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FINAL WORK PLAN RCRA FACILITY INVESTIGATION WORK PLAN FOR SANITARY SEWER SYSTEM NAS FORT WORTH TX

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FORT WORTH JRB
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COVER SHEET

AR File Number 513

FINAL
WORK PLAN

NAVAL AIR STATION (NAS)
FORT WORTH JOINT RESERVE BASE, TEXAS

PHASE 2 RCRA FACILITY INVESTIGATION
WORK PLAN FOR THE
SANITARY SEWER SYSTEM

CONTRACT NO. F41624-94-D-8047, DELIVERY ORDER D0039

Project No. 768579

March 2000

Final
Phase 2 RCRA Facility Investigation Work Plan for the Sanitary Sewer System Naval Air Station (NAS) Fort Worth Joint Reserve Base, Texas

Prepared for:

Air Force Center for Environmental Excellence
Brooks Air Force Base, Texas 78235-5353

March 2000

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List of Acronyms

AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AOC	area(s) of concern
DPT	direct-push technology
EPA	U.S. Environmental Protection Agency
FSP	field sampling plan
IT	IT Corporation
JRB	Joint Reserve Base
Law	Law Environmental, Inc.
MSC	media-specific concentration
NAS	Naval Air Station Joint Reserve Base
OWS	oil/water separator
PCB	polychlorinated biphenyl
PQL	practical quantitation limit
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RRS	risk reduction standard
SAP	sampling and analysis
SPLP	synthetic precipitation leaching procedure
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TAL	target analyte list
TCA	trichloroethane
TCE	trichloroethene
TNRCC	Texas Natural Resource Conservation Commission
UTL	upper tolerance level
VOC	volatile organic compound

1.0 Introduction

IT Corporation (IT) has been contracted by the Air Force Center for Environmental Excellence (AFCEE) to conduct a Phase 2 Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) work plan to evaluate existing information, obtain additional data as needed, and prepare a Phase 2 RFI addendum report for the Sanitary Sewer System at the Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), (former Carswell Air Force Base [AFB]), Texas. The RFI addendum report will recommend site closure, additional sampling, or remediation, as needed. IT is performing this work under Contract F41624-94-D-8047, Delivery Order 39.

This Phase 2 RFI work plan is to provide: objectives for the additional investigation of the Sanitary Sewer System at NAS Fort Worth, the plan of investigation for additional field investigation of the Sanitary Sewer System, the methods for reporting the regulatory status of the Sanitary Sewer System in accordance with Texas Natural Resource and Conservation Commission (TNRCC) Risk Reduction Standards (RRS), and requests for no further action status and closure of the Sanitary Sewer System (Solid Waste Management Unit [SWMU] 66). Results of work previously performed on the oil/water separators (OWS) are provided in the draft OWS RFI addendum report (IT, 1998). This Sanitary Sewer System Phase 2 RFI work plan includes by reference the findings provided in the draft Sanitary Sewer System RFI report (IT, 1997a).

Additional investigation of the Sanitary Sewer System will comply with the requirements specified in the (Phase 1) Sanitary Sewer System investigation work plan and quality program plan (IT, 1997b; 1999). The quality program plan includes a health and safety plan and a sampling and analysis plan (SAP). The health and safety plan is a project-specific and site-specific plan. The SAP consists of two volumes: the field sampling plan (FSP) and the quality assurance project plan (QAPP). The Sanitary Sewer System RFI FSP describes the methods to be used in the collection and analysis of additional Phase 2 RFI site data samples (IT, 1997c). The QAPP documents the data quality objectives and the quality assurance/quality control (QA/QC) procedures to be used in the performance of field and laboratory work.

This document appends the NAS Fort Worth Sanitary Sewer System RFI work plan (IT, 1997b) and FSP (IT, 1997c) and presents the proposed sampling locations and sampling rationale. The sampling locations and analytical methods will be reviewed by the TNRCC before field work begins. This document will identify the Sanitary Sewer System areas that require further investigation, identify the analytical samples to be collected, reference for sample collection methods, explain the rationale for the sample collection, and provide sufficient information to serve as the Phase 2 FSP. The work plan will be based on the modification of the existing (Phase 1) NAS Fort Worth Sanitary Sewer System RFI work plan (IT, 1997b) and FSP (IT, 1997c) and will include:

- Locations for delineation and rationale for sampling.
- Conduct synthetic precipitation leaching procedure (SPLP) sample analysis to allow RRS 2 closure of locations where soils exceed TNRCC RRS No. 2 (RRS 2) media-specific concentrations (MSC).
- Project schedule and organization.

1.1 Project Objectives

After completion of the (Phase 1) Sanitary Sewer System RFI report (IT, 1997a), TNRCC comments indicated additional delineation of contaminants detected would be required for completion of the RFI. Compliance with TNRCC RRSs for completion of the RFI will require additional lateral delineation of contaminants exceeding background upper tolerance levels (UTL) or analytical methods practical quantitation limits (PQL). The work plan does not include corrective measures, such as detailed contaminant delineation sampling, legal surveys of the contaminated Sanitary Sewer System area site boundaries, or deed restrictions, to provide closure of the site.

The objectives of this investigation are:

- Obtain additional data necessary to adequately assess the extent of Sanitary Sewer System-related soil and groundwater contamination for constituents detected above TNRCC RRS 2.
- Consolidate additional Sanitary Sewer System data in a Phase 2 RFI addendum report compliant with TNRCC regulations and procedures.

- Prepare an interim corrective measures work plan for the areas of the Sanitary Sewer System where appropriate remediation may be warranted, and identify and recommend candidate remedial technologies.

- Prepare reports to document "no further action" for the areas of the Sanitary Sewer System where contaminants did not exceed TNRCC RRS 1.

- Prepare reports to document closure in place where contaminants exceeded TNRCC RRS 1, but met closure criteria under RRS 2 standards.

- Allow for property transfer of parcels containing the Sanitary Sewer System.

1.2 Project Investigation Methods

Evaluation of the analytical data from the draft Sanitary Sewer System RFI report indicates sample locations can be categorized as:

- Locations with contaminant concentrations exceeding TNRCC RRS 1 criteria that require further delineation

- Locations requiring sample confirmation due to detections less than one order of magnitude above RRS 1

- Locations not requiring additional delineation due to influences from co-mingled plumes or proven anthropogenic contaminants

- Locations not requiring additional delineation due to organic analytes not exceeding analytical method PQL or inorganic analytes not exceeding site-wide background UTLs.

The estimated number of soil and groundwater samples is based on the locations that had constituents exceeding background UTLs or PQLs. These investigation locations are divided into confirmation and delineation. These will provide both confirmation of sampling results and additional delineation of the lateral extent of contamination. Samples collected in already delineated areas (SWMUs, OWSs, or previously documented known spill sites) were not used in selection determination.

The basis for selection for removal of the sample locations from the Sanitary Sewer System RFI data is as follows:

- Remove organic analytes not exceeding laboratory method PQLs.
- Remove inorganic analytes not exceeding background UTLs.
- Remove groundwater sample locations from known spill sites and the areas influenced by the Air Force Plant 4 trichloroethene (TCE) groundwater plume.
- Removal of sample locations that have contaminants suspected of anthropogenic source (polynuclear aromatic hydrocarbons from asphalt), removal of sample detections suspected to be caused by laboratory contamination, and removal of single detections of uncommon constituents that do not have an identified local industrial source.

Sample locations were selected for soil and groundwater analysis in order to complete the RFI in compliance with TNRCC RRSs. Completion of the RFI will require confirmation of contaminant detections and additional lateral delineation of contaminants exceeding background UTLs or analytical methods PQLs.

2.0 Background and Existing Site Information

2.1 Site Description

NAS Fort Worth JRB is located in Tarrant County, 8 miles west of downtown Fort Worth (see Figure 1), Texas. A description of NAS Fort Worth JRB and the surrounding area is provided in the NAS Fort Worth JRB Sanitary Sewer System work plan (IT, 1997b). The general area of the Sanitary Sewer System Phase 2 RFI is located throughout the industrialized areas of NAS Fort Worth JRB (see Figure 2).

2.2 Environmental Setting

Description of the environmental setting at NAS Fort Worth JRB is fully described in the Sanitary Sewer System RFI work plan (IT, 1997b).

2.3 Site History and Operations

2.3.1 Ownership

Description of the site history and ownership at NAS Fort Worth JRB is fully described in the Sanitary Sewer System RFI work plan (IT, 1997b).

2.3.2 Operation

Before the construction of the initial airfield facilities in 1942, the area now occupied by NAS Fort Worth JRB consisted of pasture and woods. The majority of the NAS Fort Worth JRB property was acquired in the 1940s, with most of the property acquired from the City of Fort Worth in 1941. Additional property, including most of the South Base, the Hospital Area, and the Off-Site Weapons Storage Area, was acquired during the 1950s. Kings Branch and the South Base Residential Areas were acquired in 1960. Several miscellaneous additional properties totaling less than 10 acres have been acquired since 1970 (Jacobs Engineering, 1995a,b).

From 1942 until 1994, the former Carswell AFB was used as a bomber and bomber training base. Carswell AFB was realigned as NAS Fort Worth JRB in 1994. Wastes have been generated and disposed of at the facility since the beginning of industrial operations in 1942. The major industrial operations at NAS Fort Worth JRB included: maintenance of jet aircraft engines and aerospace ground equipment, aircraft fuel, weapons, and hydraulic operations;

maintenance of general and special purpose vehicles; aircraft corrosion control; and nondestructive inspection activities (Jacobs Engineering, 1995a,b).

"Waste oils" generally refers to lubricating fluids, such as crankcase oils and synthetic turbine oils. Hydraulic fluids have also been included in this category. "Recoverable fuels" refers to fuel drained from aircraft tanks and vehicles, such as jet propulsion fuel grade 4 and motor gasoline. "Spent solvents and cleaners" refers to liquid used for degreasing and general cleaning of aircraft, aircraft systems, electronic components, and vehicles. This category includes PD-680 and various chlorinated organic compounds, such as TCE and 1,1,1-trichloroethane (TCA).

Specific types of solvents used by the Air Force have changed over the years. In the 1950s, carbon tetrachloride was in common use. Its use was replaced by TCE about 1960. Since then, TCE and TCA have been commonly used; however, TCE usage has decreased in favor of TCA. Today, PD-680 Type II, TCA, and TCE are used.

Waste paint solvents or thinners and strippers are generated by corrosion control activities. Typical thinners include isobutyl acetate, toluene, methyl ethyl ketone, isopropanol, naphtha, and xylene. Paint strippers generally contain such compounds as methylene chloride, toluene, ammonium hydroxide, and phenolics (CH2M Hill, 1996).

All of these operations generated waste materials, primarily oils, recoverable fuels, spent solvents, and cleaners. Most waste oils, recovered fuels, spent solvents and cleaners were either burned at fire training areas on the NAS Fort Worth JRB, reused on NAS Fort Worth JRB, or processed through the Defense Property Disposal Office. An undetermined amount of these materials were discharged through to the Sanitary Sewer System at the NAS Fort Worth JRB (Jacobs Engineering, 1995a,b).

2.3.3 Results of Previous Site Investigations

Since 1984, Air Force IRP studies have been conducted by several contractors, and have focused on the identification and characterization of SWMUs and areas of concern (AOC) identified in the installation's TNRCC Hazardous Waste Permit (HU-50289).

In an RFI report (preliminary review/visual site inspection) (A.T. Kearney, 1989), eight OWSs were designated as SWMUs and four were designated as AOCs.

In 1995, an investigation of 11 OWSs was performed (Law Environmental [Law], 1995) to assess contamination associated with the OWSs and to evaluate the condition and future use of the OWSs. During this investigation, surface and subsurface soil samples were collected at the 11 OWSs and analyzed for volatile organic compounds (VOC) and RCRA metals (except mercury). No groundwater samples were analyzed. No samples were above TNRCC RRSs for VOCs, however, soils in the immediate area of each of the 11 OWSs were contaminated with metals concentrations exceeding TNRCC RRSs (Law, 1995).

IT conducted an RFI on the Sanitary Sewer System (SWMU No. 66) in 1997. Results of this August 1997 investigation (IT, 1997a) indicated that no unacceptable risk to human health or the environment occurred from past management practices of the Sanitary Sewer System. However, the extent of some releases at the OWSs were not delineated. The Sanitary Sewer System RFI report indicated no unacceptable risk to human health or the environment from past management practices of the Sanitary Sewer System. The draft RFI reported the extent of some releases was not known.

The draft OWS RFI addendum report (IT, 1998a) presented the combined investigation findings from the draft Sanitary Sewer System RFI report and additional investigation of 21 OWSs. As shown by Table 1 of that addendum report, 8 OWSs have been identified as SWMUs and 4 have been identified as AOC. Nine of the OWSs have not been designated as either a SWMU or AOC.

Subsequent evaluation of the draft Sanitary Sewer System RFI report (IT, 1997a) resulted in recommendations for additional evaluation of selected segments of the Sanitary Sewer System. Selected line segments were recommended for either additional evaluation or delineation of the extent of contamination for determining the closure status of specific Sanitary Sewer System segments. The Sanitary Sewer System will be recommended for either Standard I or Standard II closure. The TNRCC RRSs defined in 30 TAC 335 Subchapter S specify a consistent risk management policy to define the cleanup actions necessary to protect human health and the environment. The RRSs define the following 3 tiers of cleanup standards:

- RRS 1 requires a cleanup to nondetectable levels or background levels unaffected by waste management activities for all contaminants. This level of a cleanup is commonly referred to as "clean closure." Deed certification on the property and post-closure care is not required under this standard.

- RRS 2 requires a cleanup to health-based levels such that any substantial threat to human health or the environment is reduced to acceptable levels. Deed certification on the property is required.

- RRS 3 requires a site-specific baseline risk assessment to define alternative cleanup levels based on health effects. Deed certification and post-closure care are required under this standard.

Based on TNRCC review of the draft Sanitary Sewer System RFI report, discussions were held between the Air Force and TNRCC to define the process for evaluating the existing data and selecting sites requiring additional investigation. Additional investigation is required for the sample locations of the Sanitary Sewer System exceeding RRS 2 levels. Criteria developed for determining the selection of locations requiring additional assessment of selected environmental media are as follows:

- Locations requiring resampling to confirm constituent detections less than one order of magnitude above RRS 1 background concentration UTL criteria

- Locations requiring contaminant lateral delineation due to detections exceeding an order of magnitude above the background concentration UTL and the occurrence of the contaminant is consistent with past waste operations at the site

- Locations requiring analysis by the SPLP (U.S. Environmental Protection Agency [EPA] SW846 Method 1312) to determine if contaminants exceeding the RRS 2 criteria may leach from soil to groundwater.

This work plan presents sample locations where samples from the Phase 1 Sanitary Sewer System RFI (IT, 1997a) exceeded the TNRCC RRSs or additional sampling where the status of a contaminant needed to be verified. The draft-final Sanitary Sewer System RFI report will present areas of sewer segment contaminant concentrations that did not exceed background UTL, permitting recommendation for Standard I closure. Where contaminant concentrations exceeded background UTLs only and not MSCs, the Sanitary Sewer System segment or area will be recommended for RRS 2, which requires deed certification. For an area of the Sanitary Sewer

System that has contaminants exceeding both UTLs and MSCs in soil and/or groundwater, the area will be recommended for RRS 2 closure. The evaluation of the draft Sanitary Sewer System RFI report indicated that for most of the areas requiring additional investigation, one or two of the soil sample locations had metals that were approximately twice the concentration of the MSCs. The additional sampling to be performed at these locations will determine if the detections of metals are statistically significant and to allow preparation of corrective measures.

3.0 Plan of Investigation

This chapter of the work plan defines the scope of work to be performed during the additional investigation of the Sanitary Sewer System. Activities associated with the collection of analytical data for site characterization at each site are addressed in this chapter. These investigation activities include collection of soil samples (surface/near-surface and subsurface) and groundwater.

The location of NAS Fort Worth JRB is shown in Figure 1. The general area and layout of the Sanitary Sewer System throughout the industrialized areas of NAS Fort Worth are shown in Figure 2.

3.1 Sanitary Sewer System Investigation Locations

Varying methods will be used for collection at different media and allow contaminant delineation in the near-surface soil, subsurface soil, and groundwater. Tables 1 and 2 show soil sample locations and Table 3 shows groundwater sample locations requiring additional OWS contaminant delineation, which include:

- Twenty-two near-surface soil sample locations
- Thirty-seven subsurface soil sample locations
- Eight installed monitoring wells and delineation groundwater samples
- Eleven monitoring well groundwater confirmation samples.

Table 4 shows the number of analyses required to confirm Phase I detections and delineate lateral contamination, which include:

- Soils (14 VOCs, 3 semivolatile organic compounds [SVOC], 2 pesticides, 1 polychlorinated biphenyl [PCB], 55 target analyte list [TAL] metals, 30 SPLP for specific metals)

- Groundwater samples (20 VOCs, 8 VOCs direct-push technology [DPT] screening samples, 1 SVOC, 7 TAL metals).

These analyses do not include the number of field (10 percent field blanks and 1 daily equipment blank) and laboratory QA/QC samples (5 percent matrix spike/matrix spike duplicate).

3.2 Sanitary Sewer Phase 2 RFI Surface Soil Investigation

Soil samples will be collected to either delineate potential soil contamination or confirm low detections of contaminants. The near-surface soil samples will be discrete grab samples collected from 0 to 2 feet in depth. The near-surface soil samples will be collected at locations shown on Figures 3 through 9. The number of soil samples to be collected and parameters to be analyzed are shown in Table 1. The field methods for collecting the soil samples are included in Attachment I.

The sample tubes will be driven into the ground with a DPT soil probe. All sampling equipment will be decontaminated before its use. Specific soil sample collections techniques are provided in the FSP (IT, 1997d) and Attachment I.

Criteria for selection of near-surface soil sample locations are as follows:

- Locations requiring resampling to confirm constituent detections less than one order of magnitude above RRS 1 background concentration UTL criteria
- Locations requiring contaminant lateral delineation due to detections exceeding an order of magnitude above the background concentration UTL and the occurrence of the contaminant is consistent with past waste operations at the site
- Locations requiring analysis by the SPLP (EPA SW846 Method 1312) to determine if contaminants exceeding the RRS 2 criteria may leach from soil to groundwater.

Laboratory Methods. Near-surface soil samples will be submitted for analysis using EPA SW846 Method SW6010 RCRA metals, including mercury, and Method 8260A for VOCs. Metals analysis will be performed to ensure the method reporting limit is lower than the constituent background UTL concentration. Analytical parameters and the number of samples to be collected are shown in Tables 1 and 4.

3.3 Sanitary Sewer Phase 2 RFI Subsurface Soil Investigation

Subsurface soil samples will be collected at several Sanitary Sewer System locations requiring additional investigation. The subsurface soil sampling locations are shown on Figures 3 through 9. The sample location and proposed analytical parameters selected for each soil sample are

shown on Table 2. The field methods for collecting the soil samples are included in Attachment I.

The subsurface soil samples will be collected with DPT soil probe methods as described in the previous section. The field methods for collecting the soil samples are included in Attachment I.

Criteria for the subsurface soil sampling locations follow the same criteria as those used for soil samples, as described in the previous section.

One subsurface soil sample will be collected at each soil boring. The subsurface soil sample collected at 2 feet directly above the water table. Field screening procedures will be used where visible contamination is observed or headspace soil field screening indicates the presence of organic contaminants. The project manager will be called to determine if an additional subsurface soil sample is required if unanticipated organic contamination is detected. Field screening procedures will follow those outlined in the Sanitary Sewer RFI FSP (IT, 1997d).

Laboratory Methods. Subsurface soil samples will be submitted for analysis using EPA SW846 Method SW6010 RCRA metals, including mercury, Method 8260A for VOCs, Method 8081A for pesticides, and Method 8082 for PCBs. Metals analysis will be performed to ensure the method reporting limit is lower than the constituent background UTL concentration. Organic analysis will be performed to ensure the method PQLs are lower than the MSCs. Analytical parameters and the number of samples to be collected are shown in Tables 2 and 4.

3.4 Sanitary Sewer Phase 2 RFI Groundwater Investigation

Groundwater will be investigated at Sanitary Sewer System locations for the Phase 2 field investigation to confirm previous detections of constituents less than 1 order of magnitude above background concentration UTLs and PQLs, or delineate contaminants exceeding RRS 2 MSCs. Table 3 shows the locations and constituents to be analyzed. Eleven locations will be sampled by low flow methods to confirm the low concentration of constituents detected during the Sanitary Sewer System RFI (IT, 1998a). Locations MH11B (monitoring well WITCTA024) and MH11 (monitoring well WITCTA025) will be resampled to confirm VOCs detected in these wells installed during the first phase of the Sanitary Sewer System RFI. Four monitoring wells will be installed to surround each monitoring well WITCTA024 and WITCTA025 for a total of

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eight new wells. These will be used to determine the extent of the dissolved VOC plumes. Proposed locations for the groundwater monitoring well sampling are shown on Figure 10. The field methods for collecting groundwater data and groundwater samples are included in Attachment I.

Objectives of the groundwater sampling are as follows:

- Confirm the presence of groundwater constituents exceeding TNRCC RRS 1 background concentration UTL.
- Confirm the presence of groundwater constituents exceeding TNRCC RRS 2 MSCs and EPA maximum contaminant levels.
- Define the lateral extent of the dissolved VOC plumes.
- Characterize groundwater conditions at the sites.

Investigation Procedures. Final groundwater monitoring well locations to delineate around monitoring well MH11 (WITCTA025) and MH11B (WITCTA024) locations will be determined in the field. Potential locations are shown on Figure 10. DPT temporary monitoring wells will be installed at each proposed monitoring well location to allow screening of the groundwater for VOC concentration before installation of the permanent monitoring well, if required. This will allow evaluation of the site groundwater before installation of the permanent wells. Monitoring wells will be installed to define the lateral extent of the dissolved VOC groundwater plume. The objective of the program will guide subsequent monitoring well placement if the original monitoring wells do not define the lateral extent of the groundwater plumes.

One monitoring well will be located upgradient of the locations (WITCTA025 and WITCTA024) in an area determined by examination of the groundwater gradient. One monitoring well will be placed downgradient of each of the above locations but outside of the plume. MW7, near the Base Service Station, will be designated as a sentinel well between the leading downgradient edge of the dissolved plume and potential receptor. Two monitoring wells will be installed laterally from the VOC contaminated monitoring wells (WITCTA025 and WITCTA024) to define the extent of the dissolved VOCs plume. Monitoring wells will be built according to construction procedures outlined in the Field Sampling Plan, Attachment I. Low flow sampling

the field measurement of groundwater parameters outlined in the Sanitary Sewer System FSP will be used to collect groundwater samples from the permanent monitoring wells (IT, 1997c). Proposed monitoring well locations are shown in Figure 10.

Laboratory Methods. Groundwater confirmation samples from permanent monitoring wells will be collected and submitted for analysis using EPA SW846 Methods SW8260 volatile organic analysis and SW6010 RCRA metals, including mercury. Analytical parameters for permanent monitoring well groundwater samples are shown in Table 3. The total number of samples collected, including QC samples, are shown in Table 4.

Groundwater field parameters will be measured during collection of samples from both temporary monitoring wells and permanent monitoring wells that have been installed. Parameters to be measured in the field include pH, temperature, conductivity, dissolved oxygen, turbidity, and oxidation-reduction potential. Field analysis parameters are shown on Table 5.

3.5 Investigation-Derived Waste Management

Wastes that may be generated during the RFI site investigation include: (1) purged groundwater, (2) decontamination water, (3) drill cuttings, (4) expendable protective clothing (e.g., Tyvek), and (5) general trash. Modifications to the planned waste management may be made if waste attributes change or field observations warrant a change. The general waste management approach is presented in this subsection; the detailed approach is included in the FSP (IT, 1997c).

All groundwater generated during monitoring well development and purging and decontamination water generated during decontamination process will be contained on-site (base) at the central storage location. All water will be stored in labeled, 55-gallon, U.S. Department of Transportation drums. The water will be tested for VOCs, diesel range organics, gasoline range organics, and metals, and the analytical results reviewed to determine if the water requires treatment before disposal. If treatment is required, the water will be treated and tested prior to discharge to the sanitary sewer. The analytical results will be provided to NAS Fort Worth JRB environmental authorities for review and approval before discharge to the NAS Fort Worth JRB Sanitary Sewer System.

Drill cuttings from soil probe and drilling activities will be contained in drums, which will be labeled and kept at the NAS Fort Worth JRB designated storage location until analytical data are received. Contaminated soils will be disposed of at an appropriate licensed landfill, most likely as industrial, nonhazardous waste.

Waste disposal activity will be coordinated with NAS Fort Worth JRB environmental authorities. Any hazardous waste disposal will be at a site selected by NAS Fort Worth JRB environmental authorities, who will sign any transportation manifest as the "generator." All waste management practices will follow the guidelines established by the TNRCC.

4.0 Reporting

After the available data have been evaluated, including field characterization data from the Sanitary Sewer System RFI, a report will be prepared that compiles and evaluates the information. The primary objective of the Sanitary Sewer System Phase 2 RFI addendum report will be to compile all existing data, evaluate the data by current TNRCC regulations, and present conclusions as to the need for remedial or other actions.

5.0 Schedule

The project schedule is shown on Figure 13.

6.0 Project Management

The objectives of this Sanitary Sewer System Phase 2 RFI investigation are to:

- Complete the Sanitary Sewer System Phase 2 RFI addendum report tasks in accordance with this work plan, the Sanitary Sewer System RFI health and safety plan, and the Sanitary Sewer System Phase 2 RFI QAPP as scheduled and within the allotted budget.
- Communicate with project participants (Air Force Base Conversion Agency, AFCEE, TNRCC, EPA) the technical compliance, scheduled and actual program progress, and budgetary status of the project as appropriate.
- Complete and issue a Sanitary Sewer System draft-final RFI report.
- Submit to regulatory agencies recommendations for suggested remedial actions at the Sanitary Sewer System.

This task includes coordinating among other RFI project participants, as well as tracking schedules and budgets and preparing monthly status reports to AFCEE. Preparation of project information, forecasting, and updating of schedules and budgets will also be done under this task.

A more detailed description of project organization and responsibility is provided in Section 3.0 of the QAPP (IT, 1999). The project organization is shown on Figure 14.

7.0 References

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Jacobs Engineering, 1995b, ***Full-Service Environmental Remediation, Quality Program Plan, Part 2, Sampling and Analysis Plan, Naval Air Station Fort Worth Joint Reserve Base, Air Force Center for Environmental Excellence,*** January.

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Law Environmental, Inc., 1995, ***Final Oil/Water Separator Assessment Report, Naval Air Station Fort Worth Joint Reserve Base, Installation Restoration Program,*** November.

TABLES

Table 1

Analytical Surface Soil Boring Sample Locations
Phase 2 Sanitary Sewer RFI Work Plan
NAS Fort Worth JRB, Texas

Analysis			VOA by SW8260	SVOA by SW8270	TAL Metals by SW6010/7000	Pest/PCB by SW8080	SPLP Metals by SW1312/SW6010B (Trace)										
Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Rationale: Confirm/ Delineate	None, 4°C	None, < 4°C	None, 4°C	None, 4°C		As	Cd	Pb	Hg	Cu	Sb	Ag	SPLP	Metals Surface Sample	VOCs Surface Sample
			14 Days	7 Days preext. 40 days postext	180 Days	14 Days preext./ 40 days postext.											
MHB9	1	Confirm MHB9			X		X							1	Ag	1	
MHB3E	1	Confirm MHB3			X					1						1	
MH13E	1	Confirm MH13	X														1
MH15E6	1	Confirm MH15E6			X	X								1		1	Pest
MH15G1	2	Confirm MH15G1B9	X		X		X				1				Hg	1	1
MH15	1	Confirm MH15			X		X							1	Ag	1	
MH15J4	2	Confirm MH15J4	X														1
MH15M	1	Confirm MH15M	X														1
MH15E12	2	Confirm MHE12	X														1
B1125N	2	Confirm B1125N			X									1		1	
MHB12	1	Confirm MHB12			X					1						1	
MH56	1	Confirm MH56			X		X	1							As	1	
MH53	2	Confirm MH53			X				1							1	
MH5	2	Confirm MH5			X									1		1	
MH4	1	Confirm MH4			X		X		1			1		1	Cd, Ag, Cu	1	
MH15Q	1	Confirm MH15Q			X		X			1			1	1	Pb, Ag, Sb	1	
MH11F	1	Confirm MH11F			X								1			1	
MH19-1	1	Confirm MH19-1			X		X							1	Ag	1	
MH11L	1	Confirm MH11L			X									1		1	
11L25S	1	Confirm MH11L25S			X									1		1	
MHB6	1	Confirm MHB6			X									1		1	
MH15J6	1	Confirm MH15J6			X		X							1	Ag	1	
								1	2	3	1	1	2	12	8	18	5

Note 1 - QC samples to be taken:
MS/MSD - 5% of total field samples, 1 set per SDG or 1 set per 20 samples. Dup. - 10% of total field samples. Mat.blk - 1 per water source/matrix. Trip blk- 1 per VOA cooler. Equip. Rinse- 1 per day.

Analytical Subsurface Soil Sample Locations
Phase 2 Sanitary Sewer System RFI Work Plan
NAS Fort Worth JRB, Texas

(Page 1 of 2)

Analysis			VOA by SW8260	SVOA by SW8270	TAL Metals by SW6010/7000	Pest/PCB by SW8080	SPLP Metals by SW1312/SW6010B (Trace)	As	Cd	Pb	Ba	Mn	Cu	Co	Se	Hg	Mo	Sb	Ag	SPLP	Metals Subsurface Sample	Organics Subsurface Sample
Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Rationale: Confirm/ Delineate	None, 4°C 14 Days	None, 4°C 7 Days preext. 40 days postext.	None, 4°C 180 Days	None, 4°C 14 Days preext./ 40 days postext.	None, 4oC															
MH15E3	1	Confirm TCB at MH15E3	X																			1
15E425N	1	Confirm TMB at 15E425N	X																			1
B15A25W	1	Confirm DCB at B15A25W	X																			1
MH46	1	Confirm napthalene at MH46	X	X																		2
MH4	1	Confirm DDE at MH4				X																1
MH11B	1	Confirm napthalene & TMB at MH11B	X																			1
11C25N	2	Confirm di-n-butyl phtalate at 11C25N		X	X		X											1	1	1	1	
MH11E	2	Confirm napthalene at MH11E	X	X																		1
15B25W	1	Confirm Arochlor 1248 at 15B25W				X																1
MH75	2	Confirm VOC at MH75	X		X		X										1		1	1	1	
11H25N	1	Confirm VOC at 11H25N	X																			1
MH11D6A	1	Confirm VOC at MH11D6A	X																			1
5225N	1	Confirm			X		X											1		1		
B6B25E	1	Confirm			X		X	1												1		
825N	1	Confirm			X		X											1	1	1		
MH11A	1	Confirm			X		X											1		1		
MH11C	1	Confirm			X		X													1		
MH11D	1	Confirm			X		X					1						1		1		
MH11D2	1	Confirm			X		X				1	1						1	1	1		
MH11D3	1	Confirm			X		X				1	1						1		1		
MH15E3	1	Confirm			X		X											1		1		
15E25N	1	Confirm			X		X					1						1		1		

Table 2

Analytical Subsurface Soil Sample Locations
Phase 2 Sanitary Sewer System RFI Work Plan
NAS Fort Worth JRB, Texas

(Page 2 of 2)

Analysis			VOA by SW8260	SVOA by SW8270	TAL Metals by SW6010/7000	Pest/PCB by SW8080	SPLP Metals by SW1312/SW6010B (Trace)	As	Cd	Pb	Ba	Mn	Cu	Co	Se	Hg	Mo	Sb	Ag	SPLP	Metals Subsurface Sample	Organics Subsurface Sample
Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Rationale: Confirm/ Delineate	None, 4°C 14 Days	None, 4°C 7 Days preext. 40 days postext	None, 4°C 180 Days	None, 4°C 14 Days preext./ 40 days postext.	None, 4oC															
15B25W	1	Confirm			X		X						1							1	1	
MH11I	1	Confirm			X		X												1		1	
MH11O7	1	Confirm			X		X			1				1						1	1	
MH15J2	1	Confirm			X		X								1	1				1	1	
MH15J4	1	Confirm			X		X								1						1	
MH11D5	1	Confirm			X		X												1		1	
MH11DO	1	Confirm			X		X												1		1	
MH11D4	1	Confirm			X		X												1		1	
MH9B	1	Confirm			X		X	1													1	
925W	1	Confirm			X		X	1											1	1	1	
15G125	1	Confirm			X		X												1		1	
MH15K	1	Confirm			X		X												1		1	
MH15J6	1	Confirm			X		X					1									1	
MH35	1	Confirm			X		X					1									1	
MH15S	1	Confirm			X		X												1		1	

Table 3

Analytical Groundwater Samples
Phase 2 Sanitary Sewer RFI Work Plan
NAS Fort Worth JRB, Texas

Analysis					VOA by SW8260	SVOA by SW8270	TAL Metals by SW6010/7000 (Dissolved)	Rationale/DQO	Field Parameters (See Table 3-8)
Sample Location	Map Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	No. of field screening rapid TAT VOC samples to be collected at each location excluding QC samples.	Preservative/ Bottle:	HCL, < 4°C 3 * 40 ml glass vials	None, < 4°C 1 Liter glass	HNO_3, < 4°C 500 ml glass		
				Holding Time:	14 Days	7 Days preext./ 40 days postext.	180 Days		
WITCTA024	WITCTA024 /MH11B	1			X			Confirm - VOCs Only	X
WITCTA049	WITCTA024 /MH11B	1			X			Delineate - VOCs Only	X
WITCTA050	WITCTA024 /MH11B	1			X			Delineate - VOCs Only	X
WITCTA051	WITCTA024 /MH11B	1			X			Delineate - VOCs Only	X
WITCTA052	WITCTA024 /MH11B	1			X			Delineate - VOCs Only	X
WITCTA025	WITCTA025 /MH11	1			X			Confirm - VOCs Only	X
WITCTA053	WITCTA025 /MH11	1			X			Delineate - VOCs Only	X
WITCTA054	WITCTA025 /MH11	1			X			Delineate - VOCs Only	X
WITCTA055	WITCTA025 /MH11	1			X			Delineate - VOCs Only	X
WITCTA056	WITCTA025 /MH11	1			X			Delineate - VOCs Only	X
STMW24	BLDG1160	1			X		X -Sb	Confirm/Resample - Sb Only Delineate - VOCs Only	X
ST14MW-05	BLDG1160	1					X-Sb	Confirm/Resample -Sb only	X
WITCTA021	BLDG1160	1					X - As	Confirm/Resample -As only	X
GMI22-05M	MH14	1					X - Sb	Confirm/Resample -Sb only	X
WITCTA022	BLDG1060	1			X			Delineate - VOCs Only	X
WITCTA015	BLDG1430	1				X		Confirm/Resample -Bis(2-ethylhexyl pthatate) only	X
BGSMW01	BLDG1275	1					X - Hg	Confirm/Resample -Hg only	X
WITCTA009	BLDG1792	1					X - Ag	Confirm/Resample -Ag only	X
WITCTA008	BLDG1430	1					X - As	Confirm/Resample -As only	X

Note 1 - QC samples to be taken:
MS/MSD- 5% of total field samples, 1 set per SDG or 1 set per 20 samples. Dup. - 10% of total field samples, Mat. blk - 1 per water source/matrix, Trip blk-1 per VOA cooler, Equip. Rinse - 1 per day.

Table 4

Summary Table of Soil Boring and Groundwater Samples
Phase 2 Sanitary Sewer System RFI
NAS Fort Worth JRB, Texas

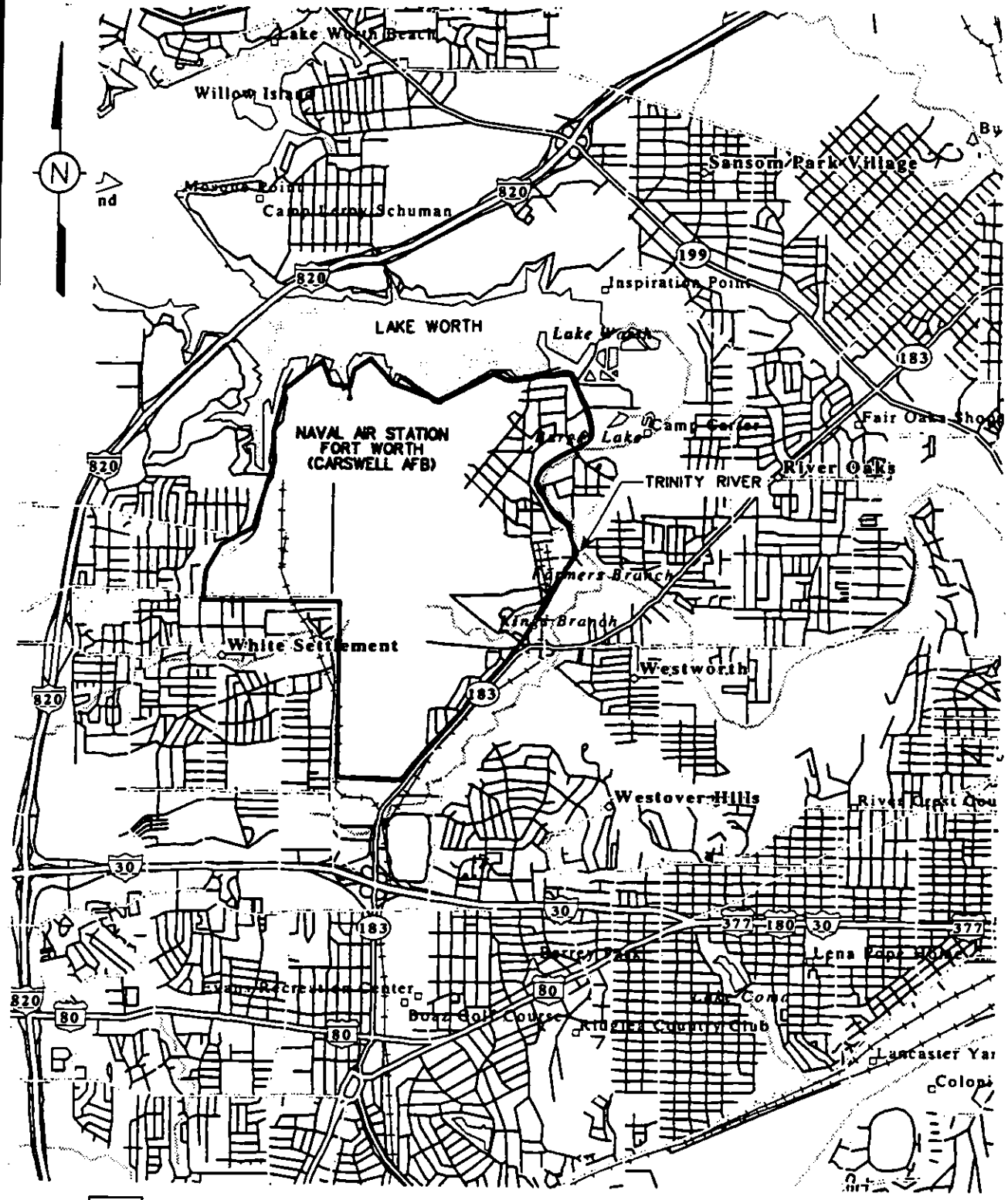
Parameter	Analytical Method	Matrix	Number of Field samples	Field Duplicate 10%	Matrix Spike 5%	Matrix Spike Duplicate 5%	Material Blank 1 per source/ matrix	Equip. Rinsate 1 per Day	Trip Blank 1 per VOA cooler	Total No. of Samples	Combined Total No. of Water/Soil Samples
Volatiles	SW8260	Soil	14	2	1	1	1	1	0	18	
		Water	28	3	2	2	0	1	6	38	
		Combined									56
Semivolatiles	SW8270	Soil	3	1	1	1	1	1	0	6	
		Water	1	1	0	0	0	1	0	3	
		Combined									9
Pesticides	SW8081A	Soil	2	1	1	1	1	1	0	5	
		Water	0	0	0	0	0	0	0	0	
		Combined									5
PCBs	SW8082	Soil	1	1	1	1	1	1	0	4	
		Water	0	0	0	0	0	0	0	0	
		Combined									4
TAL Metals	SW6010b Trace/	Soil	55	6	3	3	0	5	0	66	
	7000	Water	7	1	0	0	1	2	0	11	
		Combined									77
SPLP	SW60101b Trace	Soil	30	3	2	2	0	0	0	33	
	/7300	Water	0	0	0	0	0	0	0	0	
		Combined									33
Field Parameters		Soil	0	0	0	0	0	0	0	0	
		Water	28	0	0	0	0	0	0	28	
		Combined									28

Table 5

Field Sampling Test and Method Table
Phase 2 Sanitary Sewer System RFI Work Plan
NAS Fort Worth JRB, Texas

Field Analysis	Method
Water	
Dissolved Oxygen	E360.1
Redox Potential	Martin Marietta Energy Systems, Inc. Environmental Surveillance Procedures, ESP-307-5
pH	SW9040
Total Volatiles	PID Organic Vapor Monitor
Conductivity	SW9050
Temperature	E170.1
Turbidity	E180.1

FIGURES



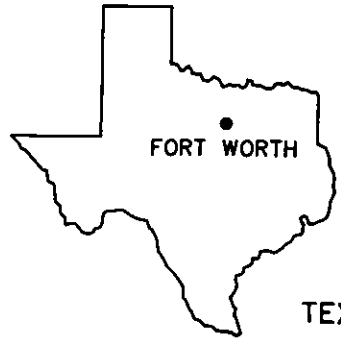


FIGURE 1
SITE LOCATION MAP

PHASE II SANITARY SEWER RFI
NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 3/20/96	DATE LAST REV.:	DRAFT. CHCK. BY: C.TUMLIN	INITIATOR: W.CARTER
DRAWN BY: K.BLAIR	DRAWN BY:	ENGR. CHCK. BY: W.CARTER	PROJ. MGR.:W.CARTER
01/12/2000 10:55:58			PROJ. NO.:765725
C:\CADD\DESIGN\768579ES.146 PCOLEMAN			DWG. NO.:\768579ES.146

NOTES:

1. SURVEY CONDUCTED JUNE, 1987 BY SURVEY RESOURCES, INC., 13800 MONTFORT DRIVE, SUITE 230, DALLAS, TEXAS 75240-1347

LEGEND

- SEWER LINE AND MANHOLE
- OWS SITE LOCATION

FIGURE 2a
NAS FORT WORTH
SANITARY SEWER SITE MAP
PHASE II SANITARY SEWER RCRA
FACILITY INVESTIGATION ADDENDUM
WORK PLAN
NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

AREA	JOB NO.	DRAWING NO.	REV
SITEWIDE	788579	788579ES172	

INTERNATIONAL TECHNOLOGY CORPORATION

NOTES:

1. SURVEY CONDUCTED JUNE, 1987 BY SURVEY RESOURCES, INC. 13800 MONTFORT DRIVE, SUITE 230, DALLAS, TEXAS 75240-4347

LEGEND

SEWER LINE AND MANHOLE

OWS SITE LOCATION

U.S. BUREAU OF PRISONS

RESIDENTIAL AREA

WEST FORK TRINITY RIVER

EAST GATE

MILITARY PARKWAY

WAREHOUSE

FUEL FARM

GOLF COURSE

FOURTH

FOURTEEN

FOURTEEN-Z

AEROSPACE MAINTENANCE

LANDFILL NO. 1

LANDFILL NO. 2

LANDFILL NO. 3

LANDFILL NO. 4

LANDFILL NO. 5

LANDFILL NO. 6

TEXAS AIR NATIONAL GUARD

LAKE WORTH SPILLWAY ELEVATION - 594 FT. MSL

ZONE WEAPONS STORAGE

INDUSTRIAL AREA BOUNDARY

FORMER WEAPONS STORAGE

FORMER WEAPONS MAINTENANCE

SEWER LINE

NORTH FORT WORTH SANITARY

CITY OF

STONE FIELD HOUSE

FORMER FIRE TRAINING NO. 2

TAXIWAY W

TAXIWAY A

TAXIWAY B

TAXIWAY C

MAIN RUNWAY

AIR FORCE PLANT NO. 4

SCALE 0 300 600 FEET

INTERNATIONAL TECHNOLOGY CORPORATION

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FIGURE 2b
NAS FORT WORTH
GROUNDWATER SITE MAP
PHASE II SANITARY SEWER RCRA
FACILITY INVESTIGATION ADDENDUM
WORK PLAN
NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

AREA	JOB NO.	DRAWING NO.	REV
SITEWIDE	768579	768579ES183	

DWG. NO.: ...\768579es.177 | PROJ. NO.: 768579
INITIATOR: M.MAKI | PROJ. MGR.: W.CARTER
DRAFT. CHCK. BY: D.HALL | ENGR. CHCK. BY: M.MAKI
DATE LAST REV.: 01/26/00 | DRAWN BY: mcraft
STARTING DATE: 01/15/00 | DRAWN BY: D.HALL
01/26/00 11:15:24
mcraft c:\caddi\design\768579es.177

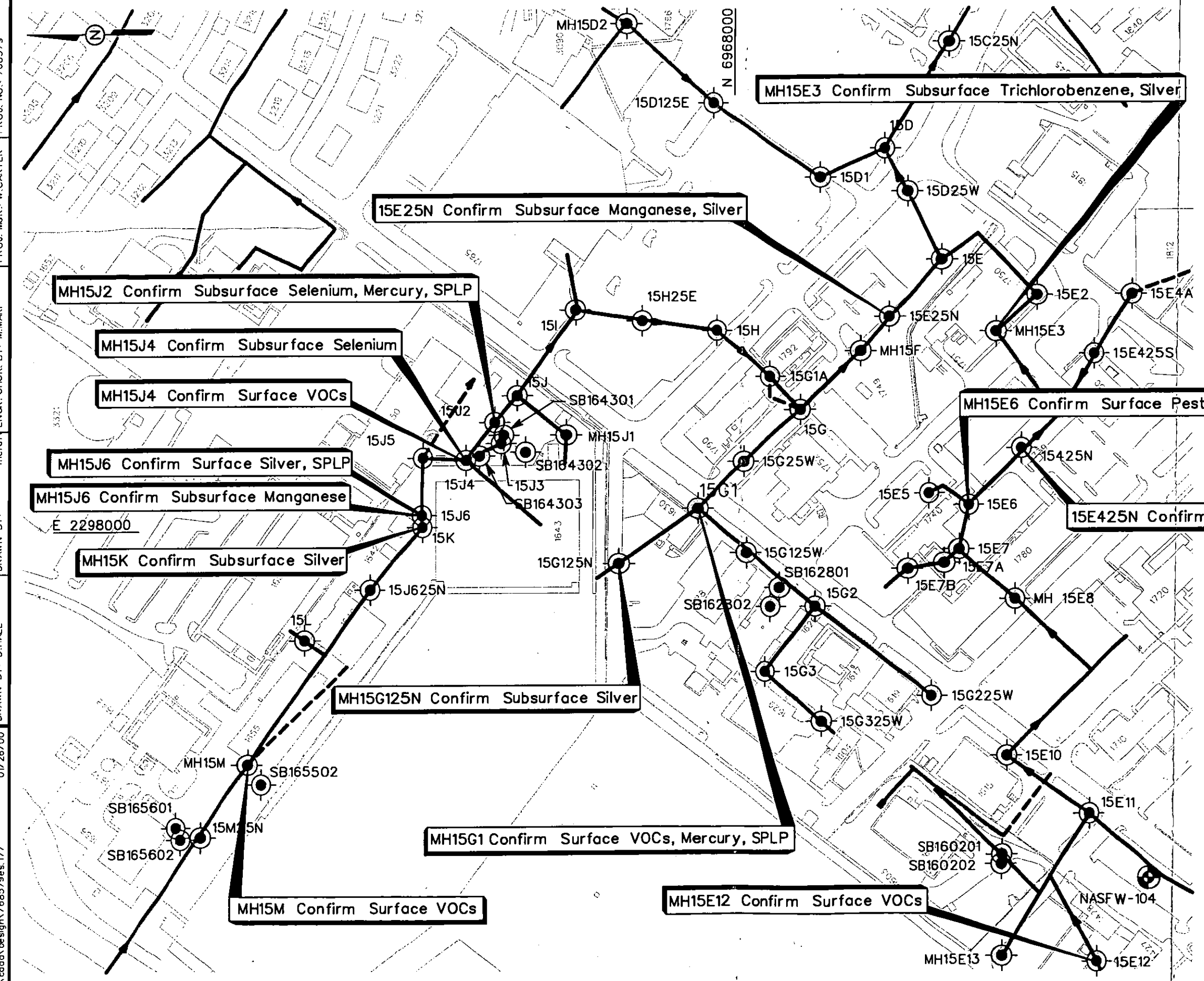

FIGURE 3
SURFACE AND SUBSURFACE SOIL SAMPLE LOCATIONS

NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

IT CORPORATION
A Member of The IT Group

MH13D
MH13E
MH13E Confirm Surface VOCs
15E4A
15E425S
11F25N
MH11G
MH11H
MH11F Confirm Surface Antimony
11H25N
E 2298000
11I
11I25W
11J
11J25W
11L
15E11
SB142301
SB142302
15E1125W
15E12
11L25S
MH11I Confirm Subsurface Silver
MH11L Confirm Surface Silver
MH11E
11E25N
11F
11C25N
11C
N 6966000
MH11D
11D25W
11D1
MH11D3
11D2
11D4
SB141401
SB141402
11D425W
11D5
MH11D6
11D6A
11D7
11D725N
11D8
11DD
MH9C
MH11C Confirm Subsurface Silver, SPLP
11C25N Confirm Subsurface di-n-butly-phtalate, Silver
MH11D Confirm Subsurface Manganese, Silver, SPLP
MH11E Confirm Subsurface Napthalene
MH11DD Confirm Subsurface Silver
MH11D2 Confirm Subsurface Barium, Manganese, Silver, SPLP
MH11D3 Confirm Subsurface Barium, Manganese, Silver
MH11D4 Confirm Subsurface Silver
MH11D5 Confirm Subsurface Silver
11H25N Confirm Subsurface VOCs
11L25S Confirm Surface Silver
MH11D6A Confirm Subsurface VOCs
MH11D7 Confirm Subsurface Lead, Cobalt, SPLP

LEGEND
SEWER LINE WITH FLOW DIRECTION
MANHOLE SAMPLING LOCATION

SCALE
0 200 400 FEET

FIGURE 4
SURFACE AND SUBSURFACE SOIL SAMPLE LOCATIONS

NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

IT CORPORATION
A Member of The IT Group

DWG. NO.: ...\768579es.178 | PROJ. NO.: 768579
INITIATOR: M.MAKI | PROJ. MGR.: W.CARTER
DRAFT. CHCK. BY: D.HALL | ENGR. CHCK. BY: M.MAKI
DATE LAST REV.: 01/26/00 | DRAWN BY: mcraft
STARTING DATE: 01/15/00 | DRAWN BY: D.HALL
11:17:25 01/26/00
mcraft
c:\cadd\design\768579es.178

N 6970000

E 2296000

15N15N
15O
MH15P
MH15Q Confirm Surface Lead, Antimony, Silver, SPLP
MH15Q
15Q25N2
15Q25N1
SB335801
SB335802
15Q25N3
15S1
15R
15T
MH15S
MH15S Confirm Subsurface Silver
SB416002
SB416001
MH15U
MH15V
15V25N
MH15W

LEGEND

SEWER LINE WITH FLOW DIRECTION

MANHOLE SAMPLING LOCATION

SCALE
0 200 400 FEET

FIGURE 5
SURFACE AND SUBSURFACE SOIL SAMPLE LOCATIONS

NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

IT CORPORATION
A Member of The IT Group

STARTING DATE: 01/15/00 | DRAFT. CHCK. BY: D.HALL | INITIATOR: M.MAKI | DWG. NO.: ...\768579es.176
DRAWN BY: D.HALL | ENGR. CHCK. BY: M.MAKI | PROJ. MGR.: W.CARTER | PROJ. NO.: 768579
DATE LAST REV.: 01/26/00 | DRAWN BY: mcraft

11:19:51 01/26/00 mcraft c:\cadd\design\768579es.176

DWG. NO.:...\768579es.182 | PROJ. NO.: 768579
INITIATOR: M.MAKI | PROJ. MGR.: W.CARTER
DRAFT. CHCK. BY: D.HALL | ENGR. CHCK. BY: M.MAKI
01/26/00 mcraft
STARTING DATE: 01/15/00 | DATE LAST REV.: 01/26/00
DRAWN BY: D.HALL | DRAWN BY: mcraft
11:23:53 01/26/00
c:\cadd\design\768579es.182

N

E 2300000

N 6966000

MH75 Confirm Subsurface VOCs, Molybdenum, SPLP

825N Confirm Subsurface Silver, SPLP

925W Confirm Subsurface Arsenic, Silver, SPLP

MH15 Confirm Surface Silver, SPLP

MH11A Confirm Subsurface Silver, SPLP

MH9B Confirm Subsurface Arsenic

15B25W Confirm Subsurface Arochlor 1248

MH11B Confirm Subsurface Napthalene, Trichlorobenzene

MH77, MH76, MH75, 7525N, MH74, MH73, MH4B, 4B25W, MH4D, 4C25N, 4C, 4C1, MH8, MH9, 825N, MH12, MH11, 1025N, MH10, 13F, MH14, MH13, MH15, 1425N, 825W, 1125W, 925W, 15A, MH15B, MH15C, 15B25W, MH13A, 13C, 13B, MH13A1, 13A2, 13A225S, 13A3, MH11A, 11A25W, 9A, MH9B, 11B, 9B25W, 11B25N, MH9C, MH13D, MH13E, 11C, 11C25N, MH11E, 11E25N, MH11D, 11F, 11F25N, 11D25W, 15E2, 15E4A, MH15E3, 15E425S

LEGEND

SEWER LINE WITH FLOW DIRECTION

MANHOLE SAMPLING LOCATION

SCALE 0 200 400 FEET

FIGURE 6
SURFACE AND SUBSURFACE SOIL SAMPLE LOCATIONS

NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

IT CORPORATION
A Member of The IT Group

N 6964000

B6B25E

B6B25E Confirm Subsurface Arsenic

B6B

B6C25N

B6C

B6B25N

SB132001

SB132002

B4A

B325N

8025N

MH3

MH4 Confirm Surface Cadmium, Copper, Silver, SPLP

B6A

MHB6A1

B4

B425N

MH4 Confirm Subsurface DDE

BD7AE

B5

MHB6

MHB6D

MH4

B7A1

MHB7C

B7A2

B7D

B7

B7A

MHB4B

425W

B7B

BD625W

B7A225N

B7E

B3A25W

MH5

B7A25W

B6D1

MHB3B

MH3B1

MHB3C

525W

B8

MH5 Confirm Surface Silver, SPLP

E 2300000

B825W

MHB3D

MHB6 Confirm Surface Silver

B9

B925N

MHB10

625N

SB114501

SB114502

MHB3E

MHB3F

MH8

MH7

MH7A1

825W

SB119401

MH7A

SB119402

B1125N

SCALE

0 200 400 FEET

LEGEND

SEWER LINE WITH FLOW DIRECTION

MANHOLE SAMPLING LOCATION

FIGURE 7
SURFACE AND SUBSURFACE SOIL SAMPLE LOCATIONS

NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

IT CORPORATION
A Member of The IT Group

DWG. NO.: ...\768579es.179
PROJ. NO.: 768579
INITIATOR: M.MAKI
PROJ. MGR.: W.CARTER
DRAFT. CHCK. BY: D.HALL
ENGR. CHCK. BY: M.MAKI
DATE LAST REV: 01/26/00
DRAWN BY: mcraft
STARTING DATE: 01/15/00
DRAWN BY: D.HALL
11:43:25
01/26/00
c:\cadd\design\768579es.179
mcraft

N 6964000

E 2299000

MHB9 Confirm Surface Silver, SPLP

B1125N Confirm Surface Silver, SPLP

MHB3E Confirm Surface Lead

MHB12 Confirm Surface Lead

B15A25W Confirm Subsurface Dichlorobenzene

625N
B9
B925N
MHB10
MHB3D
SB114501
SB114502
MHB3E
MHB3F
MH8
MH7
MH7A1
MH7A
B1125N
825W
SB119401
SB119402
MHB3G
SB119103
SB119104
SB119101
SB119102
MHB12A
MHB12
MHB3H
SB106401
SB106402
MH8C
MHB13
SB110101
SB110102
B1325W
SB106001
SB106002
MHB14
B1425W
MHB16
B15
MHB15A
B15A25W

LEGEND

SEWER LINE WITH FLOW DIRECTION

MANHOLE SAMPLING LOCATION

SCALE
0 200 400 FEET

FIGURE 8
SURFACE AND SUBSURFACE SOIL SAMPLE LOCATIONS

NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

IT CORPORATION
A Member of The IT Group

STARTING DATE: 01/15/00 | DRAWN BY: D.HALL | DATE LAST REV.: 01/26/00 | DRAWN BY: mcroft
DRAFT. CHCK. BY: D.HALL | ENGR. CHCK. BY: M.MAKI | INITIATOR: M.MAKI | PROJ. MGR.: W.CARTER | DWG. NO.: ...\768579es.180 | PROJ. NO.: 768579
01/26/00 11:28:08 mcroft c:\cadd\design\768579es.180

N 6964000

E 2296000

5225N Confirm Subsurface Silver, SPLP

MH46 Confirm Subsurface Napthalene.

MH53 Confirm Surface Cadmium

MH56 Confirm Surface Arsenic, SPLP

SB101501

SB101502

CFWM1

MH53

5225N

MH52

5325N

MH54

MH55

5525N

MH56

5025S

MH51

MH50

MH49

4825N

NMH46

NMH45

MH44

MH42

MH40

4225W

MHP

MH41

LEGEND

SEWER LINE WITH FLOW DIRECTION

MANHOLE SAMPLING LOCATION

SCALE

0 200 400 FEET

FIGURE 9
SURFACE AND SUBSURFACE SOIL SAMPLE LOCATIONS

NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

IT CORPORATION
A Member of The IT Group

DWG. NO.: ...\768579es.181
PROJ. NO.: 768579
INITIATOR: M.MAKI
PROJ. MGR.: W.CARTER
DRAFT. CHCK. BY: D.HALL
ENGR. CHCK. BY: M.MAKI
DATE LAST REV.: 01/26/00
DRAWN BY: mcraft
STARTING DATE: 01/15/00
DRAWN BY: D.HALL
01/26/00 11:30:12
mcraft
c:\cadd\design\768579es.181

N 6956000

WITCTA055 | DELINEATE | VOCs

WITCTA056 | DELINEATE | VOCs

WITCTA025 | CONFIRM | VOCs

WITCTA018 | DRY HOLE

WITCTA018

GMI-22-05M | CONFIRM | ANTIMONY

GMI-22-05M

WITCTA053 | DELINEATE | VOCs

WITCTA052 | DELINEATE | VOCs

WITCTA055

WITCTA056

WITCTA025

WITCTA054

WITCTA026

WITCTA027

WITCTA053

WITCTA052

G.W. FLOW

WITCTA054 | DELINEATE | VOCs

WITCTA051 | DELINEATE | VOCs

WITCTA024 | CONFIRM | VOCs

WITCTA051

WITCTA050 | DELINEATE | VOCs

WITCTA024

WITCTA050

WITCTA049 | DELINEATE | VOCs

WITCTA049

BGSMW01 | CONFIRM | MERCURY

BGSMW-01

LEGEND

- WITCTA019 — MONITORING WELL
- WITCTA055 — PROPOSED MONITORING WELL
- SANITARY SEWER LINE
- G.W. FLOW — GROUNDWATER FLOW DIRECTION

SCALE: 0 150 300 FEET

FIGURE 10
GROUNDWATER MONITORING WELL SAMPLE LOCATIONS VOC PLUME DELINEATION PHASE II SANITARY SEWER RFI WORK PLAN

NAVAL AIR STATION FORT WORTH FORT WORTH, TEXAS

IT CORPORATION
A Member of The IT Group

DRAFT. CHCK. BY: D.HALL | DWG. NO.:...\768579es.174
ENGR. CHCK. BY: M.MAKI | PROJ. NO.: 768579
INITIATOR: M.MAKI
PROJ. MGR.: W.CARTER
DATE LAST REV.: 03/06/00
DRAWN BY: dhall
STARTING DATE: 1/13/00
DRAWN BY: P. COLEMAN
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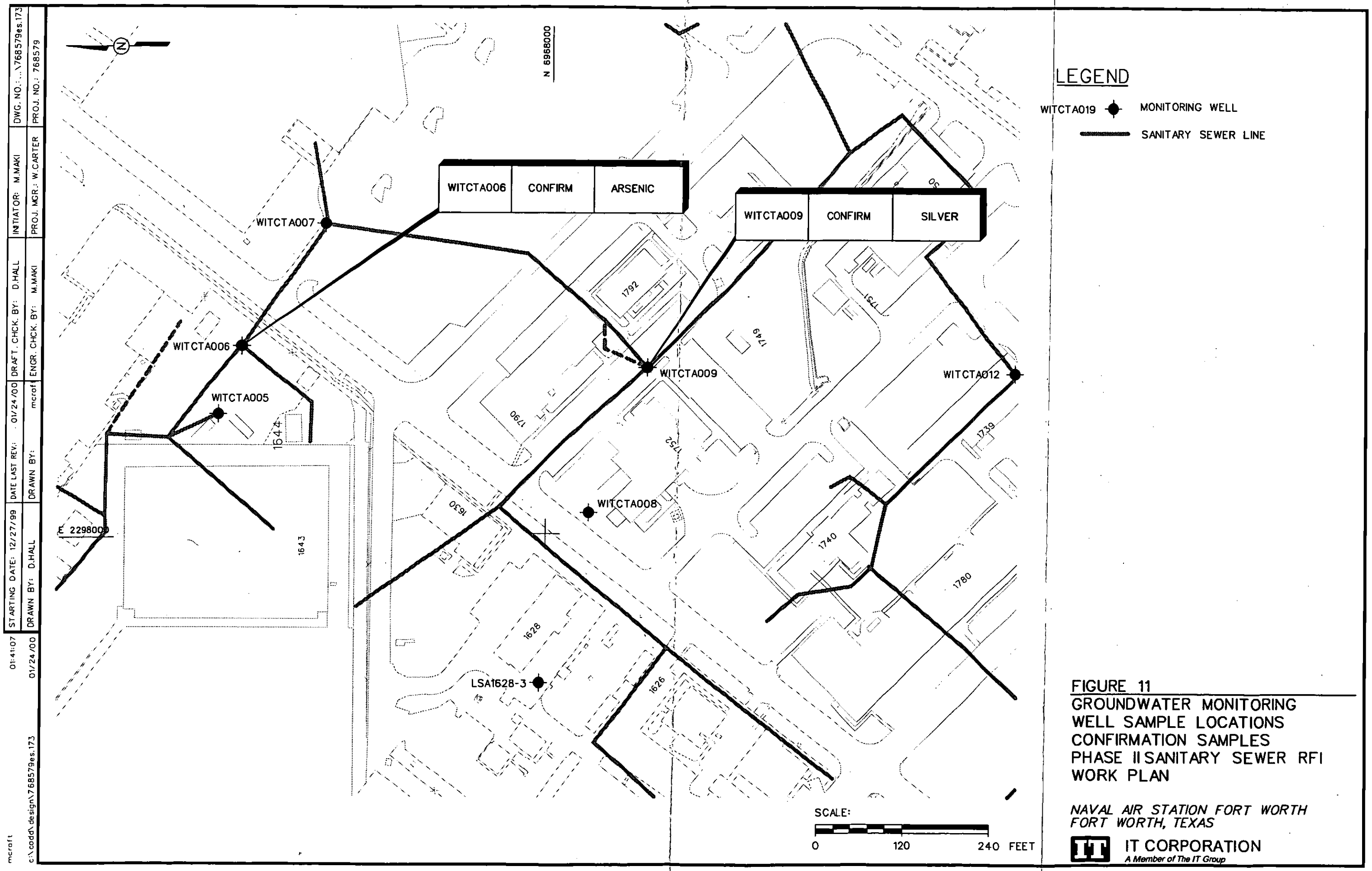
dhall c:\cadd\design\768579es.174



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ENGR. CHCK. BY: M.MAKI	PROJ. MGR.: W.CARTER	PROJ. NO.: 768579	
DATE LAST REV.: 01/24/00	STARTING DATE: 12/27/99		
DRAWN BY: mcraft	DRAWN BY: D.HALL		

01:41:07 01/24/00 c:\cadd\design\768579es.173 mcraft

FIGURE 11
GROUNDWATER MONITORING
WELL SAMPLE LOCATIONS
CONFIRMATION SAMPLES
PHASE II SANITARY SEWER RFI
WORK PLAN

NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

IT CORPORATION
A Member of The IT Group

FIGURE 12
GROUNDWATER MONITORING WELL SAMPLE LOCATIONS CONFIRMATION SAMPLES PHASE II SANITARY SEWER RFI WORK PLAN

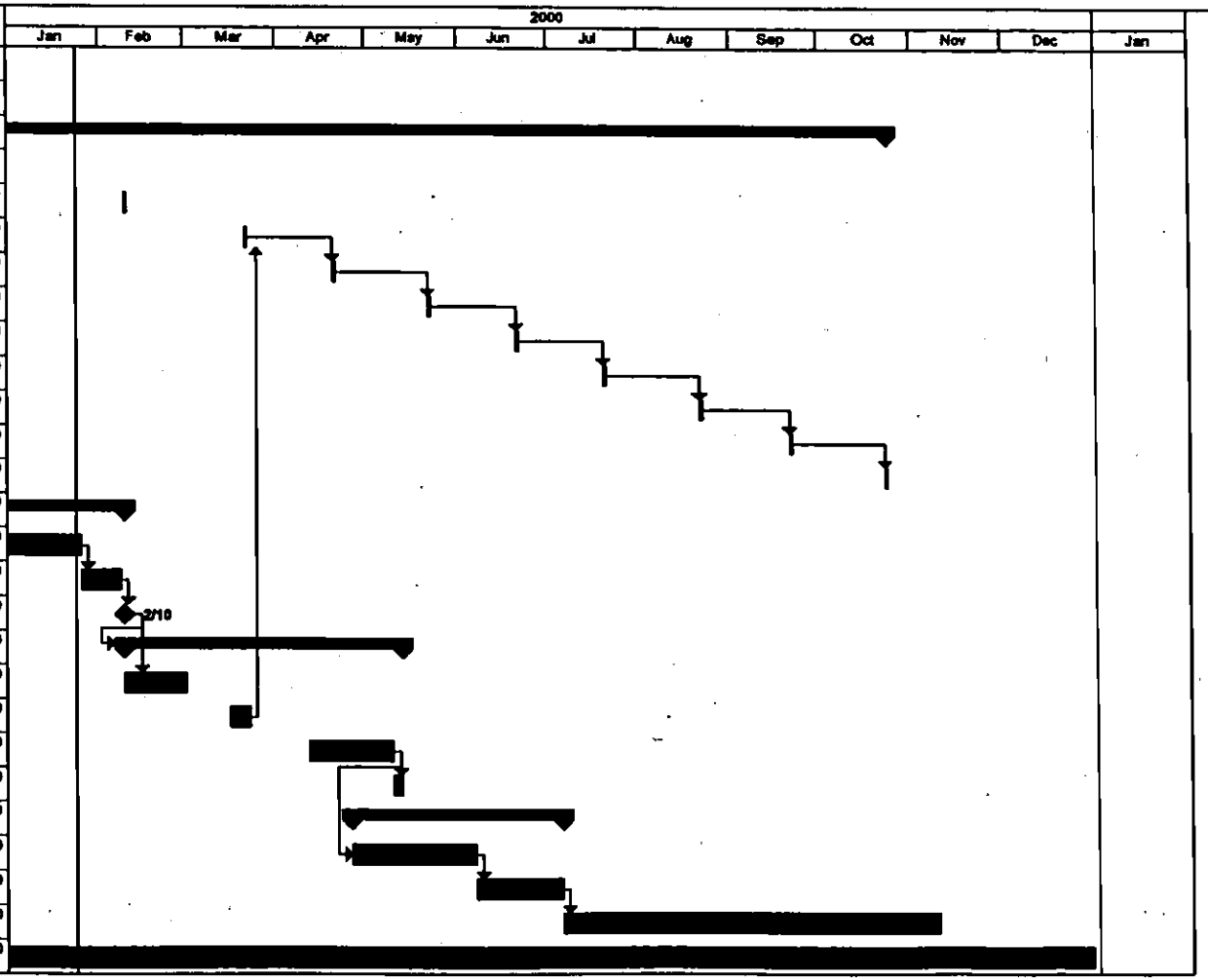
NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

IT CORPORATION
A Member of The IT Group

DWG. NO.: ...\768579es.175	
PROJ. NO.: 768579	
INITIATOR: M.MAKI	
PROJ. MGR: W.CARTER	
DRAFT. CHCK. BY: D.HALL	
ENGR. CHCK. BY: M.MAKI	
DATE LAST REV.: 01/24/00	
DRAWN BY: mcraft	
STARTING DATE: 12/27/99	
DRAWN BY: D.HALL	
01/24/00 01:25:37	
mcraft c:\cadd\design\768579es.175	

Figure 13
Project Schedule - Sanitary Sewer System Phase 2 RFI
NAS Ft Worth, TX

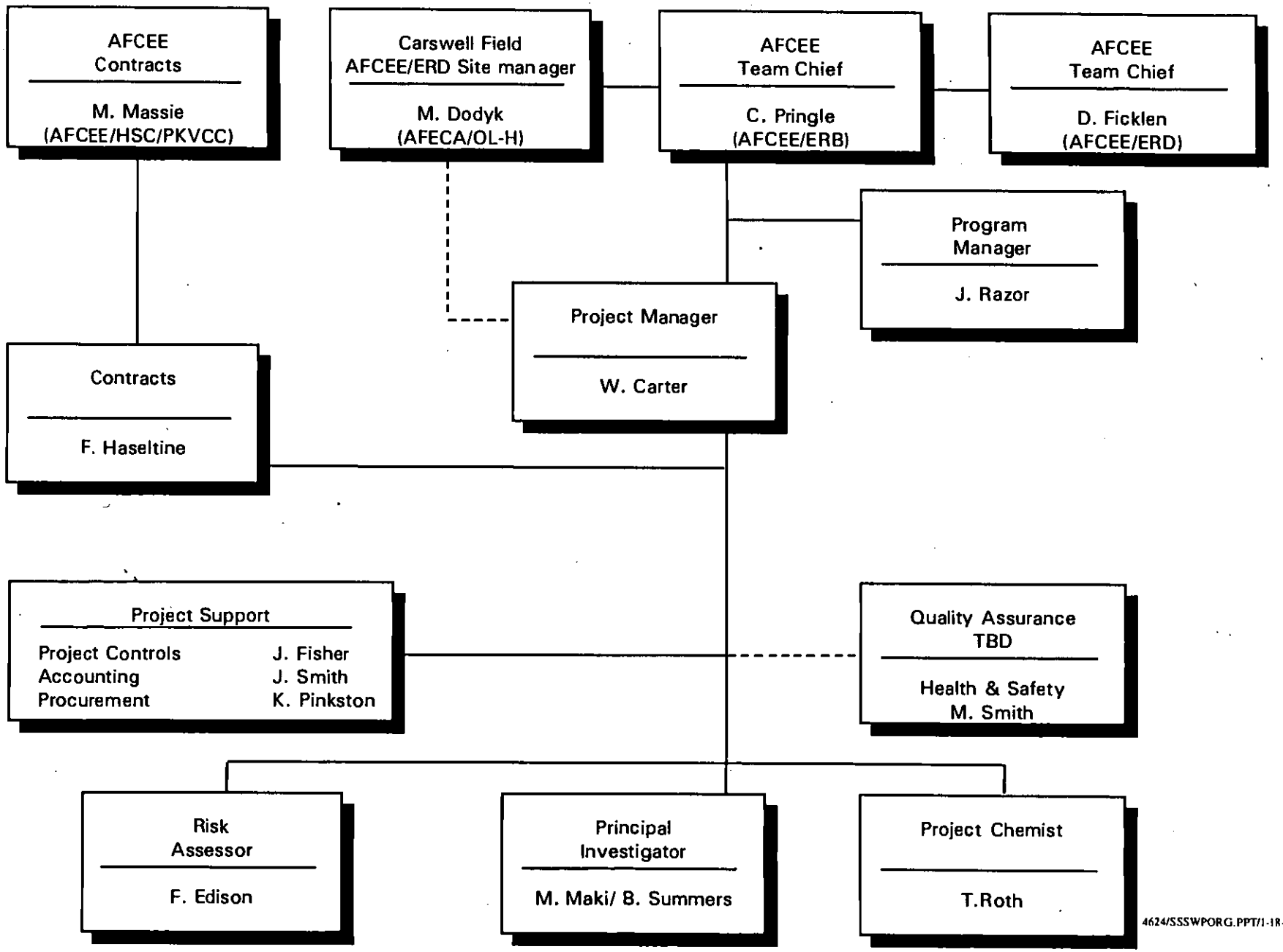
ID	Task Name	Duration	Start	Finish
1	Propopsal	0 days	Fri 11/5/99	Fri 11/5/99
2	Notice to proceed	0 days	Fri 12/3/99	Fri 12/3/99
3	Meetings	228 days	Thu 12/9/99	Mon 10/23/00
4	Post award	1 day	Thu 12/9/99	Thu 12/9/99
5	Tech. Mtg. 1	1 day	Thu 2/10/00	Thu 2/10/00
6	Tech. Mtg. 2	1 day	Tue 3/21/00	Tue 3/21/00
7	Tech. Mtg. 3	1 day	Thu 4/20/00	Thu 4/20/00
8	Tech. Mtg. 4	1 day	Mon 5/22/00	Mon 5/22/00
9	Tech. Mtg. 5	1 day	Wed 6/21/00	Wed 6/21/00
10	Tech. Mtg. 6	1 day	Fri 7/21/00	Fri 7/21/00
11	Tech. Mtg. 7	1 day	Tue 8/22/00	Tue 8/22/00
12	Tech. Mtg. 8	1 day	Thu 9/21/00	Thu 9/21/00
13	Tech. Mtg. 9	1 day	Mon 10/23/00	Mon 10/23/00
14	Plans	46 days	Wed 12/8/99	Thu 2/10/00
15	Work Plan addendum	35 days	Wed 12/8/99	Tue 1/25/00
16	AF review work plans	10 days	Wed 1/26/00	Tue 2/8/00
17	Review @ BCT	0 days	Thu 2/10/00	Thu 2/10/00
18	Environmental sampling	67 days	Thu 2/10/00	Fri 5/12/00
19	Clearance	15 days	Thu 2/10/00	Wed 3/1/00
20	Mobilization	5 days	Thu 3/16/00	Wed 3/22/00
21	Sampling	20 days	Wed 4/12/00	Tue 5/9/00
22	Demob	3 days	Wed 5/10/00	Fri 5/12/00
23	Data management	61 days	Wed 4/26/00	Wed 7/5/00
24	Analyses	30 days	Wed 4/26/00	Tue 6/6/00
25	Data verfication	21 days	Wed 6/7/00	Wed 7/5/00
26	Technical Reports	90 days	Thu 7/6/00	Wed 11/8/00
27	Project Administration	281 days	Fri 12/3/99	Fri 12/29/00



Project: OWS - Carswell AFB
Date: Mon 1/24/00

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
Split
Rolled Up Split

Figure 14. Project Organization - Sanitary Sewer System Phase 2 RFI (Project No. 768579)



4624/SSSWPORG.PPT/1-18-00

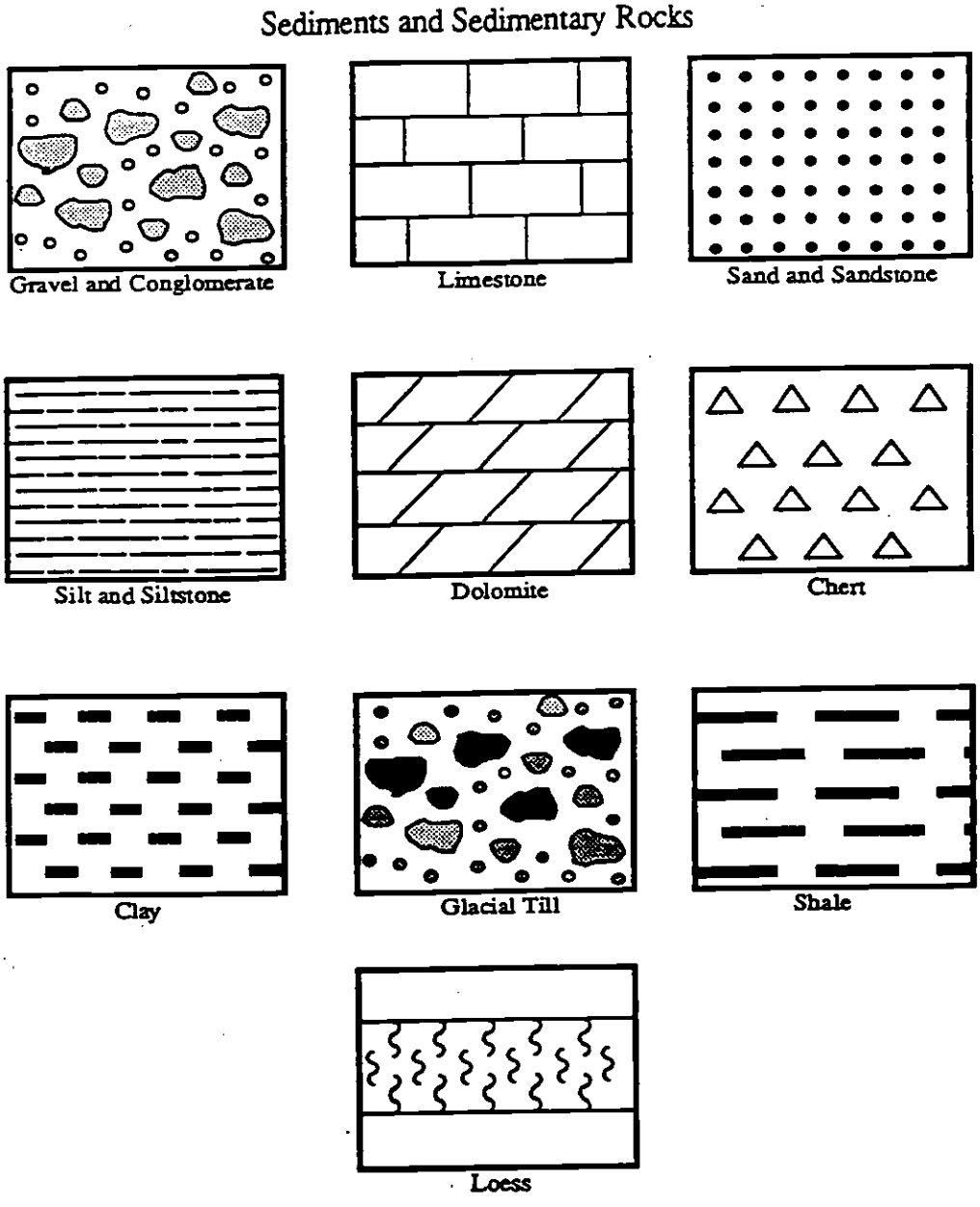


Figure 15

Lithologic Patterns for Illustration

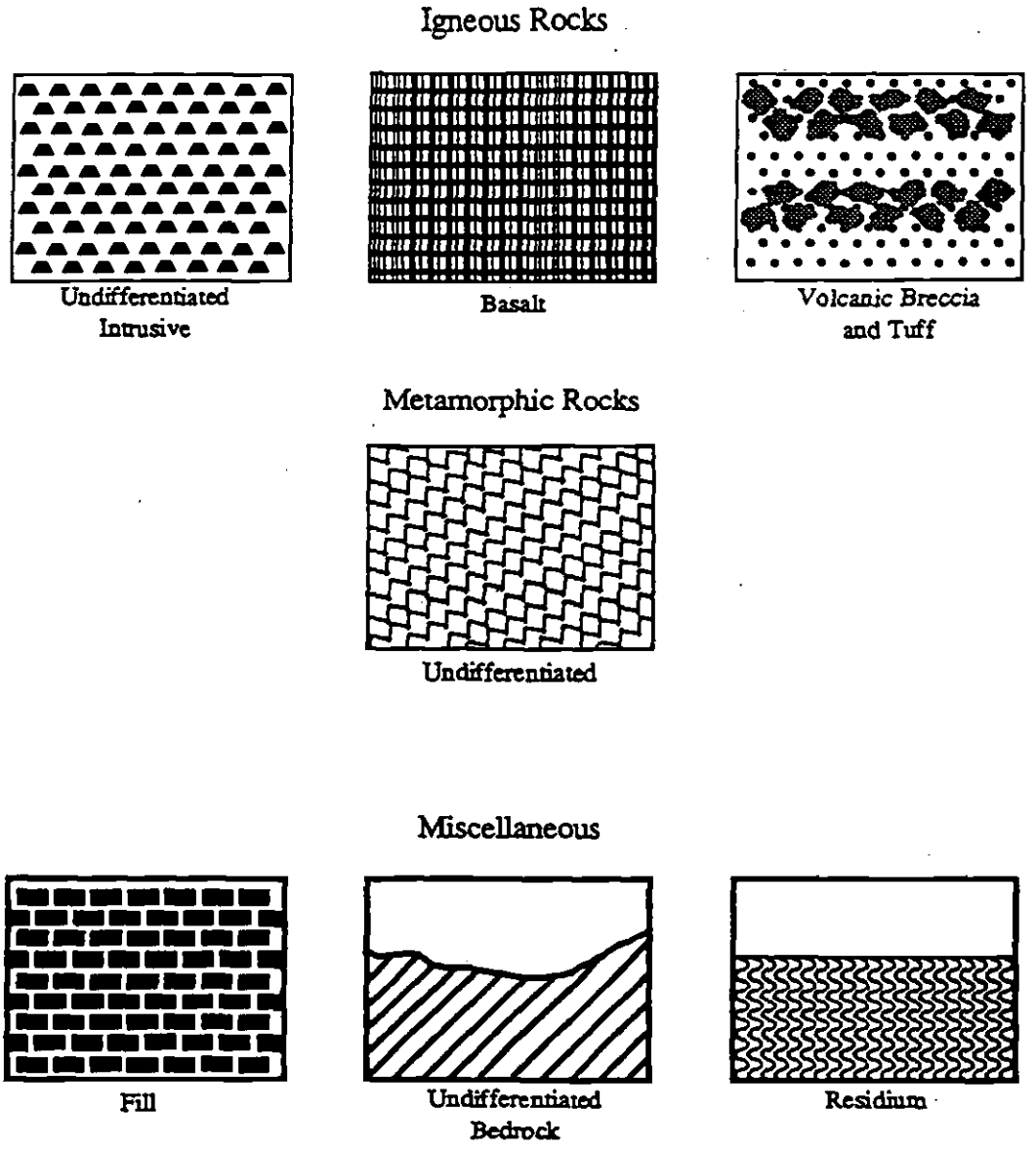


Figure 15 (Continued)

Lithologic Patterns for Illustration

INTERNATIONAL TECHNOLOGY CORPORATION

(Not To Scale)

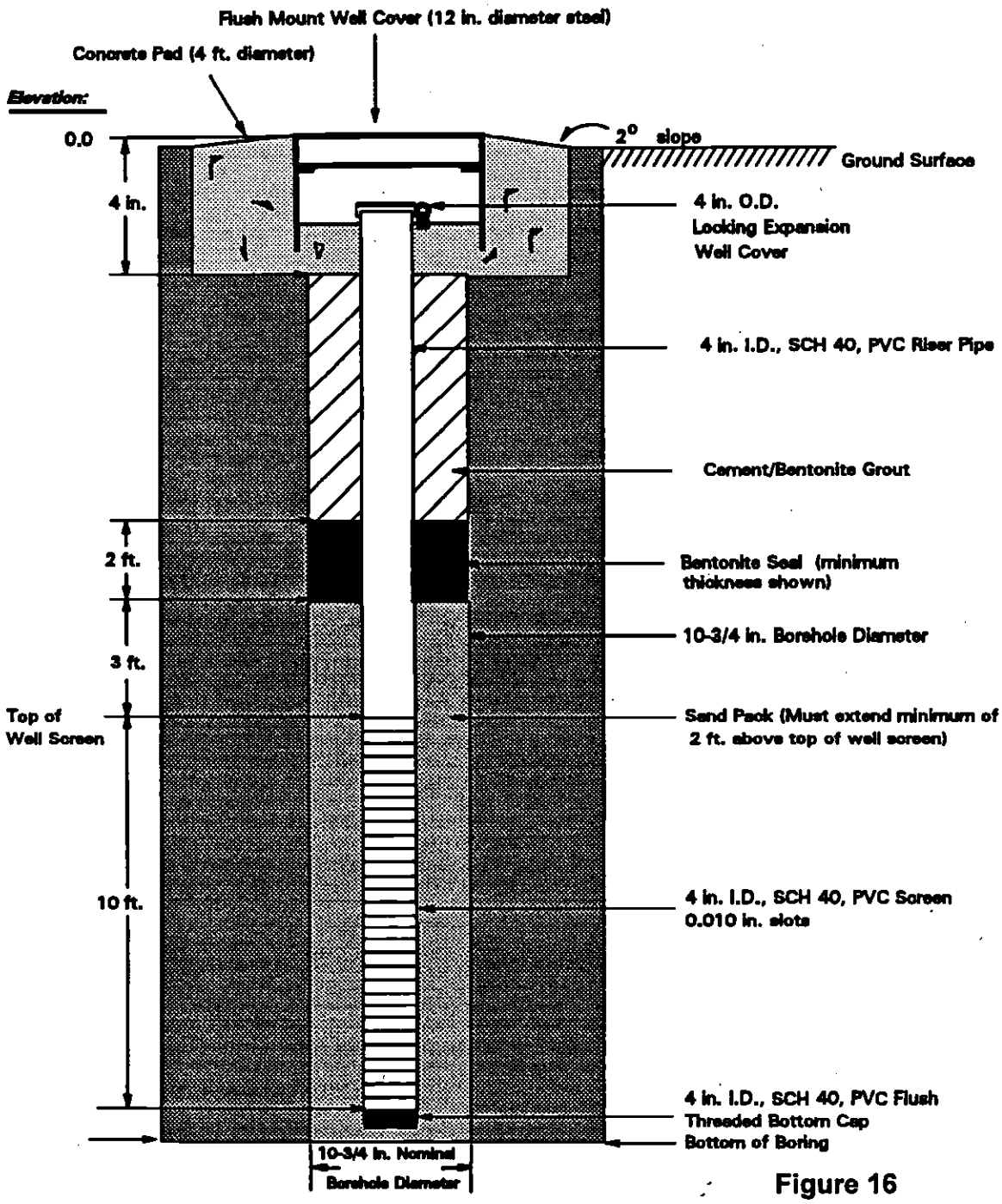


Figure 16

Monitoring Well Design
Prepared for:

NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

N:\CARSWELL\BORINGS\WCD1.DRW/ma/2-20-97

ATTACHMENT I

SANITARY SEWER SYSTEM RFI
FIELD SAMPLING PLAN PROCEDURES

5.0 Field Operations

5.1 Geologic Standards

The lithologic descriptions for consolidated materials (igneous, metamorphic, and sedimentary rocks) shall follow the standard professional nomenclature (Tennissen, 1983), with special attention given to describing fractures, vugs, solution cavities and their fillings or coatings, and any other characteristics affecting permeability. Colors shall be designated by the Munsell Color System.

The lithologic descriptions for unconsolidated materials (soils [engineering usage] or deposits) shall use the name of the predominant particle size (e.g., silt, fine sand, etc.). The dimensions of the predominant and secondary sizes shall be recorded using the metric system. The grain size and name of the deposit shall be accompanied by the predominant mineral content, accessory minerals, color, particle angularity, and any other characteristics. The clastic deposit descriptions shall include, as a supplement, symbols of the Unified Soil Classification System (USCS). The color descriptions shall be designated by the Munsell Color System.

The sedimentary, igneous, and metamorphic rocks and deposits shall be represented graphically by the patterns shown in Figure 15. Columnar sections, well and boring logs, well construction diagrams, cross sections, and three-dimensional (3-D) diagrams shall use these patterns. Supplementary patterns shall follow Swanson, 1981. Geologic structure symbols shall follow 1989 American Geological Institute Data Sheets.

The scales for maps, cross sections, or 3-D diagrams shall be selected in accordance with the geologic and hydrologic complexity of the area and the purposes of the illustrations. Geophysical logs shall be run at a constant vertical scale of 1 inch equals 20 feet. When geophysical logs are superimposed on geologic logs, cross sections, or 3-D diagrams, the scales shall be the same. If defining geological conditions requires other scales, additional logs at those scales shall be provided.

For orientation, the cross sections shall show the northern end on the viewer's right. If the line of cross section is predominantly east-west, the eastern end is on the right. Maps shall be oriented

with north toward the top, unless the shape of the area dictates otherwise. Indicate orientation with a north arrow.

5.2 Site Reconnaissance, Preparation, and Restoration Procedures

A request will be made by IT's principal investigator through the Air Force to "clear" all utility lines where there will be subsurface investigation. These areas shall be cleared by the Air Force or its designee for the presence of underground utilities. Utility locations will be determined using existing utility maps. NAS Fort Worth facility engineering personnel will clear utilities at intrusive sampling locations before issuing a digging permit. These will be updated in the field and are verified using a hand-held magnetometer or utility probe. Vehicle access routes to sampling locations shall be determined prior to any field activity. Caution tape and barricades will be used to delimit work areas. Personnel will be trained by NAS Fort Worth personnel before permitted access to flight line operations areas.

A designated decontamination area shall be provided for drilling rigs and equipment. The decontamination area shall be large enough to allow storage of cleaned equipment and materials prior to use, as well as to stage drums of decontamination waste. The decontamination area shall be lined with a minimum 6-mil heavy gauge plastic sheeting, and designed with a collection system to capture decontamination waters. Solid wastes shall be accumulated in 55-gallon drums or roll-off boxes and subsequently transported to a waste storage area designated by the Air Force. Smaller decontamination areas for personnel and portable equipment shall be provided as necessary. These locations shall include basins or tubs to capture decontamination fluids, which shall be transferred to a large accumulation tank as necessary. These designated areas of decontamination shall be arranged with NAS Fort Worth and AFBCA personnel prior to mobilization.

The contractor's field operation office will be established in that area designated by the AFBCA remedial project manager.

Each work site or sampling location shall be returned to its original condition when possible. Efforts shall be made to minimize impacts to work sites and sampling locations, particularly those in or near sensitive environments such as wetlands. Following the completion of work at a

site, all drums, trash, and other waste shall be removed. Decontamination and/or purge water and soil cuttings shall be transported to the designated locations as described in Section 5.12.

5.3 Geophysical Surveys

No geophysical surveys will be performed as part of this investigation.

5.4 Soil Gas Surveys

No volatile organic compound soil gas surveys will be performed as part of this investigation.

5.5 Soil Probe Installations, Lithologic Sampling, Logging, and Abandonment

5.5.1 Soil Probe Borings

The sanitary sewer system soil assessment will be performed with soil probe sample locations located along the length of the Base sanitary sewer system. Subsurface assessment of soil for the sanitary sewer system RFI will be performed with soil probe methods to define the vertical and horizontal extent of soils impacted from any releases of contaminants from the sanitary sewer system.

Soil probe assessment borings will be performed with decontaminated Geoprobe® or equivalent hydraulic equipment. Either a large bore (1.0625-inch inside diameter [ID]) or Maccro-core® (1.5-inch ID) soil sampler will be used with a polyethylene terephthalate (PET) or cellulose acetate butyrate (CAB) liner in the sample tube.

Soil probes will be advanced and samples collected continuously from the surface to the top of the groundwater table. The soil probe unit consists of a truck-mounted hydraulic-driven soil probe with steel probe rods, and assorted sampling equipment. A hydraulically driven hammer drill will penetrate paved or hard surfaces before continuous sampling begins. All parts of the soil probe assembly that contact soils will be decontaminated between each use.

Soil boring locations will be located as close to the buried sanitary sewer lines as possible without unreasonable risk of puncturing the line as determined by the accuracy of the utility field location. This will usually be within 2 to 3 feet from the centerline of the sanitary sewer or 2 feet

from the edge of a manhole or OWS structure. The field geologist will estimated the centerline of the sewer line based on the alignment of consecutive manholes straddling the sewer line sampling location and confirmation of the line location and its diameter on utility maps provided by the Air Force. During advancement of the boring, the field geologist will determine from recovered samples if the material has characteristics of select fill material or disturbed or undisturbed native material. Disturbed native material, created during installation of the line, may have erratic soil structure and artifacts such as angular limestone gravel clasts. The characteristics of the material will be noted on field logs (Appendix A). The data will be used to determine the acceptable locations for groundwater sampling.

Soil borings will be advanced by directly pushing the drive probe to 4 feet above the estimated water table based on historical groundwater elevations at the boring for the time if year when the sample is being collected. The soil will then be continuously sampled until either 2 feet above the water table where contaminated groundwater has previously been determined to exist or immediately above the water table where there is no evidence of previous groundwater contamination. The sample at the deepest point sampled but above groundwater will be sent for analysis.

The soil sample device has a retractable drive point that will allow driving the sampler to the calculated elevation above the groundwater table, releasing the drive point, and then continuing to drive the sampling tube across the selected soil simple interval. The probe unit then retracts the soil sampler to the surface where the soil sample is extracted from the sampling tube. The soil sample will be encased in a clear PET or CAB liner that will allow visual classification of the soil and collection of soil samples by the field geologist. The sleeve containing the selected soil sample will be capped with Teflon® tape and slip-on end caps.

Field screening will be accomplished by use of a PID measuring headspace vapors of selected portions of the soil sample. Soil samples will be placed in a sealable plastic bag with boring number, depth, and time marked on it, and the bagged sample allowed to adjust to ambient surface temperature. Headspace concentrations in the plastic bag will be checked by puncturing the bag with a PID probe, measuring the headspace concentration in the bag, and recording the PID reading and time on the soil classification log in Appendix A.

Continuous soil sampling and logging of soils will be performed at subsurface soil sampling locations instead of grab sampling techniques at locations where a groundwater monitoring well will be installed. The monitoring well locations are shown on Figure 10. The soil probe will be advanced until suitable aquifer material for setting the probe is found or to probe refusal. Local changes in geologic conditions, such as unanticipated shallow bedrock or a shallow groundwater table elevation may result in the field geologist moving and resampling the subsurface soil sample location using continuous soil sampling techniques. This will be performed in order to collect additional stratigraphic data in the area; identify the groundwater table; identify the soil interval above the groundwater table for collection of an unsaturated soil sample; and to identify suitable aquifer material for monitoring well installation in the immediate area.

5.5.2 Plugging and Abandonment

Completed soil probe and other borings will be abandoned by filling the boring with bentonite chips placed from total depth to the surface, tamping the chips in the boring with a rod, and hydrating the chips with potable water. The boring will be reinspected by the field geologist within 24 hours to determine if grouting of the boring is satisfactory and if additional grout materials may be needed. Borings located on paved surfaces will be capped with an asphaltic material plug.

At each sampling point in the hardened areas, a fully penetrating, 3- to 4-inch-diameter concrete core will be installed. The core bit will be cooled by water. To keep the work area clean, the water and concrete cuttings mixture will be collected by the operator. Upon completion of the sampling activities in the hardened areas, bentonite pellets/chips will be placed down the annulus of the boring to approximately 6 inches below the base of the concrete, followed by clean potable water to allow for hydration. After the bentonite pellets/chips have been allowed to hydrate for a minimum of 2 hours, the remainder of the cored sample location will be filled to grade with a mixture of 60 pounds of Sakrete and 94 pounds of Portland cement and allowed to dry. This mixture will give the concrete core a dry compressional strength of approximately 5,000 pounds per square inch. Due to the small diameter of the concrete core, rebar will not be used to strengthen the location.

5.6 Monitoring Wells

5.6.1 Permanent Monitoring Well Installation

The hollow-stem auger method will be used to install monitoring wells required during the NAS Fort Worth sanitary sewer system RFI. All drilling equipment that will come in contact with the borehole or groundwater will be decontaminated in accordance with approved methods in Section 5.12. A soil boring will be enlarged by over-reaming, if necessary, and completed as a monitoring well. The ID of the decontaminated over-reaming auger shall be at least 6 inches in outside diameter. Figure 16 shows a general monitoring well design.

Well screens will be 2-inch ID Schedule 40 polyvinyl chloride (PVC) pipe with a 0.01-inch slot (No. 10) size with a threaded cap below the screen. The well screen will be steam-cleaned no more than 24 hours before installation and wrapped in uncontaminated plastic to protect its cleanliness until use. The condition of the well screen will be inspected by the geologist prior to its placement. Connections between the screen and well casing will be flush-threaded with no glue used to join casing. A direct measurement of the borehole depth by the use of a weighted tape will be made before screen placement. The depth, to the nearest tenth of a foot, will be recorded on the well construction log. The screen for monitoring wells will cover the full saturated thickness of the water bearing unit, but it will not exceed 10 feet in length. The top of the screened interval will extend a maximum of 2 feet above the top of the saturated interval for future potential remedial uses of the well. Screen length may be increased in the field in areas where the saturated thickness exceeds 10 feet, with concurrence from the AFCEE designated field representative.

The well casing will be 2-inch ID Schedule 40 PVC blank pipe with threaded connections. The well casing will extend from the top of the screen to approximately ground surface for a flush-mount style completion. The top of the well casing will be secured with a well cap to prevent entry of foreign objects during completion (Figure 16).

After the screen is placed inside the augers, the filter pack will be placed between the screen and inner wall of the hollow-stem auger. The filter pack is to be placed in the well by tremie pipe in such a manner as to be distributed around the screen at a uniform height and density. For wells

with a total depth shallower than 25 feet, however, the filter pack sand may be placed in the annulus between the well screen and the augers as the augers are withdrawn from the boring to allow the filter pack to slump against the side walls of the boring and prevent borehole caving.

The filter pack will extend a minimum of 2 feet and a maximum of 5 feet above the top of the well screen. The filter pack will consist of a washed, rounded 95 plus percent silicious aggregate, and will be free of lignite and chlorides. The filter pack sand for the wells will be 20/40 sized sand. The field geologist will inspect the filter pack prior to placement.

The bentonite seal will consist of at least 2 feet of bentonite above the filter pack and below the grout seal. The well construction will be designed so the bentonite is placed in a nontransmissive zone and effectively isolates the screened interval. The bentonite will be 100-percent sodium bentonite pellets and will be placed on top of the sand pack in the annular space between the well casing and the augers. The augers will be raised to allow the bentonite pellets to slump against the side walls of the boring. After the elevation of the top of the bentonite seal is confirmed by weighted tape, the bentonite pellets will be hydrated with potable water and well activity will cease for 2 hours to allow the bentonite to hydrate. After the hydration period, the top of the bentonite seal will be determined by direct measurement with a weighted tape and recorded on the well construction log.

Cement/bentonite grout will consist of portland cement and powdered sodium bentonite mixed to a 13.8 plus or minus 0.3 lbs/gal (5 percent mix) slurry weight. The grout will be pumped using a side discharge tremmie pipe until the grout returns to the surface. The level of the grout mixture will be left 1 foot bgs to allow installation of flush mount casing protectors.

Flush mount surface completions will be flush with the land surface if located on a paved surface. The casing protector will be located in the middle of a 4-by-4-foot by 4-inch-thick concrete pad that slopes away from the casing protector at 1/4 inch per foot. The identity of the well shall be permanently marked on the well cover lid and the casing cap and secured by lock and key.

5.6.2 Well/Piezometer Completion Diagrams

A completion diagram shall be submitted for each permanent monitoring well or piezometer installed. It shall include the following information: (1) well identification (this shall be identical to the boring identification described), (2) drilling method, (3) installation date(s), (4) elevations of ground surface and the measuring point notch, (5) total boring depth, (6) lengths and descriptions of the screen and casing, (7) lengths and descriptions of the filter pack, bentonite seal, casing grout, and any back-filled material, (8) elevation of water surface before and immediately after development, and (9) summary of the material penetrated by the boring.

Forms for these data are in Appendix A of this document.

5.6.3 Monitoring Well Development

Each well will be developed using a decontaminated submersible pump, bottom discharge/filling bailer, or a surge block as soon as practical, but not sooner than 48 hours nor longer than 7 calendar days after placement of the internal cement/bentonite well grout seal. Prior to development, the static water level will be measured from the top of the casing and recorded. During purging, water throughout the entire water column will be removed by periodically raising and lowering the development equipment.

Well development will consist of evacuating water and surging the well until the groundwater produced is clear and the sediment thickness remaining in the well is less than 1 percent of the screen length. Representative groundwater is presumed to have been obtained when:

- A minimum of five casing volumes of water have been removed from the well.
- The water is clear to the unaided eye and is relatively free of suspended sediments. Turbidity measurements will not be taken.
- Field measurement of the water for pH is within 0.1 standard unit of the previous reading.
- Field measurement of the water specific conductivity is within 5 percent of the previous reading.

- Field measurement of the water temperature is within 1 °C of the previous reading.
- Field measurements will be recorded on the groundwater well development/purge log in Appendix A.

5.6.4 Abandoning Monitoring Wells

All abandonment of monitoring wells shall be performed in accordance with state and local laws and regulations. If slurry is used, a mud balance and/or Marsh Funnel shall be used to ensure that the density (pounds per gallon) of the abandonment mud mixture conforms with the manufacturer's specification. All abandoned monitoring wells shall be checked 24 to 48 hours after mud/solid bentonite emplacement to determine whether curing is occurring properly. Additional curing specifications or QA checks recommended by the bentonite manufacturer and shall be followed. Additionally, if visible settling of greater than 1 inch has occurred, a sufficient amount of mud/solid bentonite shall be added to attain its initial level. These slurry/solid bentonite curing checks and any addition of mud/solid bentonite shall be recorded in the field logs.

5.6.5 Temporary Sampling Device Installation (Optional)

Groundwater samples collected to define the extent of VOCs in the groundwater may be collected along sewer lines at selected sampling locations with a direct-push rig and a temporary reusable well point groundwater sample device. The temporary sampling device acts as a temporary monitoring well, allowing a one-time collection of a groundwater sample from the location for assessment purposes.

A groundwater sample will be collected at each sample location where the sewer system line or manhole is below the top of the groundwater table. Groundwater samples will be collected on the down gradient side of each sampling location, which is predominantly east to southeast. Soil boring data collected from the area will be used to assist the geologist in determining the depth to set the groundwater sampling device. The sampling device will be driven by the hydraulic rig across the water table. The outer wall of the sampling device will be pulled upward, while the drive point that has a well screen attached to it remains in the aquifer material. The well screen will allow groundwater to flow through the screen and into hollow drive rods, allowing collection of groundwater samples with polyethylene sample tubing with a foot valve at its base

to allow pumping of the groundwater to the surface with a rapid up and down motion of the tubing. The groundwater sample device will be purged by pumping to allow formation water into the sampler before the sample is collected.

5.6.6 Temporary Monitoring Well Purging

Well development using the temporary sample device will require evacuation of groundwater from the well until the groundwater produced is relatively clear to slightly turbid and the sediment thickness remaining in the well is less than 10 percent of the screen length. Representative groundwater is presumed to have been obtained when:

- A minimum of five casing volumes of water have been removed from the sampling device.
- The water is relatively clear to the unaided eye and is relatively free of suspended sediments.
- Field measurement of the water for pH is within 0.1 standard unit of the previous reading.
- Field measurement of the water specific conductivity is within 5 percent of the previous reading.
- Field measurement of the water temperature is within 1 °C of the previous reading.

Field measurements will be recorded on the groundwater well development/purge log in Appendix A.

After collection of the groundwater sample, the sampling device and rods will be retrieved from the boring and the hole grouted. Plugging and abandonment procedures in Section 5.5.2 will be used to abandon these temporary wells.

5.7 Aquifer Tests

No aquifer tests will be performed.

5.8 Test Pit Excavation

No test pits will be installed.

5.9 Surveying

All surveying locations of field activities shall be measured by a certified land surveyor as the distance in feet from a reference location that is tied to the state plane system. The surveys shall be third order (Urquhart, 1962). An XY-coordinate system shall be used to identify locations. The X-coordinate shall be the east-west axis; the Y-coordinate shall be the north-south axis. The reference location is the origin. All surveyed locations shall be reported using the state plane coordinate system. The surveyed control information for all data collection points shall be recorded and displayed in a table. The table shall give the X and Y coordinates in state plane coordinate values, the ground elevation, and the measuring point elevation if the location is a ground-water monitoring well. The elevation of all newly installed wells and piezometers shall be surveyed at the water level measuring point (notch) on the riser pipe. Include the elevation of the ground surface in the survey. Soil probe locations will be surveyed with elevation of the ground surface measured and recorded.

5.10 Equipment Decontamination

5.10.1 Nonsampling Equipment

A centrally located decontamination station will be established for decontamination of equipment. The decontamination station will include a pad on which the drilling rig, soil probe unit, and other large equipment, such as auger flights, can be steam-cleaned. The decontamination pad will be of a temporary construction. The decontamination pad will consist of two layers of minimum 6-mil high-density polyethylene plastic sheeting laid out on a level, firm surface. The pad edges will be built up with material (lumber or steel) to contain decontamination water. A collection sump will be furnished inside the pad to allow removal of the decontamination waters. Coordination with NAS Fort Worth personnel will be required to identify the location of the decontamination station. Access to the decontamination station area will be controlled by caution tape, barricades, and warning signs.

The drill rigs and other equipment that could come in contact with the soil being investigated will be steam-cleaned between each hole. The general procedures for nonsampling equipment are as follows:

- Augers and other drilling equipment in contact with soil will be decontaminated before coming onto the NAS Fort Worth sanitary sewer RFI site and before leaving the site.

- Augers, bits, and rods will be decontaminated with high-pressure hot water, scrubbed with phosphate-free detergent, rinsed thoroughly by steam cleaning, and allowed to air dry.

- All casings, screens, and other downhole equipment will be steam-cleaned prior to installation and wrapped in plastic to prevent recontamination.

5.10.2 Sampling Equipment

Field measurement equipment will be kept free of contamination. All reusable field equipment used to collect, handle, or measure samples shall be decontaminated before coming into contact with any sample. Brushes and soap will be used to remove dirt from equipment that comes into contact with soils.

The decontamination procedures for sampling equipment are as follows:

- Use potable water from a known source with a phosphate-free detergent to wash and brush soil from the sampling item.

- Rinse sampling item thoroughly with potable water; check item for any residual dirt, and rewash if necessary.

- Rinse item with ASTM Type II Reagent-grade deionized water.

- Rinse item with solvent (methanol) to remove residual organics. Follow with a deionized water rinse if fuels are encountered. Solvents will be pesticide grade or better. A hexane rinse will only be used in highly contaminated areas where liquid wastes are present on the tools.

- Allow item to completely air-dry prior to any use. Cover item with uncontaminated plastic if it is not intended for immediate use.

5.11 Waste Handling

The potential investigation waste types generated from work performed during field activities are:

- Drill cuttings and soil samples
- Developments and purge water from well installation and sampling
- Decontamination water
- Personnel protective equipment and decontamination equipment.

Procedures for disposal of these wastes will be coordinated with Base personnel. Analytical testing of these wastes may be required to characterize the waste for disposal. An analytical sample for VOCs, SVOCs, total petroleum hydrocarbons, and metals will be collected from each 50 cubic yards of investigation-derived waste soils to determine if the soils are hazardous by TNRCC Risk Reduction Standards and to subcontract disposal options. All decontamination fluid will be collected, contained in an appropriate vessel, properly labeled, and stored on-site at an approved storage facility at the Base. All soils generated during soil borings, well installation, and sampling activities will be collected, contained in drums or roll-off boxes, properly labeled, and stored on site until disposal or treatment is conducted. All drums will be clearly labeled with the contents, date of accumulation, location generated, and generator.

5.12 Hydrogeological Conceptual Model

Modeling is not part of this project.

6.0 Environmental Sampling

All purging and sampling equipment shall be decontaminated according to the specifications in Section 5.12 prior to any sampling activities and shall be protected from contamination until ready for use.

6.1 Soil Sampling Procedures

6.1.1 Surface Soil Sampling

Surface soil samples will be collected from the 0-to-1-foot interval. The surface soil samples will be collected with the direct-push rig in PET or CAB liners. If the samples cannot be collected due to either surface fill material or poor soil cohesiveness, a California modified shoe with brass liners will be driven through the interval in 6-inch increments with a slide hammer. The samples will be collected, described, logged, labeled, preserved, and stored for analyses.

Surface soil locations are at selected locations are shown in Figures 1 through 9. The sample numbers are shown in Table 1.

6.1.2 Subsurface Soil Probe Sampling

Soil samples will be visually examined by a certified geologist experienced with the Base's lithology. Samples will be described in accordance with ASTM D-2487 (USCS) and the Munsell Color Chart. All information regarding soil texture, consistency, and color shall be recorded on drilling logs. Additional information recorded on the borehole log will be soil sampling location, the method of sampling, the percent recovery of the sample, the depth to first water encountered, and the results of field screening.

Field screening of the soil samples with a PID will provide qualitative information on the location of soils potentially impacted with petroleum hydrocarbons. Each sample collected from a boring will be observed for physical evidence of contamination, such as staining or presence of residues. The soil cores will be collected in clear PET or CAB liners of either 24 or 48 inches in length. The length will be determined in the field by the supervising geologist. The cores will be visually examined through the clear liner for soil properties classification and visual

hydrocarbon staining. The interval selected for soil analysis will be isolated from the rest of the core by cutting the sample (including the liner) from the rest of the core using a decontaminated knife. The ends of each sample tube will be covered with Teflon® tape and capped with a vinyl or polyethylene cap. The geologist will maintain detailed boring logs in conformance with standard operating procedures outlined in the QAPP. The soil probe rig will be decontaminated prior to collecting samples, and any part of the rig will be decontaminated that will contact a sample between boreholes.

The geologist will classify the soil by ASTM methods, including soil type, color, moisture, and firmness, and will note other soil characteristics such as staining. Additional information recorded on the borehole log will be soil sampling location, the method of sampling, the percent recovery of the sample, the depth to first water encountered, and the results of field screening. All hand soil sampling tools will be decontaminated between each use. Care will be taken not to touch the ends of the sleeves before capping. The exterior of the cap will be taped to the tube holding the sample, the sample will be labeled accordingly, and stored in a cooler at the site at 4°C before submittal to the laboratory for analysis.

PID readings for field screening will be taken at the exposed ends of the sample. The remaining portion of each sample will be placed in a resealable plastic bag for field screening. Each jar and bag will be marked with the boring number, depth of sample collected, and time of sample collection. Headspace concentrations in the plastic bags will be checked after 10 minutes by puncturing the bag with the PID probe, measuring the headspace concentration in the bag, and recording the PID reading and time on the borehole log.

The soil probe sample names, the number of samples to be collected at each location, the laboratory analysis; and QC samples to be collected are shown in Table 2.

6.2 Groundwater Sampling

Groundwater samples for laboratory analysis will be collected from temporary groundwater sampling points and any monitor wells installed at NAS Fort Worth during the sanitary sewer system RFI. Groundwater sample collection procedures will follow standard procedures outlined in Section 5.0 of the QAPP addendum. Low flow groundwater sampling techniques will be utilized to collect samples from groundwater monitoring wells.

The air in the breathing zone will be checked with a PID each time a well cap is removed prior to monitoring well activity. Each well shall be inspected for signs of tampering or other damage. If tampering is suspected, it will be recorded on the Field Activity Daily Log, on the sampling form, and reported to the principal investigator. Wells that are suspected to have been tampered with will not be sampled until the matter has been cleared by the principal investigator or the project manager. Each well will be measured with an interface probe to collect water level data and to check for and measure light nonaqueous-phase liquid thickness. The forms of recording data are in Appendix A. The field geologist will calculate the volume of water for the well bore volume and the total for three well bore volumes of groundwater needed to purge the well.

Before the start of sampling activities, plastic sheeting will be placed on the ground surrounding the well. Remove any water in the well protective casing before venting and purging the well. Well purging will consist of evacuation of water until the groundwater has little visible turbidity (i.e., is clear) and the groundwater parameters (temperature, pH, and conductivity) have stabilized as defined in the following paragraphs. Purging and sampling of the wells will be performed in a manner that minimizes agitation of sediment in the well and formation. Equipment will not be allowed to free fall into the well.

The groundwater sample numbers, the number of analytical samples to be collected at each location, the laboratory analysis, and QC samples to be collected are shown on Table 3. Field analytical tests and methods for groundwater samples are shown on Table 5.

In addition to the information required in Chapter 8.0, the following information shall be recorded each time a well is purged and sampled (forms are in Appendix A). This information shall be encoded in IRP Information Management System (IRPIMS) files when required: (1) depth to water before and after purging, (2) well bore volume calculation, (3) total depth of the monitor well as measured with a tape, (4) the condition of each well, including visual (mirror) survey, (5) the thickness of any nonaqueous layer, and (6) field parameters, such as pH, temperature, specific conductance, and turbidity.

6.2.1 Water Level Measurement

An interface probe shall be used if a nonconductive nonaqueous-phase liquid (NAPL) is suspected in a monitoring well. The interface probe shall be used to determine the presence of light or dense NAPL, if any, during measurement of the groundwater level.

Water levels will be measured from the top of monitor well casing and recorded on the well sampling form. If well casings are not notched, measurements will be taken from the north edge of the top of the well casing, and a notch will be made with using a decontaminated metal file. Following water level measurement, the total depth of the temporary well point or monitoring well from the top of the casing will be determined using the electric water level indicator or the interphase probe (monitoring well) and recorded on the well sampling form. The water level depth will then be subtracted from the total depth of the well to determine the height of the water column present in the well casing. Groundwater field sampling forms are located in Appendix A. All water level and total depth measuring devices shall be routinely checked at least annually with a tape measure to ensure measurements are accurate.

The volume of a 1-foot section of the well borehole (F) can also be calculated using the formula:

$$F = \pi (D/2)^2 \times 7.48\ gal/\ ft^3$$

where:

= 3.14

D = the inside diameter of the well borehole in feet.

6.2.2 Groundwater Sample Collection

Before collecting groundwater samples, the sampler will don clean, phthalate-free protective gloves. From monitoring wells, VOC samples will be collected first using disposable clear polyethylene tubing discharging directly into the sample container. Low flow sampling will use small positive displacement pumps. Samples to be analyzed for volatile or gaseous constituents

will not be withdrawn with pumps that exert a vacuum on the sample. Polyethylene tubing used for sample collection will be used once and then disposed of.

The sampler will establish a pump flow rate to minimize groundwater head drawdown low flow groundwater sampling procedures. After the flow rate is established, the sampler will monitor groundwater parameters of temperature, pH, dissolved oxygen, and conductivity and record the measurements on a groundwater sample collection log (Appendix A). Low flow sampling procedures will be conducted by the following methods:

- The sampling pump should be installed at the same depth in each well. Moderate sustained well yields of 5 gallons per minute are common and pumps will be set in the upper third of the saturated well screen due to low expected drawdown. If low-yielding wells are present in an area, then the pump should be positioned towards the bottom one-third of the saturated well screen.

- A pumping rate that minimizes drawdown in the well will be established. Initial purge rates will begin at 0.2 liter per minute (L/min). If the well drawdown is very low, the purge rate may be increase to up to 2.0 L/min. Well drawdown should not exceed one-third of the water column.

- A minimum of three casing volumes of water will be purged from the well.

- Purging a monitoring well will be considered complete where three casing volumes of water have been removed, and:

  - Field measurement of groundwater turbidity is less than or equal to 5 nephelometric turbidity unit (NTU) in one of three consecutive readings or three consecutive turbidity readings less than 10 NTUs are attained.

  - Field measurement of the water for pH is within 0.1 standard unit of the previous reading.

  - Field measurement of the water specific conductivity is within 5 percent of the previous reading.

  - Field measurement of the water temperature is within 1°C of the previous reading.

- Field measurement of the dissolved oxygen is within 0.3 milligrams per liter of the previous reading.

- Once the parameters stabilize and the purge is complete, the flow rate will be reduced to 100 milliliters per minute before collecting the groundwater sample.

If the parameters do not stabilize, the sample will be collected after a maximum of six well volumes have been removed, and the nonstabilizing parameters will be documented and brought to the task leaders attention. All field measurements of groundwater collected by low flow methods will be made with the instrument probes submerged in a flow cell.

An initial groundwater sample will be collected at least 24 hours after completion of monitoring well development. Subsequent samples may be collected when scheduled. A groundwater sample may not be collected until three well bore volumes have been removed and the listed field parameters have stabilized. The sample will then be collected immediately after the water level has recovered to 80 percent of its static level or 8 hours after completion of purging, whichever comes first. The field geologist will record measurements on a groundwater sample collection log (Appendix A) all pertinent information from the well being developed; the water level; the groundwater parameters measured after each well volume removed; and total volume removed.

VOC sample bottles will have been prepared by the laboratory with hydrochloric acid preservative. The sample will be collected from the bailer with a bottom discharge device down the side of a tilted sample vial to minimize volatilization. The sample vial will be filled until a meniscus is visible and immediately sealed. When the bottle is capped, it will be inverted and gently tapped to ensure no air bubbles are present in the vial. Vials with trapped air will be refilled until no bubbles are present in the vial. These samples will never be composited, homogenized, or filtered.

Following collection of VOC samples, remaining water samples will be collected in the following order: SVOCs, pesticides/PCBs (if collected at that location), metals, sulfate, nitrate, alkalinity (if biotechnical samples are collected at that location) and field analytical methods for ferrous iron, carbon dioxide, and sulfide. The pH of preserved sample will be checked by pouring a small amount of a non-VOC water sample onto pH paper. The paper will not touch the inside of the container. The preservation checks will be documented in the chain-of-custody

forms. One preserved VOC sample a day that will not be submitted for laboratory analysis will be checked with pH paper to verify proper preservation.

6.3 Surface Water Sampling

There will be no surface water sampling.

6.4 Sediment Sampling

There will be no sediment sampling.

6.5 Soil Gas Sampling

There will be no soil gas sampling.

6.6 Indoor Air Sampling

Indoor air sampling is not applicable to the project.

6.7 Sample Handling

6.7.1 Sample Containers

Sample containers are purchased precleaned and treated according to EPA specifications for the methods. Containers will be stored in clean areas to prevent exposure to fuels, solvents, and other contaminants. Amber glass bottles are used routinely where glass containers are specified in the sampling protocol.

6.7.2 Sample Volumes, Container Types, and Preservation Requirements

Sample volumes, container types, and preservation requirements for the analytical methods performed on samples are listed in Section 5.0 of the QAPP.

6.7.3 Sample QA/QC Requirements

These requirements are defined and specified in Section 4.4 of the QAPP.

7.0 Field Measurements

7.1 Parameters

Table 5 specified the parameters that will be field measured.

7.2 Equipment Calibration and Quality Control

Equipment calibration requirements are specified in Section 4.3 of the QAPP.

7.3 Equipment Maintenance and Decontamination

Preventative maintenance for equipment will be completed per Section 10.0 of the QAPP. Decontamination will be in accordance with that specified in Chapter 5.0.

7.4 Field Monitoring Measurements

7.4.1 Groundwater Level Measurements

Water level measurements shall be taken in all wells to determine the elevation of the water table within a single 24-hour period prior to a sampling round or initial well development. These measurements shall be taken after all wells have been installed and developed and their water levels have completely recovered. Any conditions that may affect water levels shall be recorded in the field log.

Water level measurements may be taken with electric sounders, air lines, pressure transducers, or water level recorders (e.g., Stevens recorder). Devices that may alter sample composition shall not be used. All measuring equipment shall be decontaminated according to the specifications in Section 5.12. Groundwater level shall be measured to the nearest 0.01 foot. Measurements will be taken to top of casing at the notched point.

Static water levels shall be measured prior to each time a well is sampled. If the casing cap is airtight, allow time prior to measurement for equilibration of pressures after the cap is removed. Repeat measurements until water level is stabilized.

7.4.2 Light or Dense Nonaqueous-Phase Liquid Measurements

The thickness of light or dense NAPL in monitor wells shall be measured with an electronic interface probe. Hydrocarbon detection paste, or any other method that may affect water chemistry, shall not be used. When detected, the presence of NAPL materials shall be confirmed by withdrawing a sample with a clear, bottom-fill bailer.

7.4.3 Groundwater Discharge Measurements

Groundwater discharge measurements shall be obtained during monitor well purging. Groundwater discharges may be measured with orifice meters, containers of known volume, in-line meters, flumes, or weirs, following the guidelines specified in the *Water Measurement Manual*, Bureau of Reclamation, 1967. If discharge measuring devices are upstream of sample collection points, the devices shall be decontaminated. Measurement devices shall be calibrated using containers of known volume.

7.5 Field Performance and System Audits

The field performance and system audits, if conducted, will be completed as specified in Section 9.0 of the QAPP.

8.0 Record Keeping

The contractor shall maintain field records sufficient to recreate all sampling and measurement activities and to meet all IRPIMS data loading requirements. The requirements listed in this section apply to all measuring and sampling activities. Requirements specific to individual activities are listed in the section that addresses each activity. The information shall be recorded on forms provided in Appendix A of this document with waterproof black indelible ink. These records shall be archived in an easily accessible form and made available to the Air Force upon request.

The following information shall be recorded for all field activities: (1) location, (2) date and time, (3) identity of people performing activity, and (4) weather conditions. For field measurements, the following shall be recorded: (1) the numerical value and units of each measurement, and (2) the identity of and calibration results for each field instrument. The specific records are specified in the QAPP.

The following additional information shall be recorded for all sampling activities: (1) sample type and sampling method, (2) the identity of each sample and depth(s), where applicable, from which it was collected, (3) the amount of each sample, (4) sample description (e.g., color, odor, clarity), (5) identification of sampling devices, and (6) identification of conditions that might affect the representativeness of a sample (e.g., refueling operations, damaged casing).

9.0 References

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APPENDIX A

FIELD FORMS

INTERNATIONAL TECHNOLOGY CORPORATION

New Location Log

Carswell Field D.O. 39 Sanitary Sewer System, NAS Fort Worth, Texas
PROJECT: 768579
AIR FORCE INSTALLATION ID: CRSWL

SITE ID: _____

LOCATION ID: _____

LOCATION CLASSIFICATION: (Circle one) BH-borehole SL-surface location
TP - test pit WL-well NA - not applicable
_____(other)

Geohydrologic Flow Classification (Circle one) : U= Upgradient D=Downgradient C=Crossgradient
O=On Site-within site boundaries B=background

LOCATION PROXIMITY (Circle one): I=Inside Site Boundary O=Outside Site Boundary

ELEVATION: _____

NORTH COORDINATE: _____

EAST COORDINATE: _____

ESTABLISHING COMPANY: ITC

DRILLING COMPANY: _____

CONSTRUCTION METHOD: DT-driven tube HA-hand augered CP - Cone Penetrometer NA-not
(Circle one): applicable B - Bored or Augered SS-Solid Stem Auger HS-Hollow Stem
Auger

EXCAVATING COMPANY: _____

DATE ESTABLISHED: ☐☐/☐☐/☐☐ (Date finished)

DEPTH: _____ (XXXX.XX in Feet)

BORING HOLE DIAMETER: _____(XX.XX in Inches) **Prepared by:**_____

LOCATION DESCRIPTION: _____

INTERNATIONAL TECHNOLOGY CORPORATION

Lithologic Codes Log

Carswell Field D.O. 39 Sanitary Sewer System, NAS Fort Worth, Texas
PROJECT: 768579
AIR FORCE INSTALLATION ID: CRSWL

SITE ID: _____

LOCATION ID: _____ ☐ EXISTING ☐ NEW

Logging Company Code: ITC **Log Date:** ☐☐/☐☐/☐☐ (MM/DD/YR)

Beginning Depth (XXX.XX in feet)	Ending Depth (XXX.XX in feet)	Lithology Code	ASTM Soil Classification Code	Stratigraphic Order	Visual Description

Groundwater Well Development/Purge L g

Carswell Field D.O. 39 Sanitary Sewer System, NAS Fort Worth, Texas
PROJECT: 768579
AIR FORCE INSTALLATION ID: CRSWL

SITE ID: _____ **LOCATION ID:** _____ (Well Number) **Static Water Level:** _____ ft **Sample No.:**_____

Target Purge Volume: _____ gal **WELL DEPTH:** _____ (ft from TOC) **Well Casing Diameter:** _____in. **Total Volatiles (PID):**_____

S/P	Date mmddyy	Time (24hr)	Purge Rate (gal /min)	Water Level (ft)	Volume purged (gal)	Temp °C	pH	Cond. _____	Turbidity (NTU)	Dissolved oxygen (mg/L)	Redox (mV)	Prepared By (init.)	Water Description

KNOXVILLE DATA MANAGEMENT

INTERNATIONAL TECHNOLOGY CORPORATION

Groundwater Elevation Log

Carswell Field D.O. 39 Sanitary Sewer System, NAS Fort Worth, Texas
PROJECT: 768579
AIR FORCE INSTALLATION ID: CRSWL

Site ID	Location ID	Log Date (MM-DD-YY)	Log Time (HHMM)	Depth of Well (xxxx.xx)	Static Depth to Water (xxxx.xx)	Hnu (ppm)

KNOXVILLE DATA MANAGEMENT

INTERNATIONAL TECHNOLOGY CORPORATION

JULY 9,

PAGE _____ OF _____

Field Analysis Log

Carswell Field D.O. 39 Sanitary Sewer System, NAS Fort Worth, Texas
PROJECT: 768579 AF INSTALLATION ID: CRSWL

Site ID	Location ID (Well No.)	Date (mm/dd/yy)	Time (hh:mm)	Sample No.	Ferrous Iron (mg/L)		Sulfide (mg/L)		Carbon Dioxide (mg/L)					
					Result 1	Result 2	Result 1	Result 2	Drops	Test H, M, L	Calc. Result 1	Drops	Test H, M, L	Calc Result 2

FIELD ANALYST: _____ SIGNATURE: _____

513 85

INTERNATIONAL TECHNOLOGY CORPORATION

Soil Sample Collection Log

Carswell Field D.O. 39 Sanitary Sewer System, NAS Fort Worth, Texas
PROJECT: 768579
AIR FORCE INSTALLATION ID: CRSWL

SITE ID: _____

LOCATION ID: _____ SAMPLE #: _____

LOG DATE: ____/____/____ LOG TIME: _____(HHMM)

BEGINNING DEPTH: _____ ENDING DEPTH: _____ LOG CODE: ITC LOCATION CLASS: SL PH BL TP BH

MATRIX: SO SQ SAMPLING METHOD: SS T G HA HP

Enter sample numbers for QA/QC samples associated to this sample:

Matrix Spike (MS): _____ Matrix Spike Dup (SD): _____

Field Dup(FD): _____ Original (N): _____

Material Blank (MB): _____ Trip Blank (TB): _____

Equipment Blank (EB): _____ Ambient Blank (AB): _____

COMMENTS: _____

_____

SAMPLER(S): _____ PREPARED BY: _____

Layout/Site Diagram

---For Data Management Only---

SAMPLE /QC TYPE: _____ LOT CONTROL #: _____

Chain-of-Custody: _____ Air Bill # _____ Ship Date: _____

Checked by : _____ Date: _____ Logged in by: _____ Date: _____

QAed by: _____ Date: _____ Filed by: _____ Date: _____

INTERNATIONAL TECHNOLOGY CORPORATION

Water Sample Collection Log

Carswell Field D.O. 39 Sanitary Sewer System, NAS Fort Worth, Texas
PROJECT: 768579
AIR FORCE INSTALLATION ID: CRSWL

SITE ID: _____

LOCATION ID: _____ **SAMPLE #:** _____

LOG DATE: ____/____/____ **LOG TIME:** _____(HHMM)

BEGINNING DEPTH: _____ **ENDING DEPTH:** _____ **LOG CODE:** ITC **LOCATION CLASS:** WL PH TP SL WW CH

MATRIX: WG WS **SAMPLING METHOD:** B G HP SP

Enter sample numbers for QA/QC samples associated to this sample:

Matrix Spike (MS): _____ Matrix Spike Dup (SD): _____

Field Dup(FD): _____ Original (N): _____

Material Blank (MB): _____ Trip Blank (TB): _____

Equipment Blank (EB): _____ Ambient Blank (AB): _____

COMMENTS: _____

_____

SAMPLER(S): _____ **PREPARED BY:** _____

Layout/Site Diagram

---For Data Management Only---

SAMPLE /QC TYPE: _____ **LOT CONTROL #:** _____

Chain-of-Custody: _____ Air Bill # _____ Ship Date: _____

Checked by : _____ Date: _____ Logged in by: _____ Date: _____

QAed by: _____ Date: _____ Filed by: _____ Date: _____

KNOXVILLE DATA ACQUISITION AND MANAGEMENT DEPARTMENT

29 OCTOBER 1996

INTERNATIONAL TECHNOLOGY CORPORATION

QC Water Sample Collection Log

Carswell Field D.O. 39 Sanitary Sewer System, NAS Fort Worth, Texas
PROJECT: 768579
AIR FORCE INSTALLATION ID: CRSWL

SITE ID: _____

LOCATION ID: _____ SAMPLE #: _____

LOG DATE: ____/____/____ LOG TIME: _____(HHMM)

BEGINNING DEPTH: 0 ENDING DEPTH: 0 LOG CODE: ITC LOCATION CLASS: NA

MATRIX: WQ WH SAMPLING METHOD: NA

Enter sample numbers for QA/QC samples associated to this sample:

Matrix Spike (MS): _____ Matrix Spike Dup (SD): _____

Field Dup(FD): _____ Original (N): _____

Material Blank (MB): _____ Trip Blank (TB): _____

Equipment Blank (EB): _____ Ambient Blank (AB): _____

COMMENTS: _____

_____

SAMPLER(S): _____ PREPARED BY: _____

Layout/Site Diagram

---For Data Management Only---

SAMPLE /QC TYPE: _____ LOT CONTROL #: _____

Chain-of-Custody: _____ Air Bill # _____ Ship Date: _____

Checked by : _____ Date: _____ Logged in by: _____ Date: _____

QAed by: _____ Date: _____ Filed by: _____ Date: _____

KNOXVILLE DATA MANAGEMENT

INTERNATIONAL TECHNOLOGY CORPORATION

JULY 9, 1996

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Field Analysis Log

Carswell Field D.O. 39 Sanitary Sewer System, NAS Fort Worth, Texas
PROJECT: 768579
Soil Sample Analysis by Landtech GA-90

Site ID	Location ID	Date (mm/dd/yy)	Time (hhmm)	SAMPLE NO.	Methane (CH_4)		Carbon Dioxide (CO_2)		Oxygen (O_2)	
					RESULT 1	RESULT 2	RESULT 1	RESULT 2	RESULT 1	RESULT 2

FIELD ANALYST: _____ SIGNATURE: _____

INTERNATIONAL TECHNOLOGY CORPORATION

Well Completion Information

Carswell Field D.O. 39 Sanitary Sewer System, NAS Fort Worth, Texas
PROJECT: 768579

LOCATION ID: _____

DATE INSTALLED: ☐☐/☐☐/☐☐ (MM/DD/YR)

WELL OWNER: USAF _____ (other) WELL TYPE: PZ MNW _____(other)

COMPLETION METHOD: GS S P ____ (other)

GEOLOGIC ZONE: A L C P S ? U W

SOLE SOURCE AQUIFER: NCSA _____ (other)

SEAL END DEPTH: _____ (XXXX.XX in feet) FILTER PACK LENGTH: _____ (XXX.XX in feet)

MEASURING PT ELEVATION (Top of Casing): _____ (XXXXX.XX)

TOTAL CASING DEPTH: _____ (XXX.XX in feet)

CASING INSIDE DIAMETER: _____*Should be smaller than the borehole diameter.

CASING MATERIAL: PVC SLS GLS _____(other)

SCREEN BEGINNING DEPTH: _____ (XXXX.XX is feet)

SCREEN LENGTH: _____ (XXX.XX in feet)

SCREEN SLOT SIZE: _____ (XXX.XX in inches)

SCREEN DIAMETER: _____ (XXX.XX in inches)

PERCENT OPEN AREA: _____ (XX.X)

REMARKS: _____

_____

_____

_____

Prepared By: _____

INTERNATIONAL TECHNOLOGY CORPORATION

VARIANCE LOG
CHRONOLOGICAL LIST OF PROJECT VARIANCES

PROJECT NUMBER _____ PAGE _____ OF _____

PROJECT NAME _____

DATE	VARIANCE GRANTED AND APPLICABLE DOCUMENT	RESPONSIBLE INDIVIDUAL

INTERNATIONAL TECHNOLOGY CORPORATION

VARIANCE FORM

VARIANCE NO. _____

PROJECT NO. _____ PAGE ____ OF ____

PROJECT NAME _____ DATE _____

VARIANCE (INCLUDE JUSTIFICATION)

APPLICABLE DOCUMENT:

CC:

REQUESTED BY _____ DATE _____

APPROVED BY _____ DATE _____
Project Manager

_____ DATE _____
Quality Assurance Officer

INTERNATIONAL TECHNOLOGY CORPORATION

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NONCONFORMANCE REPORT

NCR Number:	Project Name and Number:	Date:	Page_____ of _____

Nonconformance Description (include specific requirement violated):

Identified By: Date:

Root Cause of Nonconforming Condition:

Corrective Action to be Taken (include date when action(s) will completed):

To be Performed By: Anticipated Completion Date:

Action to be Taken to Preclude Recurrence:

To be Performed By: Anticipated Completion Date:

Acceptance By:_____ Date:_____ Acceptance By:_____ Date_____
Project Manager QA Officer

Corrective Actions Completed By and Date:	Verification Completed By and Date:

c:

INTERNATIONAL TECHNOLOGY CORPORATION

FIELD CALIBRATION LOG

Job Name: _____ Job No._____

Checked By: _____ Date: _____ Instrument Source: ☐ IT Equipment ☐ Rental

Date/Time	Instrument Make/Model/Serial #/IT#	Calibrated By	Standard/Manuf./Lot #/ Cal. Method	Instrument Readings	Instrument Settings	Pass/Fail Description	Comments

Resolution for Instrument Failure _____

513 94

513 95

IT TAILGATE SAFETY MEETING

Division/Subsidiary _____ Facility _____

Date _____ Time _____ Job Number _____

Customer _____ Address: _____

Specific Location _____

Type of Work _____

Chemicals Used _____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment _____

Chemical Hazards _____

Physical Hazards _____

Emergency Procedures _____

Hospital / Clinic _____ Phone ( ) _____ Paramedic Phone ( ) _____

Hospital Address _____

Special Equipment _____

Other _____

ATTENDEES

NAME PRINTED	SIGNATURE

Meeting conducted by:

_____ NAME PRINTED _____ SIGNATURE

Supervisor _____ Manager _____

36-8-85

INTERNATIONAL TECHNOLOGY CORPORATION

FIELD ACTIVITY DAILY LOG

	DATE			
	NO.			
	SHEET ___ OF ___			

PROJECT NAME	PROJECT NO.
FIELD ACTIVITY SUBJECT:	
DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:	
VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS.
WEATHER CONDITIONS:	IMPORTANT TELEPHONE CALLS:
IT PERSONNEL ON SITE:	
SIGNATURE	DATE:

INTERNATIONAL TECHNOLOGY CORPORATION

FIELD CALIBRATION LOG

Job Name: _____ Job No._____

Checked By: _____ Date: _____ Instrument Source: ☐ IT Equipment ☐ Rental

Date/Time	Instrument Make/Model/Serial #/IT#	Calibrated By	Standard/Manuf./Lot #/ Cal. Method	Instrument Readings	Instrument Settings	Pass/Fail Description	Comments

Resolution for Instrument Failure _____

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FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE