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FINAL QUALITY ASSURANCE PROJECT PLAN FOR SITE CHARACTERIZATION OF BASE
SERVICE STATION VOLUME 2 NAS FORT WORTH TX
7/1/1996
INTERNATIONAL TECHNOLOGIES

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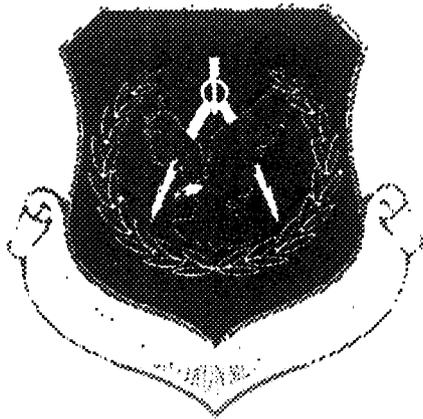
**NAVAL AIR STATION
FORT WORTH JRB
CARSWELL FIELD
TEXAS**

**ADMINISTRATIVE RECORD
COVER SHEET**

AR File Number 299

HQ Air Force Center for Environmental Excellence

Final Quality Assurance Project Plan Volume 2



Prepared for:

Site Characterization of Base Gas Station
Naval Air Station Fort Worth Joint Reserve Base
Carswell Field, Texas

F41624-94-D8047-032
Project No. 765725

July 1996

Final

**Quality Assurance Project Plan
Remedial Investigation Base Gas Station
Naval Air Station Fort Worth
Joint Reserve Base, Carswell Field
Fort Worth, Texas**

Prepared for:

**Air Force Center for Environmental Excellence
Brooks Air Force Base, Texas
Contract No. F41624-94-D-8047
Delivery Order No. 0032**

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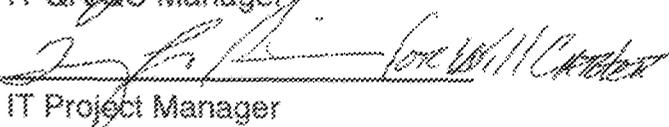
Project No. 765725

**Revision 1
July 1996**

QUALITY ASSURANCE PROJECT PLAN
For
Site Characterization of Base Gas Station
Volume 2 of 2 of the Sampling and Analysis Plan

Final
for
Naval Air Station Fort Worth
Fort Worth, Texas
Revision 1, July 1996

Approved:  Date 7/6/96
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List of Acronyms

AA	atomic absorption
AFCEE	Air Force Center for Environmental Excellence
AFID	Air Force installation identification
A ₂ LA	American Association for Laboratory Accreditation
ARAR	applicable or relevant and appropriate requirement
ASCII	American Standard Code Information Interchange
ASTM	American Society for Testing and Materials
BFB	bromofluorobenzene
BHC	benzene hexachloride
Br	bromide
BTEX	benzene, toluene, ethyl benzene, xylene
°C	degrees Celsius
CCC	calibration check compound
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulation
CH ₄	methane
CI	confidence interval
CL	chloride
CLP	Contract Laboratory Program
CN	cyanide
CO	carbon monoxide
COC	chain of custody
2,4-D	2,4-dichlorophenoxy acetic acid
2,4-DB	2,4-dichlorophenoxy butyric acid
DCA	dichloroethane
DCB	dichlorobenzene
DCBP	decachlorobiphenyl
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DEQPPM	Defense Environmental Quality Program Policy Memorandum

List of Acronyms (Continued)

ID	identification
IRP	Installation Restoration Program
IRPIMS	Installation Restoration Program Information Management System
IS	internal standard
ITIR	informal technical information report
KCl	potassium chloride
LCL	lower control limit
LCS	laboratory control sample
LOCXREF	location cross-reference
LOGDATE	sampling date
MCPA	(4-chloro-2-methylphenoxy) acetic acid
MCPP	2-(4-chloro-2-methylphenoxy) propionic acid
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	milliliter
mm	millimeter
MS	matrix spike
MSD	matrix spike duplicate
m/z	mass to charge ratio
N	newton
N/A	not applicable
NaI	sodium iodide
NaOH	sodium hydroxide
Na ₂ S ₂ O ₃	sodium thiosulfate
NCP	National Contingency Plan
ng/L	nanograms per liter
ng/mL	nanograms per milliliter
NIST	National Institute of Standards and Technology
nm	nanometer
NO ₂	nitrite
NO ₃	nitrate
NTU	nephelometric turbidity unit

List of Acronyms (Continued)

OCDD	octachlorodibenzo-p-dioxin
ORP	oxidation-reduction potential
OVA	organic vapor analyzer
P	polyethylene
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofuran
PE	performance evaluation
PeCDD	pentachlorodibenzo-p-dioxin
PeCDF	pentachlorodibenzofuran
PEG	polyethylene glycol
PID	photoionization detector
PO ₄	phosphate
ppb	parts per billion
ppm	parts per million
ppmv	parts per million volume
PQL	practical quantitation limit
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
r	correlation coefficient
R	recovery
RCA	recommendations for corrective action
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RF	response factor
RI	remedial investigation
RPD	relative percent difference
RSD	relative standard deviation
S	soil
SARA	Superfund Amendments and Reauthorization Act
S/N	signal to noise

List of Acronyms (Continued)

SO ₄	sulfate
SOP	standard operating procedure
SOW	statement of work
SPCC	system performance check compound
SVOC	semivolatile organic compound
2,4,5-T	2,4,5-trichlorophenoxy acetic acid
T	California brass
TC	Team Chief
TCA	trichloroethane
TCDD	tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofuran
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TCMX	tetrachlorometaxylene
TIC	tentatively identified compound
TNB	trinitrobenzene
TNT	trinitrotoluene
2,4,5-TP	2,4,5-trichlorophenoxy acetic acid (silvex)
TPH	total petroleum hydrocarbon
UCL	upper control limit
VOC	volatile organic compound

TAB

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1.0 Introduction

This Quality Assurance Project Plan (QAPP) presents in specific terms the policies, organization, functions, and QA/QC requirements designed to achieve the data quality goals for environmental services performed at the Naval Air Station Fort Worth Joint Reserve Base, Carswell Field, Texas (NAS Fort Worth). These environmental services will include all aspects of remedial investigation. It is Part 2 of the Sampling and Analysis Plan. The Field Sampling Plan is Part 1.

The U.S. Environmental Protection Agency (EPA) QA policy requires a written and approved QAPP for every monitoring and measurement project mandated or supported by the EPA through regulations, contracts, or other formalized means not currently covered by regulation. Guidelines followed in the preparation of this plan are set out in *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans* (EPA, 1983a) and *EPA Region IX QAPP: Guidance for Preparing QAPPs for Superfund Remedial Projects* (EPA, 1989). Other documents that have been referenced for this plan include *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final* (EPA, 1988); *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations, Draft Final, EPA QA/R-5* (EPA, 1993); *Compendium of Superfund Field Operations Methods* (EPA, 1987a); *Data Quality Objectives Process for Superfund, Interim Final Guidance* (EPA, 1993); *EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA, 1994), *EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA, 1994), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA SW-846, Third Edition and its first update), and the *Handbook for Installation Restoration Program (IRP) Remedial Investigations and Feasibility Studies (RI/FS)* (Handbook), September 1993.

This detailed QAPP has been prepared for use to ensure that the data are scientifically valid and defensible. This QAPP is a procedural document developed to ensure consistency in field and laboratory analytical procedures.

This QAPP will be reviewed by all staff participating in the work effort. Copies of this QAPP will be retained in the field by field teams and in the laboratories performing all analytical methods. All contractors are required to comply with procedures documented in this QAPP to ensure comparability and representativeness of the data produced.

The signed approval page will be updated for each numbered revision of the QAPP.

Controlled distribution of the QAPP has been implemented to ensure that the current version is being used. A sequential number is used to identify controlled copies of the QAPP. Controlled copies will be provided to the Air Force and applicable regulatory agency remedial project managers, suppliers' project managers, and the QA coordinator. Whenever a revision is made to the QAPP, document control will ensure that (1) all parties holding a controlled copy of the QAPP will receive the revised copy and (2) outdated copies are removed from circulation. The document control system does not preclude making and using copies of the QAPP; however, the holders of controlled copies are responsible for distributing additional material to update any copies within their organizations. The distribution list is in Appendix A.

This QAPP will be revised as necessary when guidelines and regulatory documents are revised. As revisions are required, they will be prepared as part of the specific task and amended to this QAPP. All contractors and agency Remedial Project Managers who might be affected by such revisions will be informed of the necessary changes and included in the decision making.

TAB

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2.0 Project Description

2.1 The U.S. Air Force Installation Restoration Program

The objective of the U.S. Air Force 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 1976 RCRA is one of the primary federal laws governing the disposal of hazardous wastes. Sections 6001 and 6003 of RCRA require that federal agencies comply with local and state environmental regulations and provide information to the 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.

To ensure compliance with RCRA regulations, the DOD developed the IRP 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 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.

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. Executive Order 12316, adopted in 1981, gave various federal agencies, including the 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.

Executive Order 12316, adopted in 1981, gave various federal agencies, including the 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.

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 11 December 1981. The memorandum was implemented by a U.S. Air Force message dated 21 January 1982.

The 1986 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 ARARs 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.

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 guidances, 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 Purpose and Scope

The purpose of this QAPP is to assure the quality of evaluating information, obtaining addition data and the preparation of Assessment Reports and Remedial Action Plans, for the Base Service Station and the Base Gas Station at the Nas Fort Worth. A more detailed discussion of the scope is provided in the Work Plan Nas Fort Worth Revision 0.

2.3 Project Background

Location and 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 AF Plant 4 to the west. The area surrounding NAS Fort Worth JRB is mostly suburban, including the residential areas of the cities of Fort Worth, Westworth Village, and White Settlement.

2.3.1 Operational History

Operational History. NAS Fort Worth was originally a dirt runway established in 1942 to train B-24 pilots during World War II. The facility was taken under the command of the Strategic Air Command (SAC) in 1946 and named Carswell Air Force Base in 1948. The SAC mission remained as Carswell AFB until 1992 when the Air Combat Command assumed control of the base. On October 1, 1994, the U.S. Navy assumed responsibility for the facility and the name was changed from Carswell AFB to NAS Fort Worth Joint Reserve Base. Note that with the transfer of property at NAS Fort Worth from the U.S. Air Force to U.S. Navy many streets names were changed. Streets cited herein are the U.S. AIR Force designation.

2.3.2 Base Service Station Site History

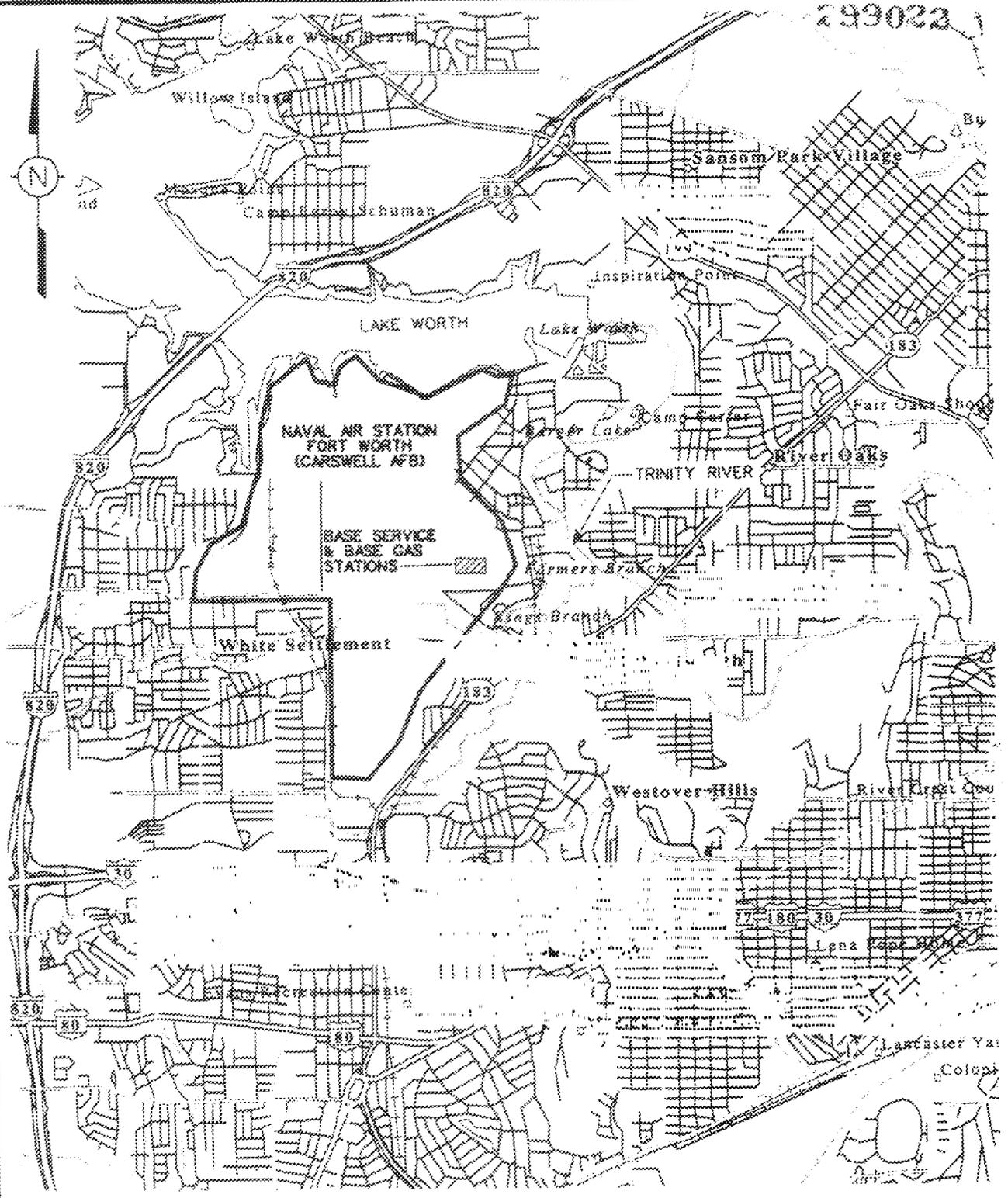
The Base Service Station located at the northwest corner of the intersection of Jennings Drive and Rogner Drive along the eastern edge of NAS Fort Worth JRB (Figure 2-2).

The Base Service Station is located approximately 500 feet west of the western bank of the West Fork Trinity River and approximately 450 feet west of the eastern installation boundary. The Base Service Station provided gasoline sales and automobile service to base personnel. The four 10,000-gallon USTs formerly servicing the Base Service Station were located in a single excavation situated at the northern extent of the service station, and were removed in May 1993.

The Base Service Station was built and placed into service in 1972. The Base Service Station was built with four 10,000-gallon fiberglass USTs in an excavation on the north side of the

299022

STARTING DATE 3/20/95	DATE LAST REV.	ERRAT CHECK BY C.TUMEN	INITIATOR W.CARTER	DWG NO. 765725E5.005
DRAWN BY F.BLANK	DRAWN BY:	ENGR. CHECK BY W.CARTER	PROJ. MGR. W.CARTER	PROJ. NO. 765725



765725E5.005 09 14 06 Apr 15 1996 RMB

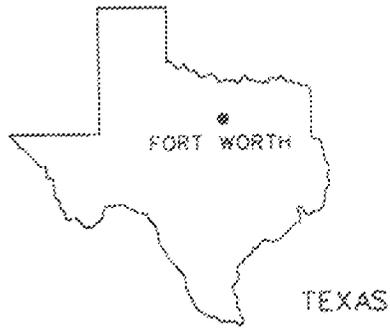
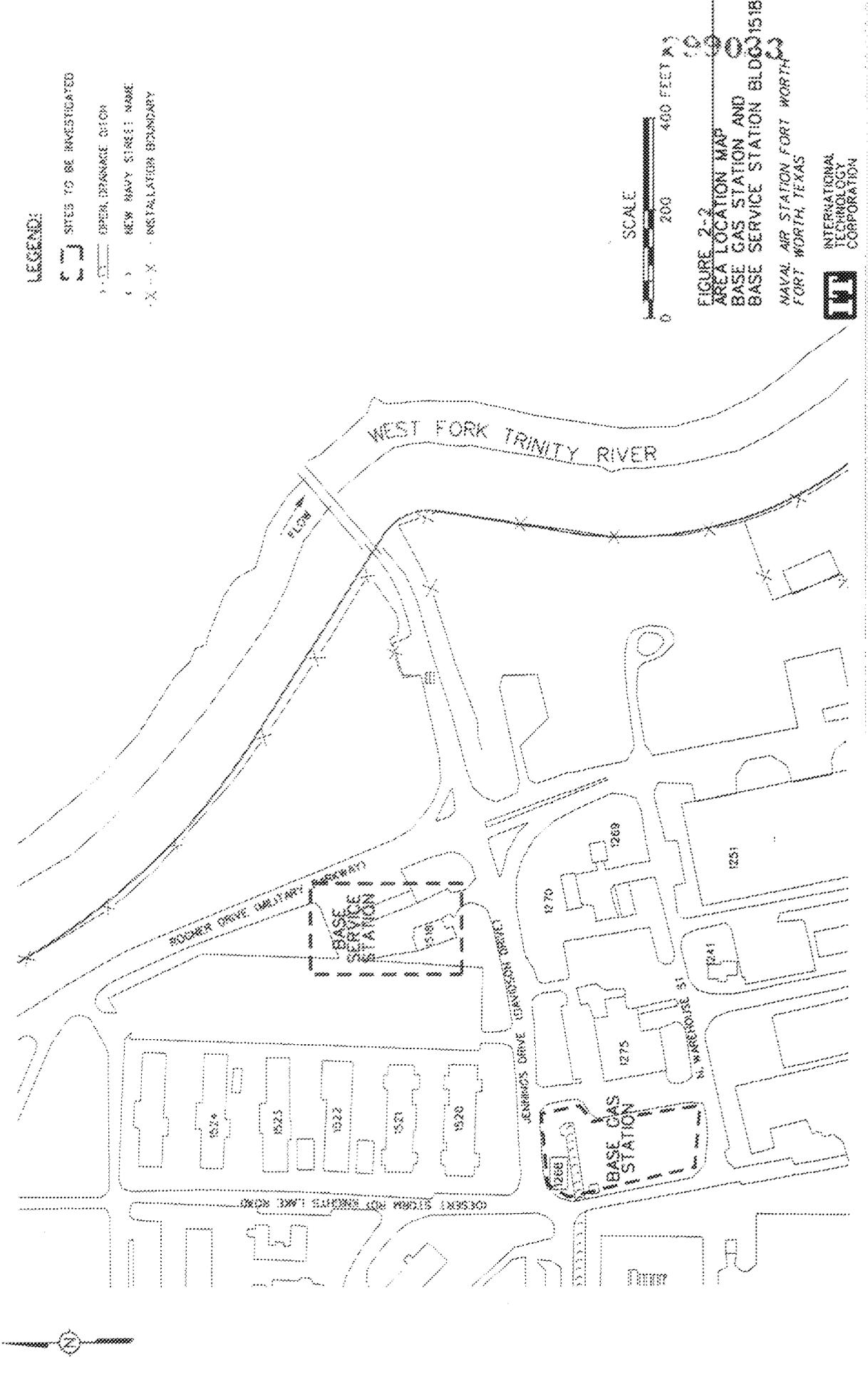


FIGURE 2-1
SITE LOCATION MAP

NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS



STARTING DATE: 7/20/98	DATE LAST REV: 7/20/98	DRWG LAST REV: 1	DRWG NO: 14657253.DWG
DRAWN BY: J. B. MOSE	DATE: 7/20/98	DRWG NO: 14657253.DWG	PROJECT NO: 146173
DESIGNED BY: W. CARTER	PROJECT NO: 146173	PROJECT NO: 146173	PROJECT NO: 146173
PROJECT NO: 146173	PROJECT NO: 146173	PROJECT NO: 146173	PROJECT NO: 146173



LEGEND:

- SITES TO BE INVESTIGATED
- OPEN DRAINAGE DITCH
- NEW NAVY STREET NAME
- X-X- INSTALLATION BOUNDARY

SCALE



**FIGURE 2-2
AREA LOCATION MAP
BASE GAS STATION AND
BASE SERVICE STATION BLDG 1518**

NAVAL AIR STATION FORT WORTH
FORT WORTH, TEXAS



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facility and one 600-gallon waste oil tank in a separate excavation. Six fueling islands, a central pay office, and a service building were also located at the Base Service Station.

Investigation Activities. In 1987, the Base Service Station was added to the Installation Restoration Program (IRP) and the initial site investigation at Base Service Station was conducted. The initial subsurface investigation was performed under Stage 2 of the IRP. The site investigation was conducted by Radian Corporation, who installed and sampled one soil boring and three monitoring wells, BSS-A, BSS-B, and BSS-C, at the Base Service Station. A detailed discussion of the Base Service Station's contamination and previous investigation history is provided in Section 2.2.2.1 in the Work Plan (IT, 1996).

2.4 Base Gas Station

2.4.1. Description of Site

The Base Gas Station occupied about 45,000 square feet on the northeast corner of Knights Lake Road and Warehouse Street at NAS Fort Worth (Figure 2.2-2). The facility was originally constructed as a gas station in the 1950s and had three underground storage tanks. Sometime in the 1960s or 1970s the facility was converted to an above ground storage tank facility with fuel dispensing facilities. The facility remained in operation until 1989, and was demolished in 1994. The facility consisted of :

- One 12,000-gallon diesel fuel tank
- One 12,000-gallon unleaded fuel tank
- One 6,000-gallon unleaded fuel tank
- Three 12,000-gallon regular fuel tanks
- Concrete foundations for the tanks
- Above and below ground piping
- Fuel dispensing island
- Fencing and berms to contain spills.

2.4.2 Site History

Operation History. The Base Gas Station was originally constructed as a gas station in the 1950s and had three underground storage tanks. Sometime in the 1960s or 1970s the facility was converted to an above ground storage tank facility with fuel dispensing facilities. The facility was active until 1989 when operations were ceased and the facility was left unused until 1994. In February 1994, Metcalf and Eddy, under contract to AFCEE, dismantled and

removed the aboveground storage tanks (AST) and other associated equipment from the former Base Gas Station.

Investigation Activities. During the removal action of the ASTs and ancillary equipment, it was discovered that the volume of soils impacted at the facility was larger than stated in the original project scope. A change in scope was approved by AFCEE personnel which deleted the removal of a limited volume of impacted soil and implemented a slightly expanded sampling program to document the site conditions. A detailed discussion of the Base Gas Station's contamination and previous investigation history is provided in Section 2.2.2.2 in the Work Plan (IT, 1996).

2.5 Project Scope and Objectives

Project Objectives. The objectives of this project are:

- Obtain additional data necessary to adequately assess the Base Gas Station and consolidate the new and existing data in an Assessment Report compliant with TNRCC PST regulations and procedures.
- In the process of obtaining site characterization data, obtain data needed for risk assessment and to evaluate remedial technologies for both facilities.
- Prepare a Remedial Action Plan for both facilities that identifies and evaluates candidate technologies and recommends an appropriate remedy, if remediation is warranted.

2.6 Subcontractors

Subcontractors for this work will be identified separately after competitive bidding. These subcontracts will involve an installation of soil probes, soil boring and monitoring well installation, well development, surveying, and laboratory analysis.

TAB

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3.0 Project Organization and Responsibility

The Air Force is assisted by several contractors, subcontractors, and consultants. In this section, the responsibilities of the key personnel from the participating organizations are defined. Figure 3-1 shows the project organization, reporting relationships, and line authority as it relates to aspects of quality assurance. Key project personnel include the project manager, the program manager, the QA coordinator, the principal investigator, the field investigation team leader, the analytical and data management team leader, the laboratory project manager, the NAS Fort Worth point of contact, and the health and safety coordinator. Their responsibilities are described in the following sections. The names and resumes of the individuals selected for the key project roles will be submitted separately to the AFCEE. If any of the people assigned to the key project roles become unavailable before the project is completed, they will be replaced with others possessing similar qualifications. AFCEE shall be notified in writing of such personnel changes should they occur. Supporting personnel will be assigned as necessary.

3.1 Program Manager

The program manager's responsibilities will include:

- Reviewing and approving the QAPP, the detailed work plan and sampling and analysis plan for each operable unit, and the HSP
- Providing sufficient resources to the project team so that it can respond fully to the requirements of the project
- Providing direction and guidance to the project manager, as appropriate
- Reviewing the quality of the data gathered during the course of the project and reviewing the final project report
- Performing responsibilities as requested by the project manager.

3.2 Project Manager

The project manager will be the prime point of contact with NAS Fort Worth and the AFCEE team chief. The project manager will have primary responsibility for technical, financial, and scheduling matters. Duties will include:

- Reviewing and approving the QAPP, the detailed work plan and sampling and analysis plan for each operable unit, and the HSP
- Assigning duties to the project staff and orienting the staff to the needs and requirements of the project
- Obtaining the approval of the QA coordinator for proposed variances to the QAPP, the individual work plan, and sampling and analysis plan
- Providing budget and schedule control
- Reviewing subcontractor work and approving subcontract invoices
- Ensuring that major project deliverables are reviewed for technical accuracy and completeness before their release
- Regularly communicating project status, progress, and any problems to the program manager.

3.3 Quality Assurance Coordinator

Responsibilities of the project QA coordinator, as appropriate, include:

- Serving as official contact for quality assurance matters for the project
- Actively identifying and responding to QA/QC needs, resolving problems, and answering requests for guidance or assistance
- Reviewing, evaluating, and approving the QAPP and approving quality-related changes to the detailed work plan and sampling and analysis plan for each operable unit
- Actively tracking the progress of quality tasks in this plan and periodically consulting with the project and program managers
- Verifying that appropriate corrective actions are taken for all nonconformances
- Verifying that appropriate methods are specified for obtaining data of known quality and integrity
- Providing project specific training in QA/QC matters to IT personnel, as needed, identified, or requested by the project manager
- Scheduling and performing an appropriate quality assurance verification activity for each site to ensure compliance with requirements and procedures

- Performing responsibilities as requested by the project manager
- Ensuring that performance and system audits are performed
- Ensuring that field logs, field variance forms, and other deviations from approved plans are maintained for review upon request by regulatory agencies

3.4 Field Investigation Team Leader and Principal Investigator/Geologist

The field investigation team leader has primary responsibility for field activities associated with the RI/RAs. The field investigation team leader will direct activities of the subcontractors, including work stoppage and/or taking appropriate emergency actions. The principal investigator/geologist has primary responsibility for the preparation of the RI/RA reports based on the field sampling and analytical data. The principal investigator/geologist shares responsibility for field activities with the field investigation team leader and could be called upon to supervise field activities as necessary. Their duties and responsibilities are as follows:

- Coordinating field activities with the AFCEE team chief and NAS Fort Worth point of contact
- Coordinating activities with the project manager
- Interfacing on analytical and data management with the analytical and data management team leader
- Being on site during field activities
- Providing orientation and any necessary training to field personnel (including subcontractors) on the requirements of the detailed work plan and sampling plan for each operable unit, the QAPP, and HSP before the start of work
- Providing direction and supervision to the drilling contractor during the drilling of soil borings
- Monitoring drilling and sampling operations to ensure that the drilling contractor and sampling team members adhere to the QAPP and the detailed work plan and sampling plan for each operable unit
- Ensuring that field QA/QC requirements are followed and that the field records management system is maintained

- Reviewing and implementing geologic data collection plans and supervising borehole logging and other geological data interpretation activities
- Preparing RI and RA reports summarizing the field and analytical data
- Reviewing reports for compliance with TNRCC requirements
- Executing the duties of the health and safety coordinator at the direction of the health and safety coordinator
- Reporting field nonconformance(s) to the project manager and QA coordinator
- Participating in the process of resolving field nonconformance(s) and the implementation corrective actions to prevent reoccurrence of any problems

3.5 Analytical and Data Management Specialist

The analytical and data management specialist is responsible for managing the data generated by the investigation in accordance with IRPIMS, and other requirements as specified by AFCEE.

The duties and responsibilities include the following:

- Participating in the preparation of the site-specific work plans, sampling and analysis plans, and the QAPP
- Preparing the field sampling analytical programs
- Communicating to the project personnel the requirements necessary for the data base initialization and management
- Establishing and maintaining the sample tracking system. Tracking the progress of environmental samples throughout the process of acquisition, transportation, receipt, analysis, data validation, and data reporting
- Coordinating with the on-site principal investigator/geologist and/or the field investigation team leader
- Verifying the receipt of samples with the subcontracted laboratory
- Coordinating with laboratory on QA/QC matters
- Resolving all QC problems with the laboratory and report them to the project manager
- Interfacing with laboratory for ensuring the maintenance of laboratory logs

- Reviewing all chemical analytical data for compliance with quality control requirements and technical accuracy
- Reviewing laboratory QA/QC reports and identify potential or existing problems
- Receiving all of the sample information, including the field logs and results from the field and the laboratory
- Ensuring all the analytical data packages are validated
- Overseeing the data entry into the data base including data entry QA
- Providing orientation and any necessary training to laboratory personnel on the requirements of the QAPP and the detailed work plan and sampling and analysis plan for each operable unit
- Serving as the "collection point" for laboratory staff reporting of nonconformances and changes in laboratory activities
- Notifying the laboratory and QA personnel of specific laboratory nonconformances and changes

3.6 NAS Fort Worth Point of Contact

The duties and responsibilities for their Air Force Base designee include the following:

- Coordinating activities with the AFCEE team chief
- Coordinating activities with the appropriate base agency(s)
- Providing security escort in all controlled areas
- Obtaining base clearance for digging permits for each site of intrusive investigation
- Providing the analytical information required for preparation of the hazardous waste manifest to the government-authorized representative
- Reviewing reports and permits for compliance with State of Texas, EPA, and U.S. Air Force regulations
- Maintaining the information repository containing all primary deliverable documents

- Notifying appropriate authorities of any deviations from approved procedures.

3.7 Health and Safety Coordinator

The health and safety coordinator or her designee will be responsible for seeing that site personnel adhere to the site safety requirements. Additional responsibilities are included in the NAS Fort Worth HSP. Either the principal investigator/geologist and the field investigation team leader may assume the role of health and safety coordinator at the discretion of the health and safety coordinator.

3.8 Subcontractor Activities

The selection of qualified subcontractors will be in accordance with the IT procurement and QA procedures. Subcontractors, such as analytical laboratories, drillers, geophysical specialists, surveyors, and environmental monitoring specialists, must meet predetermined qualifications developed by the project manager that are defined in the procurement bid packages. Each subcontractor bid submittal will be reviewed by technical and purchasing personnel to verify that the bidders are qualified and can satisfy bid requirements. A review of the subcontractor's file will be conducted before starting work, to determine if the subcontractor has fulfilled the procurement requirements necessary to begin activities. Subcontractors involved in environmental measurements will be monitored by the principal investigator/geologist and the field investigation team leader to verify the use of calibrated equipment and qualified operators. Subcontracted laboratories will be monitored by the analytical and data management team leader to verify compliance with this QAPP and all site-specific plans, as well as IT and AFCEE requirements.

3.9 Qualifications and Training of Personnel

Personnel assigned to the project, including field personnel and subcontractors, will be qualified to perform the tasks to which they are assigned. In addition to education and experience, specific training may be required to qualify individuals to perform certain activities. Training will be documented on the appropriate form and placed in the project file as a record. Project personnel will receive an orientation to the detailed work plan and sampling and analysis plan for each operable unit, the HSP, and the QAPP as appropriate to their responsibilities before participation in project activities. This orientation will be documented.

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TAB

4.0

4.0 Quality Program and Data Quality Objectives

This section identifies the DQOs for site characterization to be performed at the Base Gas Station and the Base Service Station, at NAS Fort Worth Carswell Field, Texas.

4.1 Data Quality Objectives

DQOs specify the data type, quality, quantity, and uses needed to make decisions and are the basis for designing data collection activities. DQOs provide an internal guide for control and review to verify that data is scientifically sound, defensible, and of known acceptable quality.

Two general categories of DQOs are defined: (1) screening with definitive confirmation and (2) definitive data. All project data will meet one of these two DQOs.

Screening with definitive confirmation includes data produced by rapid field screening methods that are less precise than standard analytical methods. Screening level methods produce analyte or class of analyte identification, often at elevated detection levels.

Definitive data are produced using standard EPA or other reference methods, usually in a mobile or off-site laboratory. Data are analyte-specific, and both identification and quantitation are confirmed. These methods have standardized QC and documentation requirements, providing the information to verify all results. Definitive data are not restricted in their use unless quality problems require data qualification.

4.2 Precision, Accuracy, Representativeness, Completeness, and Comparability

The basis for assessing each of these elements of data quality is discussed in the following subsections. Precision and accuracy QC limits for each method and matrix are identified in Appendix C.

4.2.1 Precision

Precision measures the reproducibility of repetitive measurements. It is strictly defined as *the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions*. Analytical precision is a measurement of the variability associated with duplicate (two) or replicate (more than two) analyses of the same sample in the laboratory and is determined by analysis of laboratory duplicates. *Total*

precision is a measurement of the variability associated with the entire sampling and analysis process. It is determined by analysis of duplicate or replicate field samples and measures variability introduced by both the laboratory and field operations. Precision data will be interpreted by taking into consideration all possible sources of variability. Duplicate samples or duplicate spiked samples may be analyzed to assess field and analytical precision, and the results are assessed using the RPD between duplicate measurements. The calculation for precision is stated as follows:

$$\text{Relative Percent Difference (RPD)} = \frac{|R_1 - R_2|}{\left(\frac{R_1 + R_2}{2}\right)}$$

4.2.2 Accuracy

Accuracy is a statistical measurement of correctness and includes components of random error (variability due to imprecision) and systematic error. It therefore reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ from the true value or known concentration of the spike or standard. Analytical accuracy is measured by determining the percent recovery of known target analytes that are spiked into an LCS. Surrogate compound recovery is reported and is used to assess method performance for each sample analyzed for volatile and semivolatile organic compounds.

Both accuracy and precision are calculated for preparation batches, and the associated sample results are interpreted by considering these specific measures. The formula for calculation of accuracy is stated as follows:

$$\text{Percent Recovery} = \frac{(X - S)}{T} \times 100$$

where:

- X = the experimentally determined concentration
- T = the true concentration of the spike
- S = the sample concentration before spiking.

4.2.3 Representativeness

Representativeness is the extent to which discrete measurements accurately describe the greater picture they are intended to represent. Objectives for representativeness are defined for each sampling and analysis task and are a function of the investigative objectives. Representativeness will be achieved through use of the standard field, sampling, and analytical procedures.

Representativeness is also determined or influenced by appropriate program design, with consideration of elements such as proper well locations, drilling and installation procedures, and sampling locations. Decisions regarding sample/well/boring locations and numbers are documented in the FSP.

4.2.4 Completeness

Completeness is the adequacy in quantity of valid measurements to prevent misinterpretation and to answer important question. Completeness is calculated for the aggregation of data for each analyte measured for any particular sampling event or other defined set of samples. The number of valid, unqualified results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. Samples with results qualified because of confirmed matrix interference may be considered to be valid for purposes of the completeness objective because the conditions for qualification cannot be controlled and do not represent errors in sampling or analysis. The objective for completeness is 95 percent for aqueous samples and 90 percent for soil samples. For any instances of samples that could not be analyzed for any reason (holding time violations in which resampling and analysis were not possible, samples spilled or broken, etc.), the numerator of this calculation becomes the number of valid, unqualified results minus the number of possible results not reported.

The formula for calculation of completeness is presented below:

$$\% \text{ completeness} = \frac{\text{number of valid unqualified results}}{\text{number of possible results}}$$

4.2.5 Comparability

Comparability is the confidence with which one data set can be compared to another data set and will yield valid conclusions. The objective for this QA/QC program is to produce data with the greatest possible degree of comparability. The number of matrices that are sampled and the range of field conditions encountered are considered in determining comparability. Comparability is

achieved by using standard methods for sampling and analysis, reporting data in standard units, and using standard and comprehensive reporting formats. Complete field documentation using standardized data collection forms will support the assessment of comparability. Analysis of PE samples and reports from audits will also be used to provide additional information for assessing the comparability of analytical data produced among subcontracting laboratories. Historical comparability will be achieved through consistent use of methods throughout the project.

4.3 Method Detection Limits, Practical Quantitation Limits, and Instrument Calibration Requirements

4.3.1 Method Detection Limits

The MDL is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. Laboratories participating in this work effort will demonstrate the MDLs for each method of analysis, including confirmatory columns, using the instructions defined in 40 CFR 136, Appendix B. The laboratories will revalidate these MDLs on at least an annual basis or whenever analytical repairs or component reconfigurations demand a more frequent demonstration of the MDLs.

4.3.2 Practical Quantitation Limits

The PQL is the lowest level that can be reasonably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The laboratories participating in this work effort will compare the results of the MDL demonstrations to the PQLs for each method that is listed in Appendix C to ensure the MDLs are lower than the relevant PQLs. The laboratories will also verify PQLs by including a standard below the PQL as the lowest point on the calibration curve.

4.3.3 Instrument Calibration

Analytical instruments will be calibrated in accordance with the analytical methods. All analytes that are reported will be present in the initial and continuing calibrations, and these calibrations must meet the acceptance criteria specified in Appendix C. Records of standard preparation and instrument calibration will be maintained. Records will unambiguously trace the preparation of standards and their use in calibration and quantitation of sample results. Inorganic calibration standards will be traceable to available NIST materials. Calibration standards for organic analytes will be traceable to materials certified by NIST, CLP, or A₂LA, when available. Instrument calibration will be checked using all of the analytes. This applies equally to multiresponse

analytes. The initial calibration will be checked at the frequency specified in the method using materials prepared independently of the calibration standards. Acceptance criteria for the calibration check are presented in Appendix C. Analyte concentrations can be determined with either calibration curves or RFs as defined in the methods. When using RFs to determine analyte concentrations, the average RF from the initial calibration will be used, except in GC/mass spectrometry methods. GC/mass spectrometry quantitation will be based on the RF from the daily continuing calibration unless samples are analyzed in the same sequence as the initial calibration. The continuing calibration of GC analyses will not be used to update the RFs for the initial calibration to include subsequent continuing calibrations.

4.4 Elements of Quality Control

This section presents QC requirements relevant to analysis of environmental samples that will be followed during all analytical activities for fixed-base, mobile, and field laboratories. The purpose of this QC program is to produce data of known quality that satisfy the project objectives and that meet or exceed the requirements of the standard methods of analysis. This program provides a mechanism for ongoing control and evaluation of data quality measurements through the use of QC materials.

Laboratory QC samples (e.g., blanks, MSs, MSDs, LCSSs) will be included in the preparation batch with the field samples. Preparation batch is a number of samples (not to exceed 20) that are similar in composition (matrix) and that are extracted or digested at the same time and with the same lot of reagents. The identity of each preparation batch will be unambiguously reported with the analyses so that a reviewer can identify the QC samples and the associated environmental samples. The type of QC samples and the frequency of use of these samples are discussed below and in the method-specific subsections of Section 4 and Appendix C. Only AFCEE samples will be used for spiking. The spiking solutions will include all analytes. Additional QC samples may be added to those required by the method to ensure accurate and precise data.

The following subsections describe the use of QC materials.

4.4.1 Laboratory Control Sample

The LCS is a method blank spiked with known concentrations of all analytes. An LCS will be carried through the complete sample preparation and analysis procedure. An LCS is used to evaluate each preparation batch.

Whenever an analyte in an LCS is outside the recovery acceptance limit, data for that analyte may not be reported. All samples in the analytical batch will be reanalyzed for the out-of-control analyte after the system problems have been resolved and system control has been reestablished. When an analyte in an LCS exceeds the upper control limit and that analyte is not detected in the associated samples, no corrective action is performed.

4.4.2 Matrix Spike/Matrix Spike Duplicate

An MS is an aliquot of sample spiked with known concentrations of all analytes. The spiking occurs prior to sample preparation and analysis. An MS is used to document the bias of a method in a given sample matrix.

One MS and one MSD sample will be included for every 20 environmental samples of similar matrix.

MS/MSDs are used to evaluate the matrix effect, not to control the analytical process. The recoveries of analytes in the MS/MSDs will be compared to the QC acceptance limits given in Appendix C. If either the MS or the MSD is outside the QC acceptance limits, the analytes in all related samples will be qualified according to the data flagging criteria in Section 8.

4.4.3 Surrogates

Surrogates are organic compounds that are similar to the target analyte(s) in chemical composition and behavior in the analytical process, but that are not normally found in environmental samples.

Surrogates will be added to samples, controls, and blanks, in accordance with the method requirements.

When the recovery of a surrogate exceeds the acceptance limit, the corrective actions outlined in Appendix C will be performed. Re-extractions, if necessary, will be done within the holding times.

4.4.4 Internal Standards

ISs are measured amounts of certain compounds added after preparation or extraction of a sample. They are used in an IS calibration method to correct sample results affected by column injection losses, purging losses, or viscosity effects. IS calibration is used for volatile organics, chlorinated pesticides, extractable organics, and metals by ICPES.

4.4.5 Retention Time Windows

Retention time windows are used in GC and HPLC analysis for qualitative identification of analytes. They are calculated from replicate analyses of a standard on multiple days. The procedure and calculation method are given in SW-846 method 8000.

4.4.6 Interference Check Sample

The ICS (ICP analyses only) contains both interfering and analyte elements of known concentrations and is used to verify background and interelement correction factors. This sample is run at the beginning and end of each run sequence.

4.4.7 Method Blank

A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank will be carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination resulting from the analytical process. A method blank is included in every preparatory batch.

The presence of analytes in a method blank at concentrations greater than the PQL indicates a need for corrective action. Corrective actions will be performed to eliminate the source of contamination prior to proceeding with analysis. No analytical data will be corrected for the presence of analytes in blanks. When an analyte is detected in the blank, but not in the associated samples, no corrective action is necessary.

4.4.8 Equipment Blank

An equipment blank is a sample of ASTM Type II reagent grade water (for inorganic and semivolatile organics analyses) or organic-free water (for volatile organics analyses) poured into the sampling device, collected in the sample bottle, and transported to the laboratory for analysis. Equipment rinsates are collected at a frequency of 10 percent of samples.

4.4.9 Trip Blank

A trip blank is a sample of organic-free water (prepared as for ambient blanks) that is placed in the sample bottle in an uncontaminated area in the laboratory prior to being taken into the field. Trip blanks are prepared only for VOC samples and are subjected to the same handling as other samples. Trip blanks serve to identify contamination from sample containers or transportation and storage procedures. Trip blanks consisting of unopened, evacuated stainless steel canisters are used during gas phase sampling. One trip blank for every shipment or cooler is collected for methods that analyze for the presence of VOCs.

4.4.10 Field Duplicates

A field duplicate sample is a second sample collected at the same location as the original sample. Duplicate sample results are used to assess precision, including variability associated with both the laboratory analysis and the sample collection process. Duplicate samples are collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis. Precision of soil samples to be analyzed for VOCs is assessed from collocated samples because the compositing process required to obtain uniform samples could result in loss of the compounds of interest. Soil samples to be analyzed for nonvolatile compounds are recovered by collecting a single sample and dividing it into equal portions for laboratory analysis or by collecting collocated samples if there is a large volume of soil required for analysis.

Field duplicates are collected at a frequency of 10 percent of samples collected. The sample containers are assigned a control number such that they cannot be identified (blind duplicate) as duplicate samples by laboratory personnel performing the analysis. Specific locations are designated for collection of field duplicate samples prior to the beginning of sample collection.

4.5 Quality Control Procedures

4.5.1 Holding Time Compliance

All sample preparation and analysis will be completed within the method-required holding times. In attributing the time of extraction and analysis, the following definitions of extraction and analysis compliance will be used:

- Extraction completion—completion of the sample preparation process as described in the applicable method, prior to any necessary extract cleanup and/or volume reduction procedures.
- Analysis completion—completion of all analytical runs, including dilutions, second-column confirmations, and any required reanalyses.

Second-column confirmation of results for samples analyzed by GC or HPLC will be completed within the method-required holding times. If holding times are exceeded, the AFCEE will review the significance of the error. If it is deemed critical to the program, the contractor shall acquire and analyze a new sample or samples.

4.5.2 Standard Materials

Standard materials used in calibration and to prepare samples will be traceable to NIST, CLP, or A₂LA standards, if available. The standard materials will be current, and the following expiration policy will be followed: The expiration dates for ampulated solutions will not exceed one year from the date of receipt or the manufacturer's expiration date, whichever comes first. Expiration dates for laboratory-prepared stock and diluted standards will be no later than the expiration date of the stock solution or material or the date calculated from the holding time allowed by the applicable analytical method, whichever comes first. Expiration dates for pure chemicals will be established by the laboratory and be based on chemical stability, possibility of contamination, and environmental and storage conditions. Expired standard materials will be either revalidated prior to use or discarded. Revalidation may be performed through assignment of a true value and error window statistically derived from replicate analyses of the material. The laboratory will label standard and QC materials with expiration dates.

4.5.3 Supplies and Consumables

The laboratory will inspect supplies and consumables prior to their use in analysis. The materials description in the methods of analysis will be used as a guideline for establishing the acceptance

TAB

5.0

5.0 Sampling Procedures

5.1 Field Sampling

Detailed work plans and sampling and analysis plans will be prepared for the Base Service Station and the Base Gas Station at NAS Fort Worth to document the scope, rationale of exploration, and the sampling activities at each of the sites.

The following considerations form the basis for the site-specific sampling and analysis programs:

- Selection of sampling and drilling sites
- Frequency of sampling
- Methods of sampling to be employed
- Media to be sampled
- Number of samples to be collected
- Volume of samples to be collected
- Types of field QC sample to be collected
- Types and kinds of analyses to be performed in the field
- Types and kinds of analyses to be performed at the laboratories
- Sample turnaround time
- Procedures and precautions to be followed during sampling
- Methods of preservation and shipment.

The methods described in this section are detailed in the work plan and sampling and analysis plans for each site. The procedures are specifically designed to ensure the collection and preservation of accurate, precise, comparable, and representative samples.

Sampling will be frequent enough to identify materials and to describe important material changes. Methods of sampling employed shall preserve the integrity of material parameters. Field procedures for the collection of soil, water, and wipe samples for analysis are discussed in the site specific sampling and analysis plans.

Any sample obtained during field sampling should be representative of the sample location and free of contaminants from sources other than the immediate environment being sampled. The equipment and the techniques that will be employed to obtain representative samples will be in accordance with IT's standard operating procedures. Rationale for each site-specific sampling program is presented in the respective sampling and analysis plan for each site.

The NAS Fort Worth specific sampling and analysis plans describe the sampling location design considerations for soil borings and water samples; the numbers and types of samples to be collected; sampling equipment, procedures, and sample containers; methods of sample preservation; decontamination procedures; and shipping and packaging methods. Analytical tests that will be performed are also described. Table 5-1 in this document lists containers, preservatives, and holding times for each type of analysis that may be performed on the project and are in accordance with the current revision of Table II of 40 CFR 136.3.

EPA has developed specific procedures for the preparation of sample containers to be used for site investigations. Sampling containers will be provided by the analytical laboratory and will be pre-cleaned in accordance with EPA protocols.

Prevention of Cross Contamination. Before entering the site, the drill rig will have been steam cleaned to remove any surface oil, grease, or other material that has the potential for contaminating the site. Drilling equipment that will be in contact with the soil will be decontaminated before use and between each borehole. Sampling equipment will be decontaminated before use and between each sample. Each decontamination activity will be recorded on the Field Activity Daily Log (Figure 5-1). Detailed procedures for decontamination of drilling and sampling equipment and disposal of decontamination by-products are provided in the site-specific Field Sampling Plan.

Area Monitoring. Ambient air monitoring will be conducted in accordance with the HSP and as required by the site-specific Field Sampling Plan. The HSP includes procedures for operating, maintaining, and calibrating the air monitoring instruments to be used for this project. Results of air monitoring will be recorded on the Field Activity Daily Log.

Sample Identification. Samples will be put into sample containers that have been supplied by the analytical laboratory. The cleaning and preservation procedures for containers are to EPA specifications. The labels on containers provided by the laboratory will state the type preservative, if any, and the sample type for which the container is intended. As samples are

Table 5-1

**Sampling and Preservation Requirements for Water and Soil Samples
NAS Fort Worth
Project No. 765725**

Parameter	Container	Preservation	Holding Time	Sample Weight
Water Samples				
	Teflon-lined Septum	<4°C		
TPH (EPA 418.1)	2 * 1 liter amber wide-mouth	Sulfuric Acid, Cool <4°C, pH < 2	28 days	1 liter
	Teflon-lined cap		40 days post-extraction	
	polyethylene	Cool <4°C		
	polyethylene			
(EPA 352.1)	polyethylene			
(EPA 375.4)	polyethylene			
(SOP-175)	Ampules			
	glass wide-mouth			
	jar			
	mouth		40 days post-extraction	
	jar			

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Table 5-1

**Sampling and Preservation Requirements for Water and Soil Samples
 NAS Fort Worth
 Project No. 765725
 (Continued)**

Parameter	Container	Preservation	Holding Time	Sample Weight
Ammonium (350.2)	8 oz glass jar	Cool <4°C	Ice to 4°C	500 grams
(ASTM D2216)				
pH (SW9045)	8 oz jar	Cool <4°C	Not required	100 grams

collected and sealed in containers, the containers will be marked. The sample identification and numbering procedure is described in the site-specific sampling and analysis plans. After collection, identification, and preservation, samples will be maintained under the chain-of-custody procedure described in detail in Section 5.2 of this document.

Sample Turnaround Time. Sample analyses will be scheduled based on site investigation needs and consistent with the sample holding times specified herein. The site-specific work plan and sampling and analysis plans are organized to provide a turnaround time that will meet the project schedule and objectives. Normal turnaround time (35 working days) will be utilized for all analyses unless otherwise specified in the site-specific plans.

Field Documentation. Original data recorded in field notebooks, chain-of-custody records, and other forms will be written in water-resistant ink. None of these documents will be altered, destroyed, or discarded, even if they are illegible or contain inaccuracies that require correction. If an error is made, the document will be corrected by the individual who made the entry. A single line will be drawn through the incorrect information and the correct information will be entered. All corrections will be initialed and dated.

An integral part of the QAPP for the field activities will be maintaining a Field Activity Daily Log (Figure 5-1). Information identified on the Field Activity Daily Log will be obtained from site investigation and sampling activities and will be documented by the field investigation

team leader or principal investigator/geologist, or his/her designee such as the sampling team leader.

All general information pertinent to field activities will be recorded in the Field Activity Daily Log. Entries in the log will include as a minimum:

- The names and affiliations of all on-site personnel associated with the field activities
- A general description of the day's field activities
- Documentation of weather conditions
- Field measurements not recorded on specific forms and readings from personnel safety instruments.

Field equipment and equipment calibration will be noted on the Test Equipment List and Calibration Log as described in Section 6.2.

Specific field data forms will be prepared for each field effort based on the requirements in the specific work plans and sampling and analysis plans. Generic forms are included as Appendix B to this QAPP.

Variance System. Procedures that properly address all specific conditions encountered during a field program cannot be prepared. Variances from approved operating procedures in the Field Sampling Plan, the QAPP, or the HSP will be documented on a Variance Form (Figure 5-2). The field investigation team leader or principal investigator/geologist will initiate and chronologically maintain the Variance Log (Figure 5-3) the Variance Log requires the approval of the project manager and the QA coordinator before work proceeds. Variances affecting project scope, costs, or schedule must be approved by the project manager. Any variance from the HSP must be approved by the health and safety coordinator. Approval by the project manager can be initiated on a verbal basis via telephone with follow-up sign-off. In no case will an IT subcontractor initiate a variance. If a variance is proposed by the client, it will be so recorded. Copies of the Variance Log will be kept on site until the field work is complete and then will be sent to the project files.

Field Data Management. The intended use of data is presented in Section 2.0 of this document. Numerical analyses, instrument readings and recordings, measurements, and tests will be documented and subjected to internal review. Field records will be legible and sufficiently complete to permit reconstruction of data-gathering activities by a qualified individual other than the originator when data are reduced. The method of data reduction will be identified and recorded. Field-generated data logs will be collected and reviewed weekly for accuracy and completeness by the field investigation team leader, the principal investigator/geologist, and the analytical and data management task leader. The data logs will be assembled into packages that represent each borehole, monitoring well, etc. These data sheet record packages will be sent to the IT Project Management Office in Knoxville, Tennessee for review. Data logs will be used to perform investigative studies and reports. Field data will be formatted and archived in accordance with the requirements of IRPIMS. Reporting of applicable field data will be included in the draft RI report and in the IRPIMS data submittal.

5.1.1 Sample Containers

Sample containers are purchased precleaned and treated according to U.S. EPA specifications for the methods. Sampling containers that are reused are decontaminated between uses by the U.S. EPA-recommended procedures. Containers are 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.

5.1.2 Sample Volumes, Container Types, and Preservation Requirements

Sample volumes, container types, and preservation requirements for the analytical methods performed are listed in Table 5-1.

5.2 Sample Handling and Custody

Procedures to ensure the custody and integrity of the samples begin at the time of sampling and continue through transport, sample receipt, preparation, analysis and storage, data generation and reporting, and sample disposal. Records concerning the custody and condition of the samples are maintained in field and laboratory records.

The following information concerning the sample will be documented on a COC form:

- Unique sample identification
- Date and time of sample collection

- Source of sample (including name, location, and sample type)
- Preservative used
- Analyses required
- Name of collector(s)
- Pertinent field data (pH, temperature, etc.)
- Serial numbers of custody seals and transportation cases (if used)
- Custody transfer signatures and dates and times of sample transfer from the field to transporters and to the laboratory or laboratories.

All samples will be uniquely identified, labeled, and documented in the field at the time of collection.

Chain of custody procedures will document sample possession from the time of collection to disposal, in accordance with IT internal procedures and the federal guidelines. Figure 5-4 is a copy of IT's Analysis Request and Chain of Custody Record form. A sample is considered in custody if:

- It is in the sampler's or the transferee's actual possession.
- It is in the sampler's or the transferee's view, after being in his/her physical possession.
- It was in the sampler's or the transferee's physical possession and then he/she secured it to prevent tampering.
- It is sealed in a shipping container, placed in a designated secure area, or delivered to the IT courier or the common carrier.

The analytical laboratory will not accept samples collected for analysis without a correctly prepared Analysis Request and Chain of Custody Record form.

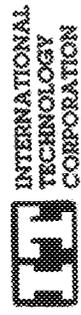
5.3 Field Custody Procedures

Field custody activity includes:

- Before sampling begins, the field investigation team leader or principal investigator/geologist will instruct site personnel in the chain-of-custody procedures, as necessary.
- The quantity and types of samples and sample locations have been specified in the Field Sampling Plan.

White: To accompany sample

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD *



Project Name/No. 1 _____ Bill to: 5 _____
 Samples Shipment Date 7 _____
 Sample Team Members 2 _____ Lab Destination 8 _____
 Profit Center No. 3 _____ Lab Contact 9 _____
 Project Manager 4 _____ Project Contact/Phone 12 _____ Report to: 19 _____
 Purchase Order No. 6 _____ Carrier/Waybill No. 13 _____

ONE CONTAINER PER LINE

Sample Number 14	Sample Description/Type 15	Date/Time Collected 16	Container Type 17	Sample Volume 18	Requested Testing Program 20	Condition on Receipt 21
						FOR USE
						FOR USE

Special Instructions: 23 _____

Possible Hazard Identification: 24
 Non-hazard Flammable Skin Irritant Poison B Unknown Sample Disposal: 25
 Return to Client Disposal by Lab A

Turnaround Time Required: 26
 Normal Rush GC Level: 27 I II III Project Specific (specify): _____

1. Relinquished by 26
 (Signature/Address) Date: _____ Time: _____ 1. Received by 28
 (Signature/Address)

2. Relinquished by
 (Signature/Address) Date: _____ Time: _____ 2. Received by
 (Signature/Address)

3. Relinquished by
 (Signature/Address) Date: _____ Time: _____ 3. Received by
 (Signature/Address)

Comments: 29 _____

Figure 5-4
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- The field investigation team leader or principal investigator/geologist determines whether proper custody procedures and report forms were used during the field work and documented in Field Activity Daily Log.
- The field investigation team leader or principal investigator/geologist has overall responsibility for the care and custody of the samples collected until they are transferred or properly dispatched to the laboratory. Each individual who collects a sample is responsible for sample custody until transferred to someone else via the Analysis Request and Chain of Custody Record.
- Analysis Request and Chain of Custody Records initiated in the field shall be placed in a plastic bag and taped to the inner lid of the shipping container used for sample transport from the field to the laboratory.
- Samples collected during the site work are classified as environmental or hazardous. All sample shipping will be done in accordance with the provisions stated in the IT Manual of Practice: Sample Packaging and Shipment.
- Shipping containers shall be secured using strapping tape and custody seals to ensure that samples have not been disturbed during transport. The custody seals shall also be placed on each container so that they cannot be opened without breaking the seal. All openings will be taped shut to prevent potential leakage during transport.
- Shipment information will be recorded for shipment of samples at the end of the shift, day, or collection period on the Field Activity Daily Log and on the sample collection logs.

5.4 Sample Labeling

Sample labels must contain sufficient information to uniquely identify the sample in the absence of other documentation. Labels will include at a minimum:

- Project name and number
- Unique sample number
- Sample location
- Sampling date and time
- Signature or initials of the individual(s) collecting the sample
- Preservation method employed.

The sample labels (Figure 5-5) will be directly affixed to the sample container and will be preprinted or completed using indelible ink. The sample identification and information will be logged in the sample collection logbook.

SAMPLE LABELS

	WATER SAMPLE	
Project Name _____		
Project No. _____		
Sample No. _____		
Collection Date/Time _____		
Collector's Name _____		
Sample Location _____		
Sample Type/Depth/Description _____		
Analyze For _____ Preservative _____		
Bottle _____ of _____ Filtered _____ Non/Based _____		
25-8-88		

	SOIL SAMPLE	
Project Name _____		
Project No. _____		
Sample No. _____		
Collection Date/Time _____		
Collector's Name _____		
Sample Location _____ Boring No. _____		
Depth Sampled _____		
Sample Type <input type="checkbox"/> Disturbed <input type="checkbox"/> Undisturbed <input type="checkbox"/> Other _____		
Riser Count _____ Recovery _____		
25-3-88		

Figure 5-5
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5.5 Transfer of Custody and Shipment

Transfer of custody and shipping procedures include:

- An Analysis Request and Chain of Custody Record will be initiated in the field for each sample. A copy of this record will accompany each sample.
- If the laboratory sample custodian judges sample custody to be invalid (e.g., samples arrive damaged or custody seals have been broken), a Nonconformance Report form will be initiated. The analytical and data management task leader and the project manager will be advised immediately and the samples will not be analyzed unless the project manager so authorizes. The QA coordinator will also be notified. The project manager will make a decision as to the fate of the sample(s) in question. The sample(s) will either be processed "as is" with custody failure noted along with the analytical data, or rejected with sampling rescheduled if necessary. The analytical and data management task leader, the project manager, and QA coordinator will sign off the Nonconformance Report, noting the reason for disposition.
- Each time responsibility for custody of the sample changes, the new custodian will sign the record and note the date. If shipment is via Federal Express (or equivalent courier service) and its agent will not be required to sign the record, the IT employee shipping the samples will note on the form "Provided to Federal Express on date." The person receiving must sign as having received the package.
- The custody of individual sample containers will be documented by recording each container's identification on an appropriate Analysis Request and Chain of Custody Record.
- The analyses to be performed for each sample will be recorded on the Analysis Request and Chain of Custody Record form.
- Upon sample destruction or disposal, the custodian responsible for the disposal will complete the Analysis Request and Chain of Custody Record, file a copy, and send a copy to the project manager or to his designated representative for record keeping.

5.6 Laboratory Receipt and Entry of Samples

Upon receipt at the laboratory, a sample is removed from the shipping container and the sample identification is compared to the information contained on the sample bottles to the chain-of-custody documents. If discrepancies exist, appropriate notes (signed and dated) are made on the chain-of-custody document and the shipping and receiving supervisor is notified.

The following items are checked upon receipt of samples with the chain-of-custody document:

- The seals and tapes on the sample containers and the cooler are unbroken and uncut.
- The sample containers in the cooler are intact and inside temperature is recorded.
- The identification on the sample bottles corresponds to the entries on the accompanying forms.
- That the number of sample containers received (i.e., bottles) is equal to the number of samples listed on the chain-of-custody or accompanying forms.

Identification numbers are stamped on labels and securely wrapped about each sample. If samples are to be shipped from one laboratory to another, proper chain-of-custody and packaging procedures will be maintained.

5.7 Preanalysis Storage

Personnel from the appropriate analytical laboratory group receive and log in the samples. These personnel have the responsibility of picking up samples that are specific to their group from shipping and receiving. The samples are then placed into temporary storage until analysis.

Samples are stored as prescribed in the analytical laboratory-specific QAM. Methods of storage are intended generally to:

- Retard biological action.
- Retard hydrolysis of chemical compounds and complexes.
- Reduce volatility of constituents.
- Reduce adsorption effects.

Preservation methods are generally limited to pH control, chemical addition, refrigeration, and freezing. Preanalysis sample storage procedures are described specifically in the analytical laboratory-specific QAM.

5.8 Postanalysis Storage

Anticipation of reanalysis prescribes proper environmental control. If reanalysis is not anticipated, environmental conditions are not observed, and the samples are stored at room temperature. Postanalysis environmental control of samples is specifically addressed in the

analytical laboratory-specific QAM. Disposal of samples will be in accordance with federal and state regulations.

Depending upon regulatory and client requirements, samples remaining after testing is completed may be disposed of at the option of the project manager. In general, samples shall not be kept longer than 6 months. Transferal to the client or owner may be arranged, as appropriate.

Samples collected in the field will be transported to the laboratory or field testing site as expeditiously as practical. When a 4°C requirement for preserving the sample is indicated, the samples will be packed in ice or chemical refrigerant to keep them cool during collection and transportation. During transit, it is not always possible to rigorously control the temperature of the samples. As a general rule, storage at low temperature is the best way to preserve most samples. It is impossible to set acceptance temperature limits for the cooler temperature because of the complexity of the issue. When, in the judgment of the laboratory, the temperature of the samples upon receipt may have affected the stability of the analytes of interest, the problem will be documented in laboratory records and discussed with AFCEE. The resolution of the problem will also be documented.

Once the samples reach the laboratory, they will be checked against information on the COC form for anomalies. The condition, temperature, and appropriate preservation of samples will be checked and documented on the COC form. The checking of the pH of samples using pH paper is an acceptable procedure. The occurrence of any anomalies in the received samples and their resolution will be documented in laboratory records. All sample information will then be entered into a tracking system, and unique analytical sample identifiers will be assigned. A copy of this information will be reviewed by the laboratory for accuracy. Sample holding time tracking begins with the receipt of samples and entry of the sample information into the tracking system and continues until the results are reported. Holding times for methods required routinely for AFCEE work are specified in Table 5-1. **Samples not preserved or analyzed in accordance with these requirements will be resampled and analyzed within the specified holding times.** As an alternative, AFCEE will be contacted in writing to obtain a variance. Subcontracted analyses will be documented with a COC form. Procedures ensuring internal COC will also be maintained. Specific instructions concerning the analysis specified for each

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sample will be communicated to the analysts. Analytical batches will be created, and laboratory QC samples will be introduced into each batch.

While in the laboratory, samples will be stored in limited-access, temperature-controlled areas. Refrigerators and coolers will be monitored for temperature. Acceptance criteria for the temperatures of the refrigerators and coolers is $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$. Freezers will also be monitored for temperature each working day. Acceptance criteria will be available and in use to assess the adequacy of freezer temperatures. All of the cold storage areas will be monitored by thermometers that have been calibrated with a NIST-traceable thermometer. As indicated by the findings of the calibration, correction factors will be applied to each thermometer. Records that include acceptance criteria will be maintained. Samples for volatile organics determination will be stored separately from other samples, standards, and sample extracts. Soil and water for volatile determinations will also be stored separately. Samples will be stored after analysis until disposed of in accordance with applicable local, state, and federal regulations. Disposal records will be maintained.

SOPs describing sample control and custody are documented and reviewed during the audits.

TAB

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6.0 Field Analytical Screening Methods and Physical Tests

The analytical screening and physical testing methods contained in this section are shown in Table 6-1. This section includes brief descriptions of the methods and QC required for field procedures commonly used to conduct remedial work efforts. The methods and QC procedures were taken from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA SW-846, Third Edition, and its first update), *Methods for Chemical Analysis of Water and Waste* (EPA 1979), *ASTM Annual Book of Standards* (1993), Army Corps of Engineers Engineering Manual (November 1970), and from manufacturers' literature. These apply only when required by Work Plan and Field Sampling Plan.

**Table 6-1
Screening Analytical Methods
NAS Fort Worth
Project No. 765725**

Method	Parameter
Field Methods	
E170.1	Temperature
E180.1	Turbidity
Organic Vapor (FID and PID)	Soil gas screening-halogenated, aromatic, and petroleum hydrocarbons
Standard Method 4500	Carbon dioxide
Standard Method 4500	Dissolved oxygen
Standard Method 4500	Sulfide
Landtech GA 90	Methane (Bio)
Landtech GA 90	Carbon dioxide (Bio)

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Method	Parameter
EPA Method 120.1	Conductance
EPA Method SW9040	pH
EPA Method 170.1	Temperature

6.1 Field Analytical Screening Method Descriptions

6.1.1 EPA Method 120.1 - Conductance

Sample conductance will be measured on site using EPA method 120.1. Standard conductivity meters are used, and the electrode is rinsed with sample before conductance is measured; temperature is also reported. The meters are standardized daily using KCl solutions of known conductance.

6.1.2 EPA Method SW9040 (Water)

Field pH measurements will be performed for water samples using method SW9040. All measurements will be determined electrometrically using either a glass electrode in combination with a reference potential, or a combination electrode. pH meters are standardized daily (preferably immediately prior to sample measurement) with a minimum of two buffers that bracket the expected pH of the samples.

6.1.3 EPA Method 170.1 - Temperature

Water temperature will be measured in the field using EPA method 170.1. A standard mercury thermometer will be rinsed twice with sample before the temperature is recorded. The temperature of a water sample can also be measured using an alternative temperature-sensing device (i.e., thermocouple).

6.1.4 EPA Method 180.1 - Turbidity

Turbidity will be determined on site using EPA method 180.1. This method is based on a comparison of the light scattered by the sample under defined conditions with the light intensity scattered by a standard reference suspension. The higher the intensity, the higher the turbidity. Turbidity measurements are made in a nephelometer and are reported in terms of NTU. The working range for the method is from 0–40 NTU. Higher levels of turbidity can be measured by diluting the sample with turbidity-free deionized water.

6.1.5 Real-Time Portable Organic Vapor Analyzers

Two types of portable analyzers will be used to perform real-time nonspecific analyses of hydrocarbon vapors. The instruments include an FID (i.e., Foxboro Century OVA) and a PID (i.e., HNu® Systems [HNu®] trace gas analyzer) organic vapor monitor. One or more of these instruments may be used at a specific site, depending on the contaminant species of interest. When used together, the instruments provide complementary information because they are sensitive to different types of hydrocarbon vapors.

The portable analyzers will be used as a screening tool to help determine the optimum locations for the collection of samples. Field data recorded on the COC forms give the laboratory analysts an indication of the approximate concentration of contaminants and aid in calculating dilution factors before analysis. Additionally, the real-time instruments are used to aid in selecting the proper level of personal protective equipment and monitoring air emissions during sampling activities. The comparability of results obtained from the PID and FID instruments can be considered only to be within the variability of this type of screening instrument. Comparability is greatest when the instruments are calibrated with the same standards and operated within similar concentration ranges.

The FID uses the principle of hydrogen flame ionization to detect and measure total hydrocarbon vapors. The FID has a dynamic operating range from 1 to 10 ppm, or 100,000 ppm, depending on the instrument, and provides a nonspecific response to total hydrocarbons. If concentrations exceed the range of the instrument, a dilution probe will be attached to the FID to allow elevated vapor concentrations to be measured. The instrument is highly sensitive to compounds such as methane, benzene, and acetone, but is less sensitive to alcohols and halogenated compounds.

During operation, a sample is drawn into the probe and transmitted to the detection chamber by an internal pumping system. Inside the chamber, the sample is exposed to a hydrogen flame that ionizes the organic vapors. As the organic vapors burn, the ions produced are collected on an electrode in the chamber, and a current proportional to the hydrocarbon concentration is generated. This current is measured and displayed on the meter.

The PID uses a photoionization detector to detect and measure total hydrocarbon vapors. The instrument has an operating range of 0 to 2,000 ppm. During operation, a gas sample is drawn into the probe and past an ultraviolet light source (10.0-eV lamp) by an internal pumping system. Contaminants in the sample are ionized, producing an instrument response if their ionization potential is equal to or less than the ionizing energy supplied by the 10.0-eV lamp. The radiation produces a free electron for each molecule of ionized contaminant, which generates a current directly proportional to the number of ions produced. This current is measured and displayed on the meter. The PID measures the *total* value for all species present with ionization potentials of 10.0-eV or less.

6.1.6 Environmental Surveillance Procedure ESP 307-5 - Oxidation-Reduction Potential

The Eh of a solution is defined as the electro-motive force developed by a noble metal electrode immersed in the water sample in reference to a standard hydrogen electrode. In this procedure the Eh of a solution is measured as a millivolt signal produced when a noble metal electrode (generally platinum) and a reference electrode, silver-silver chloride, or other of constant potential) are placed in the sample. The electrodes are calibrated using standard redox solutions prior to use.

6.1.7 Standard Methods for Examination of Water and Wastewater- Method 3500 - Ferrous Iron

Two methods of colorimetric iron analysis are presented in the following procedure. The 1,10-phenanthroline method is the most well-known test for ferrous and total iron. The 1,10-phenanthroline reagent gives an orange color with ferrous iron and is free from common interferences. The indicator is combined with a reducing agent for total iron analysis in a single powder formulation called Ferro Ver® Iron Reagent. The amount of ferric iron present can be determined as the difference between the amount of ferrous iron and the results of a total iron test. The Ferro Ver Iron Reagent converts all iron present in the sample to the ferrous state, including precipitated or suspended iron such as rust, whereby it reacts with the 1,10-

phenanthroline to give the orange color necessary for the determination. This test has been approved by the EPA for NPDES reporting purposes based on comparability studies if the sample is first digested.** Testing done for nonreporting purposes generally does not require sample digestion.

6.1.8 Standard Methods for Examination of Water and Wastewater - Method 4500 - Carbon Dioxide

The analysis for carbon dioxide is similar to that for acidity. A water sample is titrated to a phenolphthalein and with sodium hydroxide standard solution. Strong mineral acids are assumed to be absent or their effect negligible. Care must be taken during the analysis to minimize the loss of carbon dioxide from the water sample as a result of aeration when collecting and swirling the sample.

6.1.9 Standard Methods for Examination of Water and Wastewater - Method 4500 - Dissolved Oxygen

The most common method and electrode instruments for determination of dissolved oxygen in water are dependent upon the rate of diffusion of molecular oxygen across a membrane and upon electrochemical reactions. Under steady-state conditions, the current or potential can be correlated with dissolved oxygen concentration.

6.1.10 Standard Method 4500 - Sulfide

Sulfide is a poisonous by-product of the anaerobic decomposition of organic matter and commonly is found in sewage and industrial wastewaters. Sulfide can be present as the free sulfide ion (S^{2-}) or as dissolved oxygen sulfide (H_2S and HS^-). The toxicity of hydrogen sulfide is equivalent to that of hydrogen cyanide but its offensive odor is detectable long before toxic levels are reached.

The sulfide test is based on the ability of hydrogen sulfide and acid-soluble metallic sulfides to convert N,N-di-methyl-p-phenylenediamine oxalate directly to methylene blue. The intensity of the methylene blue color developed is directly proportional to the amount of sulfide present in the original sample.

6.1.11 Grain Size - ASTM D-422

Grain size analysis determines the quantitative determination of the distribution of particle sizes in soils. The distribution of particle sizes larger than 75 micron is determined by sieving, while

the distribution of particle sizes smaller than 75 micron is determined by a sedimentation process, using a hydrometer to secure the necessary data.

6.1.12 Moisture Content - ASTM D-2216

Moisture content analysis determines the amount of water content by mass of a soil sample or other type matrix. The water content of a material is defined by this standard as the ratio, expressed as a percentage of the mass of "pore" or "free" water in a given mass of material to the mass of the solid material.

6.1.13 Organic Content - ASTM D-2974

Organic content analysis determines the moisture content, ash content, and organic matter in organic clays and peats. Moisture is determined by drying a peat or organic soil in an oven at 105°C. Ash content is expressed as a percentage of the mass of the oven-dried sample after the soil sample has been placed in a muffle furnace. Organic matter is determined by subtracting percent ash content from one hundred.

6.1.14 Permeability - ASTM D-5084

Permeability analysis is a laboratory measurement of the hydraulic conductivity (coefficient of permeability) of water-saturated porous materials with a flexible wall permeameter. The test applies to one-dimensional laminar flow of water within porous materials such as soil and rock.

6.1.15 Specific Gravity - ASTM D-854

Specific gravity is the ratio of the mass of a volume of solid soil particles at a stated temperature to the mass in air of the same volume of gas-free distilled water at a stated temperature. Specific gravity is determined by using a pycnometer and a balance. Results are determined based upon gravimetric measurement.

6.1.16 EM-1110-2-1906, Appendix II - Unit Weight Density

Unit weight density of a soil is derived by taking the weight and volume of an undisturbed sample. Density determination is used to define the density of the in situ field soil conditions.

6.1.17 EM-1110-1906, Appendix II - Porosity

Porosity is the ratio of the aggregate volume of interstices, in a rock or soil to its volume. Porosity is expressed as a percentage and determined by calculating the difference in the weight

in the volume of the dry specimen from the volume of the wet specimens and dividing by the volume of the wet specimen.

6.1.18 Methane, Oxygen, and Carbon Dioxide by Landtec GA-90

The GA-90 is a compact field instrument that can be configured to analyze the methane (CH₄), carbon dioxide (CO₂), and oxygen (O₂) levels in landfill gas. The GA-90 can be used by landfill technicians in monitoring migration probes, active and passive gas extraction systems and measuring landfill gas at flares or other approved control systems. The GA-90 uses computer technology with on-screen menus to provide a simplified user interface for accurate data analysis and recording while eliminating the need to carry many separate field instruments. The GA-90 gas analyzer is designed for all passive landfill gas monitoring appliance.

6.2 Calibration and QC Procedures for Field and Physical Test Methods

A summary of calibration and QC procedures for field and physical test methods is given in Table 6-2. All field screening data will be flagged with an S data qualifier to show that the reported data are field level data. The other data qualifiers that will be used with field data are also shown in Table 6-2.

Table 6-2 also presents the calibration and QC procedures for each method. These requirements as well as the corrective actions and data flagging criteria are included. In this table, the first two columns designate the method number and the class of analytes that may be determined by the method. The third column lists the method-required calibration and QC elements. The fourth column designates the minimum frequency for performing each calibration and QC element. The fifth column designates the acceptance criteria for each calibration and QC element. The sixth column designates the mandatory corrective action in the event that a calibration or QC element does not meet the acceptance criteria. The last column designates the data flagging criteria that must be applied in the event that the method-required calibration and QC acceptance criteria are not met. Table 6-3 summarizes the geotechnical calibration requirements and includes geotechnical equipment calibration checks, interval acceptance criteria, and applicable methods.

Table 6-2
Summary of Calibration and QC Procedures for Field and Physical Test Methods
NAS Fort Worth
Project No. 765725

Analytical Method	Applicable Parameter	QC
E160.1	Turbidity	Calibr one for standa instrum range
None	Organic vapor concentrations (FID and PID)	Multiple calbra
		Calbra verifice check
		LCS
		Duplic

Table 6-3

Summary of Geotechnical Calibration Checks, Interval
 Acceptance Criteria, and Applicable Methods
 NAS Fort Worth
 Project No. 765725

Equipment	Calibration Interval	Type of Calibration	Acceptance Criteria	Applicable Method
Thermometer	Annual	3-point comparison to standard thermometer	$\pm 1^\circ\text{Celsius}$	Grain-size/ASTM D-422, Specific Gravity ASTM D-854
Balance	Quarterly	Calibrated against Class S weights	$\pm 0.2\%$	Applicable to all tests
Sieve Shaker	Annual	A calibrated set of calipers, gauge blocks, tape measure, or ruler is used to measure the hammer drop.	Hammer drop should be $< \pm 1-3/8$ inches or $> \pm 1-1/4$ inches	Grain size/ASTM D-422
Hydrometer	24 months	Visual inspection of body, stem, scale graduation and markings. Observe reading of meniscus on stem of hydrometer after placed in 1-liter jar of deionized water	Reading should be ± 1 division	Grain size/ASTM D-422
Vacuum System	Annual	Check vacuum	< 100 mm of Hg	Permeability/ASTM D-5084

Table 6-3
Summary of Geotechnical Calibration Checks, Interval
Acceptance Criteria, and Applicable Methods
NAS Fort Worth
Project No. 765725
(Continued)

Equipment	Calibration Interval	Type of Calibration	Acceptance Criteria	Applicable Method
Permeability Panel	24 months	A volume of water is allowed to flow out of the permeability panel reservoir and into a glass graduate. The volume of water is captured in the graduate and compared to the volume of water lost from the reservoir.	0.1% or 0.02 grams	Permeability/ASTM D-5084
Calipers	Annual	Determine the measurement error by subtracting the caliper measurement from the certified gage block values.	0.001 ± 0.001 inches	Permeability/ASTM D-5084, Density EM-1110-2-1906
ASTM Weights	Annual	NIST traceable to brass weights	0.1% or 0.02 grams of 2 decimal place balance (ASTM Class Weights)	Applicable to all tests

TAB

7.0

7.0 Analytical Preparation Methods and Procedures

Section 7.1 contains brief descriptions of preparation methods. Section 7.2 contains subsections for each analytical procedure. Each subsection contains the following information:

- A brief method description
- A table of PQLs
- A table of QC acceptance criteria
- A table of calibration procedures, QC procedures, and data validation guidelines

This information was obtained from the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (U.S. EPA SW-845, Third Edition, and its first update); *Handbook for the Installation Restoration Program (IRP) Remedial Investigations and Feasibility Studies (RI/FS)* (Handbook), September 1993; *EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, U.S. EPA, Office of Solid Waste and Emergency Response, Washington, D.C., Publication 9240.1-05-01, EPA-540/R-94-013, PB94-963502, February 1994; and *EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA, Office of Solid Waste and Emergency Response, Washington, D.C., Publication 9240.1-05, EPA-540/R-94-012, PB94-963501, February 1994. Definitions of terms are given in Section 4.0, and data validation guidelines are presented in Section 8.0.

7.1 Preparation Methods

Extraction, digestion, and cleanup methods for liquid and solid matrices are briefly described in this section.

7.1.1 Method SW1311 - Toxicity Characteristic Leaching Procedure

Method SW1311 is used to prepare samples for determination of the concentration of organic (semivolatile and volatile) and inorganic constituents that are leachable from waste or other material.

QC is accomplished by preparing a TCLP blank at a rate of one blank for every 20 extractions conducted in the extraction vessel. Additional extract is prepared so that one MS is performed for each analytical batch. These QA measures are in accordance with the requirements of Section 8.0 of EPA method SW1311.

7.1.2 Method SW3005 - Acid Digestion of Aqueous Samples

This method is an acid digestion procedure used to prepare water samples for metals analysis. The digested samples are analyzed for total recoverable and dissolved metals determination by either FLAA or GFAA or ICPES.

For analysis of total recoverable metals, the entire sample is acidified at collection time with nitric acid. At the time of analysis the sample is heated with acid and reduced, without boiling, to a specific volume. The digestate is then filtered and diluted to provide the desired concentration for analysis.

For analysis of dissolved metals, immediately upon collection the samples are filtered through a 0.45 µm filter and acidified with nitric acid. For analysis, the sample is heated with acid and reduced in volume. The digestate is again filtered (if necessary) and diluted to volume.

7.1.3 Method SW3010 - Acid Digestion for Metals

Method SW3010 prepares waste samples for total metals determination by FLAA and ICPES. The samples are vigorously digested with nitric acid and then diluted with hydrochloric acid.

7.1.4 Method SW3020 - Acid Digestion for Metals

Method SW3020 prepares waste samples for total metals determination by GFAA spectroscopy. The samples are vigorously digested with nitric acid and then diluted.

7.1.5 Method SW3050 - Acid Digestion for Solids, Sediments, and Sludges for Metals Determinations

Method SW3050 is applicable to the preparation of sediment, sludge, and soil samples for metals analysis by FLAA or GFAA or ICPES.

A 1-g (wet weight) sample is treated and digested in nitric acid and hydrogen peroxide. The digestate is then refluxed with nitric or hydrochloric acid, depending on the type of analysis to be performed. When using HCl as the final refluxing acid, do not boil because antimony is volatile and easily lost. A separate aliquot of the sample is dried for a total solids and/or percent moisture determination.

Some sludge samples can contain diverse matrix types, which may present specific analytical problems. Spiked samples and any relevant standard reference material are processed to aid in determining whether method SW3050 is applicable to a given waste.

7.1.6 Method SW3060 - Alkaline Digestion

This method is a basic digestion used to solubilize the total concentration of hexavalent chromium in solid samples.

Method SW3060 is taken from SW-846, Third Edition, and is used only as a guideline for the extraction of hexavalent chromium in a solid matrix. The digestion approach may vary according to the matrix, and sample conditions may significantly influence the recovery of hexavalent chromium.

A specific weight of sample is extracted with a hot solution of 3 percent sodium carbonate/2 percent sodium hydroxide. The digestion solution is then heated to near boiling with constant mixing for 30 to 45 minutes, cooled, and filtered and diluted with deionized distilled water at a specified volume.

7.1.7 SW3500 Series Methods - Organic Extraction and Sample Preparation

The SW3500 series methods are used to quantitatively extract nonvolatile and SVOCs from various sample matrices. Prior to analysis, a sample of a known volume or weight is solvent extracted, dried with anhydrous sodium sulfate, and concentrated in a Kuderna-Danish apparatus.

7.1.8 Method SW3510 - Separatory Funnel Extraction

Method SW3510 is designed to quantitatively extract nonvolatile and SVOCs from liquid samples using standard separatory funnel techniques. The sample and the extracting solvent must be immiscible in order to yield recovery of target compounds. Subsequent cleanup and detection methods are described in the organic analytical method that is used to analyze the extract.

Samples are adjusted to a specified extraction pH and extracted with the appropriate solvent for the analytical method. Methylene chloride should be employed when a solvent is not specified. Samples are extracted three times, and the combined extracts are dried with anhydrous sodium sulfate and concentrated in a Kuderna-Danish apparatus.

7.1.9 Method SW3520 - Continuous Liquid-Liquid Extraction

Method SW3520 is designed to quantitatively extract nonpurgeable organic compounds from liquid samples using a continuous extraction apparatus. The method minimizes emulsion formation and thus improves recovery of target compounds. The sample and extracting solvent must be immiscible in order to yield recovery of target compounds. Subsequent cleanup methods and detection are described in the analytical methods.

The method is designed for extraction solvents with greater density than the sample, although continuous extraction devices are available for extraction solvents that are less dense than the sample. The analyst must demonstrate the effectiveness of any such automatic extraction device before employing it in sample extraction.

Each sample is placed into a continuous extraction apparatus adjusted to the specified extraction pH and extracted with the appropriate solvent. Methylene chloride should be employed when a solvent is not specified. The extraction pH and solvent to be used are listed in the quantification method. Samples are extracted for 18 hours; the extract is collected, dried with anhydrous sodium sulfate, and concentrated with a Kuderna-Danish apparatus. In some cases, the sample pH is adjusted after the first extraction, and continuous extraction is carried out for an additional 18 hours to recover another class of compounds.

7.1.10 Method SW3540 - Soxhlet Extraction

Method SW3540 is a procedure for extracting nonvolatile and SVOCs from solids such as soils and sludges. The Soxhlet extraction process ensures intimate contact of the sample matrix with the extraction solvent. Extraction is accomplished by mixing the solid sample with anhydrous sodium sulfate, placing it in an extraction thimble or between two plugs of glass wool, and extracting it for 16 to 24 hours with an appropriate solvent in the Soxhlet extractor. Methylene chloride should be employed when a solvent is not specified. The extract is dried and concentrated and then treated using a cleanup method, or analyzed directly by the appropriate measurement technique.

7.1.11 Method SW3550 - Sonication Extraction

Method SW3550 is a procedure for extracting nonvolatile and SVOCs from solids such as soils and sludges. The sonication process ensures intimate contact of the sample matrix with the extraction solvent.

A weighed sample of the solid waste is ground and mixed with the extraction media, then dispersed into the solvent using sonication. The extract is then dried with anhydrous sodium sulfate and concentrated with a Kuderna-Danish apparatus. The resulting solution may then be cleaned up or analyzed directly using the appropriate technique. Methylene chloride is typically used as the solvent, although other solvents may be used for specific analytical applications.

7.1.12 Method SW3650 - Acid-Base Partition Cleanup

The method SW3650 cleanup procedure is employed to remove interferences that prevent direct chromatographic measurement and is based on the differential solubility between the compounds of interest and the interfering species. The method allows for a choice of solvents to optimize extraction of specific species.

An aliquot of the sample is mixed in a separatory funnel with solvent and distilled water, and the pH is adjusted to between 12 and 13 with sodium hydroxide. After extraction, the aqueous phase is collected. The solvent phase is extracted twice more with distilled water, and the aqueous extracts are combined. The analyte of interest will reside in either the solvent or aqueous phase. If it is in the aqueous phase, that phase is then solvent extracted at pH 2, and the extract is concentrated in a Kuderna-Danish apparatus using a three-ball Snyder column. If the solvent phase contains the analyte of interest, only the concentration step is required.

7.1.13 Method SW5030 - Purge and Trap Method

Method SW5030 describes sample preparation and extraction for the analysis of VOCs. The method is applicable to nearly all types of samples, including aqueous sludges, caustic liquors, acid liquors, waste solvents, oily wastes, water, tars, fibrous wastes, polymeric emulsions, filter cakes, spent carbons, spent catalysts, soils, and sediments. The success of this method depends on the level of interferences in the sample; results may vary due to the large variability and complexity of matrices of solid waste samples.

A direct purge and trap can be performed for low concentration solid samples. If higher concentrations are expected, a portion of the solid sample is dispersed in methanol to dissolve the volatile organic constituents. A portion of the PEG, tetraglyme, or methanol solution is combined with water in a purging chamber. An inert gas is then bubbled through the solution at ambient temperature to transfer the volatile components to the vapor phase. The vapor is swept through a sorbent column where the volatile components are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb the components onto a GC column. For SW8020 and SW8030, drying of the trap for four minutes under helium flow is required. For methods SW8010, SW8020, and SW8030, the GC column is heated to elute the components that are detected by an appropriate detector.

7.2 Analytical Procedures

The analytical procedures presented in this section are outlined in Table 7-1.

A brief description and three tables for each method are included in Appendix C. The first table presents the PQLs for each analyte in the method. The PQLs are presented for both soil and water matrices. The second table presents the acceptance criteria for the accuracy of spiked analyte and surrogate recoveries. This table also presents the acceptance criteria for the precision of matrix, field, and laboratory duplicate recoveries. The third table presents the calibration and QC procedures for each method. Corrective actions and data flagging criteria are also included in this table. In the third table, the first two columns designate the method number and the class of analytes that may be determined by the method. The third column lists the method-required calibration and QC elements. The fourth column designates the minimum frequency for performing each calibration and QC element. The fifth column designates the acceptance criteria for each calibration and QC element. The sixth column designates the mandatory corrective action in the event that a calibration or QC element does not meet the acceptance criteria. The last column designates the data flagging criteria that will be applied in the event that the method-required calibration and QC acceptance criteria are not met.

Table 7-1

Analytical Procedures
 NAS Fort Worth
 Project No. 765725

A - A Method	Parameter
160.1	Total dissolved solids (water)

TAB

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Analysts are provided with specific criteria that must be met for each procedure, operation, or measurement system.

Laboratory data verification includes dated and signed entries by analysts and group leaders on the worksheets and logbooks used for samples, the use of sample tracking and numbering systems to track the progress of samples through the laboratory, and the use of QC criteria to reject or accept specific data.

Steps and checks used to validate precision and accuracy of the measured parameters and to support the representativeness, comparability, and completeness include:

- Description of the calibration performed
- Description of routine instrument checks (background noise levels, drift, linearity, etc.)
- Documentation of the traceability of instrument standards, samples, and data
- Documentation of analytical methodology and quality control methodology
- Description of the controls taken to determine and minimize interference contaminants in analytical methods (use of reference blanks and check standards for method accuracy and precision)
- MS recoveries, percent RPDs between the MS and the MSD and surrogate recoveries
- Description of routine maintenance performed
- Documentation of sample preservation and transport when shipped elsewhere.

Laboratory validation responsibilities are as follows:

- **Analyst.** Responsible for the actual analyses performed. If several types of analyses are performed, there will be more than one analyst. The data are organized and placed into the job envelope.
- **Analyst or Group Leader.** Responsible for reviewing data, calculations, and the results for 20 percent of all jobs. If an analyst performs this function, it is always a second, independent analyst from the analyst performing the analyses.

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Table 8-1
Analytical Soil Boring Samples
Base Gas Station Field Sampling Plan
NAS Fort Worth
Project No. 765725

Boring No.	Depth (ft)	Sample No.	Sample Type	Analysis
1	0-1	1	Soil	Asbestos
1	1-2	2	Soil	Asbestos
1	2-3	3	Soil	Asbestos
1	3-4	4	Soil	Asbestos
1	4-5	5	Soil	Asbestos
1	5-6	6	Soil	Asbestos
1	6-7	7	Soil	Asbestos
1	7-8	8	Soil	Asbestos
1	8-9	9	Soil	Asbestos
1	9-10	10	Soil	Asbestos
1	10-11	11	Soil	Asbestos
1	11-12	12	Soil	Asbestos
1	12-13	13	Soil	Asbestos
1	13-14	14	Soil	Asbestos
1	14-15	15	Soil	Asbestos
1	15-16	16	Soil	Asbestos
1	16-17	17	Soil	Asbestos
1	17-18	18	Soil	Asbestos
1	18-19	19	Soil	Asbestos
1	19-20	20	Soil	Asbestos
1	20-21	21	Soil	Asbestos
1	21-22	22	Soil	Asbestos
1	22-23	23	Soil	Asbestos
1	23-24	24	Soil	Asbestos
1	24-25	25	Soil	Asbestos
1	25-26	26	Soil	Asbestos
1	26-27	27	Soil	Asbestos
1	27-28	28	Soil	Asbestos
1	28-29	29	Soil	Asbestos
1	29-30	30	Soil	Asbestos
1	30-31	31	Soil	Asbestos
1	31-32	32	Soil	Asbestos
1	32-33	33	Soil	Asbestos
1	33-34	34	Soil	Asbestos
1	34-35	35	Soil	Asbestos
1	35-36	36	Soil	Asbestos
1	36-37	37	Soil	Asbestos
1	37-38	38	Soil	Asbestos
1	38-39	39	Soil	Asbestos
1	39-40	40	Soil	Asbestos
1	40-41	41	Soil	Asbestos
1	41-42	42	Soil	Asbestos
1	42-43	43	Soil	Asbestos
1	43-44	44	Soil	Asbestos
1	44-45	45	Soil	Asbestos
1	45-46	46	Soil	Asbestos
1	46-47	47	Soil	Asbestos
1	47-48	48	Soil	Asbestos
1	48-49	49	Soil	Asbestos
1	49-50	50	Soil	Asbestos
1	50-51	51	Soil	Asbestos
1	51-52	52	Soil	Asbestos
1	52-53	53	Soil	Asbestos
1	53-54	54	Soil	Asbestos
1	54-55	55	Soil	Asbestos
1	55-56	56	Soil	Asbestos
1	56-57	57	Soil	Asbestos
1	57-58	58	Soil	Asbestos
1	58-59	59	Soil	Asbestos
1	59-60	60	Soil	Asbestos
1	60-61	61	Soil	Asbestos
1	61-62	62	Soil	Asbestos
1	62-63	63	Soil	Asbestos
1	63-64	64	Soil	Asbestos
1	64-65	65	Soil	Asbestos
1	65-66	66	Soil	Asbestos
1	66-67	67	Soil	Asbestos
1	67-68	68	Soil	Asbestos
1	68-69	69	Soil	Asbestos
1	69-70	70	Soil	Asbestos
1	70-71	71	Soil	Asbestos
1	71-72	72	Soil	Asbestos
1	72-73	73	Soil	Asbestos
1	73-74	74	Soil	Asbestos
1	74-75	75	Soil	Asbestos
1	75-76	76	Soil	Asbestos
1	76-77	77	Soil	Asbestos
1	77-78	78	Soil	Asbestos
1	78-79	79	Soil	Asbestos
1	79-80	80	Soil	Asbestos
1	80-81	81	Soil	Asbestos
1	81-82	82	Soil	Asbestos
1	82-83	83	Soil	Asbestos
1	83-84	84	Soil	Asbestos
1	84-85	85	Soil	Asbestos
1	85-86	86	Soil	Asbestos
1	86-87	87	Soil	Asbestos
1	87-88	88	Soil	Asbestos
1	88-89	89	Soil	Asbestos
1	89-90	90	Soil	Asbestos
1	90-91	91	Soil	Asbestos
1	91-92	92	Soil	Asbestos
1	92-93	93	Soil	Asbestos
1	93-94	94	Soil	Asbestos
1	94-95	95	Soil	Asbestos
1	95-96	96	Soil	Asbestos
1	96-97	97	Soil	Asbestos
1	97-98	98	Soil	Asbestos
1	98-99	99	Soil	Asbestos
1	99-100	100	Soil	Asbestos

*See Table 8-6
**See Table 8-7
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Table 8-1
Analytical Soil Boring Samples
Base Gas Station Field Sampling Plan
NAS Fort Worth
Project No. 765725
(Continued)

Boring No.	Depth (ft)	Soil Type	Sample No.	Depth (ft)	Soil Type	Sample No.	Depth (ft)	Soil Type	Sample No.
1	0-1	CL	1	1-2	CL	2	2-3	CL	3
2	0-1	CL	4	1-2	CL	5	2-3	CL	6
3	0-1	CL	7	1-2	CL	8	2-3	CL	9
4	0-1	CL	10	1-2	CL	11	2-3	CL	12
5	0-1	CL	13	1-2	CL	14	2-3	CL	15
6	0-1	CL	16	1-2	CL	17	2-3	CL	18
7	0-1	CL	19	1-2	CL	20	2-3	CL	21
8	0-1	CL	22	1-2	CL	23	2-3	CL	24
9	0-1	CL	25	1-2	CL	26	2-3	CL	27
10	0-1	CL	28	1-2	CL	29	2-3	CL	30
11	0-1	CL	31	1-2	CL	32	2-3	CL	33
12	0-1	CL	34	1-2	CL	35	2-3	CL	36
13	0-1	CL	37	1-2	CL	38	2-3	CL	39
14	0-1	CL	40	1-2	CL	41	2-3	CL	42
15	0-1	CL	43	1-2	CL	44	2-3	CL	45
16	0-1	CL	46	1-2	CL	47	2-3	CL	48
17	0-1	CL	49	1-2	CL	50	2-3	CL	51
18	0-1	CL	52	1-2	CL	53	2-3	CL	54
19	0-1	CL	55	1-2	CL	56	2-3	CL	57
20	0-1	CL	58	1-2	CL	59	2-3	CL	60
21	0-1	CL	61	1-2	CL	62	2-3	CL	63
22	0-1	CL	64	1-2	CL	65	2-3	CL	66
23	0-1	CL	67	1-2	CL	68	2-3	CL	69
24	0-1	CL	70	1-2	CL	71	2-3	CL	72
25	0-1	CL	73	1-2	CL	74	2-3	CL	75
26	0-1	CL	76	1-2	CL	77	2-3	CL	78
27	0-1	CL	79	1-2	CL	80	2-3	CL	81
28	0-1	CL	82	1-2	CL	83	2-3	CL	84
29	0-1	CL	85	1-2	CL	86	2-3	CL	87
30	0-1	CL	88	1-2	CL	89	2-3	CL	90
31	0-1	CL	91	1-2	CL	92	2-3	CL	93
32	0-1	CL	94	1-2	CL	95	2-3	CL	96
33	0-1	CL	97	1-2	CL	98	2-3	CL	99
34	0-1	CL	100	1-2	CL	101	2-3	CL	102

Table 8-1
Analytical Soil Boring Samples
Base Gas Station Field Sampling Plan
NAS Fort Worth
Project No. 765725
(Continued)

Boring No.	Depth (ft)	Soil Type	Sample No.	Depth (ft)	Soil Type	Sample No.	Depth (ft)	Soil Type	Sample No.	Depth (ft)	Soil Type	Sample No.
1	0-1	CL	1	1-2	CL	2	2-3	CL	3	3-4	CL	4
2	0-1	CL	5	1-2	CL	6	2-3	CL	7	3-4	CL	8
3	0-1	CL	9	1-2	CL	10	2-3	CL	11	3-4	CL	12
4	0-1	CL	13	1-2	CL	14	2-3	CL	15	3-4	CL	16
5	0-1	CL	17	1-2	CL	18	2-3	CL	19	3-4	CL	20
6	0-1	CL	21	1-2	CL	22	2-3	CL	23	3-4	CL	24
7	0-1	CL	25	1-2	CL	26	2-3	CL	27	3-4	CL	28
8	0-1	CL	29	1-2	CL	30	2-3	CL	31	3-4	CL	32
9	0-1	CL	33	1-2	CL	34	2-3	CL	35	3-4	CL	36
10	0-1	CL	37	1-2	CL	38	2-3	CL	39	3-4	CL	40
11	0-1	CL	41	1-2	CL	42	2-3	CL	43	3-4	CL	44
12	0-1	CL	45	1-2	CL	46	2-3	CL	47	3-4	CL	48
13	0-1	CL	49	1-2	CL	50	2-3	CL	51	3-4	CL	52
14	0-1	CL	53	1-2	CL	54	2-3	CL	55	3-4	CL	56
15	0-1	CL	57	1-2	CL	58	2-3	CL	59	3-4	CL	60
16	0-1	CL	61	1-2	CL	62	2-3	CL	63	3-4	CL	64
17	0-1	CL	65	1-2	CL	66	2-3	CL	67	3-4	CL	68
18	0-1	CL	69	1-2	CL	70	2-3	CL	71	3-4	CL	72
19	0-1	CL	73	1-2	CL	74	2-3	CL	75	3-4	CL	76
20	0-1	CL	77	1-2	CL	78	2-3	CL	79	3-4	CL	80
21	0-1	CL	81	1-2	CL	82	2-3	CL	83	3-4	CL	84
22	0-1	CL	85	1-2	CL	86	2-3	CL	87	3-4	CL	88
23	0-1	CL	89	1-2	CL	90	2-3	CL	91	3-4	CL	92
24	0-1	CL	93	1-2	CL	94	2-3	CL	95	3-4	CL	96
25	0-1	CL	97	1-2	CL	98	2-3	CL	99	3-4	CL	100

Table 8-1
Analytical Soil Boring Samples
Base Gas Station Field Sampling Plan
NAS Fort Worth
Project No. 765725
(Continued)

Boring No.	Depth (ft)	Sample No.	Sample Type	Analysis	Remarks
1	0-1	1	Soil	VOCs, SVOCs, PCBs, PAHs	
1	1-2	2	Soil	VOCs, SVOCs, PCBs, PAHs	
1	2-3	3	Soil	VOCs, SVOCs, PCBs, PAHs	
1	3-4	4	Soil	VOCs, SVOCs, PCBs, PAHs	
1	4-5	5	Soil	VOCs, SVOCs, PCBs, PAHs	
1	5-6	6	Soil	VOCs, SVOCs, PCBs, PAHs	
1	6-7	7	Soil	VOCs, SVOCs, PCBs, PAHs	
1	7-8	8	Soil	VOCs, SVOCs, PCBs, PAHs	
1	8-9	9	Soil	VOCs, SVOCs, PCBs, PAHs	
1	9-10	10	Soil	VOCs, SVOCs, PCBs, PAHs	
1	10-11	11	Soil	VOCs, SVOCs, PCBs, PAHs	
1	11-12	12	Soil	VOCs, SVOCs, PCBs, PAHs	
1	12-13	13	Soil	VOCs, SVOCs, PCBs, PAHs	
1	13-14	14	Soil	VOCs, SVOCs, PCBs, PAHs	
1	14-15	15	Soil	VOCs, SVOCs, PCBs, PAHs	
1	15-16	16	Soil	VOCs, SVOCs, PCBs, PAHs	
1	16-17	17	Soil	VOCs, SVOCs, PCBs, PAHs	
1	17-18	18	Soil	VOCs, SVOCs, PCBs, PAHs	
1	18-19	19	Soil	VOCs, SVOCs, PCBs, PAHs	
1	19-20	20	Soil	VOCs, SVOCs, PCBs, PAHs	
1	20-21	21	Soil	VOCs, SVOCs, PCBs, PAHs	
1	21-22	22	Soil	VOCs, SVOCs, PCBs, PAHs	
1	22-23	23	Soil	VOCs, SVOCs, PCBs, PAHs	
1	23-24	24	Soil	VOCs, SVOCs, PCBs, PAHs	
1	24-25	25	Soil	VOCs, SVOCs, PCBs, PAHs	
1	25-26	26	Soil	VOCs, SVOCs, PCBs, PAHs	
1	26-27	27	Soil	VOCs, SVOCs, PCBs, PAHs	
1	27-28	28	Soil	VOCs, SVOCs, PCBs, PAHs	
1	28-29	29	Soil	VOCs, SVOCs, PCBs, PAHs	
1	29-30	30	Soil	VOCs, SVOCs, PCBs, PAHs	
1	30-31	31	Soil	VOCs, SVOCs, PCBs, PAHs	
1	31-32	32	Soil	VOCs, SVOCs, PCBs, PAHs	
1	32-33	33	Soil	VOCs, SVOCs, PCBs, PAHs	
1	33-34	34	Soil	VOCs, SVOCs, PCBs, PAHs	
1	34-35	35	Soil	VOCs, SVOCs, PCBs, PAHs	
1	35-36	36	Soil	VOCs, SVOCs, PCBs, PAHs	
1	36-37	37	Soil	VOCs, SVOCs, PCBs, PAHs	
1	37-38	38	Soil	VOCs, SVOCs, PCBs, PAHs	
1	38-39	39	Soil	VOCs, SVOCs, PCBs, PAHs	
1	39-40	40	Soil	VOCs, SVOCs, PCBs, PAHs	
1	40-41	41	Soil	VOCs, SVOCs, PCBs, PAHs	
1	41-42	42	Soil	VOCs, SVOCs, PCBs, PAHs	
1	42-43	43	Soil	VOCs, SVOCs, PCBs, PAHs	
1	43-44	44	Soil	VOCs, SVOCs, PCBs, PAHs	
1	44-45	45	Soil	VOCs, SVOCs, PCBs, PAHs	
1	45-46	46	Soil	VOCs, SVOCs, PCBs, PAHs	
1	46-47	47	Soil	VOCs, SVOCs, PCBs, PAHs	
1	47-48	48	Soil	VOCs, SVOCs, PCBs, PAHs	
1	48-49	49	Soil	VOCs, SVOCs, PCBs, PAHs	
1	49-50	50	Soil	VOCs, SVOCs, PCBs, PAHs	
1	50-51	51	Soil	VOCs, SVOCs, PCBs, PAHs	
1	51-52	52	Soil	VOCs, SVOCs, PCBs, PAHs	
1	52-53	53	Soil	VOCs, SVOCs, PCBs, PAHs	
1	53-54	54	Soil	VOCs, SVOCs, PCBs, PAHs	
1	54-55	55	Soil	VOCs, SVOCs, PCBs, PAHs	
1	55-56	56	Soil	VOCs, SVOCs, PCBs, PAHs	
1	56-57	57	Soil	VOCs, SVOCs, PCBs, PAHs	
1	57-58	58	Soil	VOCs, SVOCs, PCBs, PAHs	
1	58-59	59	Soil	VOCs, SVOCs, PCBs, PAHs	
1	59-60	60	Soil	VOCs, SVOCs, PCBs, PAHs	
1	60-61	61	Soil	VOCs, SVOCs, PCBs, PAHs	
1	61-62	62	Soil	VOCs, SVOCs, PCBs, PAHs	
1	62-63	63	Soil	VOCs, SVOCs, PCBs, PAHs	
1	63-64	64	Soil	VOCs, SVOCs, PCBs, PAHs	
1	64-65	65	Soil	VOCs, SVOCs, PCBs, PAHs	
1	65-66	66	Soil	VOCs, SVOCs, PCBs, PAHs	
1	66-67	67	Soil	VOCs, SVOCs, PCBs, PAHs	
1	67-68	68	Soil	VOCs, SVOCs, PCBs, PAHs	
1	68-69	69	Soil	VOCs, SVOCs, PCBs, PAHs	
1	69-70	70	Soil	VOCs, SVOCs, PCBs, PAHs	
1	70-71	71	Soil	VOCs, SVOCs, PCBs, PAHs	
1	71-72	72	Soil	VOCs, SVOCs, PCBs, PAHs	
1	72-73	73	Soil	VOCs, SVOCs, PCBs, PAHs	
1	73-74	74	Soil	VOCs, SVOCs, PCBs, PAHs	
1	74-75	75	Soil	VOCs, SVOCs, PCBs, PAHs	
1	75-76	76	Soil	VOCs, SVOCs, PCBs, PAHs	
1	76-77	77	Soil	VOCs, SVOCs, PCBs, PAHs	
1	77-78	78	Soil	VOCs, SVOCs, PCBs, PAHs	
1	78-79	79	Soil	VOCs, SVOCs, PCBs, PAHs	
1	79-80	80	Soil	VOCs, SVOCs, PCBs, PAHs	
1	80-81	81	Soil	VOCs, SVOCs, PCBs, PAHs	
1	81-82	82	Soil	VOCs, SVOCs, PCBs, PAHs	
1	82-83	83	Soil	VOCs, SVOCs, PCBs, PAHs	
1	83-84	84	Soil	VOCs, SVOCs, PCBs, PAHs	
1	84-85	85	Soil	VOCs, SVOCs, PCBs, PAHs	
1	85-86	86	Soil	VOCs, SVOCs, PCBs, PAHs	
1	86-87	87	Soil	VOCs, SVOCs, PCBs, PAHs	
1	87-88	88	Soil	VOCs, SVOCs, PCBs, PAHs	
1	88-89	89	Soil	VOCs, SVOCs, PCBs, PAHs	
1	89-90	90	Soil	VOCs, SVOCs, PCBs, PAHs	
1	90-91	91	Soil	VOCs, SVOCs, PCBs, PAHs	
1	91-92	92	Soil	VOCs, SVOCs, PCBs, PAHs	
1	92-93	93	Soil	VOCs, SVOCs, PCBs, PAHs	
1	93-94	94	Soil	VOCs, SVOCs, PCBs, PAHs	
1	94-95	95	Soil	VOCs, SVOCs, PCBs, PAHs	
1	95-96	96	Soil	VOCs, SVOCs, PCBs, PAHs	
1	96-97	97	Soil	VOCs, SVOCs, PCBs, PAHs	
1	97-98	98	Soil	VOCs, SVOCs, PCBs, PAHs	
1	98-99	99	Soil	VOCs, SVOCs, PCBs, PAHs	
1	99-100	100	Soil	VOCs, SVOCs, PCBs, PAHs	

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Table 8-1
Analytical Soil Boring Samples
Base Gas Station Field Sampling Plan
NAS Fort Worth
Project No. 765725
(Continued)

Boring No.	Depth (ft)	Sample No.	Sample Description	Analysis
1	0-1	1	Soil Boring Sample	...
1	1-2	2	Soil Boring Sample	...
1	2-3	3	Soil Boring Sample	...
1	3-4	4	Soil Boring Sample	...
1	4-5	5	Soil Boring Sample	...
1	5-6	6	Soil Boring Sample	...
1	6-7	7	Soil Boring Sample	...
1	7-8	8	Soil Boring Sample	...
1	8-9	9	Soil Boring Sample	...
1	9-10	10	Soil Boring Sample	...
1	10-11	11	Soil Boring Sample	...
1	11-12	12	Soil Boring Sample	...
1	12-13	13	Soil Boring Sample	...
1	13-14	14	Soil Boring Sample	...
1	14-15	15	Soil Boring Sample	...
1	15-16	16	Soil Boring Sample	...
1	16-17	17	Soil Boring Sample	...
1	17-18	18	Soil Boring Sample	...
1	18-19	19	Soil Boring Sample	...
1	19-20	20	Soil Boring Sample	...
1	20-21	21	Soil Boring Sample	...
1	21-22	22	Soil Boring Sample	...
1	22-23	23	Soil Boring Sample	...
1	23-24	24	Soil Boring Sample	...
1	24-25	25	Soil Boring Sample	...
1	25-26	26	Soil Boring Sample	...
1	26-27	27	Soil Boring Sample	...
1	27-28	28	Soil Boring Sample	...
1	28-29	29	Soil Boring Sample	...
1	29-30	30	Soil Boring Sample	...
1	30-31	31	Soil Boring Sample	...
1	31-32	32	Soil Boring Sample	...
1	32-33	33	Soil Boring Sample	...
1	33-34	34	Soil Boring Sample	...
1	34-35	35	Soil Boring Sample	...
1	35-36	36	Soil Boring Sample	...
1	36-37	37	Soil Boring Sample	...
1	37-38	38	Soil Boring Sample	...
1	38-39	39	Soil Boring Sample	...
1	39-40	40	Soil Boring Sample	...
1	40-41	41	Soil Boring Sample	...
1	41-42	42	Soil Boring Sample	...
1	42-43	43	Soil Boring Sample	...
1	43-44	44	Soil Boring Sample	...
1	44-45	45	Soil Boring Sample	...
1	45-46	46	Soil Boring Sample	...
1	46-47	47	Soil Boring Sample	...
1	47-48	48	Soil Boring Sample	...
1	48-49	49	Soil Boring Sample	...
1	49-50	50	Soil Boring Sample	...
1	50-51	51	Soil Boring Sample	...
1	51-52	52	Soil Boring Sample	...
1	52-53	53	Soil Boring Sample	...
1	53-54	54	Soil Boring Sample	...
1	54-55	55	Soil Boring Sample	...
1	55-56	56	Soil Boring Sample	...
1	56-57	57	Soil Boring Sample	...
1	57-58	58	Soil Boring Sample	...
1	58-59	59	Soil Boring Sample	...
1	59-60	60	Soil Boring Sample	...
1	60-61	61	Soil Boring Sample	...
1	61-62	62	Soil Boring Sample	...
1	62-63	63	Soil Boring Sample	...
1	63-64	64	Soil Boring Sample	...
1	64-65	65	Soil Boring Sample	...
1	65-66	66	Soil Boring Sample	...
1	66-67	67	Soil Boring Sample	...
1	67-68	68	Soil Boring Sample	...
1	68-69	69	Soil Boring Sample	...
1	69-70	70	Soil Boring Sample	...
1	70-71	71	Soil Boring Sample	...
1	71-72	72	Soil Boring Sample	...
1	72-73	73	Soil Boring Sample	...
1	73-74	74	Soil Boring Sample	...
1	74-75	75	Soil Boring Sample	...
1	75-76	76	Soil Boring Sample	...
1	76-77	77	Soil Boring Sample	...
1	77-78	78	Soil Boring Sample	...
1	78-79	79	Soil Boring Sample	...
1	79-80	80	Soil Boring Sample	...
1	80-81	81	Soil Boring Sample	...
1	81-82	82	Soil Boring Sample	...
1	82-83	83	Soil Boring Sample	...
1	83-84	84	Soil Boring Sample	...
1	84-85	85	Soil Boring Sample	...
1	85-86	86	Soil Boring Sample	...
1	86-87	87	Soil Boring Sample	...
1	87-88	88	Soil Boring Sample	...
1	88-89	89	Soil Boring Sample	...
1	89-90	90	Soil Boring Sample	...
1	90-91	91	Soil Boring Sample	...
1	91-92	92	Soil Boring Sample	...
1	92-93	93	Soil Boring Sample	...
1	93-94	94	Soil Boring Sample	...
1	94-95	95	Soil Boring Sample	...
1	95-96	96	Soil Boring Sample	...
1	96-97	97	Soil Boring Sample	...
1	97-98	98	Soil Boring Sample	...
1	98-99	99	Soil Boring Sample	...
1	99-100	100	Soil Boring Sample	...

Table 8-1
Analytical Soil Boring Samples
Base Gas Station Field Sampling Plan
NAS Fort Worth
Project No. 765725
(Continued)

Boring No.	Depth (ft)	Soil Type	Sample No.	Sample Date	Sample Type	Sample Location	Remarks
1	0-1	CL	1	7/10/96	Soil	Base Gas Station	
1	1-2	CL	2	7/10/96	Soil	Base Gas Station	
1	2-3	CL	3	7/10/96	Soil	Base Gas Station	
1	3-4	CL	4	7/10/96	Soil	Base Gas Station	
1	4-5	CL	5	7/10/96	Soil	Base Gas Station	
1	5-6	CL	6	7/10/96	Soil	Base Gas Station	
1	6-7	CL	7	7/10/96	Soil	Base Gas Station	
1	7-8	CL	8	7/10/96	Soil	Base Gas Station	
1	8-9	CL	9	7/10/96	Soil	Base Gas Station	
1	9-10	CL	10	7/10/96	Soil	Base Gas Station	
1	10-11	CL	11	7/10/96	Soil	Base Gas Station	
1	11-12	CL	12	7/10/96	Soil	Base Gas Station	
1	12-13	CL	13	7/10/96	Soil	Base Gas Station	
1	13-14	CL	14	7/10/96	Soil	Base Gas Station	
1	14-15	CL	15	7/10/96	Soil	Base Gas Station	
1	15-16	CL	16	7/10/96	Soil	Base Gas Station	
1	16-17	CL	17	7/10/96	Soil	Base Gas Station	
1	17-18	CL	18	7/10/96	Soil	Base Gas Station	
1	18-19	CL	19	7/10/96	Soil	Base Gas Station	
1	19-20	CL	20	7/10/96	Soil	Base Gas Station	
1	20-21	CL	21	7/10/96	Soil	Base Gas Station	
1	21-22	CL	22	7/10/96	Soil	Base Gas Station	
1	22-23	CL	23	7/10/96	Soil	Base Gas Station	
1	23-24	CL	24	7/10/96	Soil	Base Gas Station	
1	24-25	CL	25	7/10/96	Soil	Base Gas Station	
1	25-26	CL	26	7/10/96	Soil	Base Gas Station	
1	26-27	CL	27	7/10/96	Soil	Base Gas Station	
1	27-28	CL	28	7/10/96	Soil	Base Gas Station	
1	28-29	CL	29	7/10/96	Soil	Base Gas Station	
1	29-30	CL	30	7/10/96	Soil	Base Gas Station	
1	30-31	CL	31	7/10/96	Soil	Base Gas Station	
1	31-32	CL	32	7/10/96	Soil	Base Gas Station	
1	32-33	CL	33	7/10/96	Soil	Base Gas Station	
1	33-34	CL	34	7/10/96	Soil	Base Gas Station	
1	34-35	CL	35	7/10/96	Soil	Base Gas Station	
1	35-36	CL	36	7/10/96	Soil	Base Gas Station	
1	36-37	CL	37	7/10/96	Soil	Base Gas Station	
1	37-38	CL	38	7/10/96	Soil	Base Gas Station	
1	38-39	CL	39	7/10/96	Soil	Base Gas Station	
1	39-40	CL	40	7/10/96	Soil	Base Gas Station	
1	40-41	CL	41	7/10/96	Soil	Base Gas Station	
1	41-42	CL	42	7/10/96	Soil	Base Gas Station	
1	42-43	CL	43	7/10/96	Soil	Base Gas Station	
1	43-44	CL	44	7/10/96	Soil	Base Gas Station	
1	44-45	CL	45	7/10/96	Soil	Base Gas Station	
1	45-46	CL	46	7/10/96	Soil	Base Gas Station	
1	46-47	CL	47	7/10/96	Soil	Base Gas Station	
1	47-48	CL	48	7/10/96	Soil	Base Gas Station	
1	48-49	CL	49	7/10/96	Soil	Base Gas Station	
1	49-50	CL	50	7/10/96	Soil	Base Gas Station	
1	50-51	CL	51	7/10/96	Soil	Base Gas Station	
1	51-52	CL	52	7/10/96	Soil	Base Gas Station	
1	52-53	CL	53	7/10/96	Soil	Base Gas Station	
1	53-54	CL	54	7/10/96	Soil	Base Gas Station	
1	54-55	CL	55	7/10/96	Soil	Base Gas Station	
1	55-56	CL	56	7/10/96	Soil	Base Gas Station	
1	56-57	CL	57	7/10/96	Soil	Base Gas Station	
1	57-58	CL	58	7/10/96	Soil	Base Gas Station	
1	58-59	CL	59	7/10/96	Soil	Base Gas Station	
1	59-60	CL	60	7/10/96	Soil	Base Gas Station	
1	60-61	CL	61	7/10/96	Soil	Base Gas Station	
1	61-62	CL	62	7/10/96	Soil	Base Gas Station	
1	62-63	CL	63	7/10/96	Soil	Base Gas Station	
1	63-64	CL	64	7/10/96	Soil	Base Gas Station	
1	64-65	CL	65	7/10/96	Soil	Base Gas Station	
1	65-66	CL	66	7/10/96	Soil	Base Gas Station	
1	66-67	CL	67	7/10/96	Soil	Base Gas Station	
1	67-68	CL	68	7/10/96	Soil	Base Gas Station	
1	68-69	CL	69	7/10/96	Soil	Base Gas Station	
1	69-70	CL	70	7/10/96	Soil	Base Gas Station	
1	70-71	CL	71	7/10/96	Soil	Base Gas Station	
1	71-72	CL	72	7/10/96	Soil	Base Gas Station	
1	72-73	CL	73	7/10/96	Soil	Base Gas Station	
1	73-74	CL	74	7/10/96	Soil	Base Gas Station	
1	74-75	CL	75	7/10/96	Soil	Base Gas Station	
1	75-76	CL	76	7/10/96	Soil	Base Gas Station	
1	76-77	CL	77	7/10/96	Soil	Base Gas Station	
1	77-78	CL	78	7/10/96	Soil	Base Gas Station	
1	78-79	CL	79	7/10/96	Soil	Base Gas Station	
1	79-80	CL	80	7/10/96	Soil	Base Gas Station	
1	80-81	CL	81	7/10/96	Soil	Base Gas Station	
1	81-82	CL	82	7/10/96	Soil	Base Gas Station	
1	82-83	CL	83	7/10/96	Soil	Base Gas Station	
1	83-84	CL	84	7/10/96	Soil	Base Gas Station	
1	84-85	CL	85	7/10/96	Soil	Base Gas Station	
1	85-86	CL	86	7/10/96	Soil	Base Gas Station	
1	86-87	CL	87	7/10/96	Soil	Base Gas Station	
1	87-88	CL	88	7/10/96	Soil	Base Gas Station	
1	88-89	CL	89	7/10/96	Soil	Base Gas Station	
1	89-90	CL	90	7/10/96	Soil	Base Gas Station	
1	90-91	CL	91	7/10/96	Soil	Base Gas Station	
1	91-92	CL	92	7/10/96	Soil	Base Gas Station	
1	92-93	CL	93	7/10/96	Soil	Base Gas Station	
1	93-94	CL	94	7/10/96	Soil	Base Gas Station	
1	94-95	CL	95	7/10/96	Soil	Base Gas Station	
1	95-96	CL	96	7/10/96	Soil	Base Gas Station	
1	96-97	CL	97	7/10/96	Soil	Base Gas Station	
1	97-98	CL	98	7/10/96	Soil	Base Gas Station	
1	98-99	CL	99	7/10/96	Soil	Base Gas Station	
1	99-100	CL	100	7/10/96	Soil	Base Gas Station	

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Table 8-2
Monitoring Well Samples
Base Gas Station Field Sampling Plan
Carswell Field, NAS Fort Worth, Texas
(Page 1 of 4)

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Table 8-2

Monitoring Well Samples
 Base Gas Station Field Sampling Plan
 NAS Fort Worth
 Project No. 765725
 (Continued)

Well ID	Depth (ft)	Sample Type	Frequency	Notes
1	10	...	...	...
2	15	...	...	...
3	20	...	...	...
4	25	...	...	...
5	30	...	...	...
6	35	...	...	...
7	40	...	...	...
8	45	...	...	...
9	50	...	...	...
10	55	...	...	...
11	60	...	...	...
12	65	...	...	...
13	70	...	...	...
14	75	...	...	...
15	80	...	...	...
16	85	...	...	...
17	90	...	...	...
18	95	...	...	...
19	100	...	...	...
20	105	...	...	...
21	110	...	...	...
22	115	...	...	...
23	120	...	...	...
24	125	...	...	...
25	130	...	...	...
26	135	...	...	...
27	140	...	...	...
28	145	...	...	...
29	150	...	...	...
30	155	...	...	...
31	160	...	...	...
32	165	...	...	...
33	170	...	...	...
34	175	...	...	...
35	180	...	...	...
36	185	...	...	...
37	190	...	...	...
38	195	...	...	...
39	200	...	...	...
40	205	...	...	...
41	210	...	...	...
42	215	...	...	...
43	220	...	...	...
44	225	...	...	...
45	230	...	...	...
46	235	...	...	...
47	240	...	...	...
48	245	...	...	...
49	250	...	...	...
50	255	...	...	...
51	260	...	...	...
52	265	...	...	...
53	270	...	...	...
54	275	...	...	...
55	280	...	...	...
56	285	...	...	...
57	290	...	...	...
58	295	...	...	...
59	300	...	...	...
60	305	...	...	...
61	310	...	...	...
62	315	...	...	...
63	320	...	...	...
64	325	...	...	...
65	330	...	...	...
66	335	...	...	...
67	340	...	...	...
68	345	...	...	...
69	350	...	...	...
70	355	...	...	...
71	360	...	...	...
72	365	...	...	...
73	370	...	...	...
74	375	...	...	...
75	380	...	...	...
76	385	...	...	...
77	390	...	...	...
78	395	...	...	...
79	400	...	...	...
80	405	...	...	...
81	410	...	...	...
82	415	...	...	...
83	420	...	...	...
84	425	...	...	...
85	430	...	...	...
86	435	...	...	...
87	440	...	...	...
88	445	...	...	...
89	450
90	455
91	460
92	465
93	470
94	475
95	480
96	485
97	490
98	495
99	500
100	505

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Table 8-3

Surface Water Samples
Base Gas Station Field Sampling Plan
NAS Fort Worth
Project No. 765725

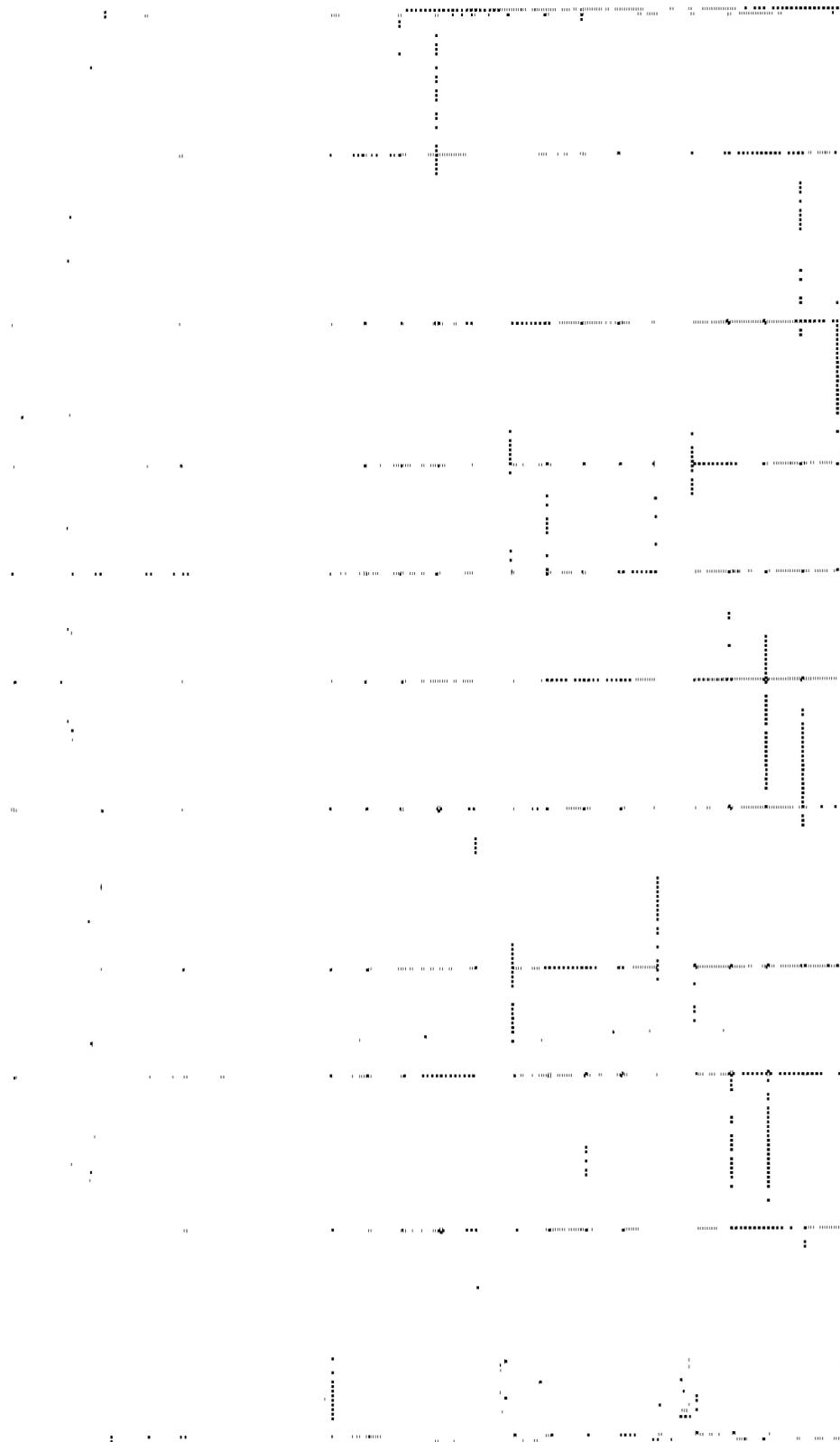


Table 8-4
Summary Table of All Samples
Base Gas Station Field Sampling Plan
NAS Fort Worth
Project No. 765725

Sample ID	Location	Depth	Sample Type	Analysis	Notes
1					
2					
3					
4					
5					
6					
7					
8					
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100					

¹ Field blanks only collected during groundwater and surface water sample events.
² Waste analysis sampling includes VOA, TPH, Lead for one solid and 1 water sample.
³ Refer to Table 8-5 for field sampling test and method table.
⁴ Refer to Table 8-6 for geotechnical analysis.
⁵ Refer to Table 8-7 for bio parameters.

Table 8-5

**Field Sampling Test and Method Table
Base Gas Station Field Sampling Plan
NAS Fort Worth
Project No. 765725**

Field Analysis	Method
Ammonia	Standard Methods for the Examination of Water and Wastewater, 3500
Sulfide	Standard Methods for the Examination of Water and Wastewater, 4500
Total Chloride	Standard Methods for the Examination of Water and Wastewater, 4500
Dissolved Oxygen	Standard Methods for the Examination of Water and Wastewater, 4500
Redox Potential	Marin Marietta Energy Systems, Inc. Environmental Surveillance Procedures, ESP-307-5
pH	SW9040
Total Volatiles	PID
Conductivity	E120.1
Temperature	E170.1
Turbidity	E180.1

Table 8-6

**Geotechnical Test and Method Table
 Base Gas Station Field Sampling Plan
 NAS Fort Worth
 Project No. 765725**

Test	Method
Moisture Content	ASTM D 2922
Unit Weight Density	EM-1110-2-1906, App. II
Specific Gravity	ASTM D 854
	EM-1110-2-1906, App. I

Table 8-7

**Biotechnical Laboratory and Field Analysis Table
Base Gas Station Field Sampling Plan
Carswell Field, NAS Fort Worth, Texas
Project No. 765725**

Test	Method
Laboratory	
Ammonium	EPA 350.2
Phosphate	EPA 365.3
TKN	EPA 351.4
Moisture Content	ASTM D2215
pH (Bio)	SW9045
Field	
Oxygen (Bio)	Landtech GA 90
Carbon dioxide (Bio)	Landtech GA 90

be reported and downloaded in the requested format. Each field data form contains information that will be used to populate the required data files within the IRPIMS. Field data collection forms are included in Appendix B. IT has prepared specific IRPIMS field collection forms to ensure compliance with IRPIMS requirements.

Upon receipt, the data coordinator will record receipt of the documents and diskettes, make a copy of the diskettes, and deliver the diskette copies to the database administrator for uploading into the IRPIMS database. The data coordinator will also make copies the data packages received for verification against the IRPIMS database. All originals, including diskettes, will be stored in the project files.

Once the database administrator has imported the data from the diskettes, reports will be generated to verify a complete relationship between data manually entered and data electronically uploaded. After the verification is complete, the IRPIMS required files can be generated.

8.3.1 Sample Identification

The data coordinator is responsible for preassigning all field sample numbers. The sample numbering system to be utilized in the field will be in accordance with preassigned sequential alphanumeric characters. These characters, such as X1234, will be assigned prior to field efforts and will correspond to a unique sample from a sample location. QC samples, be reported and downloaded in the requested format. Each field data form contains information that will be used to populate the required data files within the IRPIMS. Field data collection forms are included in Appendix B. IT has prepared specific IRPIMS field collection forms to ensure compliance with IRPIMS requirements.

Upon receipt, the data coordinator will record receipt of the documents and diskettes, make a copy of the diskettes, and deliver the diskette copies to the database administrator for uploading into the IRPIMS database. The data coordinator will also make copies the data packages received for verification against the IRPIMS database. All originals, including diskettes, will be stored in the project files.

Once the database administrator has imported the data from the diskettes, reports will be generated to verify a complete relationship between data manually entered and data electronically uploaded. After the verification is complete, the IRPIMS required files can be

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generated, for instance, will be indistinguishable from original field samples by just the sample number. However, other parameters are also assigned to a sample to distinguish the media, location, site, and QC type (if applicable). All of these values will be preassigned to the projected samples prior to initiation of field efforts. This additional information will be captured on the sample collection logs, but not completely on the sample labels or on the AR/COC forms. This process provides for a complete unbiased analysis of project samples by the laboratory. The one exception to this procedure will be the MS and MSD samples, which will be designated on the AR/COC Record in the sample description/type column only, not as a trailer.

8.4 Deliverables

8.4.1 Hard Copy Deliverables

The laboratory will provide the raw instrument data analytical results in a format based on the EPA format. These data packages will represent "stand alone" deliverables, which include instrument data, parameter-specific QC documentation, calibration, and calibration check performance information. Data validation deliverables will also include copies of the signed AR/COC forms, along with validation narratives from the person(s) performing the data validation.

The deliverables shall be presented to the project chemist. The forms shall be used when reporting any data and in submitting the final data package before its inclusion in an appendix or summary tables of a report.

8.4.2 Electronic Deliverables

Electronic data transfers (EDT) from the laboratory to the analytical data coordinator will follow a specific format to allow for IRPIMS deliverables to AFCEE. This format is specified in Appendix D.

File formats and associated information for the IRPIMS deliverable are defined in the current version of the *IRPIMS Data Loading Handbook*. All data submissions will be consistent with, and inclusive of, all project activities required by the Statement of Work and the current version of the *Handbook to Support the Installation Restoration Program*.

8.5 Data Validation

Data validation will be performed at 100 percent on all sample results. The data validation staff of chemists is trained to perform data validation procedures outlined in the EPA *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (February 1993, EPA-540/R-94/012) and the *Contract Laboratory Program National Guidelines for Inorganic Data Review* (February 1994, EPA-540/R-94/013). Validation of the EPA methods will follow the functional guidelines as closely as possible. Validation will involve data flagging, blank evaluation, evaluation of duplicates, and statistical evaluation of data. Table 8-8 includes a list of commonly used organic and inorganic data qualifiers which may be used by the data validators and the laboratory to flag the data.

TAB

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9.0 Systems and Performance Audits, Performance Evaluation Programs, and Certifications

Technical systems and performance audits will be performed as independent assessments of sample collection and analysis procedures. Audit results will be used to evaluate the ability of an analytical contractor to (1) produce data that fulfill the objectives established for the program, (2) comply with the QC criteria, and (3) identify any areas requiring corrective action. The systems audit is a qualitative review of the overall sampling or measurement system, while the performance audit is a quantitative assessment of a measurement system. Full data validation is also a quantitative check of the analytical process, where all documentation and calculations are evaluated and verified; data validation is discussed in Section 8.0.

9.1 Project Audits

Audits by various state and federal agencies are commonly conducted for the laboratories that will analyze project samples. Audit reports from these agencies will be reviewed by project staff to determine whether data produced by the analytical contractor fulfill the objectives of the program.

Audits will be conducted as the scheduled activities dictate. After project and sampling plan schedules are developed, the audit schedule may be revised. The QA coordinator is responsible for scheduling and performing audits. Within 20 working days of completion of an audit, the QA coordinator and/or his representative will prepare and submit an Audit Report. The report will be addressed to the IT project manager, program manager, and copies will be sent to the organization or group audited.

Within 30 working days after receipt of the Audit Report, the IT project manager will prepare and submit to the QA coordinator a reply to the audit. This reply will include, at a minimum, a plan for implementing the corrective action to be taken on nonconformances indicated in the Audit Report, the date by which such corrective action will be completed, and actions taken to prevent reoccurrence. If the corrective action has been completed, supporting documentation should be attached to the reply. The QA coordinator will ascertain (by reaudit or other means) whether appropriate and timely corrective action has been taken. Reaudits will be conducted and reported in the same manner as the original audit.

Records of audits will be maintained in the project files. Audit files will include, as a minimum, the Audit Report, the reply to audit, and any supporting documents. It is the responsibility of the project manager to conform to the established procedures, particularly as to timely replies to audit reports and implementation of such corrective action as may be indicated.

For each field screening contractor and each analytical contractor, list the agencies that may perform audits, including the anticipated frequencies of audits. Discuss the information expected to be obtained from each type of assessment and the criteria for success. Discuss the procedures for responding to audit findings.

Audit findings will be transmitted to the project staff and the AFCEE. The report will also include discussion of recommended corrective actions or procedural changes, as indicated by the audit results. The audit results and discussion will be incorporated into the QA report for each sampling effort.

9.1.1 Technical Systems Audit

A technical systems audit is an on-site, qualitative review of the sampling or analytical system to ensure that the activity is being performed in compliance with the QAPP, WP, and FSP specifications. Sampling and field procedures will be audited at the beginning of the field work. A laboratory systems audit may be performed by AFCEE if previous audit reports indicate that corrective actions are outstanding, a recent audit has not been conducted, or quality concerns have arisen based upon the use of that laboratory for other projects. The laboratory systems audit results will be used to review laboratory operation and ensure that the technical procedures and documentation are in place and operating to provide data that fulfill the project objectives and that outstanding corrective actions have been addressed.

Critical items for a laboratory or field systems audit include:

- Sample custody procedures
- Calibration procedures and documentation
- Completeness of data forms, notebooks, and other reporting requirements
- Data review and validation procedures
- Data storage, filing, and record keeping procedures
- QC procedures, tolerances, and documentation

- Operating conditions of facilities and equipment
- Documentation of training and maintenance activities
- Systems and operations overview.

Critical items for a sampling systems audit include:

- Calibration procedures and documentation for field equipment
- Documentation in field logbooks and sampling data sheets
- Organization and minimization of potential contamination sources while in the field
- Proper sample collection, storage, and transportation procedures
- Compliance with established COC and transfer procedures.

After each audit, a debriefing session will be held for all participants to discuss the preliminary audit results. The auditor will then complete the audit evaluation and submit an audit report including observations of strengths, deficiencies, and recommendations for improvements. Compliance with the specifications presented in this QAPP will be noted; noncompliance or deviations will be addressed in writing by the laboratory or field manager to the audit agency, with corrective actions listed and a time frame for implementation established. Follow-up audits will be performed prior to completion of the project to ensure that corrective actions have been taken.

9.1.2 Project-Specific Performance Audits

Performance audits quantitatively assess the data produced by a measurement system. A performance audit involves submitting project-specific PE samples for analysis for each analytical method used in the project. The project-specific PE samples are selected to reflect the expected range of concentrations for the sampling program. The performance audit answers questions about whether the measurement system is operating within control limits and whether the data produced meet the analytical QA specifications.

The project-specific PE samples are made to look as similar to field samples as possible and are submitted as part of a field sample shipment so that the laboratory is unable to distinguish between them. This approach ensures unbiased sample analysis and reporting by the laboratory.

Critical items for review of PE results are:

- Correct identification and quantitation of the PE sample analytes, within project specifications
- Accurate and complete reporting of the results
- Measurement system operation within established control limits for precision and accuracy.

The concentrations reported for the PE samples will be compared to the known or expected concentrations spiked. The percent recovery will be calculated and the results assessed according to the accuracy criteria for the LCS presented in Appendix C. If the accuracy criteria are not met, the cause of the discrepancy will be investigated and a second PE sample will be submitted. The project staff, AFCBE, and agencies will be notified of the situation at the earliest possible time and will be kept up to date regarding corrective actions and subsequent PE sample results.

No PE samples are currently required during the investigation since previous investigations have established the constituents and range of expected concentrations. These will be used to gauge laboratory performance.

9.1.3 Internal Audits

Internal audits or system audits will be performed on a schedule that allows complete assessment of the operation on at least an semiannual basis. Internal audits may be systems audits, performance audits, or follow-up audits to verify that corrective actions have been taken in response to findings from other audits. A system audit includes a careful evaluation of Field and Laboratory quality control procedures.

Frequency of Audits. Audits will be conducted as the scheduled activities dictate. After project and sampling plan schedules are developed, the audit schedule may be revised. The QA coordinator is responsible for scheduling and performing audits. Within 20 working days of completion of an audit, the QA coordinator and/or his representative will prepare and submit an Audit Report. The report will be addressed to the IT project manager, program manager, and copies will be sent to the organization or group audited.

Within 30 working days after receipt of the Audit Report, the IT project manager will prepare and submit to the QA coordinator a reply to the audit. This reply will include, at a minimum, a plan for implementing the corrective action to be taken on nonconformances indicated in the Audit Report, the date by which such corrective action will be completed, and actions taken to prevent reoccurrence. If the corrective action has been completed, supporting documentation should be attached to the reply. The QA coordinator will ascertain (by reaudit or other means) whether appropriate and timely corrective action has been taken. Reaudits will be conducted and reported in the same manner as the original audit.

Records of audits will be maintained in the project files. Audit files will include, as a minimum, the Audit Report, the reply to audit, and any supporting documents. It is the responsibility of the project manager to conform to the established procedures, particularly as to timely replies to audit reports and implementation of such corrective action as may be indicated.

For each field screening contractor and each analytical contractor, describe the internal audit procedures, including the anticipated frequencies. Include any checklists or other audit aids used by the organization. Identify the person(s) who will perform the audits, including any authority to stop work if significant conditions are discovered. Explain the unsatisfactory conditions under which the auditors are authorized to act. Discuss the procedures for responding to audit findings if the findings potentially affect the data quality or usability for the project.

9.2 Other Performance Evaluation Sample Programs

All laboratories participate in the EPA PE programs (e.g., water supply and water pollution studies) or equivalent programs for state certifications. Satisfactory performance in these nonproject-specific PE programs also demonstrate proficiency in methods used to analyze AFCEE samples. The laboratory responds to unacceptable PE results with documented corrective actions to demonstrate resolution of the problems.

9.3 Certifications and Training

Certifications and records of training will be made available upon request by each analytical laboratory or field screening subcontractor. Usually these will be maintained in the procurement files with prequalification documents.

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Training will be provided to all project personnel to ensure compliance with the health and safety plan and technical competence in performing the work effort. Documentation of this training will be maintained in the records of the contracted organizations.

TAB

10.0

10.0 Preventive Maintenance

A preventive maintenance program is in place to promote the timely and effective completion of a measurement effort. The preventive maintenance program is designed to minimize the downtime of crucial sampling and/or analytical equipment due to unexpected component failure. In implementing this program, efforts are focused in three primary areas:

- Establishment of maintenance responsibilities
- Establishment of maintenance schedules for major and/or critical instrumentation and apparatus
- Establishment of an adequate inventory of critical spare parts and equipment.

10.1 Maintenance Responsibilities

Maintenance responsibilities for equipment and instruments are assumed by the respective facility managers. The managers then establish maintenance procedures and schedules for each major equipment item. This responsibility may be delegated to laboratory personnel, although the managers retain responsibility for ensuring adherence to the prescribed protocols.

10.2 Maintenance Schedules

The effectiveness of any maintenance program depends to a large extent on adherence to specific maintenance schedules for each major equipment item. Other maintenance activities are conducted as needed. Manufacturers' recommendations provide the primary basis for the established maintenance schedules, and manufacturers' service contracts provide primary maintenance for many major instruments (e.g., GC/mass spectrometry instruments, AA spectrometers, and analytical balances).

10.3 Spare Parts

Along with a schedule for maintenance activities, an adequate inventory of spare parts is required to minimize equipment downtime. The inventory includes those parts (and supplies) that are subject to frequent failure, have limited useful lifetimes, or cannot be obtained in a timely manner should failure occur.

Field sampling task leaders and the respective laboratory managers are responsible for maintaining an adequate inventory of spare parts. In addition to spare parts and supply inventories, the contractor will maintain an in-house source of backup equipment and instrumentation.

10.4 Maintenance Records

Maintenance and repair of major field and laboratory equipment will be recorded in field or laboratory logbooks. These records will document the serial numbers of the equipment, the person performing the maintenance or repairs, the date of the repair, the procedures used during the repair, and proof of successful repair prior to the use of the equipment.

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11.0 Corrective Action/Nonconformances Procedures

Requirements and procedures for documenting the need for corrective actions are described in this section.

11.1 Corrective Action/Nonconformance Report

Problems that require corrective action in the laboratory are documented by the use of a corrective action report. The QA coordinator or any other laboratory member can initiate the corrective action request in the event that QC results exceed acceptability limits, or upon identification of some other laboratory problem. Corrective actions can include reanalysis of the sample or samples affected, resampling and analysis, or a change in procedures, depending upon the severity of the problem.

Nonconforming equipment, items, activities, conditions and unusual incidents that could affect compliance with project requirements will be identified, controlled, and reported in a timely manner. A nonconformance is defined as a malfunction, failure, deficiency, or deviation that renders the quality of an item unacceptable or indeterminate. The originator (any IT employee) of a Nonconformance Report (Figure 11-1) will describe the finding on the form provided for this purpose and notify the project manager and QA coordinator. Each nonconformance will be reviewed and a disposition given for the item, activity, or condition. The disposition of a nonconformance will be documented and approved by the IT organization responsible for the issuance of the nonconformance. The QA coordinator will concur with the disposition of the nonconformance.

In the laboratory, the laboratory project manager is responsible for assessment of QC sample information. If data fall outside accepted limits, the laboratory project manager will immediately notify the laboratory manager and the responsible group leader. If the situation is not corrected and an out-of-control condition occurs or is expected to occur, the laboratory project manager will notify the analytical and data management team leader and the IT project manager. The laboratory manager, laboratory project manager, and the group leaders are responsible for identifying the source of the nonconformance and initiating corrective action. Completion of corrective action should be evidenced by data returning to prescribed acceptable limits. Evidence should be provided to the IT project manager to close out the nonconformance.



NONCONFORMANCE REPORT

NCR Number:	Project Name and Number:	Date:	Page _____ of _____
<p>Nonconformance Description (include specific requirement violated):</p> <p style="text-align: right;">Identified By: _____ Date: _____</p>			
<p>Root Cause of Nonconforming Condition:</p> <p>Corrective Action to be Taken (include date when action(s) will completed):</p> <p style="text-align: right;">To be Performed By: _____ Anticipated Completion Date: _____</p>			
<p>Action to be Taken to Preclude Recurrence:</p> <p style="text-align: right;">To be Performed By: _____ Anticipated Completion Date: _____</p>			
<p>Acceptance By: _____ Date: _____ Acceptance By: _____ Date: _____</p> <p style="text-align: center;"><small>Project Manager: _____ QA Officer: _____</small></p>			
Corrective Actions Completed By and Date:		Verification Completed By and Date:	

Figure 11-1
NAS Fort Worth
Project No. 765725

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The modification, repair, rework, or replacement of nonconforming equipment, items, or activities utilized either in the field or in the laboratory will require the reverification of acceptability. The project manager and QA coordinator will concur on whether these actions require immediate (within 72 hours) corrective action be completed and verified before site work continues. Since nonconformances usually occur in the field, the corrective action will normally be completed by the FAC or someone designated by the FAC.

The equipment, item, or activity that has the deficiency may be temporarily stopped while the nonconformance is being investigated. If, in the opinion of the project manager and the QA coordinator, the nonconformance does not significantly affect the technical quality or use of the work, the work may continue pending resolution of the nonconformance. The basis for such decisions will be documented on the Nonconformance Report and submitted to the QA coordinator for review and approval. The documentation will include the statement that the decision was made prior to continuing with the work. The records of nonconformance and their dispositions will be kept in the project files.

In addition, the project manager will notify AFCEE of significant nonconformances that could impact cost or schedule, or results of the work, and will indicate the corrective action taken or planned. At a minimum, all variances and nonconformances will be included and/or discussed in the RI report.

11.2 Corrective Action System

A system for issuing, tracking, and documenting completion of formal Recommendations for Corrective Action (RCA) exists for addressing significant and systematic problems. Recommendations for corrective actions are issued only by a member of the QA group, or a designee in a specific QA role. Each RCA addresses a specific problem or deficiency, usually identified during QA audits of laboratory or project operations. An RCA requires a written response from the party to whom the RCA was issued. A summary of unresolved RCAs is included in the monthly QA report to management. The report lists all RCAs that have been issued, the manager responsible for the work area, and the current status of each RCA. An RCA requires verification by the QA group that the corrective action has been implemented before the RCA is considered to be resolved. In the event that there is no response to an RCA within 30 days, or if the proposed corrective action is disputed, the recommendation and/or conflict is pursued to successively higher management levels until the issue is resolved.

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The analytical laboratory and field screening subcontractor will maintain a corrective action system that is consistent with the above.

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12.0 Quality Assurance Reports to Management

On a periodic basis the QA coordinator will prepare a summary report of the status of the project, of QA/QC problems, corrective actions taken, and unresolved RCAs with recommended solutions for management. The report will also include results from all PE samples, audit findings, and periodic data quality assessments. This report will be available for review by auditors upon request.

Periodic Assessment of Measurement Data Accuracy, Precision, and Completeness. Audits may be performed to review and evaluate the adequacy of laboratory performance, which includes data accuracy, precision, and completeness, and to ascertain if the QAPP is being completely and uniformly implemented. Section 4.0 specifies the statistical methods of assessing data quality. The laboratory QA/QC coordinator is responsible for assigning personnel for such audits and may perform an audit to coincide with appropriate activities on the project schedule and sampling plans. Additional audits may be initiated for one or more of the following reasons:

- When significant changes are made in the QAPP
- When it is necessary to verify that corrective action has been taken on a nonconformance report in a previous audit
- When requested by the project manager or by the AFCEE.

The objectives of performance and systems audits are to verify that the QA program developed for this project is being implemented according to the specified requirements, to assess the effectiveness of the laboratory QA program, to identify nonconformances, and to verify that identified deficiencies are corrected. Upon discovery of any significant deviation from the QA program, the project manager, program manager, and QA coordinator shall be informed of the nature, extent, and corrective action taken to remedy the deviation.

Results of the Audits

Project Audits. Results of project audits performed by the QA coordinator or his/her designee will be reported to the project manager and program manager. Corrective action responses to audit findings and audit closure reports will also be sent to these persons. Project audits will be performed as scheduled activities dictate.

Laboratory Performance Audits. The laboratory review activities of the laboratory QA/QC coordinator will be summarized in a monthly surveillance report. A copy of the laboratory nonconformance logs for the month will be attached. The monthly report will emphasize ongoing or recurring problems. Copies of the monthly surveillance report and the nonconformance log will be sent by the laboratory project manager to the IT project manager for distribution to the program manager and the QA coordinator.

Laboratory System Audits. Results of any laboratory system audits performed for this project will be sent to the project manager, program manager, and QA coordinator. Corrective action responses to audit findings and audit closure reports will also be sent to these persons.

Nonconformance Reports

Project Nonconformance Reports. Project nonconformances (other than those reported by laboratory personnel) will be reported on the form shown in Figure 11-1 by the person who identifies or observes the nonconformance. Copies will be sent to the project manager, program manager, and QA coordinator. Copies of corrective action reports for nonconformances will also be provided to these persons.

Laboratory Nonconformance Reports. Laboratory nonconformances that impact the project will be reported in a nonconformance memorandum by the laboratory staff member who identifies or observes the nonconformance. Copies will be sent to the project manager, program manager, and QA coordinator. Copies of the "closed" nonconformance memos showing that corrective action has been satisfactorily completed will also be sent to these persons.

For each field screening and analytical contractor, identify the frequency of the periodic data quality assessments, the personnel responsible for preparation and review of the monthly QA reports, and the distribution list for the reports.

TAB

APPENDIX A

Appendix A

Document Distribution List

TAB

APPENDIX B

Appendix B

Field Forms



New Location Log

Carswell Field, NAS Fort Worth, Texas
PROJECT: 765725
AIR FORCE INSTALLATION ID: CRSWL

SITE ID: _____

LOCATION ID: _____

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

Geohydrologic Flow Classification : U= Upgradient D=Downgradient C=Crossgradient
S=within site boundaries B=background

LOCATION PROXIMITY: I=inside Site Boundary O=Outside Site Boundary

ELEVATION: _____

NORTH COORDINATE: _____

EAST COORDINATE: _____

ESTABLISHING COMPANY: ITC

DRILLING COMPANY: _____

CONSTRUCTION METHOD: DT-driven tube HA-hand augered SC - scoop NA-not applicable

EXCAVATING COMPANY: _____

DATE ESTABLISHED: / / (Date finished)

DEPTH: _____ (XXXX.XX in Feet)

BORING HOLE DIAMETER: _____ (XX.XX in inches)

LOCATION DESCRIPTION: _____



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Soil Sample Collection Log

Carswell Field, NAS Fort Worth, Texas
PROJECT: 765725
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 CP BL TP BH TE

MATRIX: SC SQ SAMPLING METHOD: SS T G HA

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 # _____

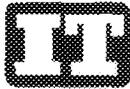
Ship Date: _____

Checked by : _____ Date: _____

Logged in by: _____ Date: _____

QAed by: _____ Date: _____

Filed by: _____ Date: _____



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Water Sample Collection Log

Carswell Field, NAS Fort Worth, Texas

PROJECT: 765725

AIR FORCE INSTALLATION ID: CRSWL

SITE ID: _____

LOCATION ID: _____

SAMPLE #: _____

LOG DATE: ____/____/____

LOG TIME: _____ (HHMM)

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

MATRIX: WO 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: _____

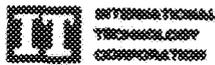
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FIELD ACTIVITY DAILY LOG

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:									



VARIANCE FORM

VARIANCE NO. _____

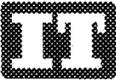
PROJECT NO. _____ PAGE _____ OF _____

PROJECT NAME _____ DATE _____

VARIANCE (INCLUDE JUSTIFICATION)

APPLICABLE DOCUMENT:

CC:	REQUESTED BY _____	DATE _____
	APPROVED BY _____	DATE _____
	Project Manager	DATE _____
	Quality Assurance Officer	DATE _____
	_____	DATE _____



NONCONFORMANCE REPORT

NCR Number:	Project Name and Number:	Date:	Page _____ of _____
-------------	--------------------------	-------	---------------------

Nonconformance Description (include specific requirements violated):

Identified By: _____ Date: _____

Root Cause of Nonconforming Condition:

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

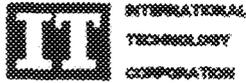
To be Performed By: _____ Anticipated Completion Date: _____

Action to be Taken to Preclude Recurrence:

To be Performed By: _____ Anticipated Completion Date: _____

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

<p>Corrective Actions Completed by and Date</p> 	<p>Corrective Actions Completed by and Date</p>
---	---



TAILGATE SAFETY MEETING

Division/Subsidiary _____ Facility 299144

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 _____

NAME PRINTED

ATTENDEES

SIGNATURE

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Meeting conducted by:

NAME PRINTED

SIGNATURE

Supervisor _____ Manager _____

TAB

APPENDIX C

Appendix C

Quality Assurance Specifications for Analytical Methods

Appendix C

Quality Assurance Specifications for Analytical Methods

Method SW8020—Aromatic Volatile Organics

Aromatic volatile organics in water and soil samples are analyzed using method SW8020. This method (also known as the BTEX method since the compounds of interest include benzene, toluene, ethyl benzene, and xylene) is a purge and trap GC method. An inert gas is bubbled through a water matrix to transfer the volatile aromatic hydrocarbons from the liquid to the vapor phase. The aromatics are removed from the inert gas by passing the gas through a sorbent trap, which is then backflushed onto a GC column with a PID to separate and quantify the compounds of interest. Soil samples are analyzed via extraction with methanol and diluted a minimum of 1:50 in reagent water. Reporting limits (PQLs) for method SW8020 are presented in Table C-1. The calibration, QC, corrective action, and data flagging requirements are given in Tables C-2 and C-3.

Table C-1

**PQLs for Method SW8020
NAS Fort Worth
Project No. 765725**

Parameter/Method	Analyte	Water		Soil	
		PQL	Unit	PQL	Unit
Environmental Report Volatiles SW5030/SW8020 (W, S)	Chlorobenzene	2.0	µg/L	0.002	mg/kg
	1,2-DCB	4.0	µg/L	0.004	mg/kg
	1,3-DCB	4.0	µg/L	0.004	mg/kg
	1,4-DCB	3.0	µg/L	0.003	mg/kg
	Ethyl benzene	2.0	µg/L	0.002	mg/kg
	Toluene	2.0	µg/L	0.002	mg/kg
	Xylenes	2.0	µg/L	0.002	mg/kg

Table C-3

Summary of Calibration and QC Procedures for Method SW8020
 NAS Fort Worth
 Project No. 765725
 (Continued)

Analytical Method	Substrate Location	Frequency	Procedure	Acceptance Criteria	Control Chart	Date Recalibrated
SW8020 (

Table C-5

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QC Acceptance Criteria for Method SW8310

Method	Analyte	Water (%R)	Water (%RPD)	Soil (%R)	Soil (%RPD)	
SW-8310	1-Methylnaphthalene	25-150	≤ 30	25-160	≤ 50	
	2-Methylnaphthalene	25-150	≤ 30	25-160	≤ 50	
	Acenaphthalene	49-125	≤ 30	39-135	≤ 50	
	Acenaphthene	43-130	≤ 30	33-140	≤ 50	
	Anthracene	54-125	≤ 30	44-135	≤ 50	
	Benzo(a)anthracene	39-135	≤ 30	29-145	≤ 50	
	Benzo(a)pyrene	52-125	≤ 30	42-135	≤ 50	
	Benzo(b)fluoranthene	31-137	≤ 30	25-147	≤ 50	
	Benzo(g,h,i)perylene	53-125	≤ 30	43-135	≤ 50	
	Benzo(k)fluoranthene	60-129	≤ 30	50-139	≤ 50	
	Chrysene	59-134	≤ 30	49-144	≤ 50	
	Dibenzo(a,h)anthracene	51-125	≤ 30	41-135	≤ 50	
	Fluoranthene	42-125	≤ 30	32-135	≤ 50	
	Fluorene	53-125	≤ 30	43-135	≤ 50	
	Indeno(1,2,3-c,d)pyrene	55-125	≤ 30	45-135	≤ 50	
	Naphthalene	43-125	≤ 30	33-135	≤ 50	
	Phenanthrene	52-129	≤ 30	42-139	≤ 50	
	Pyrene	55-125	≤ 30	45-135	≤ 50	
		Surrogates				
		Terphenyl-D14	25-157		22-167	

Table C-6

Summary of Calibration and QC Procedures for Method SW8310
 NAS Fort Worth
 Project No. 765725
 (Continued)

Analytical Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action*
SW8310 (Continued)	PAHs (Continued)	Method blank	One per analytical batch	No analytes detected > PQL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank
		LCS for all analytes	One LCS per analytical batch	QC acceptance criteria, Table 7.2.17.2	Correct problem then reprep and analyze the LCS and all samples in the affected APCEE analytical batch
		Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria, Table 7.2.17-2	Correct problem then re-extract and reanalyze sample

Table C-6

Summary of Calibration and QC Procedures for Method SW8310
 NAS Fort Worth
 Project No. 765725
 (Continued)

Analyte Method	Acceptance Criteria	Minimum Sample Size	Acceptance Criteria	Acceptance Criteria	Data Flagging Criteria
					For the spec analyte(s) in samples colle the same site the parent, at (1) %R for MC >UCL or (2) %R for MC <LCL or (3) MSMSD F Apply R to the the specific ar n the sample Apply R to all the specific ar n all samples Apply F to all between MDL

*All corrective actions associated with AFCEE project work shall be documented, and all records shall be maintained by the laboratory.
 †Flagging criteria are applied when acceptance criteria were not met and correction action was not successful or corrective action was not performed.
 ‡Use a second column or different detector.

2/29/15

Method SW7421 - Graphite Furnace Atomic Absorption (Lead) 299160

GFAA is used to measure low concentrations of metals in water and soil samples. The samples are extracted using method SW3005 or SW3050, as appropriate. Discrete aliquots of sample extract are deposited in a graphite tube furnace in μL amounts. The graphite tube is heated resistively by an electrical current. The sample solution is dried and charred to remove sample matrix components and then atomized at temperature sufficient to vaporize the lead. Matrix modification is used to eliminate interference effects and may also enhance the vaporization efficiency and allow lower detection limits. This method usually has a linear analysis range at the ppb or sub-ppb level. The elements and corresponding PQLs for this method are listed in Table C-6. The calibration, QC, corrective action, and data flagging requirements are given in Tables C-7 and C-8.

Table C-7

**PQLs for Method SW7421
NAS Fort Worth
Project No. 765725**

Parameter/Method	Analyte	Water		Soil	
		PQL	Unit	PQL	Unit
SW3020/SW7421(W) SW3050/SW7421(S)	Lead	0.005	mg/L	0.5	mg/kg

Table C-8

299161

QC Acceptance Criteria for Method SW7421
 NAS Fort Worth
 Project No. 765725

Method	Analyte	Accuracy Water (% R)	Precision Water (% RPD)	Accuracy Soil (% R)	Precision Soil (% RPD)
SW7421	Lead	74-124	< 15	74-124	< 25

Table C-9

Summary of Calibration and QC Procedures for Method SW7421
 NAS Fort Worth
 Project No. 765725

Analytical Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action*	Data Flagging Criteria
SW7421	Lead	Multipoint calibration (minimum of 3 standards and a calibration blank)	Daily	$r \geq 0.995$	Repeat initial calibration	Apply R to all samples
		Second-source calibration verification	Once per multipoint calibration	Recovery within $\pm 10\%$ of expected value	Repeat initial calibration	Apply R to all samples
		Calibration blank	Once per second-source calibration verification	No analytes detected > PQL	Repeat blank	Apply B to all positive samples if no calibration blank exists
		Continuing calibration verification	After every 10 samples	Recovery within $\pm 20\%$ of expected value	Repeat initial calibration and reanalyze all samples analyzed since the last successful calibration verification	Apply B to all samples if the sample concentration is < 10x the blank concentration

Table C-9

Summary of Calibration and QC Procedures for Method SW7421
 NAS Fort Worth
 Project No. 765725
 (Continued)

Analytical Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action*	Data Flagging Criteria
SW7421 (Continued)	Lead (Continued)	LCS for all analytes	One LCS per prep batch	QC acceptance criteria, Table 7.2.21-2	Reprep and analyze all affected AC and field samples	Apply J to all positive samples if any of the following exist: (1) $LCS > UCL$ (2) $LCS < LCL$ Apply R to all non-detects if $LCS < LCL$ Apply R to all samples if any of the following exists: (1) $LCS < 10\%$ (2) Minimum frequency not met

2009164

Chemical Analysis of Water and Wastewater Method 418.1 - Total Petroleum Hydrocarbons

Total petroleum hydrocarbons are analyzed using Chemical Analysis of Water and Wastewater by method 418.1. This method is used for the measurement of fluorocarbon-113 extractable petroleum hydrocarbons from surface and saline waters, industrial and domestic wastes by infrared spectrophotometric analysis. Loss of about half of any gasoline present during the extraction manipulations can be expected because this method is only applicable to the measurement of light fuels. The sample is acidified to a low pH (<2) and serially extracted with fluorocarbon -113 in a separatory funnel. Interferences are removed with silica gel adsorbant. Infrared analysis of the extract is performed by direct comparison with standards.

TABLE C-10

PQLS for Total Petroleum Hydrocarbons by Chemical Analysis of Water and Wastewater, Method 418.1

Parameter/Method	Analyte	Water		Soil	
		PQL	Units	PQL	Units
Hydrocarbons/418.1					

Calibration and Target Acceptance Criteria for Total Petroleum Hydrocarbons by Method 418.1

Parameter/Method	QC Check	Frequency	Criteria	Corrective Action
	point calibration)		%RSD <20% or correlation coefficient of ≥ 0.995	tion 2. Make instrument adjustments 3. Repeat
	standard	each 12-hour shift)	from initial calibration	2. Recalibrate and reanalyze subsequent analyses
			\leq PQL)	

EPA Method 353.2 - Nitrogen, Nitrate-nitrite

Nitrogen is analyzed by EPA method 353.2. The method pertains to determination of nitrite singly or nitrite and nitrate combined. A filtered sample is passed through a column containing granulated copper-cadmium. The build-up of suspended matter in reduction column restricts flow, low results may be found on samples with high concentrations of iron, copper or other metals, and samples with large concentrations of oil and grease will coat the surface of the cadmium. The instrumentation for analysis of nitrogen is a Technicon Auto Analyzer with 15 or 50 millimeter tubular flow.

Table C-12

PQLS for EPA Nitrate Analysis by Method 353.2

Parameter/Method	Analyte	Water	
		PQL	Units
Nitrate/353.2	Nitrate	0.050	mg/L

Table C-13

Calibration and Target Acceptance Criteria for Nitrate by Method 353.2

Parameter/Method	QC Check	Recommended Frequency	Target Acceptance Criteria	Laboratory Corrective Action
	check standard		Recovery	and subsequent analyses
	MS/MSD	5% of analyses	70 -130 % Recovery, ≤ 30% RPD	Flag data
	Field Dup.	10% of analyses	≤ 30% RPD	1. Recheck 2. Recalibrate

Chemical Analysis of Water and Wastewater by method 375.4 is used to test drinking, surface waters, domestic and industrial waste samples for nitrogen content. Nitrate ion is converted to a barium sulfate suspension under controlled conditions. The resulting turbidity is determined by a nephelometer, filter photometer or spectrophotometer and compared to a curve prepared from standard sulfate solutions. Method 375.4 is suitable for all concentration ranges of sulfate; however, in order to obtain reliable readings, the use of sample aliquot containing not more than 40 mg of SO₄/l should be prepared.

Table C-14

PQLS for EPA Sulfate Analysis by Method 375.4

Parameter/Method	Analyte	Water	
		PQL	Units
Sulfate/375.4	Sulfate	5.0	mg/L

Table C-15

Calibration and Target Acceptance Criteria for Sulfate by Method 375.4

Parameter/Method	QC Check	Recommended Frequency	Target Acceptance Criteria	Laboratory Corrective Action
	check standard		Recovery	and subsequent analyses
			Recovery, $\leq 30\%$ RPD	
				2. Recalibrate

Method RSKSOP-175 - Methane

Method RSKSOP-175 is applicable to the preparation of water samples for analysis of the headspace to quantify part - per million levels of dissolved gases in water samples. Although this method is specific for determining methane, ethene, ethane, and nitrous oxide, it has also been used to determine vinyl chloride, nitrogen, oxygen and carbon dioxide.

Table C-16

PQLS for RSKSOP-175

Parameter/Method	Analyte	Water	
		PQL	Units
Methane/RSKSOP-175	Methane	1.0	ppm ¹

¹ Methane detection limit is 1 ppm in the headspace vapor the water sample.

Table C-17

Calibration and Target Acceptance Criteria for Methane by RSKSOP-175

Parameter/Method	Target Acceptance Criteria	Recommended	Target Acceptance Criteria	Laboratory Corrective Action
				2. Recalibrate

EPA Method 160.1 - Total Dissolved Solids

Drinking, surface, saline water and wastewater samples can be tested for residue, filterable total dissolved solids by EPA method 160.1. A well mixed sample is filtered through a standard glass fiber filter. The filtrate is evaporated and dried to a constant weight at 180°C. The increase in dish weight represents the total dissolved solids or the filtrate from the residue that was non-filterable. Highly mineralized waters with considerable calcium, magnesium, chloride, and/or sulfate content may be hygroscopic and will require prolonged drying, desiccation and rapid weighing. Samples with high concentrations of bicarbonates require prolonged drying.

Table C-18

Calibration and Target Acceptance Criteria for TDS by EPA method 160.1

Parameter Measured	Units	Recommended Frequency	Target Acceptance Criteria	Laboratory Corrective Action
				2. Recalibrate

Chemical Analysis of Water and Wastewater, Method 310.1 - Alkalinity

Drinking, surface, saline water, domestic and industrial wastes can be tested for alkalinity titrimetrically. The method is performed by using an unaltered sample that is titrated to an electrometrically determined end point of a pH 4.5. A pH meter or electrically operated titrator that uses a glass electrode that can be read to 0.05 pH units is used to read the pH. Alkalinity determination is based upon normality of the sample with sodium carbonate solution and the amount of the sample used for analysis.

Table C-19**PQL for Alkalinity by Chemical Analysis of Water and Wastewater, Method 310.1 - Alkalinity**

Parameter/Method	Analyte	Water	
		PQL	Units
Alkalinity/310.1	Alkalinity	1.0	mg/L

Table C-20**Calibration and Target Acceptance Criteria for Alkalinity by Method 310.1**

Parameter/Method	QC Check	Recommended Frequency	Target Acceptance Criteria	Laboratory Corrective Action
				2. Recalibrate

Chemical Analysis for Phosphorus, Method 365.1 - Colorimetric, Automated, Ascorbic Acid

Phosphorus of soil samples can be determined by EPA Method 365.1. Sample preparation may vary depending on the type matrix of the sample. The methods are based on reactions that are specific for the orthophosphate ion. Thus, depending on the prescribed pretreatment of the sample, the various forms of phosphorus may be determined. Except for in-depth and detailed studies, the most commonly measured forms are phosphorus and dissolved phosphorus, and orthophosphate and dissolved orthophosphate. Hydrolyzable phosphorus is normally found only in sewage-type samples. Insoluble forms of phosphorus are normally determined by calculation.

Table C-21

PQL for Phosphorus by Method 365.1

Parameter/Method	Analyte	Soil	
		PQL	Units

Table C-22

Calibration and Target Acceptance Criteria for Phosphorus by Method 365.1

Parameter/Method	QC Check	Recommended Frequency	Target Acceptance Criteria	Laboratory Corrective Action
Phosphorus/365.1	Field Duplicate	10% of analyses	$\leq 30\%$ RPD	1. Recheck 2. Recalibrate

Chemical Analysis of Nitrogen, Kjeldahl, Total, Method 351.4 - Potentiometric, Ion Selective Electrode)

Measurement of total Kjeldahl nitrogen in soil can be determined by EPA Method 351.4. Sample preparation may vary depending on the type matrix of the sample. Following digestion and cooling, distilled water is added to the digestion flask and the pH adjusted to between 3 and 4.5 by the addition of 10 N NaOH. The sample is cooled and transferred to a 100-ml beaker. After inserting the electrode into the sample, NaOH-NaI-ethylene diamine tetracetic acid (EDTA is added and the ammonia measured. ETA is added to the alkaline reagent (NaOH-NaI) to prevent precipitation of hydroxides, thereby avoiding deposition on the electrode membrane).

Table C-23

PQL for TKN by Method 351.4

Parameter/Method	Analyte	Soil
		Unit

Table C-24

Calibration and Target Acceptance Criteria for TKN by Method 351.4

Parameter/Method	QC Check	Recommended Frequency	Target Acceptance Criteria	Laboratory Corrective Action
TKN/351.4	Field Duplicate	10% of analyses	≤ 30% RPD	1. Recheck 2. Recalibrate

Chemical Analysis of Nitrogen, Ammonia , Method 350.2 - Colorimetric, Titrimetric; Potentiometric - Distillation Procedure

Measurement of ammonia - nitrogen exclusive of total kjeldahl nitrogen in soil samples can be determined by EPA Method 350.2. Sample preparation may vary depending on the type of matrix of the sample. The sample is buffered at a pH of 9.5 with a borate buffer in order to decrease hydrolysis of cyanates and organic nitrogen compounds, and is then distilled into a solution of boric acid. The ammonia in the distillate can be determined colorimetrically by nesslerization, titrimetrically with standard sulfuric acid with the use of a mixed indicator, or potentiometrically by the ammonia electrode. The choice between the first two procedures depends on the concentration of the ammonia.

Table C-25

PQL for Nitrogen and Ammonia by Method 350.2

Parameter/Method	Analyte	Soil	
		PQL	Units
Nitrogen, Ammonia/350.2	Nitrogen, ammonia	3.0	mg/kg

Table C-26

Calibration and Target Acceptance Criteria for TKN by Method 350.2

Parameter/Method	QC Check	Recommended Frequency	Target Acceptance Criteria	Laboratory Corrective Action
				2. Recalibrate

Soil pH by EPA, SW-9045

Soil pH can be measured on soil and waste samples by Method SW-9045. Method SW-9045 can measure pH by an electrometric procedure applicable to soils, solid wastes, sludges, or nonaqueous liquids. The sample is mixed with reagent water and the pH of the resulting aqueous solution is measured. The pH of the soil sample is measured by use of a pH meter, electrodes, reagent grade chemicals and buffers. The instrument/electrode system must be calibrated at a minimum of two points that bracket the expected pH of the samples and are approximately three pH units or more apart.

Table C-27**Calibration and Target Acceptance Criteria for Soil pH by SW-9045**

Parameter/Method	QC Check	Recommended Frequency	Target Acceptance Criteria	Laboratory Corrective Action
				2. Recalibrate

TAB

APPENDIX D

Appendix D
IRPIMS Specifications

IT-IRPIMS EDT Format Specifications

293100

File Structure: IT-IRPIMS uses a standard file format for transmitting analytical data. Each file should be in standard DOS format and consist of:

- A header record with the IT project number (1:20), file preparation date(21:28), total record count(29:34), total analysis record count(35:40) and total TIC count(41:46)
- A variable number of records containing analytical data
- A trailer record containing three dollar signs (i.e., \$\$\$) followed by blanks

Each individual analytical record must be 292 bytes long, contain only ASCII characters and be terminated by a carriage return. IT-IRPIMS identifies the information included in each record by position. The specific format IT-IRPIMS requires is summarized below.

Position	Field Length	Content	IRPIMS Name	Comments
1-20	20	Project Sample Number		a
21-28	8	Sample Date as MM/DD/YY	INCDATE	b
29-34	6	Total Record Count	TICOUNT	c
35-40	6	Total Analysis Record Count	ANALCNT	d
41-46	6	Total TIC Count	TICOUNT	e
49-56	8	Lab Matrix		
57-64	8	Sample Prep Date as MM/DD/YY	EXDATE	f
65-72	8	Sample Prep Time (HH:MM:SS) as HH:MM:SS	EXTIME	g
73-80	8	Extraction Method Code	EXMCODE	h
81-88	8	Parameter Classification Code	PNCECODE	i
89-96	8	Extraction Method Code	EXMCODE	j
117-126	10	Panelcode		k
127-129	3	Result Type		l
130-140	11	CAS Number		m
141-150	10	Result	PARVAL	nk
176-182	7	Retention Time		d
183-212	30	Parameter Name		
213-222	10	Parameter Classification Code	PNCECODE	o
223-232	10	Extraction Method Code	EXMCODE	p
233-242	10	Parameter Classification Code	PNCECODE	q
243-252	10	Extraction Method Code	EXMCODE	r
253-262	10	Parameter Classification Code	PNCECODE	s
260	1	Basis	BASIS	t
261-270	10	Parameter Classification Code	PNCECODE	u
271-280	10	Extraction Method Code	EXMCODE	v
281-282	2	IRPIMS Run Number	RUN_NUMBER	
283-292	10	SDG Number / Work Order Number		

Comments:

- ☛ Valid value tables are provided.
- ☛ IRPIMS Data Loading Valid Value List should be referenced and used exclusively.
- a. The laboratory QC sample number should be uniquely identified in both the project and lab sample number fields. Laboratory method blanks, blank spikes and blank spike duplicates should not share laboratory sample numbers.
- b. The sample date, sample time, prep date, prep time, analysis date and analysis time are required fields for all samples whether they are field or laboratory generated.
- c. The detection limit must be greater than 0.0001 and less than 9999.9999; remember to convert the Result, Expected Result, and Unit of Measure fields accordingly.
- d. Retention time is required for Tentatively Identified Compounds (TICs) only. For target compounds and surrogates, this field should be left blank.
- e. The value applied should be the laboratory's standard reporting limit for the analysis with respect to matrix, adjusted mathematically for all applicable dilution and/or dryness factors. This value should be defensible, if necessary, by the required method detection or quantitative studies used to demonstrate method performance.
- f. These fields should be in accordance with the IRPIMS Valid Value Handbook.
- g. When submitting percent recovery records, the (A) EXPECTED value must be 100.0, the (B) IRPIMS qualifier must be '%', the (C) measure of unit must be 'PERCENT' and the (D) detection limit must be NULL. ** The exceptions include %Solid, %Carbon and %Moisture records. In these cases, the (A) EXPECTED value must be 0.0, the (B) IRPIMS qualifier must be '=', the (C) units of measure must be 'PERCENT' and the (D) detection limit must be NULL.
- h. The EXPECTED field should be populated with (A) '0.0' for original field samples, (B) the corresponding parameter's original result plus the added spike concentration that are reported as a concentration rather than a percent recovery and (C) the corresponding field duplicate original result for both field and lab initiated duplicates.
 - ** Any spiked sample can be reported as percent recoveries or concentrations as preferred providing there is consistency throughout the project.
- i. Per record, this field should contain the appropriate batch sample number which is associated to the given project sample number, method, and parameter. This field is often used for blank correcting purposes and should always be populated.
- j. When the matrix analyzed is water, air or gas, the BASIS should be 'X'. If the matrix is soil or tissue will the BASIS should be 'D' if reported on a dry weight basis or 'W' if reported on a wet weight basis.
- k. For "non-detect" records, load '0.0' in the result field and set the IRPIMS qualifier to 'ND'; for detected compounds above the reporting limit, report the value in the result field and set the IRPIMS qualifier to '='; and, for results detected below the reporting limit, report the value in the result field and set the IRPIMS qualifier to 'TR'.

Table 1. Panelcode

Panelcode	Description
ASBESTOS	Asbestos Analyses
DIOXIN	Dioxin and Furan Analyses
TXPL	Ortho-aromatic Analyses
HERBIC	Herbicide Analyses
METALS	Metals Analyses
PESTICID	Pesticide and PCB Analyses
RAD	Radioisotopic Analyses
SOX	Semi-volatile Organic Analyses

Table 5. Sample Preparation

299183

Prep Code	Description
CIT	Waste extraction test using sodium citrate
DION	Waste extraction test using de-ionized water
DIL	Dilution
DIL1	DIL1 DILUTION USED WHERE MORE THAN ONE DILUTION WAS NECESSARY
DIL2	DIL2 DILUTION USED WHERE MORE THAN ONE DILUTION WAS NECESSARY
N	Normal preparation associated with analytical method used
REA	Re-extraction
TH	Sample Filtered by Laboratory

Table 6. Toxicity Characteristic Leaching Procedure Identifier

TCLP Flag	Description
0	Standard TCLP procedure used
Y	TCLP Procedures external to generalization

General Requirements:

For such things as analytical methods (ANMCODE), extraction methods (EXMCODE) and parameter labels (PARLABEL) it is the laboratory's responsibility to coordinate with the IRPIMS Help Desk in acquiring a new valid value when the appropriate value is not listed. International Technology should receive a copy of the AFCEE Letterhead with the reference number stating the addition of a new valid value from the laboratory.

It is the laboratory's responsibility to verify/validate the completeness and correctness of analytical method (ANMCODE) and extraction method (EXMCODE) combinations. The validity of the combination must also be matched with the general matrix (water or soil).

All fields should contain capital letters with the exception of the parameter field (position 181:210). The full parameter name should be capitalized appropriately. On a projects-by-project basis, parameter valid value lists will be provided grouped by requested analytical methods.

Until the initiation and sole use of the IRPIMS Run Number, the following trailers must be added to the existing project sample numbers for lab initiated duplicates '-LR', matrix spikes '-MS', matrix spike duplicates '-SD', dilutions '-DL' and re-extractions(re-runs) '-RE'. For multiple dilution runs the solutions would be '-DL1', '-DL2' etcetera. This will allow for IRPIMS processing while the IRPIMS Run Number is piloted. The IRPIMS Run Number field should so that the logic used to populate this field can be evaluated.

IRPIMS Run Number:

299184

This definition came straight from the IRPIMS Help Desk.

The IRPIMS database can accept multiple records for given tests on an IRP sample using a key field which identifies the analytical run number. The RUN_NUMBER field is increased by one each time a given test is performed on an IRP sample. Use of this field permits a complete history of test and results records to be maintained for a given IRP sample. It should only be incremented when a given test used to determine multiple analytes is run on different days or in different analytical batches for a given IRP sample. The RUN_NUMBER field is not to be increased for sample tested for quality control purposes in which a given test is run on different days or in a different analytical batch.

The RUN_NUMBER field is always 1 for first/initial analytical run/batch for all methods per sample. When the same sample and analytical method is run in a different batch (i.e., dilutions, re-extractions, etcetera) the RUN_NUMBER will be incremented sequentially. When methods are analyzed over multiple days such as SW6010, the RUN_NUMBER should be incremented sequentially by dates.

Sample Number	Analytical Method	Analytical Date	Purpose for data run	RUN #
A1234	M8015D	8-10-95	initial	1
A1234	SW6010	8-10-95	initial	1
A1234	SW6010	8-11-95	same batch different dates	2
A1234	SW7196	8-10-95	initial	1
A1234	SW8080	8-12-95	initial	1
A1234	SW8080	8-13-95	dilution	2
A1234	SW8240	8-11-95	initial	1
A1234	SW8240	8-11-95	dilution	2
A1234	SW8270	8-10-95	initial	1
A1234	SW8270	8-11-95	re-extraction	2
A1234	SW8270	8-11-95	first dilution	3
A1234	SW8270	8-16-95	second dilution	4
A1234	SW9310	8-10-95	initial	1

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FINAL PAGE

ADMINISTRATIVE RECORD

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