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FINAL FIELD SAMPLING PLAN FOR SITE CHARACTERIZATION OF SANITARY SEWER SYSTEM NAS FORT WORTH TX

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NAVAL AIR STATION FORT WORTH JRB CARSWELL FIELD TEXAS

ADMINISTRATIVE RECORD COVER SHEET

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HQ Air Force Center for Environmental Excellence

Final
Field Sampling Plan

Prepared for:

Site Characterization of Sanitary Sewer System
Naval Air Station Fort Worth Joint Reserve Base
Carswell Field, Texas

F41624-94-D8047-0039
Project No. 768579

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FINAL
RCRA FACILITIES INVESTIGATION
FIELD SAMPLING PLAN
For
Site Characterization of Sanitary Sewer System

for
Naval Air Station Fort Worth
Fort Worth, Texas
Revision 1, February 1997

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Table of Contents

Section/Page

List of Tables ..... Contents/iv
List of Figures ..... Contents/v
List of Acronyms ..... Contents/vi
1.0 Introduction 1/1
2.0 Project Background 2/1
2.1 The U.S. Air Force Installation Restoration Program 2/1
2.2 Project Purpose and Scope 2/2
2.3 Project Site Description 2/3
2.3.1 Ownership 2/4
2.3.2 Operation 2/4
2.3.3 Results of Previous Site Investigations 2/5
3.0 Project Scope and Objectives 3/1
3.1 Objectives 3/1
3.2 Field Activities 3/1
3.2.1 Surface Soil Samples 3/2
3.2.2 Subsurface Soil Investigation 3/2
3.2.3 Groundwater Investigation Field Procedures 3/4
3.2.4 Surface Water 3/4
3.3 Sampling Frequency and Analysis 3/5
3.3.1 Soils 3/5
3.3.2 Groundwater 3/6
3.3.3 Surface Water Lab Methods 3/6
4.0 Project Organization and Responsibility 4/1
5.0 Field Operations 5/1
5.1 Geologic Standards 5/1
5.2 Site Reconnaissance, Preparation, and Restoration Procedures 5/2
5.3 Geophysical Surveys 5/3
5.4 Soil Gas Surveys 5/3
5.5 Soil Probe Installations, Lithologic Sampling, Logging, and Abandonment 5/3

Table of Contents (Continued)

Section/Page

5.5.1 Soil Probe Borings 5/3
5.5.2 Plugging and Abandonment 5/5
5.6 Monitoring Wells 5/6
5.6.1 Temporary Monitoring Well Installation 5/6
5.6.2 Well/Piezometer Completion Diagrams 5/8
5.6.3 Monitoring Well Development 5/8
5.6.4 Abandoning Monitoring Wells 5/9
5.6.5 Temporary Sampling Device Installation (Optional) 5/9
5.6.6 Temporary Monitoring Well Purging 5/10
5.7 Aquifer Tests 5/10
5.8 Test Pit Excavation 5/10
5.9 Surveying 5/11
5.10 Equipment Decontamination 5/11
5.10.1 Nonsampling Equipment 5/11
5.10.2 Sampling Equipment 5/12
5.11 Waste Handling 5/12
5.12 Hydrogeological Conceptual Model 5/13
6.0 Environmental Sampling 6/1
6.1 Soil Sampling Procedures 6/1
6.1.1 Surface Soil Sampling 6/1
6.1.2 Subsurface Soil Probe Sampling 6/1
6.2 Groundwater Sampling 6/3
6.2.1 Water Level Measurement 6/4
6.2.2 Groundwater Sample Collection 6/4
6.3 Surface Water Sampling 6/7
6.4 Sediment Sampling 6/7
6.5 Soil Gas Sampling 6/7
6.6 Indoor Air Sampling 6/7
6.7 Sample Handling 6/8
6.7.1 Sample Containers 6/8

Table of Contents (Continued)

Section/Page

6.7.2 Sample Volumes, Container Types, and Preservation Requirements 6/8
6.7.3 Sample QA/QC Requirements 6/8
7.0 Field Measurements 7/1
7.1 Parameters 7/1
7.2 Equipment Calibration and Quality Control 7/1
7.3 Equipment Maintenance and Decontamination 7/1
7.4 Field Monitoring Measurements 7/1
7.4.1 Groundwater Level Measurements 7/1
7.4.2 Light or Dense Nonaqueous-Phase Liquid Measurements 7/2
7.4.3 Groundwater Discharge Measurements 7/2
7.5 Field Performance and System Audits 7/2
8.0 Record Keeping 8/1
9.0 References 9/1
Appendix A - Field Forms
Appendix B - Elevation Data

List of Tables

Number	Title	Follows Section/Page
3-1	Summary Table	3/1
3-2	Analytical Soil Boring Samples	3/2
3-3	Analytical Groundwater Samples	3/4
3-4	Analytical Surface Water Samples	3/5
3-5	Biotechnical Laboratory Analysis Table	3/6
3-6	Geotechnical Test and Method Table	3/6
3-7	Field Sampling Test and Method Table	3/6

List of Figures

Number	Title
2-1	Site Location Map
2-2	Sanitary Sewer System RFI, D.O. 39
3-1	Soil Sample Locations (Sheets 2, 3, 5, 6, 8, 9, 10, 11, 12, 14, and 15)
3-2	Groundwater Sampling Locations (Sheets 2, 3, 5, 6, 8, 9, 10, 11, 12, 14, and 15)
3-3	Surface Water Sample Location
4-1	Project Organization Chart
5-1	Lithologic Patterns for Illustration
5-2	Monitoring Well Design

List of Acronyms

3-D	3-dimensional
AFB	Air Force
AFBCA	Air Force Base Conversion Agency
AGE	aerospace ground equipment
AOC	area of concern
ARAR	applicable or relevant and appropriate requirement
ASTM	American Society for Testing and Materials
bgs	below ground surface
CAB	cellulose acetate butyrate
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DEQPPM	Defense Environmental Quality Policy Program Memorandum
DOD	U.S. Department of Defense
DQO	data quality objectives
EPA	U.S. Environmental Protection Agency
FSP	field sampling plan
gal/yr	gallons per year
ID	inside diameter
IRP	Installation Restoration Program
IRPIMS	Installation Restoration Program Information Management System
IT	IT Corporation
JP-4	jet petroleum grade 4
L/min	liters per minute
lb/yr	pounds per year
MEK	methyl ethyl ketone
NAS Fort Worth	Naval Air Station Fort Worth
NCP	National Contingency Plan
NCTCOG	North Central Texas Council of Governments
NDI	nondestructive investigation
NFA	no further action
OWS	oil/water separator

List of Acronyms (Continued)

PCB	polychlorinated biphenyl
PET	preliminary equipment test
PID	photoionization detector
PVC	polyvinyl chloride
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RI/FS	remedial investigation/feasibility study
SAC	Strategic Air Command
SAP	sampling and analysis plan
SARA	Superfund Amendments and Reauthorization Act
SOW	statement of work
SVOC	semivolatile organic compounds
SWMU	solid waste management unit
TCA	trichloroethane
TCE	trichloroethene
USGS	U.S. Geological Survey
VOC	volatile organic compounds

Preface

This field sampling plan (FSP) prepared by IT Corporation (IT) is for site characterization of the sanitary sewer system (solid waste management unit [SWMU] 66), Naval Air Station (NAS) Fort Worth Joint Reserve Base, Carswell Field, Texas (NAS Fort Worth).

The FSP is Part 1 of the sampling and analysis plan (SAP). The quality assurance project plan (QAPP) is Part 2. The interim draft Basewide QAPP (CH2M Hill, 1996) is supplemented by the draft QAPP for the sanitary sewer system for NAS Fort Worth. The FSP includes sample locations, sampling frequency, and analytical methods; also, a detailed description of the field methods; and a detailed description of the analytical methods.

Work under this FSP will include investigation of potentially contaminated soil and groundwater along the length of the sanitary sewer system. The data will be collected at both industrial and residential areas of NAS Fort Worth. The data will be used to prepare a RCRA Facility Investigation (RFI) report of the sanitary sewer system that will include a baseline risk assessment of the sanitary sewer system.

TAB

1.0

1.0 Introduction

This field sampling plan (FSP) is for site characterization of the sanitary sewer system (solid waste management unit [SWMU] No. 66), Naval Air Station Fort Worth Joint Reserve Base, Carswell Field, Texas (NAS Fort Worth).

The FSP presents, in specific terms, the requirements and procedures for conducting the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI). This project-specific FSP has been prepared to ensure (1) the data quality objectives specified for this project in the work plan are met, (2) the field sampling protocols are documented and reviewed in a consistent manner, and (3) the data collected are scientifically valid and defensible. This site-specific FSP and the quality assurance project plan (QAPP), shall constitute, by definition, a sampling and analysis plan (SAP), with the FSP as Part 1 and the QAPP as Part 2.

The National Contingency Plan (NCP) specifies circumstances under which an FSP is necessary for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response actions. For cleanup actions at the remedial investigation/feasibility study (RI/FS) stage, the NCP requires lead agents to develop SAPs that provide a process for obtaining data of sufficient quality and quantity to satisfy data needs. Such SAPs must include an FSP (Title 40 Code of Federal Regulations [CFR] Part 300.430 [b][8][ii]).

Guidelines followed in the preparation of this plan are set out in the *Data Quality Objectives Process for Superfund, Interim Final Guidance* (EPA, 1993). This FSP is to be used in conjunction with the work plan, QAPP, and health and safety plan for investigations at NAS Fort Worth.

This FSP is required reading for all staff participating in the work effort. The FSP shall be in the possession of the field teams collecting the samples. All contractors and subcontractors shall be required to comply with the procedures documented in this FSP, which are applicable to their respective statements of work (SOW). This will assure that they maintain comparability and representativeness of the collected and generated data. In all instances where "contractor" is specified, this will mean "IT." Subcontracts executed during the production of this work will be

identified as part of the project reporting and the applicable requirements of this FSP will be communicated to their personnel.

Copies of this FSP shall be provided to applicable Air Force managers, regulatory agencies, remedial project managers, project managers, and quality assurance (QA) coordinators. Whenever Air Force revisions are made or addenda added to this FSP, actions shall be taken to ensure (1) all parties receive the current copy of the FSP with revisions/addenda and (2) outdated material is removed from circulation. The distribution list for FSP copies shall be maintained by the contractor.

TAB

2.0

2.0 Project Background

2.1 The U.S. Air Force Installation Restoration Program

The objective of the U.S. Air Force Installation Restoration Program (IRP) is to assess past hazardous waste disposal and spill sites at U.S. Air Force installations and to develop remedial actions consistent with the NCP for sites that pose a threat to human health and welfare or the environment. This section presents information on the program origins, objectives, and organization. The actions under this FSP are governed by RCRA.

RCRA is one of the primary federal laws governing the disposal of hazardous wastes. Sections 6001 and 6003 of RCRA require federal agencies to comply with local and state environmental regulations and provide information to the U.S. Environmental Protection Agency (EPA) concerning past disposal practices at federal sites. RCRA Section 3012 requires state agencies to inventory past hazardous waste disposal sites and provide information to the EPA concerning those sites.

In 1980, Congress enacted CERCLA (Superfund). CERCLA outlines the responsibility for identifying and remediating contaminated sites in the United States and its possessions. The CERCLA legislation identifies the EPA as the primary policy and enforcement agency regarding contaminated sites.

The 1986 Superfund Amendments and Reauthorization Act (SARA) extends the requirements of CERCLA and modifies CERCLA with respect to goals for remediation and the steps that lead to the selection of a remedial process. Under SARA, technologies that provide permanent removal or destruction of a contaminant are preferable to action that only contains or isolates the contaminant. SARA also provides for greater interaction with public and state agencies and extends the EPA's role in evaluating health risks associated with contamination. Under SARA, early determination of applicable or relevant and appropriate requirements (ARAR) is required, and the consideration of potential remediation alternatives is recommended at the initiation of an RI/FS. SARA is the primary legislation governing remedial action at past hazardous waste disposal sites.

Executive Order 12580, adopted in 1987, gave various federal agencies, including the Department of Defense (DOD), the responsibility to act as lead agencies for conducting investigations and implementing remediation efforts when they are the sole or co-contributor to contamination on or off their properties.

To ensure compliance with CERCLA, its regulations, and Executive Order 12580, the DOD developed the IRP, under the Defense Environmental Restoration Program, to identify potentially contaminated sites, investigate these sites, and evaluate and select remedial actions for potentially contaminated facilities. The DOD issued the Defense Environmental Quality Program Policy Memorandum (DEQPPM) 80-6 regarding the IRP program in June 1980, and implemented the policies outlined in this memorandum in December 1980. The NCP was issued by EPA in 1980 to provide guidance on a process by which (1) contaminant release could be reported, (2) contamination could be identified and quantified, and (3) remedial actions could be selected. The NCP describes the responsibility of federal and state governments and those responsible for contaminant releases.

The DOD formally revised and expanded the existing IRP directives and amplified all previous directives and memoranda concerning the IRP through DEQPPM 81-5, dated December 11, 1981. The memorandum was implemented by a U.S. Air Force message dated January 21, 1982.

The IRP is the DOD's primary mechanism for response actions on U.S. Air Force installations affected by the provisions of SARA. In November 1986, in response to SARA and other EPA interim guidance, the U.S. Air Force modified the IRP to provide for an RI/FS program. The IRP was modified so that RI/FS studies could be conducted as parallel activities rather than serial activities. The program now includes ARAR determinations, identification and screening of technologies, and development of alternatives. The IRP may include multiple field activities and pilot studies prior to a detailed final analysis of alternatives. Over the years, requirements of the IRP have been developed and modified to ensure that DOD compliance with federal laws, such as RCRA, NCP, CERCLA, and SARA, can be met.

2.2 Project Purpose And Scope

The purpose and scope of the field sampling for the sanitary sewer system are to:

- Characterize the nature and extent of any soil and groundwater contamination resultant from the historic use of the sanitary sewer system.

- Obtain data necessary to adequately assess the sanitary sewer system. The data is to be sufficient to characterize the environmental conditions of site groundwater and subsurface soil.

- Determine if the sanitary sewer system is acting as a conduit for migration of contaminants from areas of known hazardous waste operations, industrial operations, and/or areas of known contamination.

- Obtain necessary data needed for risk-based assessment and to determine if a threat to human health exists.

- Obtain necessary data needed to prepare an interim corrective measures work plan for the sanitary sewer system that identifies and evaluates candidate technologies if warranted.

- Acquire analytical data needed to validate data and/or fill any potential data gaps from previous investigations.

- Allow for site closure so that affected property might be transferred.

2.3 Project Site Description

NAS Fort Worth is located in north-central Texas in Tarrant County, 8 miles west of downtown Fort Worth (Figure 2-1). The Base property, totaling 2,555 acres, consists of the main Base and two, noncontiguous parcels. The main Base comprises 2,264 acres and is bordered by Lake Worth to the north, the West Fork of the Trinity River and Westworth Village to the east, Fort Worth to the northeast and southeast, White Settlement to the west and southwest, and Air Force Plant No. 4 to the west. The area surrounding NAS Fort Worth is mostly suburban, including the residential areas of the cities of Fort Worth, Westworth Village, and White Settlement. The Base was home to Carswell Air Force Base prior to realignment to NAS Fort Worth in 1991.

The sanitary sewer system is networked throughout the facility, primarily in the areas that are developed for industrial and residential purposes (Figure 2-2).

2.3.1 Ownership

The facility known as NAS Fort Worth was originally a modest dirt runway built to service an aircraft manufacturing plant located where Air Force Plant No. 4 is now located. When it was established in 1942, the installation was referred to as the Tarrant Field Airdrome and was originally under the jurisdiction of the Gulf Coast Army Air Field Training Command. The Strategic Air Command (SAC) assumed control of the installation in 1946 and the Base served as headquarters of the Eighth Air Force. At that time, the 7th Bomber Wing became the Base host unit. The Base was renamed Carswell Air Force Base (AFB) in 1948 in honor of Fort Worth native, Major Horace S. Carswell.

In 1951, Headquarters 19 Air Division was located at Carswell AFB, where it remained until September 1988. The Air Combat Command assumed control of the Base in 1992 with the disestablishment of SAC. On October 1, 1994, the US Navy assumed responsibility for the facility and the name changed from Carswell AFB to Naval Air Station Fort Worth Joint Reserve Base, referred to in this document as NAS Fort Worth.

The Air Force Base Conversion Agency (AFBCA) is currently the on-site responsible party for IRP sites and the RCRA Part B permit holder for SWMUs. The AFBCA operating location is tasked with coordinating closure activities, maintaining a caretaker force, and serving as an Air Force liaison supporting Base property disposal and interim leases. AFBCA will remain the on-site responsible party for areas outside the 301 Tactical Fighter Wing area until the disposal of all Base properties is complete (Jacobs Engineering, 1995).

2.3.2 Operation

Before the construction of the initial airfield facilities in 1942, the area now occupied by NAS Fort Worth was pasture land and woods. The majority of the Base 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 south Base residential areas were acquired in 1960. Several miscellaneous additional properties totaling less than 10 acres have been acquired since 1970 (Jacobs Engineering, 1995).

After 1941, the former Carswell AFB mission was as a bomber training base. Wastes have been generated and disposed of at NAS Fort Worth since the beginning of industrial operations in

1942. The major industrial operations at NAS Fort Worth included maintenance of jet engines, aerospace ground equipment, fuel systems, weapons systems, and hydraulic systems; maintenance of general and special purpose vehicles; aircraft corrosion control; and nondestructive inspection activities (Jacobs Engineering, 1995).

Waste oils generally refer to lubricating fluids, such as crankcase oils and synthetic turbine oils. Hydraulic fluids have also been included in this category. Recoverable fuels refer to fuel drained from aircraft tanks and vehicles, such as jet petroleum grade 4 (JP-4) and MOGAS (gasoline). Spent solvents and cleaners refer 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 carbon tetrachloride, trichloroethylene (TCE), and 1,1,1-trichloroethane (TCA).

Waste paint solvents or thinners and strippers are generated by corrosion control activities. Typical thinners include isobutyl acetate, toluene, methyl ethyl ketone (MEK), 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 Base, reused on Base, or processed through the Defense Property Disposal Office. An undetermined amount of these materials were discharged to the sanitary sewer system at the Base (Jacobs Engineering, 1995).

2.3.3 Results of Previous Site Investigations

In 1984, the IRP was initiated at NAS Fort Worth and began with a program records search conducted by CH2M Hill, Inc. Since 1984, Air Force IRP studies have been conducted by several contractors, and have focused on the identification and characterization of waste disposal areas and SWMUs identified in the installation's RCRA Part B permit.

The sanitary sewer system was designated as SWMU 66 in a RCRA Facility Assessment (RFA) report by U.S. Environmental Protection Agency (EPA) (A.T. Kearney, 1989). The RFA reported the sanitary sewer system collects sanitary wastewater as well as some industrial wastewater from Base facilities, including the Visual Information Center Work Station Waste

Accumulation Areas (SWMU No. 13). The report indicated that other industrial activities that discharged waste to the sanitary sewer system include:

- Aerospace ground equipment (AGE) maintenance shop at Building 1414 (1,800 pounds per year [lb/yr] aircraft soap)
- Battery shop at Building 1410 (500 gallons per year [gal/yr] of neutralized electrolyte)
- Fuel systems shop at Building 1048 (300 gal/yr of JP-4)
- Nondestructive investigation (NDI) laboratory at Building 1414 (500 gal/yr of film development chemicals)
- Jet engine test cell at Building 1015 (350 gal/yr of JP-4, 225 gal/yr of oil and hydraulic fluid)
- Wash rack at Building 29 (15,000 gal/yr of PD-680, 5,000 gal/yr of aircraft soap)
- AGE maintenance shop at Building 1628 (100 gal/yr of PD680)
- Wash rack at Building 18 (9,000 gal/yr of PD 680, 3,100 gal/yr of aircraft soap).

The wastewater collected by the sanitary sewer system is discharged into the City of Fort Worth publicly-owned treatment works. The sanitary sewer system has been in operation since the Base was activated in 1942.

NAS Fort Worth currently has 19 IRP sites. A Phase I records search conducted in 1984 identified 15 sites requiring further evaluation. Subsequent IRP investigations and other Base activities have identified an additional four sites. Thirteen of these sites are also RCRA SWMUs (Jacob Engineering, 1995).

An investigation of 11 oil/water separators (OWS) at the Base was performed to assess contamination at the OWS and evaluate the condition and future use of the OWSs. The report indicated that two of the OWSs, and located at Building 1015 (SWMU 47) and another at Building 1194 (SWMU 35), were connected to the sanitary sewer system. The OWS at Building 1064 was reported to be connected to the storm sewer system and the OWS at Building 38 was connected to a french drain and discharged to an unnamed stream (area of concern [AOC] No.

14). The discharge connections of the remaining seven OWSs have not been investigated or were not reported (Law Environmental, Inc., 1995). An investigation of the sanitary sewer system in 1994 indicated that most of the OWS at the NAS Fort Worth discharged effluent through the sanitary sewer system (Carter and Burgess, 1994). Of the 21 OWSs connected to the sanitary sewer system at NAS Fort Worth, 5 OWSs have been submitted for no further action (NFA) status with Texas Natural Resources Conservation Commission. NFA status will be achieved for the five OWSs after completion of a pending background study for metal concentration in soil. These OWSs are located at Buildings 1060, 1064, 1145, 1643, and 4210 (CH2M Hill, 1996).

Shallow and deep soil samples were collected at the 11 OWSs and analyzed for volatile organic compounds (VOC) by EPA Method SW8240 and RCRA metals (except mercury) by EPA Method SW6010/7000. No analysis for semivolatile organic compounds (SVOC) were performed. No groundwater samples were collected during a Law Environmental investigation.

None of the soil samples analyzed contained VOCs above Texas Risk Reduction Standards. Soil in the immediate area of each of the 11 OWSs had metals concentrations greater than Texas Risk Reduction Standards, based on the limited background data (Law Environmental, Inc., 1995).

TAB

3.0

3.0 Project Scope and Objectives

3.1 Objectives

The data quality objectives (DQO) for this FSP are specified in the work plan and Section 4.0 of the QAPP (CH2M Hill, 1996). Actions to meet the DQOs for the investigation of the sanitary sewer system will include: (1) screening of soil to select data points for potential placement of groundwater monitoring wells; (2) collecting definitive data to determine the nature and extent of contamination in soil and groundwater resulting from historical operations of the sanitary sewer system; and (3) conducting an ecological and human health risk assessment. The data will also be adequate to guide a subsequent remediation, if warranted.

The number of samples, sample types, and their locations have been established to satisfy the stated objective and determine contaminant transport via the sanitary sewer system from areas of known industrial activities. Sample locations have also been selected in the residential areas to verify the absence of contaminants greater than background levels so that residential areas can be cleared for property transfer. A summary of the number and types of samples collected are shown on Table 3-1.

3.2 Field Activities

Field activities will require that the specific location of the sanitary sewer lines and offsets be identified before any investigation begins. The areas of investigation will be subdivided into residential, which includes southwest housing, the north-south area and west housing with prison hospital area, and industrial, which includes all other areas. The sequence of field activities will be as follows: (1) locate and mark, as required, sanitary sewer lines, manholes, and other features (OWSs and surface water), (2) the NAS Fort Worth personnel will be requested to complete utility clearance of all lines before investigated, (3) the surface/near surface soil investigations will be initiated, (4) subsurface soil sampling via Geoprobe will be completed, (5) geotechnical and biotechnical samples will be collected, and finally (6) groundwater samples from permanent groundwater monitoring wells will be collected. Field forms that may be used during the investigation are presented in Appendix A.

Table 3-1

Summary Table of all Soil and Water[a] Samples, Sanitary Sewer RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

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	424	42	21	21	2	30	60	600	
		Water	44	4	2	2	2	20	20	94	
		Combined									694
Semivolatiles	SW8270	Soil	464	46	23	23	2	30	0	588	
		Water	44	4	2	2	2	20	0	74	
		Combined									662
RCRA Metals	SW6010/7000	Soil	424	42	21	21	2	30	0	540	
		Water	44	4	2	2	2	20	0	74	
		Combined									614
Pest/PCB[b]	SW8080	Soil	262	26	13	13	2	30	0	346	
		Water	0	0	0	0	0	0	0	0	
		Combined									346
Nitrate[c]	EPA 300.0	Water	14	1	1	1	2	5	0	24	24
Sulfate[c]	EPA 300.0	Water	14	1	1	1	2	5	0	24	24
TDS	EPA 160.1	Water	14	1	0	0	0	0	0	15	15
Volatiles[d]	SW8240 (48 hr. TAT)	Soil	60	6	3	3	2	30	30	134	134
TPH-Gasoline[e]	SW8015M (48 hr. TAT)	Soil	60	6	3	3	2	30	0	104	104
TPH-Jet Fuel[f]	SW8015M (48 hr. TAT)	Soil	60	6	3	3	2	30	0	104	104
RCRA Metals	SW6010/7000 (48 hr. TAT)	Soil	43	4	2	2	2	30	0	83	83
Biotechnical	See Table 3-5	Soil	12	1	0	0	1	1	0	15	
		Water	10	1	0	0	1	1	0	13	
		Combined									28
Geotechnical	See Table 3-6	Soil	12	0	0	0	0	0	0	12	12
Field Parameters	See Table 3-7	Soil	10	1	0	0	0	0	0	11	
		Water	14	1	0	0	0	0	0	15	
		Combined									26

[a] Groundwater and surface water.

[b] Pest/PCB QC water samples collected in 1 liter glass, no preservative (hold time = 7 day preext., 40 day postext.)

[c] Nitrate and Sulfate to be collected in the same bottle

[d] Volatile QC water samples: collected in 3 * 40 ml glass amber vials, preserved in HCL with 14 day hold time

[e] TPH Gasoline QC water samples: collected in 3 * 40 ml glass amber vials, preserved in HCL with 14 day hold time

[f] TPH- Jet Fuel QC water samples: collected in 2 * 1 liter glass amber, no preser. with 7 day hold time

3.2.1 Surface Soil Samples

Surface soil samples (0 to 2 foot below ground surface [bgs]) will be collected to evaluate potential surface contamination. Approximately 129 surface soil samples will be collected. The surface soil samples will be collected at selected sanitary sewer system manholes and OWS locations at residential and industrial areas to confirm if there have been any contaminant releases from the sanitary sewer to near surface soils. Surface soil samples will be collected at selected subsurface soil sample locations to determine if the sanitary sewer effluent has impacted near surface soils. Manholes along the sanitary sewer system and OWSs have been selected as locations where there is a higher potential of a surface release of effluent from the sanitary sewer system and OWSs. At OWS locations, a surface soil sample will be collected prior to a subsurface soil sample to determine distribution of contaminants and identify concentrations for exposure pathway assessment. Soil sample locations at OWSs have been selected to collect soil samples along the side of the OWS that is accessible to sampling equipment. Where previous investigation of OWS soils has occurred, soil samples will only be collected to fill data gaps. The surface and subsurface soil samples will be collected at the same time during the sampling event.

The number and analytical parameters of the surface soil sample locations are shown in Table 3-2. The surface soil samples will be collected at locations as indicated in Table 3-2 where two field samples are to be collected at the same locations (see third column of Table 3-2). All sample locations are shown in Figure 3-1, Sheets 2, 3, 5, 6, 8, 9, 10, 11, 12, 14, and 15. See Section 6.1 for environmental sampling techniques.

3.2.2 Subsurface Soil Investigation

Soil borings will be installed along the sanitary sewer system by direct-push soil probe methods. Sample depth will depend on whether there is a known groundwater plume below the location being sampled. If there is a known plume, the sample will be collected 2 feet above the groundwater table. If there is no known plume, the sample will be collected immediately above the groundwater table. The elevation of the groundwater table will be calculated based on historic and seasonal data. Invert elevations and groundwater elevation at specific manhole locations are presented in Appendix B. Subsurface soil sampling locations are shown on Figure 3-1. The analytical parameters specified for each subsurface soil sample is shown on Table 3-2.

Table 3-2
Analytical Soil Boring Samples
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

Analysis				VOA by SW8260	SVOA by SW8270	RCRA Metals by SW6010/7000	Pest/PCB by SW8080	Volatiles by SW8240 (48 hour TAT)	TPH -Gasoline by SW8015M (48 hour TAT)	TPH-Jet Fuel by SW8015M (48 hour TAT)	RCRA Metals by SW6010/7000 (48 hour TAT)	Biotechnical Analysis (See Table 3-5)	Geotechnical Analysis (See Table 3-5)	Field Parameters (See Table 3-7)
Location	Map Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Preservative/ Container:	None, 4°C Sample Tube	None, < 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C , Sample Tube	None, 4°C, Sample Tube	
			Holding Time:	14 Days	7 Days preext. 40 days postext	180 Days	14 Days preext./ 40 days postext.	14 Days	14 Days	14 Days	180 Days		None	
SUBSURFACE SAMPLES														
MH3	3	1		X	X	X								
425W	4	1		X	X	X								
MH4	4	1		X	X	X	X							
525W	5	1		X	X	X								
MH5	5	1		X	X	X	X							
625W	6	1		X	X	X								
MH7	7	1		X	X	X								
825W	8	1		X	X	X								
MH8	8	1		X	X	X								
925W	9	1		X	X	X								
MH9	9	1		X	X	X	X							
1025N	10	1		X	X	X	X							
MH10	10	1		X	X	X								
1125W	11	1		X	X	X								
MH11	11	1		X	X	X	X							
1225N	12	1		X	X	X								
MH12	12	1		X	X	X								
MH13	13	1		X	X	X	X							
1425N	14	1		X	X	X								
MH14	14	1		X	X	X								
MH15	15	1		X	X	X	X							
MH16	16	1		X	X	X								
MH17	17	1		X	X	X								
MH18	18	1		X	X	X	X							
MH25	25	1		X	X	X	X							
MH35	35	1		X	X	X	X							
MH40	40	1		X	X	X								
4125S	41	1		X	X	X								
4225W	42	1		X	X	X								
MH41	41	1		X	X	X	X							
MH42	42	1		X	X	X								
MH44	44	1		X	X	X	X							
MH45	45	1		X	X	X								
MH46	46	1		X	X	X								
MH47	47	1		X	X	X								
4825N	48	1		X	X	X								
MH49	49	1		X	X	X	X							
5025E	50	1		X	X	X								
MH50	50	1		X	X	X								
MH51	51	1		X	X	X	X							
5225N	52	1		X	X	X								
MH52	52	1		X	X	X								
5325N	53	1		X	X	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 3-2
Analytical Soil Boring Samples
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

Analysis				VOA by SW8260	SVOA by SW8270	RCRA Metals by SW6010/7000	Pest/PCB by SW8080	Volatiles by SW8240 (48 hour TAT)	TPH -Gasoline by SW8015M (48 hour TAT)	TPH-Jet Fuel by SW8015M (48 hour TAT)	RCRA Metals by SW6010/7000 (48 hour TAT)	Biotechnical Analysis (See Table 3-6)	Geotechnical Analysis (See Table 3-6)	Field Parameters (See Table 3-7)
Location	Map Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Preservative/ Container:	None, 4°C Sample Tube	None, < 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C , Sample Tube	None, 4°C, Sample Tube	
			Holding Time:	14 Days	7 Days preext. 40 days postext	180 Days	14 Days preext./ 40 days postext.	14 Days	14 Days	14 Days	180 Days		None	
SUBSURFACE SAMPLES														
MH53	53	1		X	X	X	X							
MH54	54	1		X	X	X								
5525W	55	1		X	X	X								
MH55	55	1		X	X	X								
MH56	56	1		X	X	X	X							
5725S	57	1		X	X	X								
MH57	57	1		X	X	X								
MH58	58	1		X	X	X								
5925S	59	1		X	X	X								
MH59	59	1		X	X	X								
6025S	60	1		X	X	X								
MH60	60	1		X	X	X								
6125S	61	1		X	X	X								
MH61	61	1		X	X	X								
MH62	62	1		X	X	X								
MH64	64	1		X	X	X	X							
MH67	67	1		X	X	X	X							
MH70	70	1		X	X	X	X							
MH73	73	1		X	X	X	X							
MH74	74	1		X	X	X								
7525N	75	1		X	X	X								
MH75	75	1		X	X	X	X							
MH76	76	1		X	X	X								
MH77	77	1		X	X	X								
7825N	78	1		X	X	X								
MH78	78	1		X	X	X								
8025N	80	1		X	X	X								
MH79	79	1		X	X	X	X							
MH80	80	1		X	X	X								
11A25W	11A	1		X	X	X	X							
MH11A	11A	1		X	X	X								
11B25N	11B	1		X	X	X								
MH11B	11B	1		X	X	X								
11C25N	11C	1		X	X	X								
MH11C	11C	1		X	X	X								
11D25W	11D	1		X	X	X								
MH11D	11D	1		X	X	X								
MH11D1	11D1	1		X	X	X	X							
MH11D2	11D2	1		X	X	X								
MH11D3	11D3	1		X	X	X								
11D425W	11D4	1		X	X	X								
MH11D4	11D4	1		X	X	X								
11D525N	11D5	1		X	X	X								

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Location	Map Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Preservative/ Container:	None, 4°C Sample Tube	None, < 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C , Sample Tube	None, 4°C, Sample Tube	
			Holding Time:	14 Days	7 Days preext. 40 days postext	180 Days	14 Days preext./ 40 days postext.	14 Days	14 Days	14 Days	180 Days		None	
SUBSURFACE SAMPLES														
MH11D5	11D5	1		X	X	X								
MH11D6	11D6	1		X	X	X								
11D725N	11D7	1		X	X	X								
MH11D7	11D7	1		X	X	X								
MH11D8	11D8	1		X	X	X								
11E25N	11E	1		X	X	X								
MH11E	11E	1		X	X	X								
11F25N	11F	1		X	X	X								
MH11F	11F	1		X	X	X	X							
MH11G	11G	1		X	X	X								
11H25N	11H	1		X	X	X	X							
MH11H	11H	1		X	X	X								
11I25W	11I	1		X	X	X								
MH11I	11I	1		X	X	X								
11J25W	11J	1		X	X	X								
MH11J	11J	1		X	X	X	X							
11L25S	11L	1		X	X	X	X							
MH11L	11L	1		X	X	X	X							
MH13A	13A	1		X	X	X								
MH13A1	13A1	1		X	X	X								
13A225S	13A2	1		X	X	X								
MH13A2	13A2	1		X	X	X	X							
MH13A3	13A3	1		X	X	X								
MH13B	13B	1		X	X	X								
13C25W	13C	1		X	X	X								
MH13C	13C	1		X	X	X								
MH13D	13D	1		X	X	X								
MH13E	13E	1		X	X	X	X							
MH15A	15A	1		X	X	X								
15B25W	15B	1		X	X	X	X							
MH15B	15B	1		X	X	X								
15C25N	15C	1		X	X	X								
MH15C	15C	1		X	X	X								
15D25W	15D	1		X	X	X								
MH15D	15D	1		X	X	X	X							
15D125E	15D1	1		X	X	X								
MH15D1	15D1	1		X	X	X								
MH15D2	15D2	1		X	X	X								
15E25N	15E	1		X	X	X								
MH15E	15E	1		X	X	X								
MH15E10	15E10	1		X	X	X	X							
15E1125W	15E11	1		X	X	X								
MH15E11	15E11	1		X	X	X								

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Location	Map Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Preservative/ Container:	None, 4°C Sample Tube	None, < 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C , Sample Tube	None, 4°C, Sample Tube	
			Holding Time:	14 Days	7 Days preext. 40 days postext	180 Days	14 Days preext./ 40 days postext.	14 Days	14 Days	14 Days	180 Days		None	
SUBSURFACE SAMPLES														
MH15E12	15E12	1		X	X	X	X							
MH15E13	15E13	1		X	X	X								
15E1325E	15E13	1		X	X	X								
MH15E2	15E2	1		X	X	X								
MH15E3	15E3	1		X	X	X								
15E425S	15E4	1		X	X	X	X							
MH15E4	15E4	1		X	X	X								
MH15E4A	15E4A	1		X	X	X								
MH15E5	15E5	1		X	X	X								
MH15E6	15E6	1		X	X	X	X							
MH15E7	15E7	1		X	X	X								
MH15E7A	15E7A	1		X	X	X								
MH15E7B	15E7B	1		X	X	X								
MH15E8	15E8	1		X	X	X								
MH15F	15F	1		X	X	X								
15G25W	15G	1		X	X	X								
MH15G	15G	1		X	X	X								
15G125N	15G1	1		X	X	X								
15G125W	15G1	1		X	X	X	X							
MH15G1	15G1	1		X	X	X								
MH15G1A	15G1A	1		X	X	X								
MH15G2	15G2	1		X	X	X	X							
15G225W	15G2	1		X	X	X								
15G325W	15G3	1		X	X	X								
MH15G3	15G3	1		X	X	X								
15H25N	15H	1		X	X	X								
MH15H	15H	1		X	X	X								
MH15I	15I	1		X	X	X								
MH15J	15J	1		X	X	X	X							
MH15J1	15J1	1		X	X	X								
MH15J2	15J2	1		X	X	X								
MH15J3	15J3	1		X	X	X								
MH15J4	15J4	1		X	X	X	X							
MH15J5	15J5	1		X	X	X								
15J625N	15J6	1		X	X	X								
MH15J6	15J6	1		X	X	X	X							
MH15K	15K	1		X	X	X								
MH15L	15L	1		X	X	X	X							
15M25N	15M	1		X	X	X	X							
15N25N	15N	1		X	X	X								
MH15N	15N	1		X	X	X								
MH15O	15O	1		X	X	X	X							
MH15P	15P	1		X	X	X								

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			Holding Time:	14 Days	7 Days preext. 40 days postext	180 Days	14 Days preext./ 40 days postext.	14 Days	14 Days	14 Days	180 Days		None	
SUBSURFACE SAMPLES														
15Q25N1	15Q	1		X	X	X								
15Q25N2	15Q	1		X	X	X								
15Q25N3	15Q	1		X	X	X								
15Q25N4	15Q	1		X	X	X								
MH15Q	15Q	1		X	X	X	X							
MH15R	15R	1		X	X	X								
MH15S	15S	1		X	X	X	X							
MH15S1	15S1	1		X	X	X								
MH15T	15T	1		X	X	X								
MH15U	15U	1		X	X	X	X							
15V25N	15V	1		X	X	X								
MH15V	15V	1		X	X	X								
MH15W	15W	1		X	X	X								
MH18A	"18A"	1		X	X	X								
MH19-1	19-1	1		X	X	X	X							
MH25B	25B	1		X	X	X	X							
MH26A	26A	1		X	X	X	X							
MH4A	4A	1		X	X	X								
MH4B	4B	1		X	X	X								
MH4C	4C	1		X	X	X	X							
MHAC1	4C1	1		X	X	X								
MH4D	4D	1		X	X	X								
MH4E	4E	1		X	X	X								
8A25W	8A	1		X	X	X								
8C25W	8C	1		X	X	X	X							
MH8A	8A	1		X	X	X								
9B25W	9B	1		X	X	X								
MH9B	9B	1		X	X	X								
MH9C	9C	1		X	X	X	X							
MHB10	B10	1		X	X	X								
B1125N	B11	1		X	X	X	X							
MHB11	B11	1		X	X	X								
B11A25W	B11A	1		X	X	X								
MHB11A	B11A	1		X	X	X								
MHB12	B12	1		X	X	X	X							
B1325W	B13	1		X	X	X								
MHB13	B13	1		X	X	X								
B1425W	B14	1		X	X	X	X							
MHB14	B14	1		X	X	X								
MHB15	B15	1		X	X	X	X							
B15A25W	B15A	1		X	X	X	X							
BD15A25W	B15A	1		X	X	X								
BD15A25W2	B15A	1		X	X	X								

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			Holding Time:	14 Days	7 Days preext. 40 days postext	180 Days	14 Days preext./ 40 days postext.	14 Days	14 Days	14 Days	180 Days		None	
SUBSURFACE SAMPLES														
MHB15A	B15A	1		X	X	X	X							
MHB16	B16	1		X	X	X								
MHB2	B2	1		X	X	X								
B325N	B3	1		X	X	X								
B325W	B3	1		X	X	X								
MHB3	B3	1		X	X	X								
B3A25W	B3A	1		X	X	X								
MHB3B	B3B	1		X	X	X								
MHB3C	B3C	1		X	X	X								
B3D25W	B3D	1		X	X	X								
MHB3D	B3D	1		X	X	X	X							
MHB3E	B3E	1		X	X	X	X							
MHB3F	B3F	1		X	X	X								
MHB3G	B3G	1		X	X	X								
MHB3H	B3H	1		X	X	X	X							
B425N	B4	1		X	X	X								
B425W	B4	1		X	X	X								
MHB4	B4	1		X	X	X	X							
MHB4A	B4A	1		X	X	X								
MHB4B	B4B	1		X	X	X								
MHB5	B5	1		X	X	X								
BD625W	B6	1		X	X	X								
MHB6	B6	1		X	X	X	X							
MHB6A	B6A	1		X	X	X								
MHB6A1	B6A1	1		X	X	X								
B6B25E	B6B	1		X	X	X								
B6B25N	B6B	1		X	X	X								
MHB6B	B6B	1		X	X	X								
B6C25N	B6C	1		X	X	X								
MHB6C	B6C	1		X	X	X	X							
MHB6D	B6D	1		X	X	X								
MHB6D1	B6D1	1		X	X	X	X							
B7A25W	B7	1		X	X	X								
MHB7	B7	1		X	X	X								
B7A225N	B7A2	1		X	X	X								
MHB7A1	B7A1	1		X	X	X								
MHB7A2	B7A2	1		X	X	X								
MHB7B	B7B	1		X	X	X								
MHB7C	B7C	1		X	X	X								
MHB7D	B7D	1		X	X	X	X							
MHB7E	B7E	1		X	X	X	X							
B825W	B8	1		X	X	X	X							

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			Holding Time:	14 Days	7 Days preext. 40 days postext	180 Days	14 Days preext./ 40 days postext.	14 Days	14 Days	14 Days	180 Days		None	
SUBSURFACE SAMPLES														
MHB8	B8	1		X	X	X	X							
B925N	B9	1		X	X	X								
MHB9	B9	1		X	X	X	X							
MHB9A	B9A	1		X	X	X								
CFWB1	CFWB1	1		X	X	X	X							
CFWD1	CFWD1	1		X	X	X								
CFWD5	CFWD5	1		X	X	X								
CFWM1	CFWM1	1		X	X	X								
CFWP1	CFWP1	1		X	X	X	X							
CFWQ	CFWQ	1		X	X	X	X							
CFWS	CFWS	1		X	X	X								
MHE1	E1	1		X	X	X	X							
MHE3A	E3A	1		X	X	X	X							
SB101501	BLDG1015	1			X		X							
SB101502	BLDG1015	1			X		X							
SB102701	BLDG1027	1			X		X							
SB102702	BLDG1027	1			X		X							
SB106401	BLDG1064	1			X		X							
SB106402	BLDG1064	1			X		X							
SB106001	BLDG1060	1			X		X							
SB106002	BLDG1060	1			X		X							
SB421001	BLDG4210	1			X		X							
SB421002	BLDG4210	1			X		X							
SB114501	BLDG1145	1			X		X							
SB114502	BLDG1145	1			X		X							
SB119001	BLDG1190	1			X		X							
SB119002	BLDG1190	1			X		X							
SB110101	BLDG1101	1		X	X	X	X							
SB110102	BLDG1101	1		X	X	X	X							
SB119101	BLDG1191	1			X		X							
SB119102	BLDG1191	1			X		X							
SB119103	BLDG1191	1		X	X	X	X							
SB119104	BLDG1191	1		X	X	X	X							
SB119401	BLDG1194	1			X		X							
SB119402	BLDG1194	1			X		X							
SB119403	BLDG1194	1		X	X	X	X							
SB119404	BLDG1194	1		X	X	X	X							
SB132001	BLDG1320	1		X	X	X	X							
SB132002	BLDG1320	1		X	X	X	X							
SB132003	BLDG1320	1		X	X	X	X							
SB132004	BLDG1320	1		X	X	X	X							
SB141401	BLDG1414	1			X		X							
SB141402	BLDG1414	1			X		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 3-2
Analytical Soil Boring Samples
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

Analysis				VOA by SW8260	SVOA by SW8270	RCRA Metals by SW6010/7000	Pest/PCB by SW8080	Volatiles by SW8240 (48 hour TAT)	TPH -Gasoline by SW8015M (48 hour TAT)	TPH-Jet Fuel by SW8015M (48 hour TAT)	RCRA Metals by SW6010/7000 (48 hour TAT)	Biotechnical Analysis (See Table 3-6)	Geotechnical Analysis (See Table 3-6)	Field Parameters (See Table 3-7)
Location	Map Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Preservative/ Container:	None, 4°C Sample Tube	None, < 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C , Sample Tube	None, 4°C, Sample Tube	
			Holding Time:	14 Days	7 Days preext. 40 days postext	180 Days	14 Days preext./ 40 days postext.	14 Days	14 Days	14 Days	180 Days		None	
SUBSURFACE SAMPLES														
SB142301	BLDG1423	1		X	X	X	X							
SB142302	BLDG1423	1		X	X	X	X							
SB160201	BLDG1602	1		X	X	X	X							
SB160202	BLDG1602	1		X	X	X	X							
SB162801	BLDG1628	1		X	X	X	X							
SB162802	BLDG1628	1		X	X	X	X							
SB165501	BLDG1655	1		X	X	X	X							
SB165502	BLDG1655	1		X	X	X	X							
SB165601	BLDG1656	1		X	X	X	X							
SB165602	BLDG1656	1		X	X	X	X							
SB335801	BLDG3358	1		X	X	X	X							
SB335802	BLDG3358	1		X	X	X	X							
SB414601	BLDG4146	1		X	X	X	X							
SB414602	BLDG4146	1		X	X	X	X							
SB414603	BLDG4146	1		X	X	X	X							
SB414604	BLDG4146	1		X	X	X	X							
SB416001	BLDG4160	1		X	X	X	X							
SB416002	BLDG4160	1		X	X	X	X							
SB421601	BLDG4216	1		X	X	X	X							
SB421602	BLDG4216	1		X	X	X	X							
SB420501	BLDG4205	1		X	X	X	X							
SB420502	BLDG4205	1		X	X	X	X							
SB164301	BLDG1643	1		X	X	X	X							
SB164302	BLDG1643	1		X	X	X	X							
SB164303	BLDG1643	1		X	X	X	X							
H325N	H3	1		X	X	X								
4B25W	4B	1		X	X	X								
4C25N	4C	1		X	X	X								
825N	8	1		X	X	X								
C25N	C	1		X	X	X								
C125N	C1	1		X	X	X								
70255	70	1		X	X	X								
825N	8	1		X	X	X								
MHB12A	B12A	1		X	X	X								
C25W	C	1		X	X	X	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 3-2
Analytical Soil Boring Samples
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

Analysis				VOA by SW8260	SVOA by SW8270	RCRA Metals by SW6010/7000	Pest/PCB by SW8080	Volatiles by SW8240 (48 hour TAT)	TPH -Gasoline by SW8015M (48 hour TAT)	TPH-Jet Fuel by SW8015M (48 hour TAT)	RCRA Metals by SW6010/7000 (48 hour TAT)	Biotechnical Analysis (See Table 3-5)	Geotechnical Analysis (See Table 3-6)	Field Parameters (See Table 3-7)
Location	Map Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Preservative/ Container:	None, 4°C Sample Tube	None, < 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C , Sample Tube	None, 4°C, Sample Tube	
			Holding Time:	14 Days	7 Days preext. 40 days postext	180 Days	14 Days preext./ 40 days postext.	14 Days	14 Days	14 Days	180 Days		None	
SURFACE SAMPLES														
MH4	4	1		X	X	X	X							
MH5	5	1		X	X	X	X							
MH9	9	1		X	X	X	X							
1025N	10	1		X	X	X	X							
MH11	11	1		X	X	X	X							
MH13	13	1		X	X	X	X							
MH15	15	1		X	X	X	X							
MH18	18	1		X	X	X	X							
MH25	25	1		X	X	X	X							
MH35	35	1		X	X	X	X							
MH41	41	1		X	X	X	X							
MH44	44	1		X	X	X	X							
MH49	49	1		X	X	X	X							
MH51	51	1		X	X	X	X							
MH53	53	1		X	X	X	X							
MH56	56	1		X	X	X	X							
MH64	64	1		X	X	X	X							
MH67	67	1		X	X	X	X							
MH70	70	1		X	X	X	X							
MH73	73	1		X	X	X	X							
MH75	75	1		X	X	X	X							
MH79	79	1		X	X	X	X							
11A25W	11A	1		X	X	X	X							
MH11D1	11D1	1		X	X	X	X							
MH11F	11F	1		X	X	X	X							
11H25N	11H	1		X	X	X	X							
MH11J	11J	1		X	X	X	X							
11L25S	11L	1		X	X	X	X							
MH11L	11L	1		X	X	X	X							
MH13A2	13A2	1		X	X	X	X							
MH13E	13E	1		X	X	X	X							
15B25W	15B	1		X	X	X	X							
MH15D	15D	1		X	X	X	X							
MH15E10	15E10	1		X	X	X	X							
MH15E12	15E12	1		X	X	X	X							
15E425S	15E4	1		X	X	X	X							
MH15E6	15E6	1		X	X	X	X							
15G125W	15G1	1		X	X	X	X							
MH15G2	15G2	1		X	X	X	X							
MH15J	15J	1		X	X	X	X							
MH15J4	15J4	1		X	X	X	X							
MH15J6	15J6	1		X	X	X	X							
MH15L	15L	1		X	X	X	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 3-2
Analytical Soil Boring Samples
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

Analysis				VOA by SW8260	SVOA by SW8270	RCRA Metals by SW6010/7000	Pest/PCB by SW8080	Volatiles by SW8240 (48 hour TAT)	TPH -Gasoline by SW8015M (48 hour TAT)	TPH-Jet Fuel by SW8015M (48 hour TAT)	RCRA Metals by SW6010/7000 (48 hour TAT)	Biotechnical Analysis (See Table 3-5)	Geotechnical Analysis (See Table 3-6)	Field Parameters (See Table 3-7)
Location	Map Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Preservative/ Container:	None, 4°C Sample Tube	None, < 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C , Sample Tube	None, 4°C, Sample Tube	
			Holding Time:	14 Days	7 Days preext. 40 days postext	180 Days	14 Days preext./ 40 days postext.	14 Days	14 Days	14 Days	180 Days		None	
SURFACE SAMPLES														
15M25N	15M	1		X	X	X	X							
MH15O	15O	1		X	X	X	X							
MH15Q	15Q	1		X	X	X	X							
MH15S	15S	1		X	X	X	X							
MH15U	15U	1		X	X	X	X							
MH19-1	19-1	1		X	X	X	X							
MH25B	25B	1		X	X	X	X							
MH26A	26A	1		X	X	X	X							
MH4C	4C	1		X	X	X	X							
MHB8	B8	1		X	X	X	X							
8C25W	8C	1		X	X	X	X							
MH9C	9C	1		X	X	X	X							
B1125N	B11	1		X	X	X	X							
MHB12	B12	1		X	X	X	X							
B1425W	B14	1		X	X	X	X							
B15A25W	B15A	1		X	X	X	X							
MHB15	B15	1		X	X	X	X							
MHB3D	B3D	1		X	X	X	X							
MHB3E	B3E	1		X	X	X	X							
MHB3H	B3H	1		X	X	X	X							
MHB4	B4	1		X	X	X	X							
MHB6	B6	1		X	X	X	X							
MHB6C	B6C	1		X	X	X	X							
MHB6D1	B6D1	1		X	X	X	X							
MHB7D	B7D	1		X	X	X	X							
MHB7E	B7E	1		X	X	X	X							
B825W	B8	1		X	X	X	X							
MHB9	B9	1		X	X	X	X							
CFWB1	CFWB1	1		X	X	X	X							
CFWP1	CFWP1	1		X	X	X	X							
CFWQ	CFWQ	1		X	X	X	X							
MHE1	E1	1		X	X	X	X							
MHE3A	E3A	1		X	X	X	X							
SB101501	BLDG1015	1			X		X							
SB101502	BLDG1015	1			X		X							
SB102701	BLDG1027	1			X		X							
SB102702	BLDG1027	1			X		X							
SB110101	BLDG1101	1		X	X	X	X							
SB110102	BLDG1101	1		X	X	X	X							
SB119101	BLDG1191	1			X		X							
SB119102	BLDG1191	1			X		X							
SB119401	BLDG1194	1			X		X							
SB119402	BLDG1194	1			X		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 3-2
Analytical Soil Boring Samples
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

Analysis				VOA by SW8260	SVOA by SW8270	RCRA Metals by SW6010/7000	Pest/PCB by SW8080	Volatiles by SW8240 (48 hour TAT)	TPH -Gasoline by SW8015M (48 hour TAT)	TPH-Jet Fuel by SW8015M (48 hour TAT)	RCRA Metals by SW6010/7000 (48 hour TAT)	Biotechnical Analysis (See Table 3-6)	Geotechnical Analysis (See Table 3-6)	Field Parameters (See Table 3-7)
Location	Map Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Preservative/ Container:	None, 4°C Sample Tube	None, < 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C Sample Tube	None, 4°C , Sample Tube	None, 4°C, Sample Tube	
			Holding Time:	14 Days	7 Days preext. 40 days postext	180 Days	14 Days preext./ 40 days postext.	14 Days	14 Days	14 Days	180 Days		None	
SURFACE SAMPLES														
SB119403	BLDG1194	1		X	X	X	X							
SB119404	BLDG1194	1		X	X	X	X							
SB132001	BLDG1320	1		X	X	X	X							
SB132002	BLDG1320	1		X	X	X	X							
SB132003	BLDG1320	1		X	X	X	X							
SB132004	BLDG1320	1		X	X	X	X							
SB141401	BLDG1414	1			X		X							
SB141402	BLDG1414	1			X		X							
SB142301	BLDG1423	1		X	X	X	X							
SB142302	BLDG1423	1		X	X	X	X							
SB160201	BLDG1602	1		X	X	X	X							
SB160202	BLDG1602	1		X	X	X	X							
SB162801	BLDG1628	1		X	X	X	X							
SB162802	BLDG1628	1		X	X	X	X							
SB164301	BLDG1643	1		X	X	X	X							
SB164302	BLDG1643	1		X	X	X	X							
SB165501	BLDG1655	1		X	X	X	X							
SB165502	BLDG1655	1		X	X	X	X							
SB165601	BLDG1656	1		X	X	X	X							
SB165602	BLDG1656	1		X	X	X	X							
SB335801	BLDG3358	1		X	X	X	X							
SB335802	BLDG3358	1		X	X	X	X							
SB414601	BLDG4146	1		X	X	X	X							
SB414602	BLDG4146	1		X	X	X	X							
SB414603	BLDG4146	1		X	X	X	X							
SB414604	BLDG4146	1		X	X	X	X							
SB416001	BLDG4160	1		X	X	X	X							
SB416002	BLDG4160	1		X	X	X	X							
SB421601	BLDG4216	1		X	X	X	X							
SB421602	BLDG4216	1		X	X	X	X							
C25W	C	1		X	X	X	X							
SB420501	BLDG4205	1		X	X	X	X							
SB420502	BLDG4205	1		X	X	X	X							
SB106401	BLDG1064	1			X		X							
SB106402	BLDG1064	1			X		X							
SB106001	BLDG1060	1			X		X							
SB106002	BLDG1060	1			X		X							
SB421001	BLDG4210	1			X		X							
SB421002	BLDG4210	1			X		X							
SB114501	BLDG1145	1			X		X							
SB114502	BLDG1145	1			X		X							
SB119001	BLDG1190	1			X		X							
SB119002	BLDG1190	1			X		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.

Soil probe sampling locations in the industrial areas will be at every manhole, at 250-foot intervals along straight sections of the sanitary sewer, at every major bend in the sanitary sewer, and at 17 selected OWS and lift station locations along the sanitary sewer system within the industrial areas. Approximately 335 subsurface soil samples will be collected. There will also be a total of six borings installed for geotechnical samples and six for biotechnical samples near the subsurface sampling.

The subsurface soil samples will be collected at selected sanitary sewer system manholes at residential areas to determine if there may have been releases of effluent from the sanitary sewer to subsurface soils. Potential releases of effluent from the sanitary sewer system would be expected in subsurface soils at depths at least 5 to 10 feet bgs. The sampling locations have been established at the sanitary sewer exit from the housing areas at major trunk line intersections. Soil probe boring installation and sampling techniques are specified in Section 5.5.

Any part of the soil probe rig, that will contact sample material will be decontaminated prior to collecting samples and between boreholes. All hand soil sampling tools will be decontaminated between each use. Decontamination techniques are specified in Chapter 5.0.

Geotechnical and biotechnical sample locations will be chosen near the conclusion of subsurface soil sampling at the industrial area. The locations will be for six geotechnical and six biotechnical soil probes. The decision will be made in the field by the principal investigator and coordinated with the Air Force Center for Environmental Excellence field representative. Locations will be chosen from areas showing the highest levels of contamination from field screening during the subsurface investigation.

The geotechnical soil probes will use decontaminated brass tubes to collect geotechnical data and the biotechnical samples will be collected using decontaminated soil probes. If possible, all samples will be collected from the same hole. If not, separate holes will be installed. Two samples will be collected for each type of analysis: geotechnical and biotechnical. The first sample will be from the 0-to-2-foot depth (defined as surface soil in this plan) and the second from the approximate elevation at which the subsurface soil sample was collected.

3.2.3 Groundwater Investigation Field Procedures

Groundwater samples will be collected along sewer lines at selected monitoring well locations. The groundwater samples will be collected from the monitoring wells with low flow sampling techniques outlined in Section 6.2. Approximately 40 groundwater samples will be collected at monitoring well locations shown on Figure 3-2, Sheets 2, 3, 5, 6, 8, 9, 10, 11, 12, 14, and 15. The number and analytical parameters of each groundwater sample are shown in Table 3-3.

All equipment that will come in contact with the sample will be decontaminated as outlined in Section 5.12. New decontaminated pump discharge hose will be used for each groundwater sample.

Monitoring wells will be installed as outlined in Section 5.6. Groundwater samples will be collected on the downgradient side of the sanitary sewer and oil/water separators. This will be predominantly east to southeast of the sanitary sewer. Soil probe data collected previously from the immediate area, such as the depth of the water table, and the depth to suitable aquifer material, such as sand and gravel, will be used to assist in determining the construction of the monitoring well.

The installation of monitoring wells and groundwater sampling methodology are specified in Section 5.6.

Available background data from previous assessments will be used to determine if the effluent is degrading the groundwater quality. The monitoring wells will be designed for both site characterization and groundwater remediation. Permanent monitoring wells will be installed in accordance with construction procedures outlined in the project QAPP and in Chapter 5.0 of this FSP.

3.2.4 Surface Water

Springs at the ground surface upstream and downstream of sanitary sewer lines will be sampled. Spring sampling locations are at the northwest corner of Desert Storm Road and Jennings Drive and the southern corner of the intersection of Rogner Drive and Desert Storm Road. The approximate locations for the surface water samples are shown on Figure 3-3.

Table 3-3
Analytical Groundwater Samples
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768679

Analysis				VOA by SW8260	SVOA by SW8270	RCRA Metals by SW6010/7000 (Dissolved)	Nitrate by EPA 300.0	Sulfate by EPA 300.0	TDS by EPA 160.1	Biotechnical Analysis (See Table 3-5)	Field Parameters (See Table 3-7)
Sample Location	Map Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Preservative/ Bottle:	HCL, < 4°C 3 * 40 ml glass vials	None, < 4°C 1 Liter glass	HNO_3, < 4°C 500 ml glass	None, < 4°C 1 * 500 ml polyethylene	None, < 4°C 1 * 500 ml polyethylene	None, < 4°C 1 * 250 ml polyethylene		
			Holding Time:	14 Days	7 Days preext./ 40 days postext.	180 Days	2 Days	28 Days	7 Days		
MH4	4	1		X	X	X					
MH8	8	1		X	X	X					
MH9	9	1		X	X	X					
MH11	11	1		X	X	X					
MH11B	11B	1		X	X	X					
MH11D1	11D1	1		X	X	X					
MH11J	11J	1		X	X	X					
MH13	13	1		X	X	X					
MH15A	15A	1		X	X	X					
MH15D	15D	1		X	X	X					
MH15E3	15E3	1		X	X	X					
MH15G	15G	1		X	X	X					
MH15I	15I	1		X	X	X					
MH15J	15J	1		X	X	X					
MHB15A	B15A	1		X	X	X					
MHB7A1	B7A1	1		X	X	X					
TW101501	BLDG1015	1		X	X	X					
TW102701	BLDG1027	1		X	X	X					
TW110101	BLDG1101	1		X	X	X					
TW119101	BLDG1191	1		X	X	X					
TW119102	BLDG1191	1		X	X	X					
TW119401	BLDG1194	1		X	X	X					
TW119001	BLDG 1190	1		X	X	X					
TW132001	BLDG1320	1		X	X	X					
TW141401	BLDG1414	1		X	X	X					
TW142301	BLDG1423	1		X	X	X					
TW160201	BLDG1602	1		X	X	X					
TW162801	BLDG1628	1		X	X	X					
TW165501	BLDG1655	1		X	X	X					
TW165601	BLDG1656	1		X	X	X					
TW335801	BLDG3358	1		X	X	X					
TW416001	BLDG4160	1		X	X	X					
TW421601	BLDG4216	1		X	X	X					
TW414601	BLDG4146	1		X	X	X					
TW420501	BLDG 4205	1		X	X	X					
TW106401	BLDG 1064	1		X	X	X					

Table 3-3
Analytical Groundwater Samples
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768679

Analysis				VOA by SW8260	SVOA by SW8270	RCRA Metals by SW6010/7000 (Dissolved)	Nitrate by EPA 300.0	Sulfate by EPA 300.0	TDS by EPA 160.1	Biotechnical Analysis (See Table 3-5)	Field Parameters (See Table 3-7)
Sample Location	Map Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Preservative/ Bottle:	HCL, < 4°C 3 * 40 ml glass vials	None, < 4°C 1 Liter glass	HNO_3, < 4°C 500 ml glass	None, < 4°C 1 * 500 ml polyethylene	None, < 4°C 1 * 500 ml polyethylene	None, < 4°C 1 * 250 ml polyethylene		
			Holding Time:	14 Days	7 Days preext./ 40 days postext.	180 Days	2 Days	28 Days	7 Days		
TW106001	BLDG 1060	1		X	X	X					
TW421001	BLDG 4210	1		X	X	X					
TW164301	BLDG 1643	1		X	X	X					
TW114501	BLDG 1145	1		X	X	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.

Two samples will be collected at each location for a total of four surface water samples. One sample will be collected at the upper end of each spring, upstream of the sanitary sewer in the area. One sample will be taken just within the downstream edge of each spring past the area of the sanitary sewer. The temperature, pH, conductivity, redox potential, and dissolved oxygen will be measured and recorded at each surface water sampling location before and after each sample is collected. The surface water sample names, the number of analytical samples to be collected at each location, the laboratory analyses, and quality control (QC) samples to be collected are shown in Table 3-4.

Environmental sampling methodology is specified in Section 6.4. The background surface water sample, upstream of the spring, will be collected first. The second surface water sample will be located at the source of the spring. Each sampling location will be marked with a stake with the sample location marked on it. The field geologist will record on a Water Collection Log in Appendix A all pertinent information of the surface water sampling location, including the location of the spring; any sewers or discharge pipes; any potential sources of surface water contamination; the estimated width, depth, and flow rate of the spring; the surface water parameters measured with field instruments; instrument calibration; and the samples collected and submitted for analysis.

3.3 Sampling Frequency and Analyses

3.3.1 Soils

Soil samples will include: surface/near surface samples (129), subsurface samples (335), geotechnical samples (12), and biotechnical samples (12). Laboratory analytical parameters for soil samples are shown in Table 3-2.

These soil borings will be screened in the field with a photoionization detector (PID) and visually examined by the field geologist for indications of contamination (e.g., discoloration). One surface soil sample will be collected from 129 locations at the 0-to-2-foot depth. One sample from below the invert elevation or immediately above the groundwater table for each boring will be submitted for laboratory analysis. All soil samples will be for a minimum analysis of EPA Methods SW8260 for VOCs, SW8270 for SVOCs, and SW6010/7000 for RCRA metals. Analytical parameters for surface soil samples are shown in Table 3-2. At sample locations

Table 3-4
Analytical Surface Water
Samples
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

Analysis			VOA by SW8260	SVOA by SW8270	RCRA Metals by SW6010/7000 (Dissolved)	Nitrate by EPA 300.0	Sulfate by EPA 300.0	TDS by EPA 160.1	Alkalinity (bio) by 310.1	Field Parameters- temperature, pH, dissolved oxygen, conductivity, redox potential (See Table 3-7)
Sample Location	No. of field samples to be taken at each location excluding QC samples. Please see Note 1	Preservative/ Bottle:	HCL, < 4°C 3 * 40 ml glass vials	None, < 4°C 1 Liter glass	HNO_3, < 4°C 500 ml glass	None, < 4°C 1 * 500 ml polyethylene	None, < 4°C 1 * 500 ml polyethylene	None, < 4°C 1 * 250 ml polyethylene	None, < 4°C 1 * 100 ml polyethylene	
		Holding Time:	14 Days	7 Days preext./ 40 days postext.	180 Days	2 Days	28 Days	7 Days	ASAP	
SSSS01	1		X	X	X	X	X	X	X	X
SSSS02	1		X	X	X	X	X	X	X	X
SSSS03	1		X	X	X	X	X	X	X	X
SSSS04	1		X	X	X	X	X	X	X	X

Note 1 - QC sample 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.

where surface and subsurface soil samples are collected, both will also be analyzed by EPA Method SW8080 for pesticides and polychlorinated biphenyls (PCB) as shown in Table 3-2.

The biotechnical soil samples will be analyzed for ammonium (EPA Method 350.2), phosphate (EPA Method 365.1), total Kjeldahl nitrogen (EPA Method 351.3), moisture content (EPA 160.3), and pH (SW 9045) as shown in Table 3-5. Each geotechnical soil sample will be analyzed for dry bulk density, effective porosity, organic content, intrinsic permeability, grain size, specific gravity, and water content as shown in Table 3-6.

3.3.2 Groundwater

Groundwater samples will be collected to determine if releases of effluent from the sanitary sewer system has impacted groundwater. Samples will be submitted for analysis by EPA Methods SW8260 for VOCs, SW8270 for SVOCs, and SW6010/7000 for RCRA metals as specified in Table 3-3. Groundwater sampling locations are shown on Figure 3-2.

Groundwater field parameters will be measured during collection of samples from installed monitoring wells. Parameters to be measured in the field include pH, temperature, conductivity, dissolved oxygen, turbidity, and redox potential as specified in Table 3-7.

For consideration of corrective measures evaluations of impacted groundwater, monitoring wells may be selected for additional laboratory analysis. Groundwater samples will be collected for nitrate (EPA Method 300), sulfate (EPA Method 300), total dissolved solids (EPA Method 160.1), methane (RSK SOP-175), and alkalinity (EPA Method 310.1) as shown in Tables 3-3 and 3-5 for biotechnical analysis. Field analysis will also be performed for ferrous iron, carbon dioxide, and sulfide as shown in Table 3-7. These analyses are to facilitate evaluation and assessment of the occurrence of natural attenuation and the implementability of in situ biorem-ediation technologies for the groundwater.

3.3.3 Surface Water Lab Methods

Surface water samples will be submitted for analysis by EPA Methods SW8260 for VOCs, SW8270 for SVOCs, and SW6010/7000 for RCRA metals as shown in Table 3-4. Surface water samples will also be analyzed for nitrate (EPA Method 300), sulfate (EPA Method 300), total dissolved solids (EPA Method 160.1), and alkalinity (EPA Method 310.1) as specified in Table 3-4.

Table 3-5
Biotechnical Laboratory Analysis Table
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

Test	Method	Holding Time	Preservative/Container
Soil			
Ammonium	EPA 350.2	28 day	None, < 4°C/
Phosphate	EPA 365.1	28 day	None, < 4°C/
Total Kjeldahl Nitrogen	EPA 351.3	28 day	None, < 4°C/
Moisture Content	EPA 160.3	28 day	None, < 4°C/
pH	SW9045	ASAP	None, < 4°C/
Water[a]			
Alkalinity	EPA 310.1	ASAP	None, < 4°C/
Methane	RSKSOP175	14 day	HCL, < 4°C/

[a] Surface water samples will require alkalinity analysis and not be tested for methane.

Table 3-6
Geotechnical Test and Method Table
Analytical Soil Boring Samples
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

Test	Method
Grain Size	ASTM D 422
Moisture Content	ASTM D 2216
Unit Weight Density	EM-1110-2-1906, App. II
Specific Gravity	ASTM D 854
Fraction Organic Carbon Content	EPA 415.1 (Walkley Black)
Permeability	ASTM D 5084
Porosity	EM-1110-2-1906, App. II

Table 3-7
Field Sampling Test and Method Table
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

Field Analysis	Method
Water	
Ferrous Iron	Standard Methods for the Examination of Water and Wastewater, 3500
Sulfide	Standard Methods for the Examination of Water and Wastewater, 4500
Carbon Dioxide	Standard Methods for the Examination of Water and Wastewater, 4500
Dissolved Oxygen	EPA 360.1
Redox Potential	ASTM D 1498
pH	SW9040
Total Volatiles	PID Organic Vapor Monitor
Conductivity	EPA 120.1
Temperature	EPA 170.1
Turbidity	EPA 180.1
Soil	
Methane (Bio)	Landtech GA 90
Oxygen (Bio)	Landtech GA 90
Carbon Dioxide (Bio)	Landtech GA 90
Total Volatiles	PID Organic Vapor Monitor

Surface water field parameters will be measured during collection of samples. Parameters to be measured in the field include pH, temperature, conductivity, dissolved oxygen, and redox potential. No field analysis will be performed.

TAB

4.0

4.0 Project Organization and Responsibility

The project organization is established as shown on Figure 4-1. Responsibilities of the key individuals are as specified in Section 3.0 of the QAPP.

Subcontractors. Subcontracts will be executed under this project for installation of soil probes, analytical laboratory testing, and surveying. The subcontracts have not been executed as of the issuance of this FSP but as the subcontracts are awarded, this will be communicated to the parties affected. The key personnel within each subcontractor's organization will be identified separately.

TAB

5.0

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 5-1. 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 3-2. 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 5-2 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 5-2).

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 tremmie 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.

TAB

6.0

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 of the Base and are presented in Table 3-2.

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 3-2. Twelve biotechnical samples will be collected from six selected soil borings in both the vadose zone and the saturated zones. The biotechnical samples will be collected in the PET or CAB tubes, the ends of the tube sealed with Teflon tape and a vinyl cap, and the sample labeled before submittal for analysis. Biotechnical sample analyses are provided in Table 3-5. Twelve geotechnical samples will be collected from six selected soil borings. The geotechnical samples will be collected in brass tubes, the ends of the tubes sealed with Teflon tape and a vinyl cap, and labeled. Geotechnical sample analysis is provided in Table 3-6.

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 3-3. Field analytical tests and methods for groundwater samples are shown on Table 3-7.

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:

π = 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

Surface water samples for laboratory analysis will be collected from springs located near the sanitary sewer within 8 hours after any seepage is observed. Surface water sample collection procedures will follow standard procedures outlined later in this section.

The temperature, pH, conductivity, and dissolved oxygen will be measured and recorded at each surface water sampling location before and after each sample is collected. The surface water sample names, the number of analytical samples to be collected at each location, the laboratory analyses, and QC samples to be collected are shown in Table 3-4.

The samples will be collected from the spring at each surface water location with a decontaminated, polyethylene pitcher. Samples will be collected at the surface of the water. Sample collection order will be VOCs, SVOCs, total metals, nitrate, sulfate, total dissolved solids, and alkalinity.

The background surface water sample, upstream of the spring, will be collected first. The second surface water sample will be located at the source of the spring. Each sampling location will be marked with a stake with the sample location marked on it. The field geologist will record on a specified field form all pertinent information of the surface water sampling location, including; the location of the spring, any sewers of discharge pipes, the estimated width, depth, and flow rate of the spring, the surface water parameters measured with field instruments, instrument calibration, and the samples collected and submitted for analysis.

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.

TAB

7.0

7.0 Field Measurements

7.1 Parameters

Table 3-7 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.

TAB

8.0

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).

TAB

9.0

9.0 References

A. T. Kearney, 1989, ***RCRA Facility Assessment, PR/VSI Report, Carswell Air Force Base, Fort Worth, Texas,*** March.

Air Force Center for Environmental Excellence (AFCEE), 1993 ***Handbook to Support the Installation Restoration Program Statements of Work***, September.

American Geological Institute, 1989, ***American Geological Institute Data Sheets***, 3rd Edition, Sheets 3.1 through 3.8.

Bureau of Reclamation, 1967, ***Water Measurement Manual.***

CH2M Hill, 1996 ***HQ Air Force Center for Environmental Excellence, Interim Draft, Naval Air Station Fort Worth Joint Reserve Base, Base-Wide Quality Assurance Project Plan***, August.

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

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

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

Swanson, R. G., 1981, ***Sample Examination Manual***, American Association of Petroleum Geologists, p. IV-41 and 43.

Tennissen, A. C., 1983, ***Nature of Earth Materials***, 2nd Ed., p. 204-348.

U.S. Environmental Protection Agency (EPA), 1993, ***Data Quality Objectives Process for Superfund, Interim Final Guidance***.

Urquhart, L. C., 1962, ***Civil Engineering Handbook***, 4th Edition, p. 96 and 97.

TAB

Appendix A

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: (Circle one): DT-driven tube HA-hand augered CP - Cone Penetrometer NA-not 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 Log

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

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)

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 (hhmm)	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: _____

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: _____

KNOXVILLE DATA ACQUISITION AND MANAGEMENT DEPARTMENT
29 OCTOBER 1996

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: _____

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 (h/mm)	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

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 #/TT#	Calibrated By	Standard/Manuf./Lot #/ Cal. Method	Instrument Readings	Instrument Settings	Pass/Fail Description	Comments

Resolution for Instrument Failure _____

_____

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 _____

_____

TAB

Appendix B

APPENDIX B

ELEVATION DATA

Table B-1

Elevation Data
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

(Page 1 of 3)

Sample Location	Map Location	Manhole Elevation	Invert Elevation of Sanitary Sewer System	Approximate Groundwater Elevation	Groundwater Elevation Above Invert Elevation of Sanitary Sewer System
MH "1"	"1"	570.05	560.72	529.00	NO
MH "5"	"5"	574.16	565.50	560.00	NO
MH4	4	561.07	554.20	550.00	NO
MH4C	4C	574.48	562.56	567.50	YES
MH8	8	582.42	573.28	575.00	YES
MH9	9	581.91	577.61	575.00	CLOSE
MH11	11	595.39	578.76	574.00	NO
MH13	13	589.78	579.98	570.00	NO
MH25	25	597.29	592.26	589.00	NO
BD46E	46	N/A	N/A	590.00	-----
MH47	47	614.87	602.19	594.00	NO
MH50	50	623.48	N/A	592.00	-----
MH52	52	621.76	N/A	594.00	-----
MH54	54	624.27	617.84	597.00	NO
MH56	56	626.69	619.63	604.00	-----
MH64	64	597.95	580.62	579.00	CLOSE
MH67	67	579.40	573.85	570.00	-----
MH71	71	568.50	561.24	550.00	NO
MH74	74	566.82	N/A	555.00	-----
MH76	76	563.15	557.71	545.00	NO
MH11B	11B	603.13	593.74	584.00	NO
MH11D	11D	603.73	595.77	588.00	NO
MH11D1	11D1	605.61	598.13	589.00	NO
MH11D4	11D4	605.75	600.96	589.50	CLOSE
MH11D5	11D5	606.28	601.50	591.00	NO
MH11D6	11D6	608.09	602.08	593.00	NO
MH11D8	11D8	611.43	603.24	595.00	NO
MH11E	11E	605.84	596.55	589.00	NO
MH11G	11G	603.11	598.50	591.00	NO
MH11I	11I	603.06	600.58	591.00	NO
MH11L	11L	608.95	601.66	591.50	NO
MH11L	11L25S			594.00	-----
MH13D	13D	604.01	600.73	588.00	NO
MH15A	15A	591.22	582.28	577.00	NO
MH15D	15D	598.52	586.90	587.00	YES
MH15D2	15D2	603.88	597.00	585.00	NO
15E25N	15E			591.00	-----
MH15E11	15E11	604.23	594.89	591.00	NO
MH15E12	15E12	N/A	N/A	595.00	-----
MH15E3	15E3	596.27	588.98	590.50	YES

Table B-1

Elevation Data
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

(Page 2 of 3)

Sample Location	Map Location	Manhole Elevation	Invert Elevation of Sanitary Sewer System	Approximate Groundwater Elevation	Groundwater Elevation Above Invert Elevation of Sanitary Sewer System
MH15E6	15E6	597.60	590.67	591.00	YES
MH15E8	15E8	597.88	591.60	591.00	YES
15G25N	15G			591.00	-----
MH15G1	15G1	601.10	596.18	591.00	NO
MH15G2	15G2	600.67	597.33	591.00	NO
15G225W	15G2			591.00	-----
MH15I	15I	602.20	595.78	590.00	NO
MH15J2	15J2	601.83	596.51	591.00	NO
MH15Q	15Q	608.26	604.49	598.00	NO
MH15S	15S	610.34	606.75	604.00	CLOSE
MH15U	15U	612.93	LIFT STATION	N/D	N/D
MH26A	26A	602.73	594.89	591.00	NO
BD3GS	3G				
MH7A	7A	587.77	574.00	576.50	YES
MH8B	8B	594.50	589.76	583.50	NO
MH9B	9B	593.02	583.67	584.00	YES
MHB12A	B12A				
B1425W	B14				
BD15A25W	B15A				
BD15A25W2	B15A				
MHB15A	B15A	N/A	N/A		
MHB3D	B3D	574.61	568.90	563.00	NO
MHB3E	B3E	576.21	572.20	568.00	NO
MHB3G	B3G	586.86	583.10	570.00	NO
BD625W	B6			563.00	-----
MHB6C	B6C	569.75	566.20	560.00	NO
MHB7A1	B7A1	572.96	564.20	562.00	CLOSE
TW101501	BLDG1015				
TW102701	BLDG1027				
TW110101	BLDG1101				
TW119101	BLDG1191				
TW119102	BLDG1191				
TW119401	BLDG1194				
TW119402	BLDG1194				
TW132001	BLDG1320				
TW141401	BLDG1414				
TW142001	BLDG1420				
TW160201	BLDG1602				
TW162801	BLDG1628				
TW165501	BLDG1655				

Table B-1

Elevation Data
Sanitary Sewer System RFI Field Sampling Plan
NAS Fort Worth
Project No. 768579

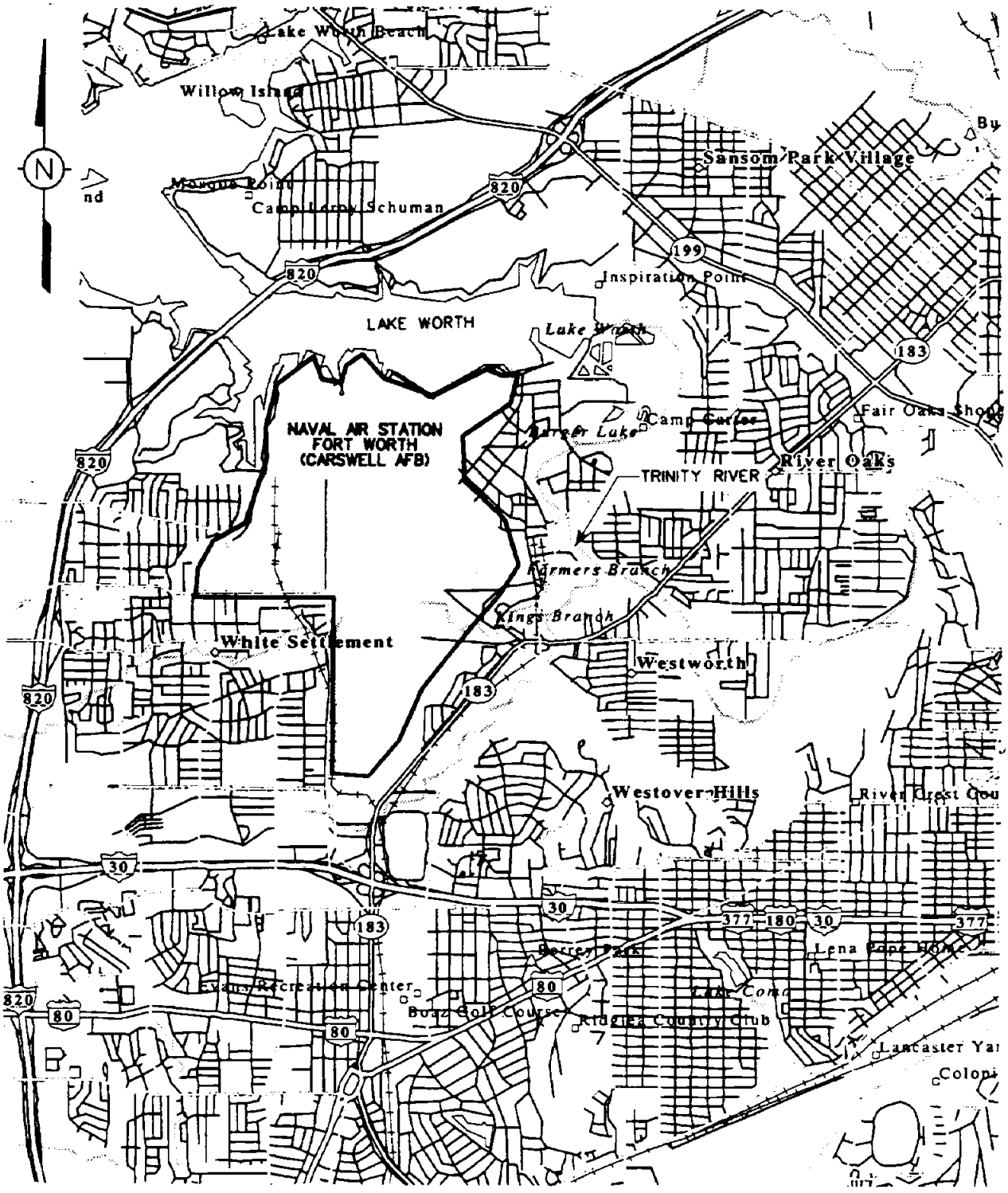
(Page 3 of 3)

Sample Location	Map Location	Manhole Elevation	Invert Elevation of Sanitary Sewer System	Approximate Groundwater Elevation	Groundwater Elevation Above Invert Elevation of Sanitary Sewer System
TW165601	BLDG1656				
TW335801	BLDG3358				
TW416001	BLDG4160				
TW421701	BLDG4217				
TW414601	BLDG4146				
MHD1	D1	N/A	N/A		
MHD4	D4	N/A	N/A		
MHE31	E31				
MHE3A	E3A	583.05	576.06	567.00	YES
MHH14	H14	633.79	627.80	N/D	
MHH7	H7	604.40	597.40	N/D	-----
MHH7F	H7F	615.41	611.30	N/D	-----
MHM1	M1	591.20	579.52	586.00	YES
MHP	P	602.30	589.86	590.00	YES
MHQ	Q	613.14	615.14	617.00	YES

TAB

Figures

FIGURES



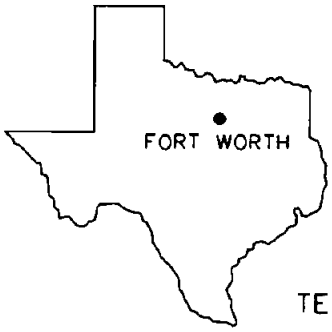


FIGURE 2-1
SITE LOCATION MAP

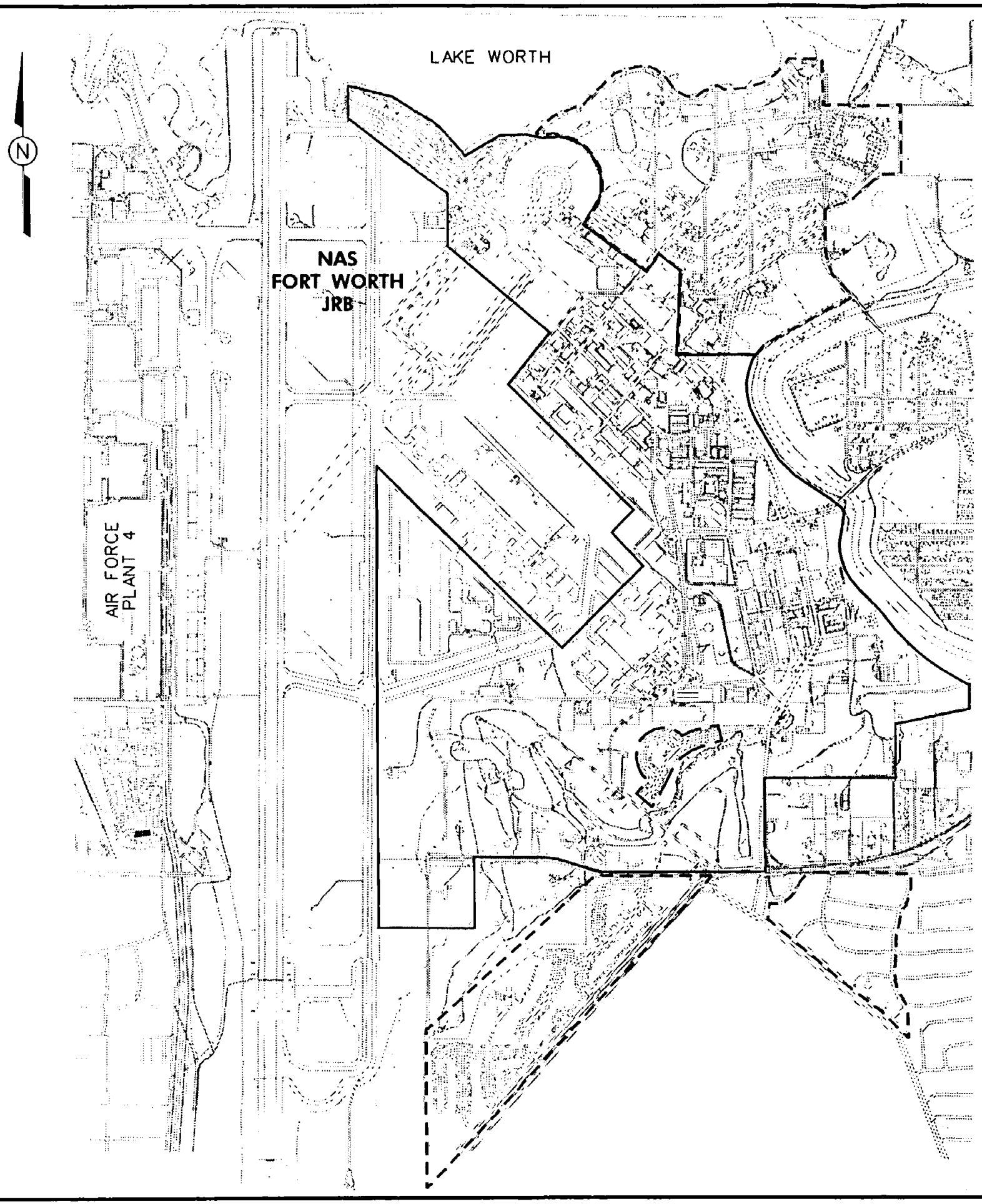
NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

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

DWG. NO.765725ES.005
PROJ. NO.:765725

765725ES.005 14:30:18 NOV. 05, 1996 RMK



LEGEND

——— APPROXIMATE INDUSTRIAL BOUNDARY

— — APPROXIMATE RESIDENTIAL BOUNDARY

SCALE

0 1500 3000 FEET

FIGURE 2-2
SANITARY SEWER SYSTEM RFI
D. O. 39

NAS FORT WORTH JRB
TEXAS

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 11/05/96	DATE LAST REV:	DRAFT. CHCK. BY: R. KNIGHT	INITIATOR: W. CARTER
DRAWN BY: R. KNIGHT	DRAWN BY:	ENGR. CHCK. BY: M. MAKI	PROJ. MGR: W. CARTER

DWG. NO.768579ES.DCB
PROJ. NO.:768579

768579ES.DCB 10/08/1996 14:50:22 RMK

MATCH LINE - SEE SHEET 5

MATCH LINE - SEE SHEET 3

MATCH LINE - SEE SHEET 1

N 6969500

N 6970500

E 2298500

E 2297500

E 2296500

SANITARY SEWER SYSTEM RFI
NAS FORT WORTH JRB
FORT WORTH, TEXAS

FIGURE 3-1 SHEET 2
SOIL SAMPLING LOCATIONS

SHEET NO.	JOB NO.	DRAWING NO.	REV
2	768579	768579ES.014	

SCALE: 0 100 200 FEET

SHEET 16 | SHEET 17 | SHEET 18

LEGEND:

- SOIL SAMPLE LOCATIONS
- GROUNDWATER SAMPLE LOCATIONS
- MANHOLE (SAMPLE WILL BE TAKEN)
- MANHOLE (SAMPLE WILL NOT BE TAKEN)
- NMH — NO MANHOLE (AFTER FIELD INVESTIGATION A MANHOLE WAS NOT IDENTIFIED OR COULD NOT BE LOCATED)
- MANHOLES IDENTIFIED IN THE FIELD THAT ARE NOT MAP LOCATED
- POTENTIAL SANITARY SEWER LINE
- CITY OF FORT WORTH SANITARY SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- BUILDINGS
- RESIDENTIAL AREA BOUNDARY
- INDUSTRIAL AREA BOUNDARY
- ROADS
- STREAMS
- FENCE

NO.	DATE	REVISION	BY	CHK'D	APPR'D	ITEM/CODE	DATE	PROJECT
						DRAWN		
						DESIGN		
						CHECK		
						APPR		

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387 108

16 15 14 13 12 11 10 9 8 7 6 5 4 3 16 2 15 1 14

A B C D E F G H I J K

E 2299500 E 2300500 E 2301500

N 6970500 N 6969500

MATCH LINE - SEE SHEET 3

MATCH LINE - SEE SHEET 6

LEGEND:

- SOIL SAMPLE LOCATIONS
- GROUNDWATER SAMPLE LOCATIONS
- MANHOLE (SAMPLE WILL BE TAKEN)
- MANHOLE (SAMPLE WILL NOT BE TAKEN)
- NMH — NO MANHOLE (AFTER FIELD INVESTIGATION A MANHOLE WAS NOT IDENTIFIED OR COULD NOT BE LOCATED)
- MANHOLES IDENTIFIED IN THE FIELD THAT ARE NOT MAP LOCATED
- POTENTIAL SANITARY SEWER LINE
- 36" CITY OF FORT WORTH SANITARY SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- 6" SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- BUILDINGS
- RESIDENTIAL AREA BOUNDARY
- INDUSTRIAL AREA BOUNDARY
- ROADS
- STREAMS
- FENCE

SHEET 1 SHEET 2 SHEET 3 SHEET 4 SHEET 5 SHEET 6 SHEET 7 SHEET 8 SHEET 9 SHEET 10 SHEET 11 SHEET 12 SHEET 13 SHEET 14 SHEET 15 SHEET 16 SHEET 17 SHEET 18

NOT TO SCALE

SCREENING/ COMMINUTING MACHINE

BUREAU OF PRISONS HOSPITAL

SCALE
0 100 200 FEET

NO	DATE	REVISION	BY	CHK'D	ENGR APPR	PROJ MGR	APPRD
DRAWING DATE	12/06/95	DRAWN BY	BC	CHK'D BY		DRAWING REF	CHK'D BY	PROJECT MGR	T. CARTER

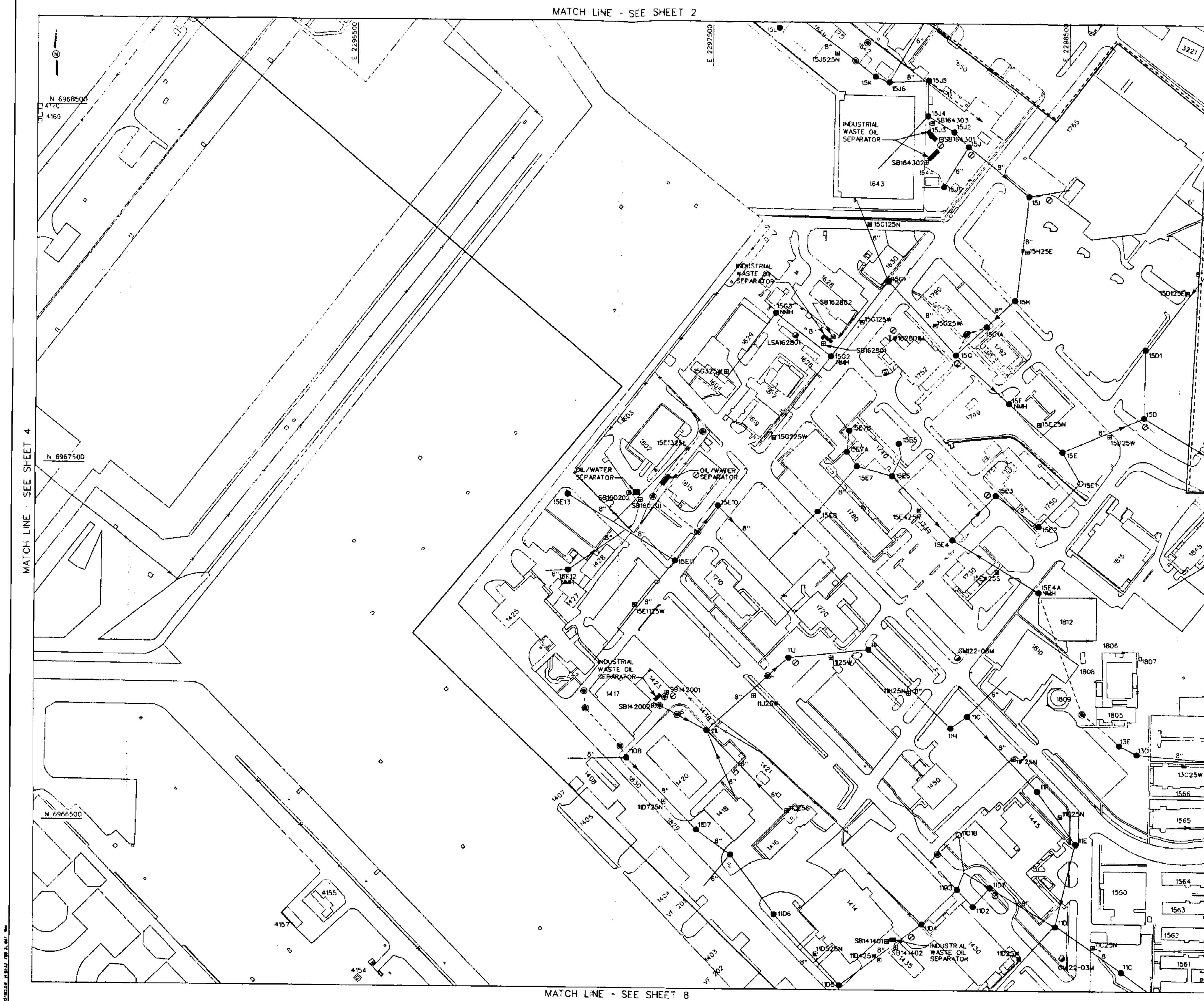
INTERNATIONAL TECHNOLOGY CORPORATION
KNOXVILLE, TENNESSEE

FIGURE 3-1 SHEET 3
SOIL SAMPLING LOCATIONS

SANITARY SEWER SYSTEM RFI
NAS FORT WORTH JRB
FORT WORTH, TEXAS

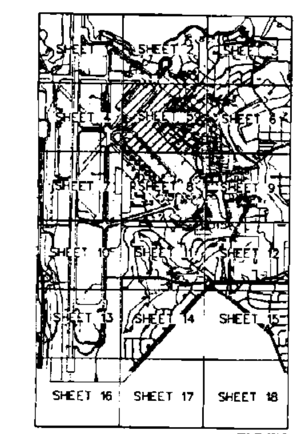
SHEET NO.	JOB NO.	DRAWING NO.	REV.
3	768579	768579ES.015	

387 110



LEGEND:

- SOIL SAMPLE LOCATIONS
- GROUNDWATER SAMPLE LOCATIONS
- MANHOLE (SAMPLE WILL BE TAKEN)
- MANHOLE (SAMPLE WILL NOT BE TAKEN)
- NMH — NO MANHOLE (AFTER FIELD INVESTIGATION A MANHOLE WAS NOT IDENTIFIED OR COULD NOT BE LOCATED)
- MANHOLES IDENTIFIED IN THE FIELD THAT ARE NOT MAP LOCATED
- POTENTIAL SANITARY SEWER LINE
- 36" — CITY OF FORT WORTH SANITARY SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- 6" — SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- BUILDINGS
- RESIDENTIAL AREA BOUNDARY
- INDUSTRIAL AREA BOUNDARY
- ROADS
- STREAMS
- FENCE



SCALE 0 100 200 FEET

INTERNATIONAL TECHNOLOGY CORPORATION

FIGURE 3-1 SHEET 5
SOIL SAMPLING LOCATIONS

SANITARY SEWER SYSTEM RFI
NAS FORT WORTH JRB
FORT WORTH, TEXAS

SHEET NO.	JOB NO.	DRAWING NO.	REV
5	768579	768579ES.016	

MATCH LINE - SEE SHEET 3

MATCH LINE - SEE SHEET 5

MATCH LINE - SEE SHEET 9

WEST FORK TRINITY RIVER

WEST FORK TRINITY RIVER

RELIEF SEWER

LEGEND:

- SOIL SAMPLE LOCATIONS
- GROUNDWATER SAMPLE LOCATIONS
- MANHOLE (SAMPLE WILL BE TAKEN)
- MANHOLE (SAMPLE WILL NOT BE TAKEN)
- NMH — NO MANHOLE (AFTER FIELD INVESTIGATION A MANHOLE WAS NOT IDENTIFIED OR COULD NOT BE LOCATED)
- MANHOLES IDENTIFIED IN THE FIELD THAT ARE NOT MAP LOCATED
- POTENTIAL SANITARY SEWER LINE
- 36" — CITY OF FORT WORTH SANITARY SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- 6" — SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- BUILDINGS
- RESIDENTIAL AREA BOUNDARY
- INDUSTRIAL AREA BOUNDARY
- ROADS
- STREAMS
- FENCE

SHEET 1 SHEET 2 SHEET 3 SHEET 4 SHEET 5 SHEET 6 SHEET 7 SHEET 8 SHEET 9 SHEET 10 SHEET 11 SHEET 12 SHEET 13 SHEET 14 SHEET 15 SHEET 16 SHEET 17 SHEET 18

NOT TO SCALE

SCALE
0 100 200 FEET

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KNOXVILLE, TENNESSEE

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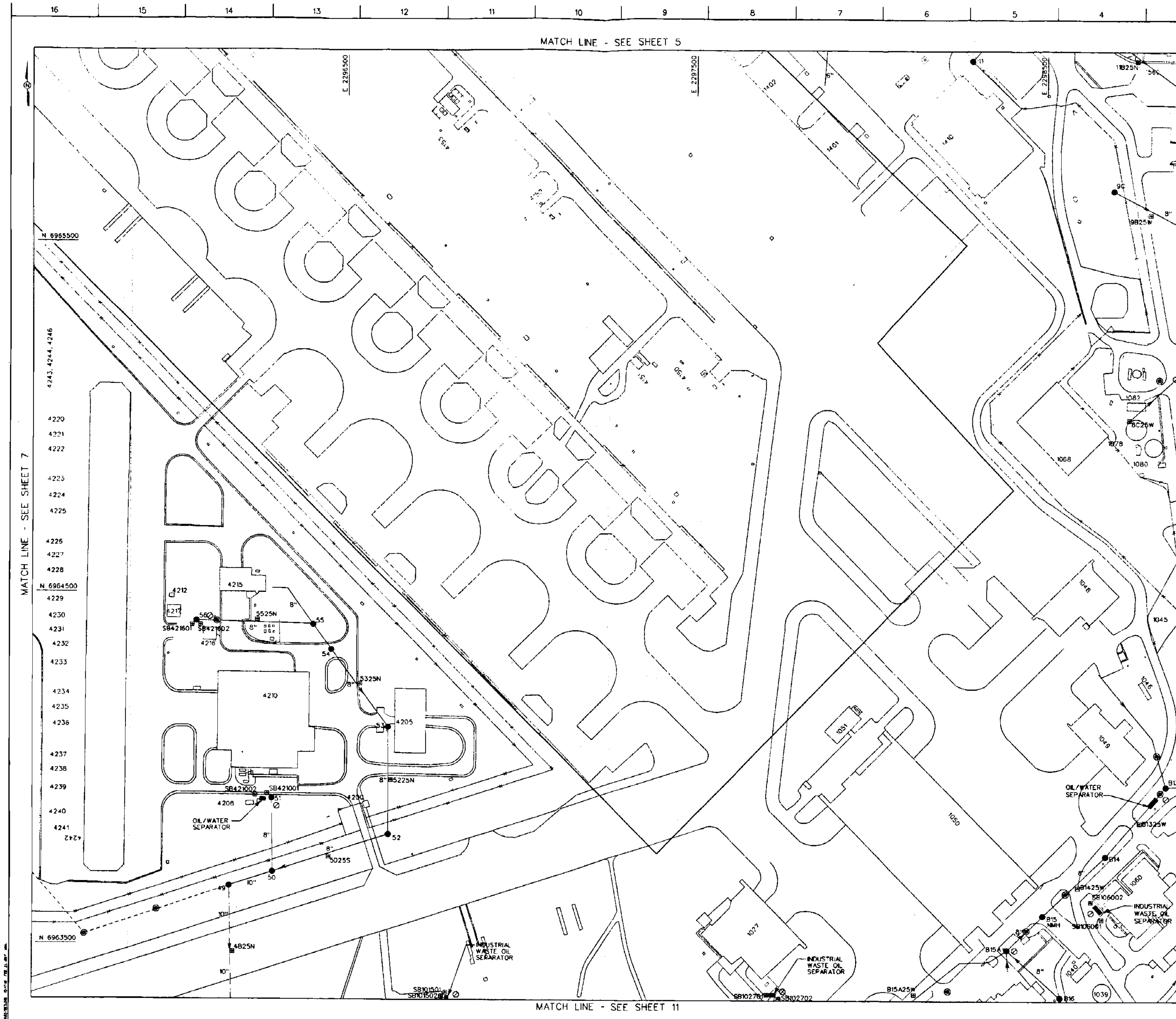
FIGURE 3-1 SHEET 6
SOIL SAMPLING LOCATIONS

SANITARY SEWER SYSTEM RFI
NAS FORT WORTH JRB
FORT WORTH, TEXAS

SHEET NO.	JOB NO.	DRAWING NO.	REV
6	768579	768579ES.017	

MATCH LINE - SEE SHEET 5



LEGEND:

- SOIL SAMPLE LOCATIONS
- GROUNDWATER SAMPLE LOCATIONS
- MANHOLE (SAMPLE WILL BE TAKEN)
- MANHOLE (SAMPLE WILL NOT BE TAKEN)
- NMH — NO MANHOLE (AFTER FIELD INVESTIGATION A MANHOLE WAS NOT IDENTIFIED OR COULD NOT BE LOCATED)
- MANHOLES IDENTIFIED IN THE FIELD THAT ARE NOT MAP LOCATED
- POTENTIAL SANITARY SEWER LINE
- 36" — CITY OF FORT WORTH SANITARY SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- 6" — SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- BUILDINGS
- RESIDENTIAL AREA BOUNDARY
- INDUSTRIAL AREA BOUNDARY
- ROADS
- STREAMS
- FENCE

INTERNATIONAL TECHNOLOGY CORPORATION

CONFIDENTIAL PROPERTY OF IT CORPORATION

FIGURE 3-1 SHEET 8
SOIL SAMPLING LOCATIONS

SANITARY SEWER SYSTEM RFI
NAS FORT WORTH JRB
FORT WORTH, TEXAS

SHEET NO.	JOB NO.	DRAWING NO.	REV
8	768579	768579ES.018	

SHEET NO.	JOB NO.	DRAWING NO.	REV
9	76852	7685296S.019	

SANITARY SEWER SYSTEM RI
NAS FORT WORTH JRB
FORT WORTH, TEXAS

FIGURE 3-1 SHEET 9
SOIL SAMPLING LOCATIONS

CONFIDENTIAL PROPERTY OF IT CORPORATION

NO.	DATE	REVISION	BY	CHK'D	APP'D

IT
INTERNATIONAL TECHNOLOGY CORPORATION

SCALE: 0 100 200 FEET

MATCH LINE - SEE SHEET 12

MATCH LINE - SEE SHEET 8

MATCH LINE - SEE SHEET 6

WEST FORK TRINITY RIVER

INVERTED SYPHON

LIFT STATION

OIL/WATER SEPARATOR

INDUSTRIAL WASTE OIL SEPARATOR

N 6963500

N 6964500

E 2301500

E 2300500

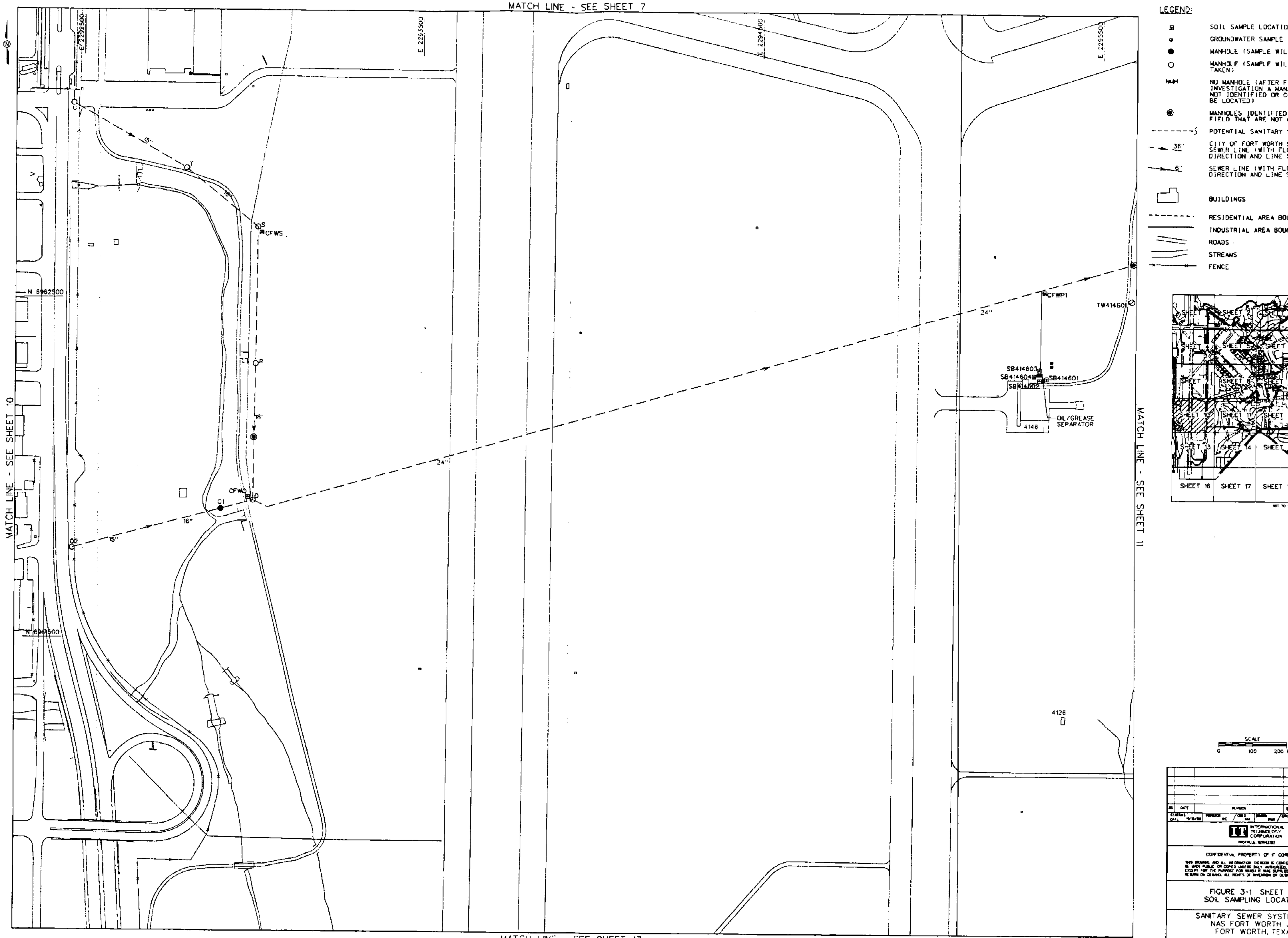
SHEET 16 | SHEET 17 | SHEET 18

LEGEND:

- SOIL SAMPLE LOCATIONS
- GROUNDWATER SAMPLE LOCATIONS
- MANHOLE (SAMPLE WILL BE TAKEN)
- MANHOLE (SAMPLE WILL NOT BE TAKEN)
- NMH — NO MANHOLE (AFTER FIELD INVESTIGATION A MANHOLE WAS NOT IDENTIFIED OR COULD NOT BE LOCATED)
- MANHOLES IDENTIFIED IN THE FIELD THAT ARE NOT MAP LOCATED
- POTENTIAL SANITARY SEWER LINE
- 36" CITY OF FORT WORTH SANITARY SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- 6" SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- BUILDINGS
- RESIDENTIAL AREA BOUNDARY
- INDUSTRIAL AREA BOUNDARY
- ROADS
- STREAMS
- FENCE

387 113

387 114



LEGEND:

- SOIL SAMPLE LOCATIONS
- GROUNDWATER SAMPLE LOCATIONS
- MANHOLE (SAMPLE WILL BE TAKEN)
- MANHOLE (SAMPLE WILL NOT BE TAKEN)
- NMH — NO MANHOLE (AFTER FIELD INVESTIGATION A MANHOLE WAS NOT IDENTIFIED OR COULD NOT BE LOCATED)
- MANHOLES IDENTIFIED IN THE FIELD THAT ARE NOT MAP LOCATED
- POTENTIAL SANITARY SEWER LINE
- 36" — CITY OF FORT WORTH SANITARY SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- 6" — SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- BUILDINGS
- RESIDENTIAL AREA BOUNDARY
- INDUSTRIAL AREA BOUNDARY
- ROADS
- STREAMS
- FENCE

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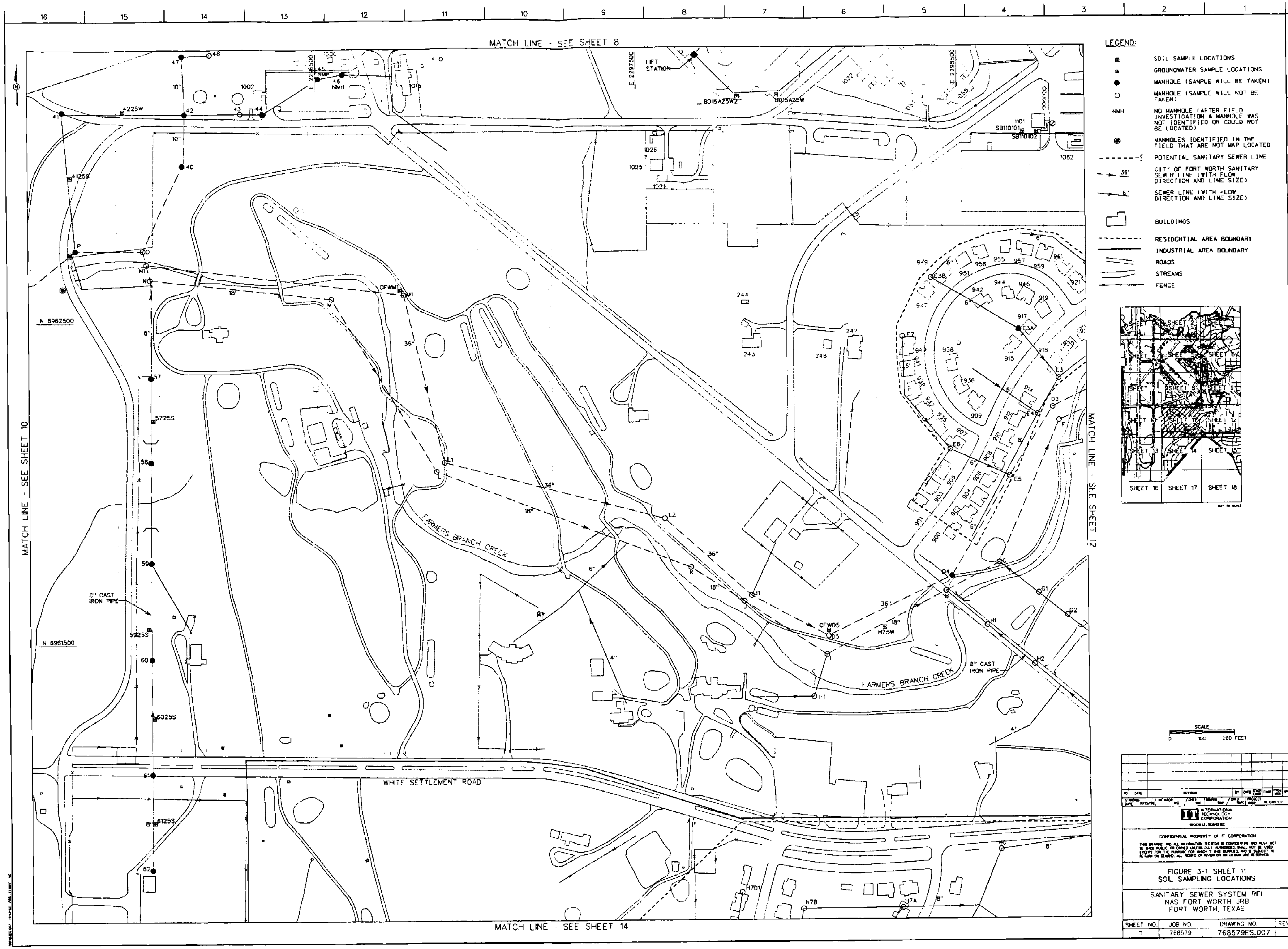
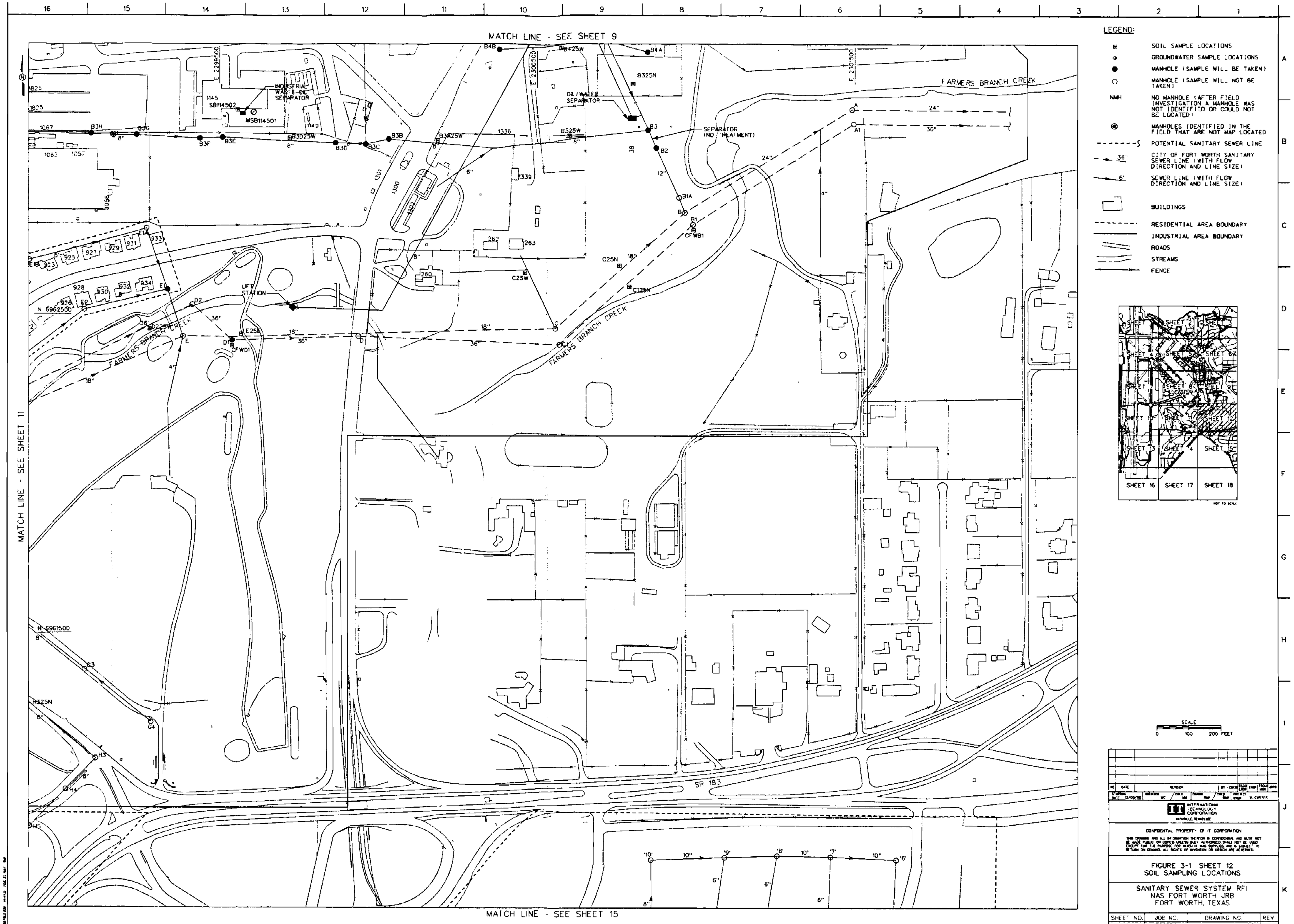
FIGURE 3-1 SHEET 10
SOIL SAMPLING LOCATIONS

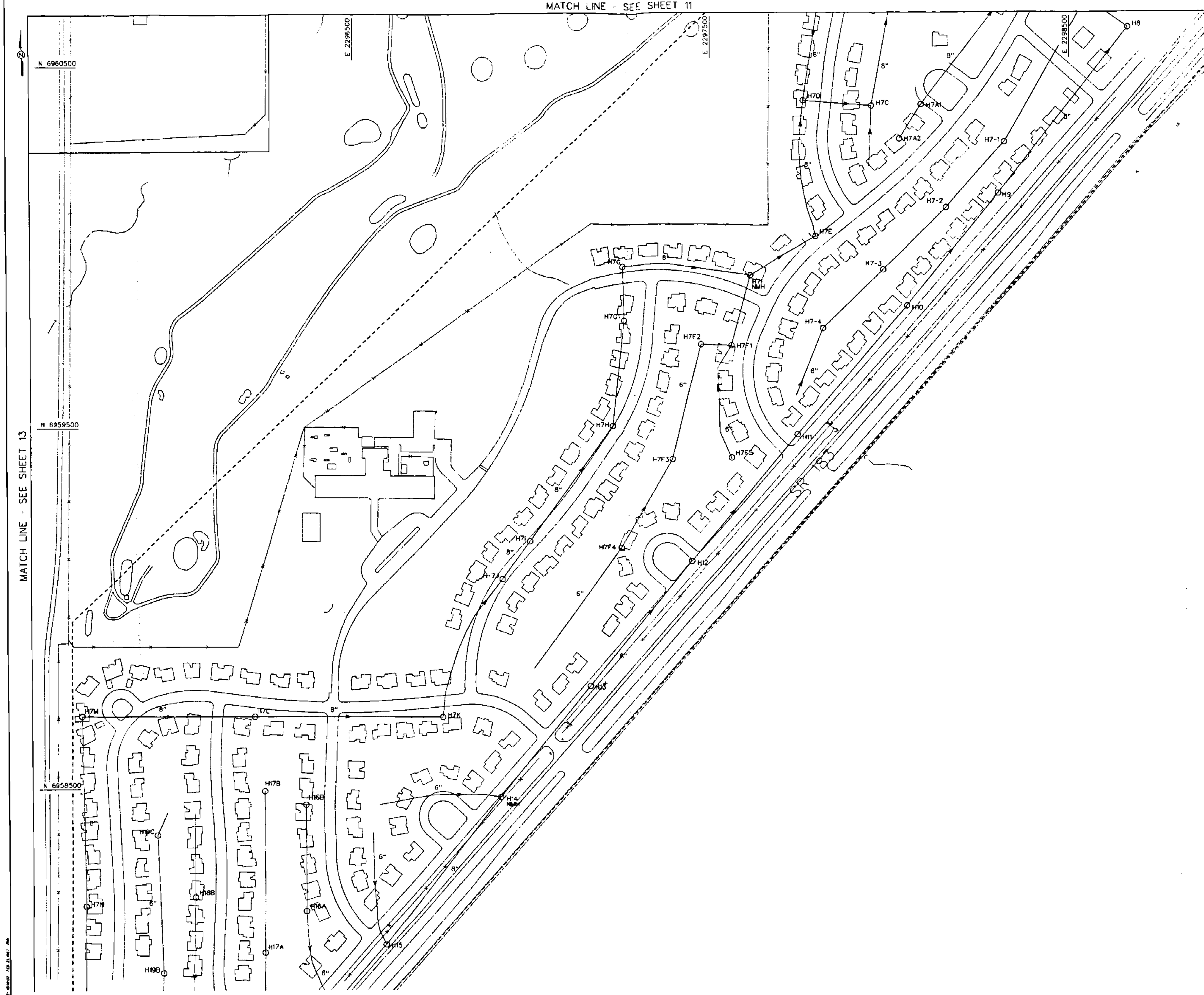
SANITARY SEWER SYSTEM RFI
NAS FORT WORTH JRB
FORT WORTH, TEXAS

SHEET NO.	JOB NO.	DRAWING NO.	REV
10	768579	768579ES.023	


MATCH LINE - SEE SHEET 8
MATCH LINE - SEE SHEET 10
MATCH LINE - SEE SHEET 12
MATCH LINE - SEE SHEET 14
LEGEND:
SOIL SAMPLE LOCATIONS
GROUNDWATER SAMPLE LOCATIONS
MANHOLE (SAMPLE WILL BE TAKEN)
MANHOLE (SAMPLE WILL NOT BE TAKEN)
NMH
NO MANHOLE (AFTER FIELD INVESTIGATION A MANHOLE WAS NOT IDENTIFIED OR COULD NOT BE LOCATED)
MANHOLES IDENTIFIED IN THE FIELD THAT ARE NOT MAP LOCATED
POTENTIAL SANITARY SEWER LINE
CITY OF FORT WORTH SANITARY SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
BUILDINGS
RESIDENTIAL AREA BOUNDARY
INDUSTRIAL AREA BOUNDARY
ROADS
STREAMS
FENCE
SHEET 16
SHEET 17
SHEET 18
FARMERS BRANCH CREEK
WHITE SETTLEMENT ROAD
LIFT STATION
8" CAST IRON PIPE
N 6962500
N 6961500
E 2297500
E 2298500
SCALE
0
100
200 FEET
INTERNATIONAL TECHNOLOGY CORPORATION
CONFIDENTIAL PROPERTY OF IT CORPORATION
FIGURE 3-1 SHEET 11
SOIL SAMPLING LOCATIONS
SANITARY SEWER SYSTEM RFI
NAS FORT WORTH JRB
FORT WORTH, TEXAS
SHEET NO.
11
JOB NO.
768579
DRAWING NO.
768579ES.007
REV

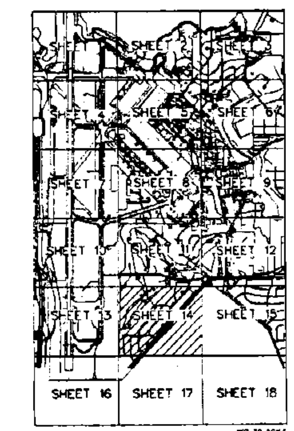

MATCH LINE - SEE SHEET 9
MATCH LINE - SEE SHEET 11
MATCH LINE - SEE SHEET 15
FARMERS BRANCH CREEK
SEPARATOR (NO TREATMENT)
OIL/WATER SEPARATOR
INDUSTRIAL WASTE SEPARATOR
LIFT STATION
SR 183
LEGEND:
SOIL SAMPLE LOCATIONS
GROUNDWATER SAMPLE LOCATIONS
MANHOLE (SAMPLE WILL BE TAKEN)
MANHOLE (SAMPLE WILL NOT BE TAKEN)
NMH
NO MANHOLE (AFTER FIELD INVESTIGATION A MANHOLE WAS NOT IDENTIFIED OR COULD NOT BE LOCATED)
MANHOLES IDENTIFIED IN THE FIELD THAT ARE NOT MAP LOCATED
POTENTIAL SANITARY SEWER LINE
CITY OF FORT WORTH SANITARY SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
BUILDINGS
RESIDENTIAL AREA BOUNDARY
INDUSTRIAL AREA BOUNDARY
ROADS
STREAMS
FENCE
SHEET 16
SHEET 17
SHEET 18
NOT TO SCALE
SCALE
0 100 200 FEET
INTERNATIONAL TECHNOLOGY CORPORATION
CONFIDENTIAL PROPERTY OF IT CORPORATION
FIGURE 3-1 SHEET 12
SOIL SAMPLING LOCATIONS
SANITARY SEWER SYSTEM RFI
NAS FORT WORTH JRB
FORT WORTH, TEXAS
SHEET NO. 12
JOB NO. 768579
DRAWING NO. 768579ES.020
REV.

387 117



LEGEND:

- SOIL SAMPLE LOCATIONS
- GROUNDWATER SAMPLE LOCATIONS
- MANHOLE (SAMPLE WILL BE TAKEN)
- MANHOLE (SAMPLE WILL NOT BE TAKEN)
- NMH — NO MANHOLE (AFTER FIELD INVESTIGATION A MANHOLE WAS NOT IDENTIFIED OR COULD NOT BE LOCATED)
- MANHOLES IDENTIFIED IN THE FIELD THAT ARE NOT MAP LOCATED
- POTENTIAL SANITARY SEWER LINE
- 36" — CITY OF FORT WORTH SANITARY SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- 6" — SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- BUILDINGS
- RESIDENTIAL AREA BOUNDARY
- INDUSTRIAL AREA BOUNDARY
- ROADS
- STREAMS
- FENCE



SCALE 0 100 200 FEET

IT INTERNATIONAL TECHNOLOGY CORPORATION

CONFIDENTIAL PROPERTY OF IT CORPORATION

FIGURE 3-1 SHEET 14
SOIL SAMPLING LOCATIONS

SANITARY SEWER SYSTEM RFI
NAS FORT WORTH JRB
FORT WORTH, TEXAS

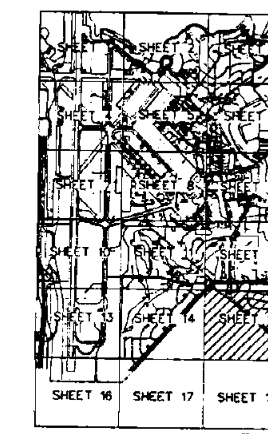
SHEET NO.	JOB NO.	DRAWING NO.	REV.
14	768579	768579ES.021	

MATCH LINE - SEE SHEET 12

MATCH LINE - SEE SHEET 14

LEGEND:

- SOIL SAMPLE LOCATIONS
- GROUNDWATER SAMPLE LOCATIONS
- MANHOLE (SAMPLE WILL BE TAKEN)
- MANHOLE (SAMPLE WILL NOT BE TAKEN)
- NMH — NO MANHOLE (AFTER FIELD INVESTIGATION A MANHOLE WAS NOT IDENTIFIED OR COULD NOT BE LOCATED)
- MANHOLES IDENTIFIED IN THE FIELD THAT ARE NOT MAP LOCATED
- POTENTIAL SANITARY SEWER LINE
- 36" — CITY OF FORT WORTH SANITARY SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- 6" — SEWER LINE (WITH FLOW DIRECTION AND LINE SIZE)
- BUILDINGS
- RESIDENTIAL AREA BOUNDARY
- INDUSTRIAL AREA BOUNDARY
- ROADS
- STREAMS
- FENCE



SCALE 0 100 200 FEET

INTERNATIONAL TECHNOLOGY CORPORATION

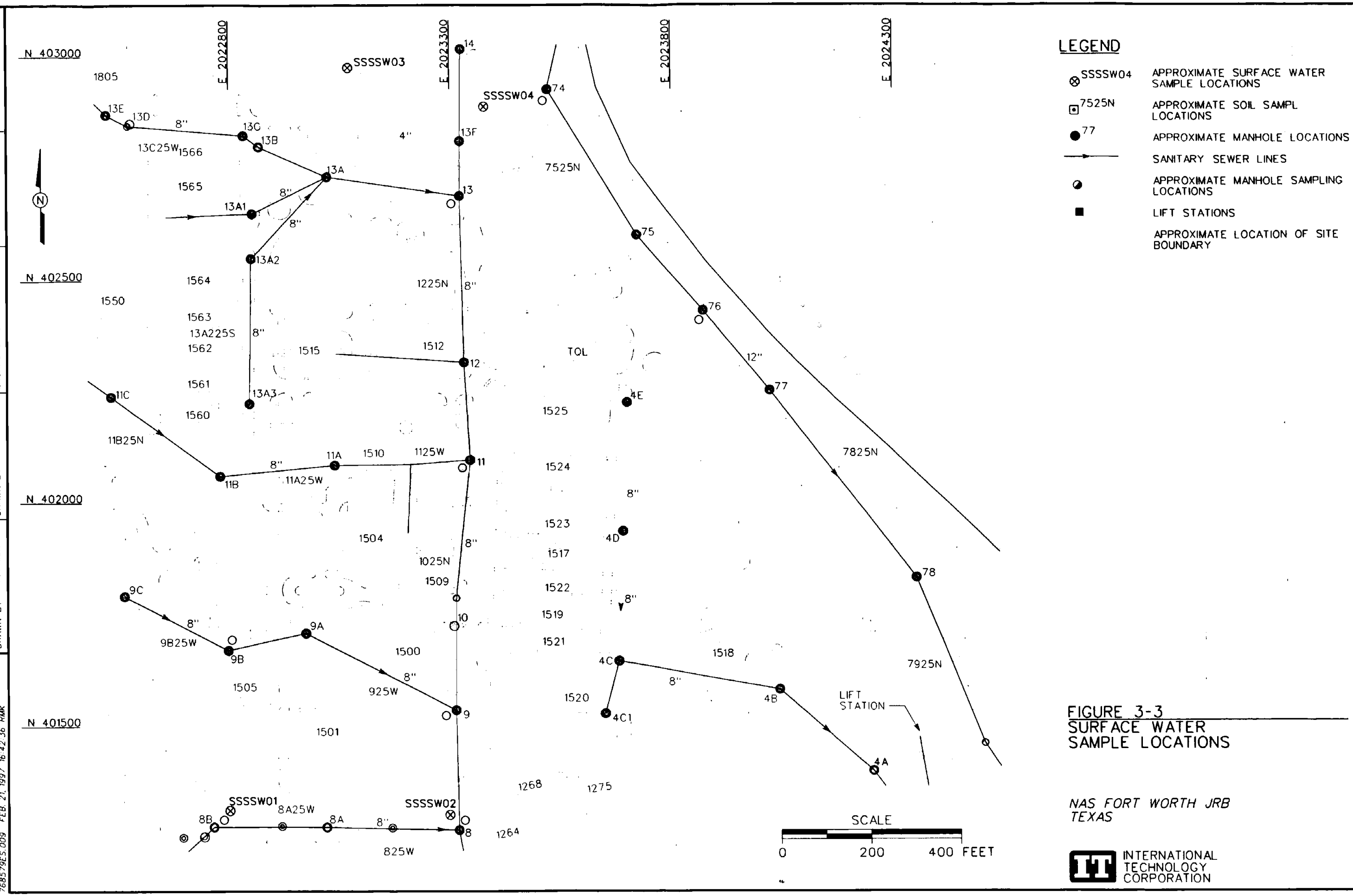
FIGURE 3-1 SHEET 15
SOIL SAMPLING LOCATIONS

SANITARY SEWER SYSTEM RFI
NAS FORT WORTH JRB
FORT WORTH, TEXAS

SHEET NO.	JOB NO.	DRAWING NO.	REV
15	768579	768579ES.022	

Figure 3-2

The Groundwater Monitoring Well map Sheets showing maps will be coordinated for approval and once approved will be transmitted separately for inclusion in this plan.



LEGEND

- SSSSW04 — APPROXIMATE SURFACE WATER SAMPLE LOCATIONS
- 7525N — APPROXIMATE SOIL SAMPL LOCATIONS
- 77 — APPROXIMATE MANHOLE LOCATIONS
- SANITARY SEWER LINES
- APPROXIMATE MANHOLE SAMPLING LOCATIONS
- LIFT STATIONS
- APPROXIMATE LOCATION OF SITE BOUNDARY

FIGURE 3-3
SURFACE WATER
SAMPLE LOCATIONS

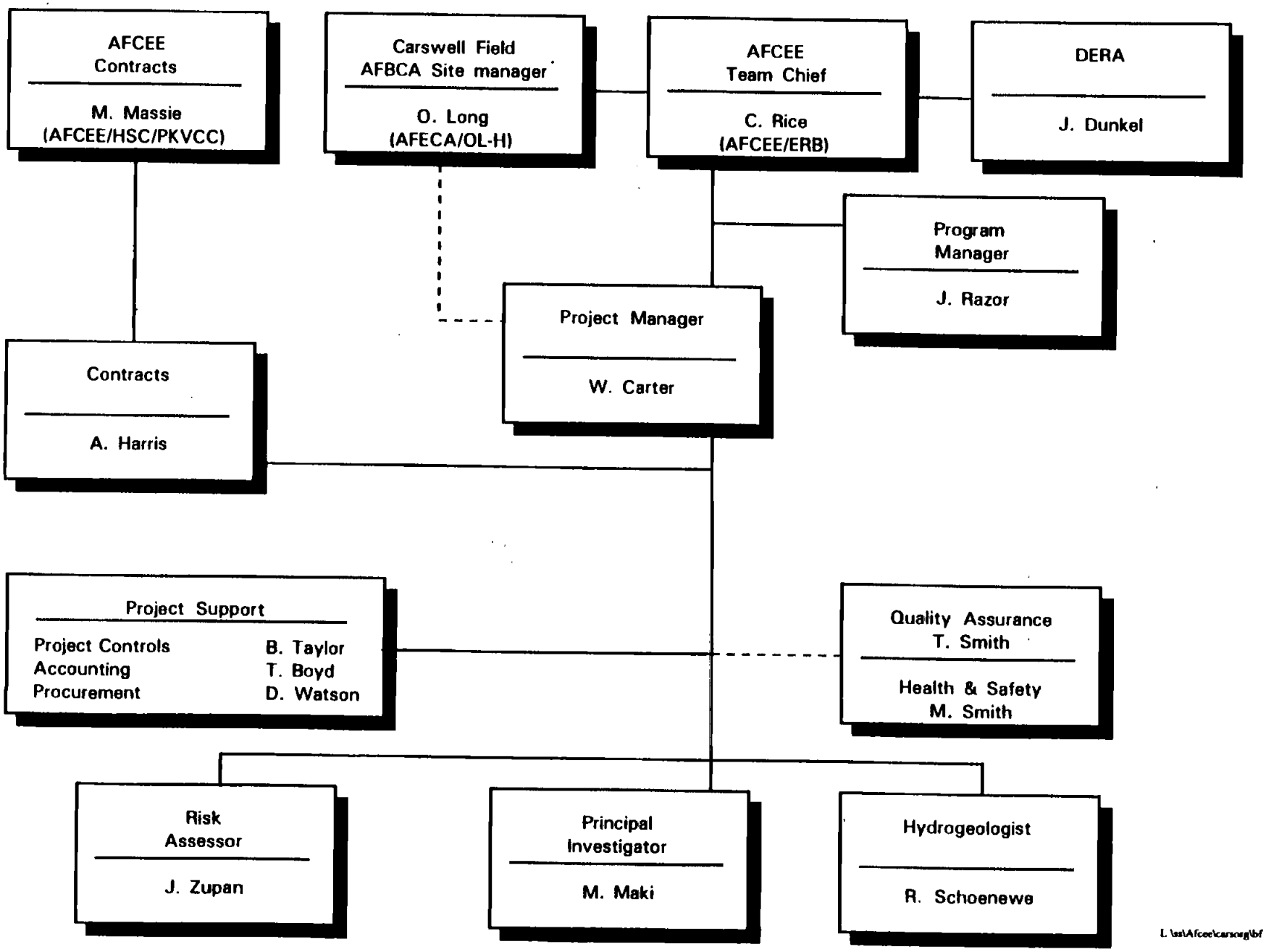
NAS FORT WORTH JRB
TEXAS

INTERNATIONAL TECHNOLOGY CORPORATION

DWG. NO.768579ES.009	PROJ. NO.:768579
INITIATOR: W. CARTER	PROJ. MGR.:W. CARTER
DRAFT. CHCK. BY: R. KNIGHT	M. MAKI
ENGR. CHCK. BY:	
DATE LAST REV.:	
DRAWN BY:	
STARTING DATE: 11/06/96	
DRAWN BY: R. KNIGHT	

768579ES.009 FEB. 21, 1997 16:42:36 RMK

Figure 4-1. Project Organization - NAS Fort Worth (Project No. 768579)



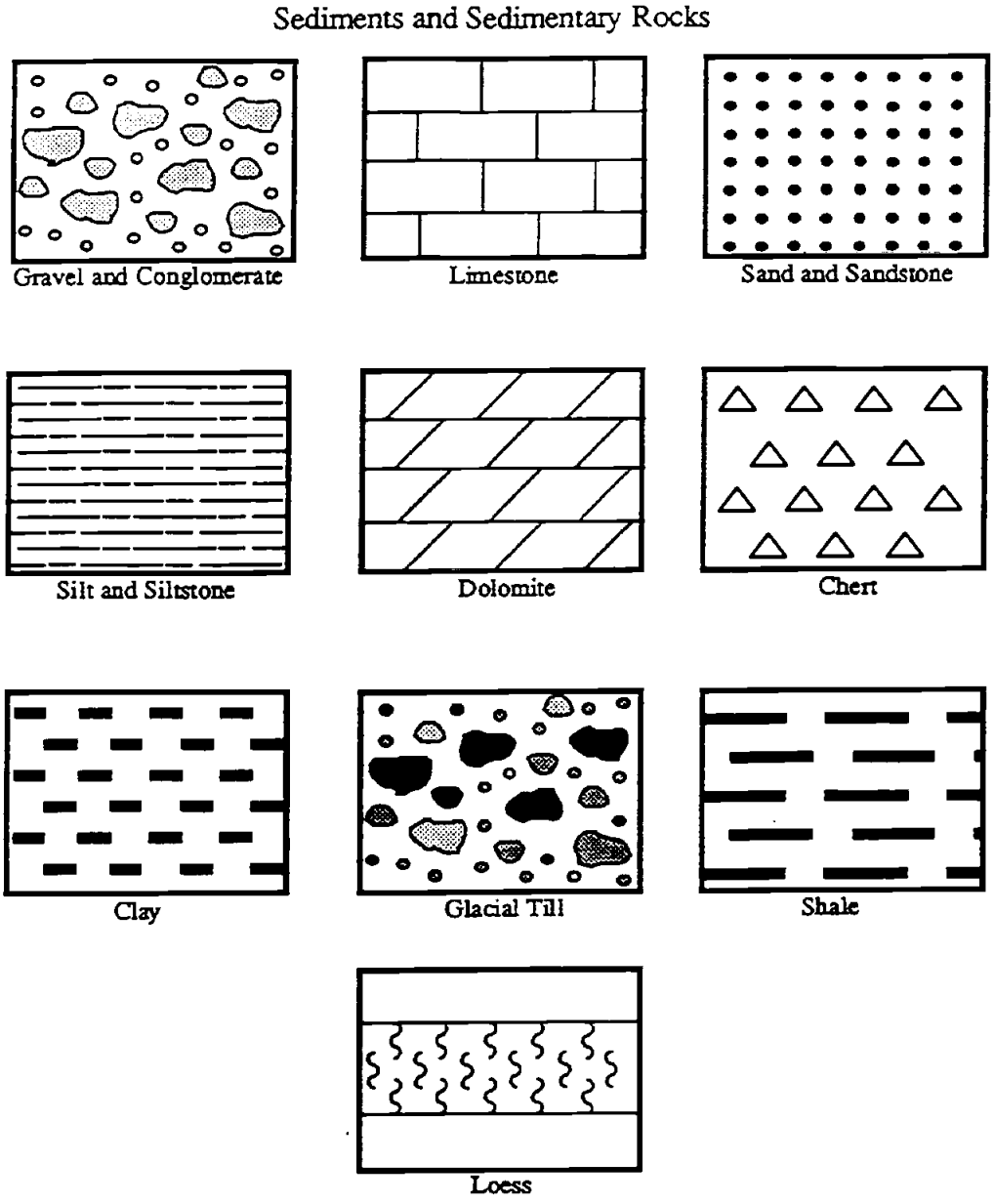


Figure 5-1

Lithologic Patterns for Illustration

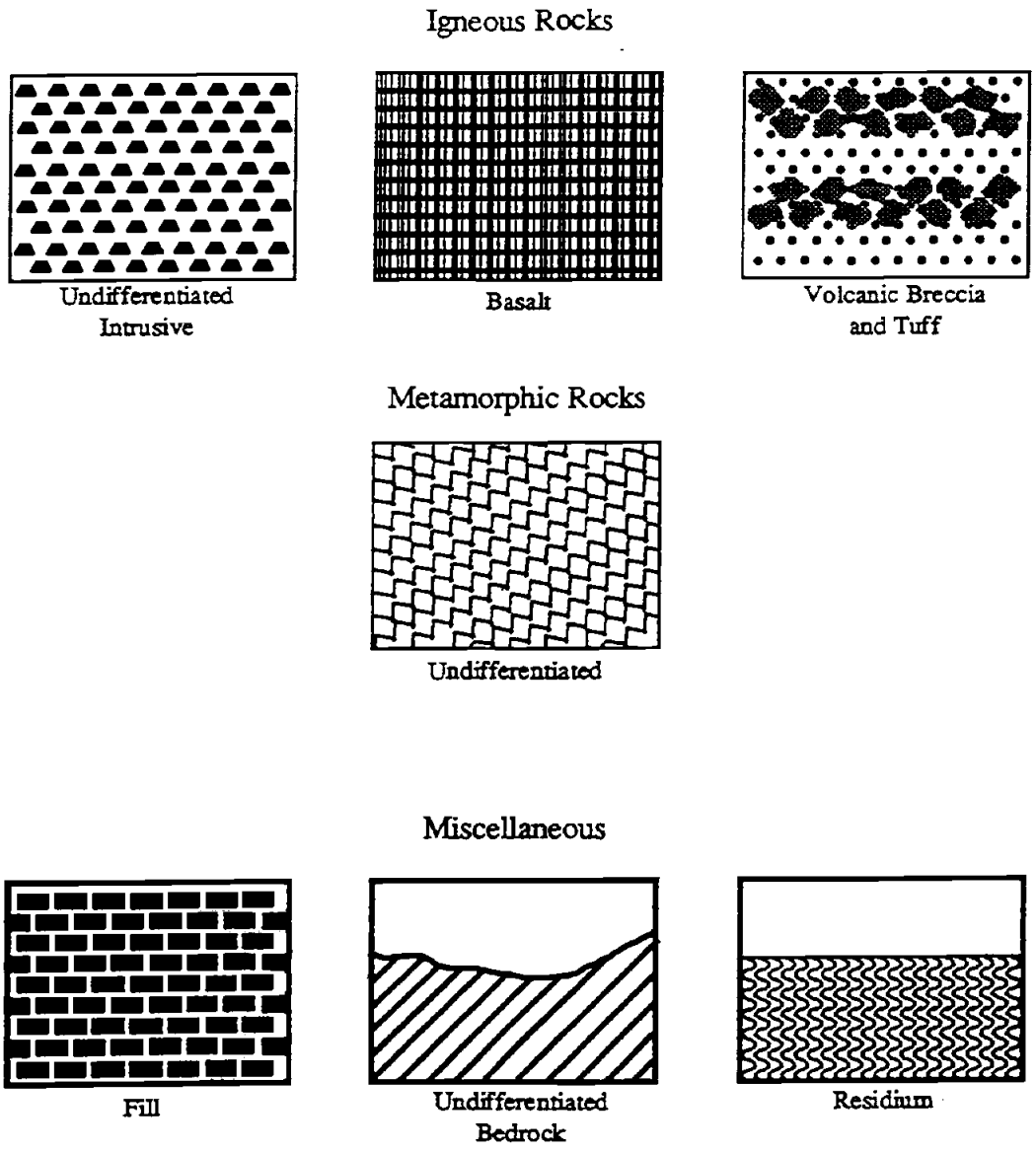


Figure 5-1 (Continued)

Lithologic Patterns for Illustration

INTERNATIONAL TECHNOLOGY CORPORATION

(Not To Scale)

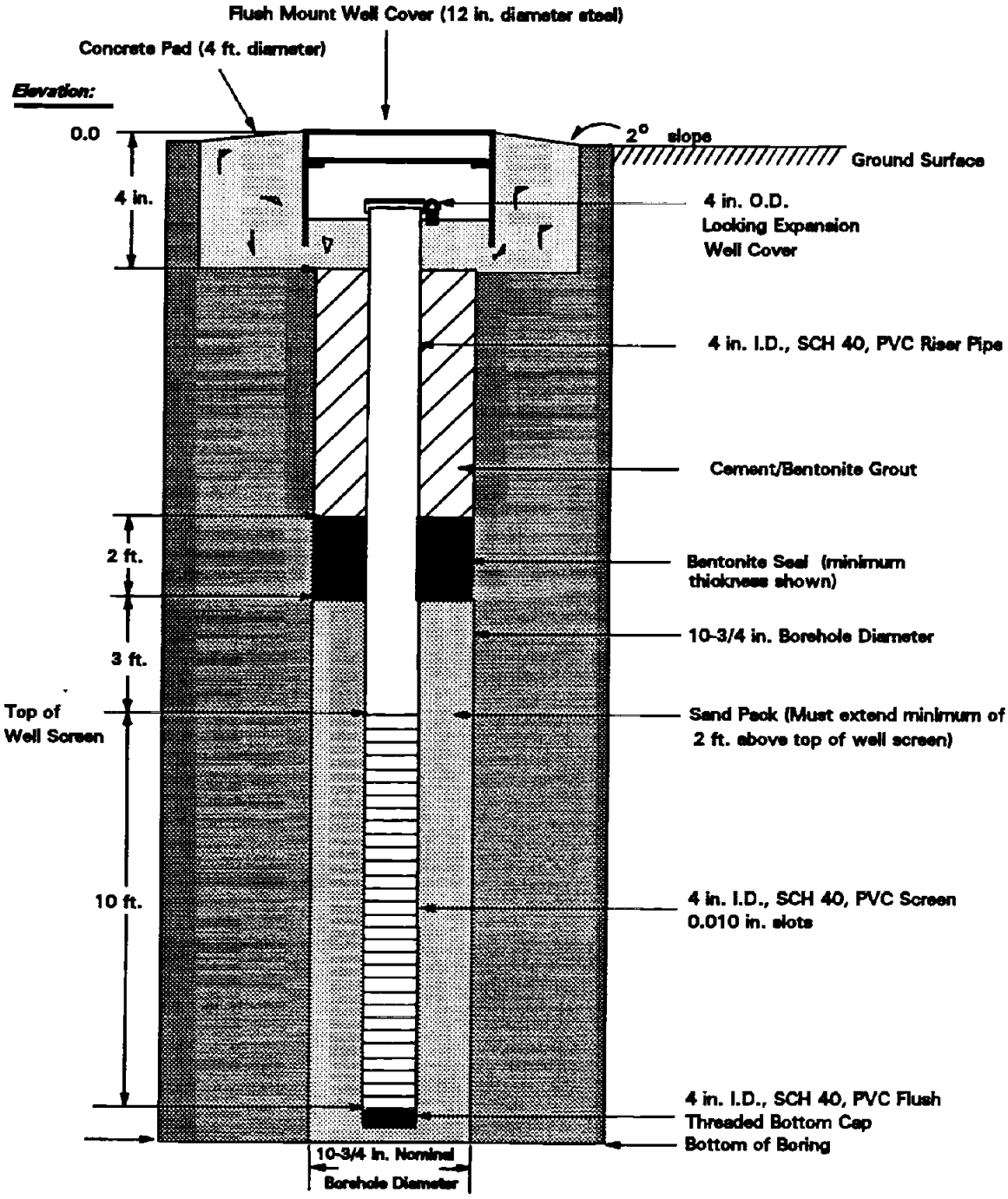


FIGURE 5-2
Monitoring Well Design
prepared for:

NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS

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

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE