and top of well casing elevations accurate to 0.01 ft.

2.5.2 Groundwater Sampling

Groundwater sampling will be conducted from the 30 newly installed and 34 existing monitoring wells at UST Site 18. Prior to collecting groundwater samples, groundwater elevations will be measured and recorded. Expansive plugs from each monitoring well will be removed and each well will be allowed a minimum of 15 minutes to equilibrate prior to obtaining the measurement. Depth to potentiometric surface will be measured from the north side of the top of well casing to the nearest 0.01 foot. Groundwater measuring instruments will be decontaminated in general accordance with FDEP SOP 001/01 FS2200 and FC 1000: Cleaning / Field Decontamination Procedures.

Groundwater sampling will be conducted in strict accordance with FDEP SOP 001/01 FS2200. During well purging, field measurements of pH, temperature, specific conductance (SC), and dissolved oxygen will be recorded using a YSI 556 water quality multimeter, or equivalent, for each purge volume. Turbidity will be measured using a Lamotte 2020 turbidimeter or equivalent. Stabilization protocol as defined in FS2200 will be conducted for each parameter prior to sample collection

Teflon® and surgical-grade silicon tubing will be used for sample collection. Groundwater samples to be analyzed for VOCs will be collected using the “straw method” and discharged into the appropriate sample bottles for analysis. Samples requiring preservation will be collected in pre-preserved bottles provided by the laboratory. Pertinent sampling data will be recorded using the appropriate sample log sheet included in Appendix B and the field logbook.

2.6 SAMPLE ANALYSIS

Groundwater samples will be collected and submitted to a fixed-base laboratory for the following analyses:

- BTEX/MTBE and 1, 2-dichloroethane (DCA) via EPA Method 8260B
- 1,2-dibromoethane (EDB) via EPA Method 504.1
- PAHs including 1-, and 2-methylnaphthalene via EPA Method 8310
- Total lead via EPA Method 6010
- TRPH via the Florida Petroleum Range Organics (FL-PRO) Method

In addition to the above laboratory analysis, 14 select groundwater samples will be also be collected and analyzed for a suite of natural attenuation parameters. Laboratory analytical methods, bottle requirements, preservation requirements, and holding times are summarized on Table 2-2.

TABLE 2-2
SUMMARY OF LABORATORY ANALYSES

Parameter	Matrix	Analytical Method	Bottle/Preservation Requirements	Holding Time
Alkalinity	GW	EPA 310.1	Plastic or Glass; cool to 4°C	14 days
Anions: N, NO_2, NO_3, $TKN_,$, SO_4, and PO_4	GW	EPA 300 series	Plastic; cool to 4°C	48 hours
EDB	GW	EPA 504.1	Plastic; cool to 4°C, $Na_2S_2O_3$	14 days
Iron and Manganese (filtered and unfiltered)	GW	SW-846 6010B	Plastic, HNO_3; cool to 4°C	28 days
Methane, Ethane, Ethene	GW	RSK SOP 147/175	3 to 40 mL glass vials, HCl; cool to 4°C	14 days
PAHs	GW	EPA SW846 8310	Two 1-Liter amber jar; H_2SO_4 pH< 2; cool to 4°C	14 days
PAHs	SO	EPA SW846 8310	One 8 ounce clear jar; cool to 4°C	40 days
TRPH	GW	FL-PRO	Two 1-Liter amber jar; cool to 4°C	14 days
TRPH	SO	FL-PRO	One 8-ounce clear jar; cool to 4°C	40 days
TOC	GW	EPA 415.1	One 250 mL HDPE; H_2SO_4 < 2; cool to 4°C	28 days
VOCs	GW	EPA SW846 8260B	3 – 40 mL vials; HCl pH< 2; cool to 4°C	14 days

TABLE 2-2
SUMMARY OF LABORATORY ANALYSES

Parameter	Matrix	Analytical Method	Bottle/Preservation Requirements	Holding Time
VOCs	SO	EPA SW846 8260B	5035 Field Kit	Extraction - Freeze w/in 48 hours; 14 days to analysis

Notes:

GW – Groundwater

EDB – Ethylene Dibromide

FL-PRO – Florida Petroleum Range Organics

H2SO4 – Sulfuric Acid

HNO3 – Nitric Acid

HCl – Hydrochloric Acid

HDPE – High Density Polyethylene

N – Nitrogen

NO2 – Nitrite

NO3 – Nitrate

NA_2SO_3 – Sodium Sulfate

PO4 – Total Phosphorous

SO – Soil

SO4 – Sulfate

TOC – Total Organic Carbon

TKN – Total Kjeldahl Nitrogen

In addition, Table 2-3 summarizes analytical parameters to be measured during field activities.

TABLE 2-3
SUMMARY OF FIELD ANALYTICAL PARAMETERS

Parameter	Matrix	Analytical Method	Holding Time	Sample Event
LNAPL	SO	Sudan IV Hydrophobic Dye or equivalent	Analyze immediately	LNAPL Soil Assessment
VOCs[1]	GW/SO	EPA Method 8260B by Mobile Laboratory	Analyze immediately	DPT Assessment
Alkalinity	GW	CHEMetrics K-9810/9815/9820	Analyze immediately	GW Monitoring
Carbon Dioxide	GW	CHEMetrics K1910/1920/1925	Analyze immediately	GW Monitoring
Hydrogen Sulfide	GW	Hach H_2S kit	Analyze immediately	GW Monitoring
Ferrous Iron	GW	DR-890	Analyze immediately	GW Monitoring
Dissolved Oxygen	GW	CHEMetrics K-7501/7512	Analyze immediately	GW Monitoring

[1] BTEX/MTBE Only.
H_2S = Hydrogen Sulfide

2.7 SAMPLE HANDLING

Sample handling includes the selection of sample containers, preservatives, allowable holding times, and the analyses requested. Sample handling procedures will be in accordance with FDEP SOP 001/01 FS1000, FS2200, and FS3000.

2.8 SAMPLING IDENTIFICATION SYSTEM

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

Soil Sample Nomenclature:

1		2		3		4
NASP18	-	SS	-	DPTXXX	-	ZZ

1. NASP = NAS Pensacola
   18 = UST Site 18
2. SS = Soil Sample
3. DPTXXX = Direct Push Technology Sample where XXX represents the sequential sample number (beginning with DPT0057 or HA001)
4. ZZZ = Sample collection depth listed as a three digit number (e.g., 004 represents a soil sample collected at 4 ft bls)

An example of the above is:

- A DPT soil sample collected from the third boring advanced at a depth 18 ft bls would be represented by NASP18-SS-DPT059-18.

DPT/Piezometer Groundwater Sample Nomenclature:

1		2		2		3
NASP18	-	GW	-	DPT/PZXXX	-	ZZZ

1. NASP= NAS Pensacola
   18 = UST Site 18
2. GW = Groundwater Sample
3. DPT/PZXXX = DPT or Piezometer location.
4. ZZZ = Sample collection depth listed as a three digit number (e.g., 015 represents a groundwater sample collected from 15 ft bls)

Examples of the above are:

- A groundwater sample collected from DPT072 from 20 ft bls would be represented by NASP18-GW-DPT072-020.

- A groundwater sample collected from PZ002 from 15 ft bls would be represented by NASP18-GW-PZ002-015.

Monitoring Well Groundwater Sample Nomenclature:

1		2		3
NASP18	-	MWXXX	-	MMYY

1. NASP= NAS Pensacola
   18 = UST Site 18
2. GW = Groundwater Sample
3. MWXXX = Monitor well location.
4. MMYY= Month/Year of sample collection

2.9 SAMPLE PACKAGING AND SHIPPING

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

- Sample labels
- Chain-of-Custody labels
- Appropriate labels applied to shipping coolers
- Chain-of Custody Forms
- Federal Express Air Bills

FS1000 also addresses the topics of containers and sample preservations.

2.10 SAMPLE CUSTODY

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

2.11 QUALITY CONTROL SAMPLES

Pre- and post-equipment rinsate blanks will be collected during the DPT soil and groundwater assessment and groundwater monitoring event in general accordance to FDEP SOP 001/01 FQ1000: Field Quality Control Requirements. Additional field blanks and duplicates may be collected as needed.

In addition, one trip blank sample will accompany each cooler containing VOC samples. Additional quality control samples for IDW are not required for this investigation.

2.12 EQUIPMENT CALIBRATION

The field instruments including the OVA-FID, YSI 556 water quality multimeter, and Lamotte 2020 turbidity meter will be calibrated daily and/or according to FDEP SOPs FT1000: General Field Testing and Measurement. Specific FDEP SOPs to be consulted for each parameter are provided in Table 2-4.

TABLE 2-4
SOP REFERENCES FOR SELECT FIELD PARAMETERS

Parameter	FDEP SOP Title	FDEP SOP No.
pH	Field Measurement of Hydrogen Ion Activity (pH)	FT1100
SC	Field Measurement of Specific Conductance (SC)	FT1200
Temperature	Field Measurement of Temperature	FT1400
Dissolved Oxygen	Field Measurement of Dissolved Oxygen	FT1500
Turbidity	Field Measurement of Turbidity	FT1600
Oxidation-Reduction Potential	Oxidation-Reduction Potential	FT2100

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

2.13 RECORD KEEPING

In addition to chain-of-custody records associated with sample handling, packaging, and shipping, certain standard forms will be completed for sample description and documentation. These shall include sample log sheets (for soil and groundwater samples), daily activities record, and logbooks.

The FOL will maintain a bound/weatherproof field notebook. The FOL, or designee, will record pertinent information related to sampling or field activities. This information may include sampling time, weather conditions, unusual events (e.g., well tampering), field measurements, site visitors, descriptions of photographs, etc. At the completion of field activities, the FOL shall submit to the TtNUS Task Order Manager (TOM) all field records, data, field notebooks, logbooks, chain-of-custody receipts, sample log sheets, drilling logs, daily logs, etc.

2.14 IDW MANAGEMENT

Purge water and decontamination water will be collected and containerized in Department of Transportation (DOT) approved (Specification 17C) 55-gallon drums. Each drum will be sealed, labeled and transported to a pre-designated staging area located within NAS Pensacola pending groundwater analytical results and/or composite waste sample results for disposal. Soil displaced during the investigation will be appropriately disposed of as per the Comprehensive Long-Term Environmental Action Draft Investigation – Derived Waste Plan, NAS Pensacola, Florida (Ensafe/Allen & Hoshall, 1994). A waste staging area will be established at the site to store IDW generated during the sampling activities. All decontamination materials generated during the site investigation will be containerized for proper disposal. Appropriate IDW documentation will be maintained in the project field log book.

2.15 DECONTAMINATION

The equipment involved in field sampling activities will be decontaminated prior to and during sampling activities in accordance to FDEP SOP FC1000. Non-disposable equipment used for collecting samples will be decontaminated prior to beginning field sampling and between sample locations.

2.16 REPORTING

TtNUS will incorporate field data and analytical results into a Supplemental Site Assessment Report (SSAR). The SSAR will include methodology, field data, and laboratory analytical results from the soil and groundwater assessment, and groundwater monitoring event. The SSAR will also provide recommendations for additional assessment or a No Further Action proposal for UST Site 18. The SSAR will be prepared in draft and final versions.

REFERENCES

CH2MHILL (CH2M Hill Constructors, Inc.), 2003. Groundwater Monitoring Report - Fourth Quarter 2002, UST 18 Naval Air Station Pensacola, Pensacola, Florida. April.

Ensafe/Allen and Hoshall, 1994, Comprehensive Long-Term Environmental Action Draft Investigation – Derived Waste Plan, Naval Air Station Pensacola, Florida. June.

Ensafe/Allen and Hoshall, 1996, Contamination Assessment Report, Underground Storage Tank Site 18 – Crash Crew Training Area, Naval Air Station Pensacola, Florida. January.

FDEP (Florida Department of Environmental Protection), 2004. Standard Operation Procedures 001/01: FS1000 – General Sampling; FS2200 – Groundwater Sampling; and FS3000 – Soil Sampling. February.

FDEP, 2005. Chapter 62-770 F.A.C. "Petroleum Contamination Site Cleanup Criteria" April.

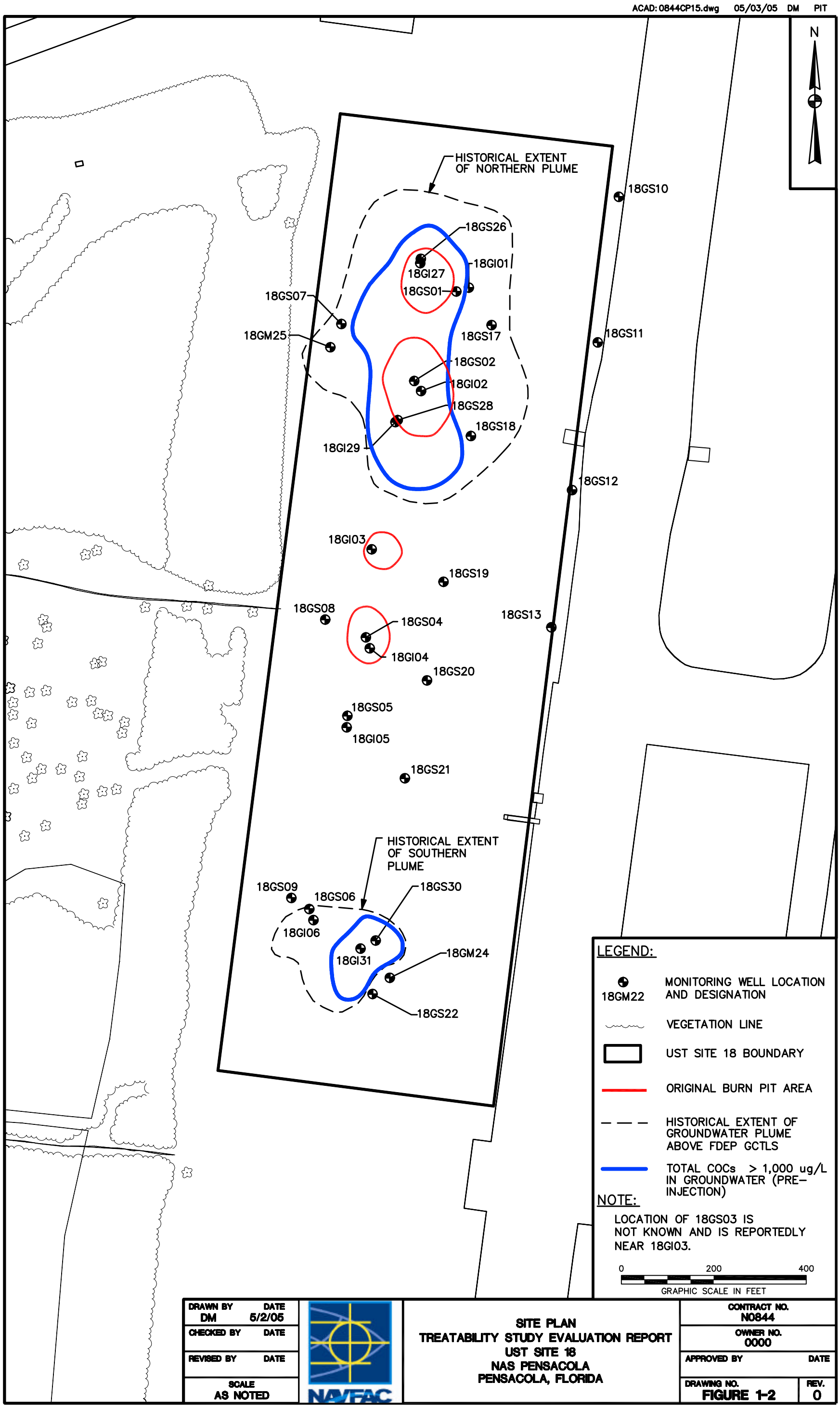
FDEP, 2005. Chapter 62-777 F.A.C. "Contaminant Cleanup Target Levels" April.

Urqhart, L.C., 1962. Civil Engineering Handbook, 4th Edition, pgs 96-97. October.

APPENDIX A

HISTORICAL FIGURES

ACAD: 0844CP15.dwg 05/03/05 DM PIT



DRAWN BY DM	DATE 5/2/05	SITE PLAN TREATABILITY STUDY EVALUATION REPORT UST SITE 18 NAS PENSACOLA PENSACOLA, FLORIDA	CONTRACT NO. N0844
CHECKED BY	DATE		OWNER NO. 0000
REVISED BY	DATE		APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 1-2 / REV. 0

FORM CADD NO. SDIV-BV.DWG - REV 1 - 9/10/98

CTO 0313

DRAFT

P:\GIS\PENSACOLA_NAS\APR\UST18.APR UST 18 TAG LAYOUT - NORTH 11/12/03 KMP

04JAX019

N

18DPT41
Volatile Organics (ug/L)
TOTAL XYLENES 24.3 [20]

18DPT56
NO EXCEEDANCES

18DPT29
Volatile Organics (ug/L)
BENZENE 17.7 [1]

18DPT28
Volatile Organics (ug/L)
TOTAL XYLENES 95 [20]

18DPT14
Volatile Organics (ug/L)
BENZENE 64 [1]
ETHYLBENZENE 37 [30]
TOTAL XYLENES 240 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 100 [20]
1-METHYLNAPHTHALENE 130 [20]
2-METHYLNAPHTHALENE 150 [20]

18DPT40
Volatile Organics (ug/L)
BENZENE 6.2 [1]
TOTAL XYLENES 106.9 [20]

18GS10
NO EXCEEDANCES

18DPT13
Volatile Organics (ug/L) 6' 19'
BENZENE 60 [1]
ETHYLBENZENE 350 160 [30]
TOTAL XYLENES 820 380 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 400 500 [20]
1-METHYLNAPHTHALENE 250 600 [20]
2-METHYLNAPHTHALENE 360 720 [20]

18DPT42
NO EXCEEDANCES

18GS01
Volatile Organics (ug/L)
BENZENE 510 [1]
ETHYLBENZENE 140 [30]
TOTAL XYLENES 290 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 270 [20]
TOTAL PETROLEUM HYDROCARBONS 38000 [5000]

18DPT27
Volatile Organics (ug/L)
BENZENE 3.9 [1]
TOTAL XYLENES 126.6 [20]

18DPT30
NO EXCEEDANCES

18DPT26
NO EXCEEDANCES

18DPT12
Volatile Organics (ug/L)
ETHYLBENZENE 280 [30]
TOTAL XYLENES 1230 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 400 [20]
1-METHYLNAPHTHALENE 200 [20]
2-METHYLNAPHTHALENE 230 [20]

18GS17
Volatile Organics (ug/L)
BENZENE 96 [1]
TOTAL XYLENES 202 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 71 [20]
TOTAL PETROLEUM HYDROCARBONS 15000 [5000]

18GS07
Volatile Organics (ug/L)
BENZENE 10 [1]
ETHYLBENZENE 78.7 [30]
TOTAL XYLENES 372.2 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 120 [20]
1-METHYLNAPHTHALENE 51.4 [20]
2-METHYLNAPHTHALENE 57.3 [20]
TOTAL PETROLEUM HYDROCARBONS 30000 [5000]

18DPT43
NO EXCEEDANCES

18GS11
NO EXCEEDANCES

18DPT26
NO EXCEEDANCES

18DPT15
Volatile Organics (ug/L)
ETHYLBENZENE 39 [30]
TOTAL XYLENES 180 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 100 [20]
1-METHYLNAPHTHALENE 100 [20]
2-METHYLNAPHTHALENE 120 [20]

18GM25
NO EXCEEDANCES

18DPT24
Volatile Organics (ug/L)
TOTAL XYLENES 22.6 [20]

18DPT44
Volatile Organics (ug/L)
BENZENE 11.9 [1]
NAPHTHALENE 36.8 [20]
TOTAL XYLENES 50.4 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 36.8 [20]
1-METHYLNAPHTHALENE 29.6 [20]
2-METHYLNAPHTHALENE 32.2 [20]

18GS18
Volatile Organics (ug/L)
BENZENE 41.8 [1]
ETHYLBENZENE 120 [30]
TOTAL XYLENES 486.4 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 47.2 [20]
1-METHYLNAPHTHALENE 43.5 [20]
2-METHYLNAPHTHALENE 52.7 [20]
TOTAL PETROLEUM HYDROCARBONS 9500 [5000]

18DPT39
Volatile Organics (ug/L)
TOTAL XYLENES 231 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 68 [20]
1-METHYLNAPHTHALENE 82 [20]
2-METHYLNAPHTHALENE 70 [20]

18GI02
NO EXCEEDANCES

18GS02
Volatile Organics (ug/L)
BENZENE 12 [1]
ETHYLBENZENE 140 [30]
TOLUENE 190 [40]
TOTAL XYLENES 810 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 160 [20]
1-METHYLNAPHTHALENE 120 [20]
2-METHYLNAPHTHALENE 120 [20]
TOTAL PETROLEUM HYDROCARBONS 19000 [5000]

18DPT36
NO EXCEEDANCES

18DPT10
Volatile Organics (ug/L) 6' 19' 34' 50'
BENZENE 5.4 1.4 [1]
ETHYLBENZENE 190 54 [30]
TOLUENE 1300 [40]
TOTAL XYLENES 1680 248.6 74.9 46.2 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 240 63 [20]
1-METHYLNAPHTHALENE 130 50 [20]
2-METHYLNAPHTHALENE 130 60 [20]

18DPT45
NO EXCEEDANCES

18DPT09
NO EXCEEDANCES

18GS12
NO EXCEEDANCES

18DPT38
Volatile Organics (ug/L)
ETHYLBENZENE 880 [30]
TOLUENE 9800 [40]
TOTAL XYLENES 4800 [20]

18DPT11
Volatile Organics (ug/L)
TOLUENE 350 [40]
TOTAL XYLENES 63 [20]

18DPT37
Volatile Organics (ug/L)
BENZENE 29 [1]
ETHYLBENZENE 280 [30]
TOLUENE 2200 [40]
TOTAL XYLENES 1880 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 190 [20]
1-METHYLNAPHTHALENE 130 [20]
2-METHYLNAPHTHALENE 120 [20]

18DPT55
Polynuclear Aromatic Hydrocarbons (ug/L)
1-METHYLNAPHTHALENE 36.4 [20]
2-METHYLNAPHTHALENE 35.3 [20]

18GI03
Volatile Organics (ug/L)
TOLUENE 40.9 [40]
TOTAL XYLENES 52.4 [20]
TOTAL PETROLEUM HYDROCARBONS 7300 [5000]

18DPT23
Volatile Organics (ug/L)
ETHYLBENZENE 120 [30]
TOLUENE 320 [40]
TOTAL XYLENES 1300 [20]

18DPT35
Volatile Organics (ug/L)
ETHYLBENZENE 62 [30]
TOLUENE 55 [40]
TOTAL XYLENES 1590 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
1-METHYLNAPHTHALENE 100 [20]

18DPT46
NO EXCEEDANCES

18GS19
Volatile Organics (ug/L)
BENZENE 1.7 [1]

18GS08
NO EXCEEDANCES

18GS04
NO EXCEEDANCES

18GS13
NO EXCEEDANCES

Runway 19

Legend

- Monitoring Well Location
- DPT Location and Sample Designation
- Petroleum Impacted Groundwater Plume above FDEP GCTLs (Dashed Where Inferred)
- UST Site 18 Boundary
- Road
- Vegetation Line

FDEP — Florida Department of Environmental Protection

GCTLs — Groundwater Cleanup Target Levels

ug/L — Micrograms per Liter

Tag Legend

Analyte	Analyte Concentration	FDEP GCTL
Toluene	55	[40]

100 0 100 Feet

DRAWN BY: A. JANOCHA	DATE: 10/16/03
CHECKED BY: C. METZ	DATE: 11/06/03
COST/SCHEDULE-AREA	
SCALE: AS NOTED	

DEPARTMENT OF THE NAVY · SOUTHERN DIV FACILITIES ENGINEERING COMMAND

ANALYTICAL SUMMARY OF FDEP GCTL EXCEEDANCES IN
DPT GROUNDWATER SAMPLES - NORTH PLUME
UST SITE 18
NAS PENSACOLA
PENSACOLA, FLORIDA

CONTRACT NUMBER: N0844

APPROVED BY — DATE —

APPROVED BY — DATE —

DRAWING NO.: FIGURE 1 - 5 REV: 0

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Rev. 1
12/01/03

P:\GIS\PENSACOLA_NAS\APR\UST18.APR UST 18 TAG LAYOUT - SOUTH 11/12/03 KMP

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18DPT08
Volatile Organics (ug/L)
TOTAL XYLENES 20 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 87 [20]
1-METHYLNAPHTHALENE 75 [20]
2-METHYLNAPHTHALENE 100 [20]

18GS20
NO EXCEEDANCES

18DPT47
NO EXCEEDANCES

18DPT54
NO EXCEEDANCES

18GS05
Volatile Organics (ug/L)
TOTAL XYLENES 68.4 [20]

18DPT48
NO EXCEEDANCES

18DPT07
NO EXCEEDANCES

18DPT06
Volatile Organics (ug/L)
TOTAL XYLENES 45.8 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
1-METHYLNAPHTHALENE 21.7 [20]

18DPT22
Volatile Organics (ug/L)
TOTAL XYLENES 720 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 140 [20]
1-METHYLNAPHTHALENE 140 [20]
2-METHYLNAPHTHALENE 140 [20]

18DPT20
NO EXCEEDANCES

18DPT21
NO EXCEEDANCES

18GS21
NO EXCEEDANCES

18DPT02
Volatile Organics (ug/L) 6' 19' 34' 50'
TOTAL XYLENES 440 78 83 34.1 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 51.3 [20]
1-METHYLNAPHTHALENE 34.9 [20]
2-METHYLNAPHTHALENE 31.7 28 [20]

18GS06
Volatile Organics (ug/L)
TOTAL XYLENES 181 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 140 [20]
1-METHYLNAPHTHALENE 120 [20]
2-METHYLNAPHTHALENE 140 [20]

18DPT18
Volatile Organics (ug/L)
TOLUENE 45 [40]
TOTAL XYLENES 305 [20]

18GS09
NO EXCEEDANCES

18DPT19
Volatile Organics (ug/L)
TOTAL XYLENES 384 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 44 [20]
1-METHYLNAPHTHALENE 38 [20]
2-METHYLNAPHTHALENE 34 [20]

18DPT04
NO EXCEEDANCES

18DPT05
NO EXCEEDANCES

18DPT03
NO EXCEEDANCES

18DPT53
NO EXCEEDANCES

18DPT34
Volatile Organics (ug/L)
ETHYLBENZENE 62 [30]
TOLUENE 45 [40]
TOTAL XYLENES 1770 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 200 [20]
1-METHYLNAPHTHALENE 120 [20]
2-METHYLNAPHTHALENE 150 [20]

18DPT01
Volatile Organics (ug/L)
TOTAL XYLENES 261.4 [20]

18DPT16
NO EXCEEDANCES

18DPT31
Volatile Organics (ug/L)
TOTAL XYLENES 163.1 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
1-METHYLNAPHTHALENE 22.4 [20]
2-METHYLNAPHTHALENE 23.5 [20]

18DPT52
Volatile Organics (ug/L)
ETHYLBENZENE 89 [30]
TOTAL XYLENES 2440 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 250 [20]
1-METHYLNAPHTHALENE 360 [20]
2-METHYLNAPHTHALENE 410 [20]

18DPT17
NO EXCEEDANCES

18DPT49
Volatile Organics (ug/L)
TOTAL XYLENES 192 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
1-METHYLNAPHTHALENE 75 [20]
2-METHYLNAPHTHALENE 86 [20]

18DPT33
Volatile Organics (ug/L)
ETHYLBENZENE 130 [30]
TOLUENE 87 [40]
TOTAL XYLENES 1860 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 290 [20]
1-METHYLNAPHTHALENE 150 [20]
2-METHYLNAPHTHALENE 200 [20]

18GM24
NO EXCEEDANCES

18DPT51
Volatile Organics (ug/L)
ETHYLBENZENE 32 [30]
TOTAL XYLENES 820 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 100 [20]
1-METHYLNAPHTHALENE 150 [20]
2-METHYLNAPHTHALENE 160 [20]

18GS22
NO EXCEEDANCES

18DPT32
Volatile Organics (ug/L)
ETHYLBENZENE 36.9 [30]
TOTAL XYLENES 510 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 90.3 [20]
1-METHYLNAPHTHALENE 34.3 [20]
2-METHYLNAPHTHALENE 36.3 [20]

18DPT50
Volatile Organics (ug/L)
ETHYLBENZENE 110 [30]
TOTAL XYLENES 1520 [20]
Polynuclear Aromatic Hydrocarbons (ug/L)
NAPHTHALENE 130 [20]
1-METHYLNAPHTHALENE 150 [20]
2-METHYLNAPHTHALENE 190 [20]

Runway 19

Legend

- Monitoring Well Location
- DPT Location and Sample Designation
- Building
- Petroleum Impacted Groundwater Plume above FDEP GCTLs (Dashed Where Inferred)
- UST Site 18 Boundary
- Road
- Vegetation Line

FDEP — Florida Department of Environmental Protection

GCTLs — Groundwater Cleanup Target Levels

ug/L — Micrograms per Liter

Tag Legend

Analyte	Analyte Concentration	FDEP GCTL
Naphthalene	90.3	[20]

100 0 100 Feet

DRAWN BY	DATE
A. JANOCHA	10/16/03
CHECKED BY	DATE
C. METZ	11/05/03
COST/SCHEDULE-AREA	
SCALE	AS NOTED

DEPARTMENT OF THE NAVY ★ NAVFAC ★ SOUTHERN DIV FACILITIES ENGINEERING

ANALYTICAL SUMMARY OF FDEP GCTL EXCEEDANCES IN
DPT GROUNDWATER SAMPLES - SOUTH PLUME
UST SITE 18
NAS PENSACOLA
PENSACOLA, FLORIDA

CONTRACT NUMBER N0844

APPROVED BY — DATE —

APPROVED BY — DATE —

DRAWING NO. FIGURE 1 - 6

REV 0

1-18

CTO 0313

Rev. 1
12/01/03

APPENDIX B

FIELD DATA SHEETS

Tetra Tech NUS, Inc.

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: UST Site 18 Treatability Study **Project No.:** N0844

Location: NAS Pensacola **Personnel:**

Weather Conditions: **Measuring Device:**

Tidally Influenced: Yes ___ No ___ **Remarks:**

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

* All measurements to the nearest 0.01 foot

TETRA TECH NUS/FDEP GROUNDWATER SAMPLING LOG

SITE NAME: **UST SITE 18**	SITE LOCATION: Naval Air Station Pensacola	
WELL NO:	SAMPLE ID:	DATE

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches): 3/16	WELL SCREEN INTERVAL DEPTH: feet to feet	STATIC DEPTH TO WATER (feet):	PURGE PUMP TYPE OR BAILER: Peristaltic Pump

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
only fill out if applicable)

_____Liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)

_____Liters

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING INITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (Liters):

TIME	VOLUME PURGED (Liters)	CUMUL. VOLUME PURGED (Liters)	PURGE RATE (lpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (µmhos/cm or µS/cm)	DISSOLVED OXYGEN (circle mg/L or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.0006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: TtNUS/	SAMPLER(S) SIGNATURES:	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
PUMP OR TUBING DEPTH IN WELL (feet):	SAMPLE PUMP FLOW RATE (mL per minute):	TUBING MATERIAL CODE: Teflon	
FIELD DECONTAMINATION: Y N	FIELD-FILTERED: Y N FILTER SIZE: ____ µm Filtration Equipment Type: _____	DUPLICATE: Y N	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH		
PP	3	CG	40 ml	HCL	NONE	<2	VOCs/8260B	SM

REMARKS:

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O** = Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP** = Electric Submersible Pump; **PP** = Peristaltic Pump; **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: UST Site 18 **WELL ID.:** PEN-18-
PROJECT NUMBER: N0844 **DATE:** _____

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Volume (L)	pH (S.U.)	Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celsius)	ORP (mV)	Comments

SIGNATURE(S): _____ PAGE_2_OF_2_

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Project Site Name: UST Site 18 | Sample ID No.:

Project No.: N0844 | Sample Location:

Sampled By: | Duplicate: ☐

Field Analyst: | Blank: ☐

Field Form Checked as per QA/QC Checklist (initials):

SAMPLING DATA:

	Color	pH	S.C.	Turbidity	DO	Temp.	ORP	
Date: / Time:	Visual	Standard	mS/cm	NTU	mg/l	°C	mV	
Method: Peristaltic								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Ferrous Iron:

Equipment: HACH IR-18C Test Kit

Analysis Time: _____

Concentration: _____ mg/L

Notes:

Hydrogen Sulfide (H_2S):

Equipment: HS-C Analysis Time: _____

Concentration: _____ mg/L

Notes:

Alkalinity:

Analysis Time: _____

Equipment: CHEMetrics (Range: _____mg/L) Filtered: ☐

CHEMetrics: _____mg/L

Notes:

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: _____mg/L) Analysis Time: _____

CHEMetrics: _____mg/L

Notes:

Dissolved Oxygen:

Equipment: CHEMetrics Range ☐ 0 - 1.0 mg/L ☐ 1 - 12 mg/L Analysis Time: _____

CHEMetrics: _____mg/L

QA/QC Checklist:

All data fields have been completed as necessary: ☐

Correct measurement units are cited in the SAMPLING DATA block: ☐

Mulitplication is correct for each *Multiplier* table: ☐

Final calulated concentration is within the appropriate *Range Used* block: ☐

Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☐

QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☐

Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☐

Title block is initialized by person who performed the QA/QC Checklist: ☐

Tetra Tech NUS, Inc.

PROJECT:	UST Site 18 Treatability Study	**LOCATION:**	NAS Pensacola
JOB & CTO #:	N0844, CTO 313	**DEPART:**	
TOM:		**RETURN:**	

SAMPLING FIELD CHECKLIST

EQUIPMENT

- ___ Well Key/ Gate Key
- ___ Submersible Pump
- ___ Peristaltic Pump
- ___ Horiba
- ___ Umbrella
- ___ Chair
- ___ Measuring cup
- ___ Clips
- ___ Well Tool (9/16)
- ___ Drum Wrench (15/16)
- ___ Buckets/lids
- ___ Water Level Indicator
- ___ Hach Kit Tests for NA
- ___ Box cutter knife
- ___ Machete
- ___ Batteries
- ___ Charger
- ___ Car Adaptor for batteries
- ___ Scrub Brush
- ___ OVA/FID
- ___ Bungee cords
- ___ Drum/Pallets
- ___ Cell Phone/charger
- ___ Secondary Spill pans
- ___ Sampling Filters

DOCS

- ___ Work Plan
- ___ HASP Addendum
- ___ EISOPQAM
- ___ COMPQAP

EXPENDABLES

- ___ Silicone Tubing
- ___ Teflon Tubing
- ___ DI Cube
- ___ DI Sprayer
- ___ Paper Towels
- ___ Gloves
- ___ Trash Bags
- ___ Liquinox
- ___ Bottleware (extra VOA vials)
- ___ Isopropyl
- ___ Ziplock Bags
- ___ Tape/dispenser
- ___ Bubblewrap
- ___ Ice
- ___ Sharpie Pens
- ___ Drinks
- ___ Small cups (if water in wells)
- ___
- ___

FORMS

- ___ Labels
- ___ COC's
- ___ Low Flow Purge Sheet
- ___ Development sheet
- ___ Field Book
- ___ Drum Labels
- ___ Custody seals
- ___ Fed Ex Air bill
- ___ Field Calibration Sheet
- ___ Groundwater Sample sheet
- ___ Site Map

EQUIPMENT CALIBRATION LOG

INSTRUMENT NAME/MODEL : ______________________ PROJECT NAME : UST Site 18

MANUFACTURER : ______________________ PROJECT NUMBER : 112G0140

CALIBRATION DATE	INSTRUMENT/ SERIAL #	INITIAL SETTINGS	STANDARDS USED	PROCEDURE	ADJUSTMENTS MADE	FINAL SETTINGS	SIGNATURE	COMMENTS