RCRA FACILITY INVESTIGATION
WORK PLAN
TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

Prepared for:

Battelle Environmental Management Operations
723 The Parkway
Richland, Washington 99352

Prepared by:

CDM Federal Programs Corporation
1626 Cole Blvd., Suite 100
Golden, Colorado 80401
December 1992

Document Control No.: 7902-025-RT-BKCV

The RFI Work Plan consists of the following separate plans bound together in this document:

Project Management Plan
Data Collection Quality Assurance Plan
Data Management Plan
Community Relations Plan
Health and Safety Plan

PREFACE

In 1980, Congress passed the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) to address the cleanup of hazardous waste disposal sites across the country. CERCLA gave the President authority to require responsible parties to remediate the sites or to undertake response actions through use of a fund (the Superfund). The President, through Executive Order 12580, delegated responsibility to investigate and remediate private party hazardous waste disposal sites that created a threat to human health and the environment to the Environmental Protection Agency (EPA). The President delegated responsibility for investigation and cleanup of federal facility disposal sites to the various federal agency heads. In 1981, the Secretary of Defense established the Defense Installation Restoration Program (IRP) to investigate and remediate Department of Defense (DOD) sites. In turn, each military service established its own IRP to locate and investigate hazardous waste sites on its installations.

Under the Air Force IRP, Tinker Air Force Base (AFB) began a Phase I study similar to a preliminary assessment/site investigation in 1981. This study helped to locate fourteen (14) sites that needed further investigation. A Phase II study was performed in 1983.

In 1986, Congress amended CERCLA through the Superfund Amendments and Reauthorization Act (SARA). SARA waived sovereign immunity for federal facilities. It gave authority to the EPA to oversee the cleanup of federal facilities and to have the final authority for selection of the remedial action at federal facilities placed on the National Priorities List (NPL) if the EPA and the relevant federal agency cannot concur in the selection. Congress also codified the Defense Environmental Response Program (DERP) (SARA Section 211) setting up a fund for the DOD to remediate its sites since the Superfund is not available for the cleanup of federal facilities. The DERP specifies the type of cleanup responses that the fund can be used to address.

In response to SARA, the DOD realigned its IRP to follow the investigation and cleanup stages of the EPA:

- preliminary assessment/site investigation (PA/SI)
- remedial investigation/feasibility study (RI/FS)
- record of decision (ROD) for selection of a remedial action, and
- remedial design/remedial action (RD/RA)

Tinker AFB has completed the PA/SI, RI/FS, and ROD phases for the Building 3001, North Fuel Tank, and Pit Q-51 operable units (OU's) and is currently preparing a RI for the Soldier Creek OU of the NPL site. Tinker AFB continues to address the other past contaminated non-NPL sites through the IRP. These non-NPL IRP sites are areas of historic contamination within the meaning of CERCLA but did not score high enough under the EPA's Hazardous Ranking System (HRS) to be placed on the NPL.

Tinker AFB is an active military industrial facility responsible for the maintenance of a wide variety of military aircraft. In order to store hazardous wastes for more than 90 days on the facility, Tinker AFB, in accordance with the requirements of the Resource Conservation and Recovery Act (RCRA), filed a Part A permit application for interim status as a storage facility. In 1984, Congress reauthorized RCRA and amended the statute to allow the EPA to require, as a permit condition, a facility to undertake corrective action for any releases of hazardous waste or constituents from any solid waste management unit (SWMU) at a treatment, storage, or disposal (T/S/D) facility. These SWMUs do not have to be active units currently being used for treatment, disposal or storage and can also be identified as sites requiring CERCLA response actions.

As of this date, the EPA, in the Part B permit for Tinker AFB, has identified forty-three (43) SWMUs and two (2) Areas of Concern (AOCs) on Tinker AFB that need to be further investigated. Tinker AFB has identified three (3) additional SWMUs requiring investigation in the Current Conditions Report. Forty-two (42) of these SWMUs are also identified as IRP sites. The final RCRA permit, granted July 1, 1991, requires Tinker AFB to undertake corrective action for all identified SWMUs. This RCRA facility investigation (RFI) is being performed in order to meet that permit requirement. It is also the installation's intent, where applicable, to meet its CERLCA requirements and to ensure funding for cleanup under the

DERP. Therefore, it is the intent of this RFI and any subsequent corrective measures study and corrective action to meet both CERCLA response action and RCRA corrective action requirements.

PROJECT MANAGEMENT PLAN

INTRODUCTION

Tinker Air Force Base (AFB) is located in central Oklahoma, in the southeast portion of the Oklahoma City metropolitan area, in Oklahoma County (Figure 1). The base is bounded by Sooner Road to the west, Douglas Boulevard to the east, Interstate 40 to the north, and Southeast 74th Street to the south. The base encompasses 4,277 acres and contains approximately 500 buildings. TAFB began operations in 1942 and serves as a worldwide repair depot for a variety of aircraft, weapons, and engines. These activities require the use of large quantities of hazardous materials and result in the generation of large quantities of hazardous wastes. These wastes have included spent organic solvents, waste oils, waste paint strippers and sludges, electroplating wastewaters and sludges, alkaline cleaners, acids, freon, jet fuels, and radium paints. Wastes are presently managed at two hazardous waste storage areas or treated at the industrial wastewater treatment plant (IWTP). However, in the past, prior to the enactment of RCRA, industrial wastes were discharged into unlined landfills and waste pits, streams, sewers, and ponds. Past releases (spills and leaks) from these landfills, pits, etc., as well as from underground tanks, have occurred. As a result, there are numerous sites of soil, groundwater, and surface water contamination on the base. In the early 1970's, the Environmental Protection Committee (EPC) was formed at Tinker AFB to track and provide oversight of all environmental activities on the base.

In 1981, the U.S. Air Force Installation Restoration Program (IRP) was established at Tinker AFB. The IRP is a comprehensive program funded and managed by the Department of Defense (DOD) to identify and cleanup CERCLA National Priorities List (NPL) and non-NPL hazardous waste sites at DOD installations. It consists of four stages of activity: identification, investigation, corrective action and closeout. Numerous remedial investigations, feasibility studies and response actions have been conducted for various sites since the Tinker AFB IRP began. Only two Tinker AFB IRP sites are NPL sites (Building 3001 and Soldier Creek). All remaining IRP sites are non-NPL sites.

The Tinker AFB draft RCRA Part B permit was approved as a final permit by EPA on July 1, 1991. This permit specifies that a RCRA Facility Investigation (RFI) be conducted for 43 Solid Waste Management Units (SWMUs) and two areas of concern (AOCs) on the base. Additionally, Tinker AFB has added three SWMUs to the list by the Current Conditions report recently submitted to EPA.

Figure 1 is a map of Tinker AFB showing all the SWMUs. The SWMUs are listed in Table 1. The table identifies the IRP status of each SWMU and whether or not each SWMU has been closed under the IRP guidelines.

This RFI Work Plan was developed as specified in the RCRA permit to support investigation of the SWMUs. The RFI Work Plan consists of this Project Management Plan, a Data Collection Quality Assurance Plan, a Data Management Plan, a Community Relations Plan, and a Health and Safety Plan. This Project Management Plan presents the objectives of the RFI and the overall approach to the RFI. The plan also includes a schedule for completing Phase I of the RFI. The Work Plan is consistent with EPA guidance in the RCRA Facility Investigation Guidance Document (OSWER Directive 9502.00-6 (D), May 1989) and the RCRA Groundwater Monitoring Technical Enforcement Guidance Document (OSWER Directive 9950-1, September 1986).

RFI OBJECTIVES

The objectives of the RFI are to determine whether contaminant releases to the environment have occurred at each SWMU and to determine the nature and extent of the contaminant releases. Adequate information must be gathered in the RFI to support a Corrective Measures Study or interim measures, if deemed necessary by EPA.

RFI APPROACH

The SWMUs addressed by this RFI have been divided into 3 groups based on proximity and/or similarity of background, operation, and/or contaminants. These groups are as follows:

- Group 1 consists of SWMUs 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22 23, 54 and the Spill Pond AOC, referred to in the Site Investigation Plan as the IRP sites. These sites are grouped together because they are all IRP sites and have been the subject of numerous investigations (with the exception of the Spill Pond AOC, which was only recently added to the IRP).

- Group 2 consists of SWMUs 24 and 32 (and associated components), referred to as the industrial and sanitary waste treatment plants. Both of these SWMUs are also listed as IRP sites, but only very preliminary site investigations have been initiated for them. These SWMUs are grouped together because they are all components of the two wastewater treatment facilities and are in close proximity.

- Group 3 consists of SWMUs 26 and 40; one area of concern; and three additional SWMUs, the Fuel Truck Maintenance Area, the Waste Fuel Dump Site, and the HCL Tank. These sites are miscellaneous sites, grouped together for convenience.

No further field investigations are proposed for the Group 1 sites with the exception of the Spill Pond AOC. This is because these SWMUs are IRP sites. They have been the subject of numerous remedial investigations, focused feasibility studies, and remedial actions. This work has been conducted under the IRP in accordance with IRP guidance, which parallels EPAs guidance for conducting RI/FSs under CERCLA. The investigations and remedial actions have all been closely monitored and approved by the Superfund (CERCLA) section of EPA. Any additional work at these sites will be handled under the IRP. Field investigations are proposed in this Work Plan for the Spill Pond AOC because no work has been performed at this site to date. This work will be performed under the IRP. Field investigations are also proposed in this Work Plan for the Group 2 SWMUs, which are also IRP sites, also because very little work has been performed at these SWMUs to date. The work proposed for the Group 2 SWMUs will also be performed under the IRP.

Based on the work accomplished to date at most of the Group 1 SWMUs, it is reasonable to assume that Phase I RFI investigations (of the type proposed in this RFI Work Plan for SWMU Groups 2 and 3) have been completed for most of the sites in Group 1. Enough information may even be available for the IRP sites to make a determination of either No Further Action or to begin Corrective Measures, as appropriate. Whether additional work is necessary must be determined by EPA, based on their review of the investigations conducted to date.

A phased approach has been taken for the site investigations presented in this Work Plan. Phasing of the RFI is in accordance with EPA RFI guidance and is also the most practical approach for sites where little or no information and/or data are available. The investigation for the Spill Pond AOC, and SWMU Groups 2 and 3 presented in this Work Plan are Phase I investigations. The objective of the Phase I investigations is to determine whether a release of contaminants to the environment occurred and to preliminarily determine the nature and extent of a contaminant release. Detailed evaluation of the nature and extent of contaminant releases would be conducted in a Phase II investigation.

MANAGEMENT APPROACH

Tinker AFB will manage and conduct the RFI. A contractor (or contractors) will actually perform the site investigations for the Group 2 and 3 SWMUs and prepare the RFI report according to the Data Collection Quality Assurance Plan of this RFI Work Plan. The contractor(s) will also adhere to the Health and Safety Plan and Data Management Plan included in this RFI Work Plan. Tinker AFB will oversee and manage the RFI contractor (s) and will be responsible for assuring that the required plans are followed. Tinker AFB will also be responsible for implementing the Data Management Plan, Community Relations Plan, and this Project Management Plan.

A contractor (or contractors) will be selected to implement the RFI site investigations presented in this Work Plan. Selection will be made based on contractor qualifications, price, and availability to conduct the work in the time frame required by the RFI schedule. Contractors will be required to show proof of insurance, OSHA compliance training for their personnel, physician approval of ability of personnel to wear respiratory protective equipment, professional registrations (as appropriate), and State and local licenses (as appropriate). An approved, standard agreement incorporating appropriate general order terms and conditions will be executed between Tinker AFB and the selected contractor(s).

Direct oversight and control of contractors will be the responsibility of the Project Manager, particularly in supporting program goals and the selection process, determining work scope, and monitoring and recording performance and quality. The Project Manager will also develop schedules and monitor contractor adherence; review and approve monthly pay requests; monitor cost versus budget; oversee development and implementation of corrective action as appropriate to minimize budget or schedule deviation; and prepare post-performance evaluations.

It should be noted that all sampling conducted by contractors must be performed according to Tinker AFB rules and regulations, specifically:

1. Tinker regulation 89-5 - Subsurface construction
2. Tinker regulation 19-5 - Procedure for compliance with RCRA of 1976 (as amended).

Contractors will be required to follow specified procedures for base entry including signing-in at the main gate and carrying a picture I.D. The Project Manager will be responsible for notifying appropriate base personnel of the presence of contractors on the base. All vehicles which enter the base must have proper registration and proof of insurance to obtain a base pass. Contractors must follow the Health and Safety Plan included with this Work Plan. The contractor(s) will also be responsible for establishing a site support facility for the RFI.

KEY PERSONNEL AND QUALIFICATIONS

The following Tinker AFB personnel will be involved in the conduct of the RFI.

Project Manager

A Project Manager will be assigned to direct and manage implementation of the RFI. The Project Manager will be in direct control of the RFI, will be responsible for the successful performance of all assignments, and will provide day-to-day coordination of the project. The Project Manager will also take responsibility for staffing, coordination, cost and schedule control, and technical quality. The Project Manager will monitor RFI activities to track compliance with RFI objectives and scope.

The Project Manager will be responsible for maintaining open communication with EPA, the State, and the contractor(s) performing the site investigations. Communications between Air Force personnel and the contractor(s) concerning the work being conducted and all reports will be directed through the Project Manager.

If the designated Project Manager changes, EPA and the State will be notified in writing no later than 5 days prior to the effective date of the change.

Program Manager

Final responsibility and authority for all work performed during the RFI will rest with the Program Manager. The Program Manager will have full authority to mobilize the resources necessary to complete the RFI. The Program Manager will be responsible for negotiating and communicating contractual obligations, including program objectives, technical requirements, schedules, budgets, and deliverables. The Program Manager will follow established policies and procedures for project execution. The Program Manager will coordinate all administrative, progress, and financial reporting, and will review all deliverables.

QA Manager

The QA Manager will verify that all deliverables are subjected to QA procedures and requirements prior to being issued. The QA Manager will be responsible for those personnel who survey, audit, and monitor adherence to project QA objectives. The QA Manager may periodically contact the analytical laboratories involved in the project to confirm that samples have arrived properly and are analyzed to predetermined requirements set in the Statement of Work (SOW). The QA Manager may conduct field audits of sampling episodes to assure adherence to sample identification and chain of custody procedures. Finally, the QA manager will assess the effectiveness of the corrective action system if deficiencies are determined during project work. This includes monitoring the status of implementation of any corrective actions.

Other Personnel

Additional personnel involved in the RFI may include senior technical specialists who will provide technical review of the work being performed and of all deliverables. These specialists will also be involved in coordinating field efforts and maintaining communication with the contractor(s) performing the site investigations.

The contractor(s) will be responsible for assuring the availability and maintenance of sampling equipment and materials, will provide shipping and packing materials, will supervise completion of all chain-of-custody records, will supervise the proper handling and shipping of samples and will be responsible for the field notebook. The contractor(s) will maintain close coordination with the Tinker AFB technical specialists involved in the project as well as with the Project Manager.

BUDGET

The work outlined in this RFI Work Plan is subject to the availability of funding from the Department of Defense (DOD). Sufficient funding through the DOD budgetary process to fulfill Air Force obligations arising under this submittal will be sought except where interpreted to be in violation of the Anti-Deficiency Act, 31 U.S.C. S1341. Funds authorized and appropriated annually by Congress under the "Environmental Restoration Defense" appropriation (IRP sites) in the Department of Defense Appropriation Act and allocated by the Deputy Assistant Secretary of Defense for Environment to the Department of the Air Force will be the source of funds for IRP site activities arising under this submittal consistent with Section 211 of SARA, 10 U.S.C. S2701. However, should the Environmental Restoration Defense appropriation be inadequate in any year to meet the total Department of the Air Force CERLCA implementation requirements, DOD will employ, and the Department of the Air Force will follow, a standardized DOD prioritization process which allocates that years DERA appropriations in a manner which maximizes the protection of human health and the environment. A standardized DOD prioritization model will be developed and utilized with the assistance of EPA and the State.

The Project Manager will closely monitor the RFI budget and the contractor(s) performing the investigations. The contractor(s) will be required to provide detailed task budget reports on a monthly basis to Tinker AFB.

SCHEDULE

A schedule for Phase I of the RFI is provided in Table 2. The schedule begins upon final EPA approval of the RFI Work Plan. The time frames shown in this schedule extend from the date of EPA approval. The total time for the RFI presented in the schedule is 13 months, with the draft RFI report due to be submitted to EPA 2 months (60 calendar days) following completion of RFI activities, or 15 months from final EPA approval of the RFI Work Plan. The estimated durations of each activity are shown in parentheses following each indicated start date. It is important to note that the proposed schedule is dependent on available funding. The schedule also includes submittal of a revised RFI Work Plan, based on EPA comments, within 30 days of receipt of the comments.

Some of the sites are scheduled to be investigated concurrently, and some consecutively. The site investigations were prioritized subjectively, based on available information concerning the contaminant release potential and severity of contamination at each site. Those sites having the greatest potential for impacting human health and the environment were scheduled to be investigated prior to those with an apparently low potential for releasing contaminants.

Table 1
RFI SWMUs

Site	SWMU No.	IRP Site Status (Non-NPL)	Closure Status
Landfill 6	1	Yes	No
Landfill 5	2	Yes	No
Landfill 1	3	Yes	No
Landfill 2	4	Yes	No
Landfill 3	5	Yes	No
Landfill 4	6	Yes	No
Fire Training Area No. 1	7	Yes	No
Fire Training Area No. 2	8	Yes	Yes
Supernatant Pond	11	Yes	No
Industrial Waste Pit No. 1	12	Yes	No
Industrial Waste Pit No. 2	13	Yes	No
Fuel Contaminated Site No. 1	15	Yes	No
Fuel Contaminated Site No. 2	16	Yes	No
Fuel Contaminated Site No. 3	17	Yes	No
Fuel Contaminated Site No. 4	18	Yes	No
Radioactive Waste Disposal Site 1030W	19	Yes	No
Radioactive Waste Disposal Site 201S	20	Yes	No
Radioactive Waste Disposal Site 62598	21	Yes	Yes
Radioactive Waste Disposal Site 1022E	22	Yes	Yes
Industrial Waste Treatment Plant (IWTP) Abandoned Waste Tanks	23	Yes	No

Table 1 (continued)

Site	SWMU No.	IRP Site Status (Non-NPL)	Closure Status
IWTP	24[1]	Yes (new)	No
- Lift Station No. 2	24.1		
- Tanks D-1 and D-2	24.2		
- Oil Separator	24.3		
- Valve Vault	24.4		
- Equalization Basins, (2)	24.5		
- Main Flow Valve	24.6		
- Mixing Basins, (3)	24.7		
- Solids Contact Clarifier	24.8		
- Wet Well Lift Station	24.9		
- Softener Basins	24.10		
- Activated Sludge Unit, (2)	24.11		
- Secondary Clarifiers	24.12		
- Industrial Sludge Drying Beds	24.19		
Ordnance Disposal Area	26	No	No
SWTP - Sanitary Waste Treatment Plant	32[2]	Yes (new)	No
- Parshall Flume	32.1		
- Flocculation Chamber	32.2		
- Primary Clarifiers	32.3		
- Trickling Filters (2)	32.4		
- Final Clarifiers	32.5		
- Former Chlorine Contact Chamber	32.6		
- Drying Beds	32.8		
AFFF Fire Control Holding Pond, Bldg 976	40	No	No
Stained Drainage Ditch and Drums	54	Yes (new)	Yes
Spill Pond, Bldg 1030	AOC	Yes (new)	No
Old Pesticide Storage Area	AOC	No	No
Fuel Truck Maintenance Area[3]	___	No	No
Waste Fuel Dump Site[3]	___	No	No
Bldg 3001 HCl Tank[3]	___	No	No

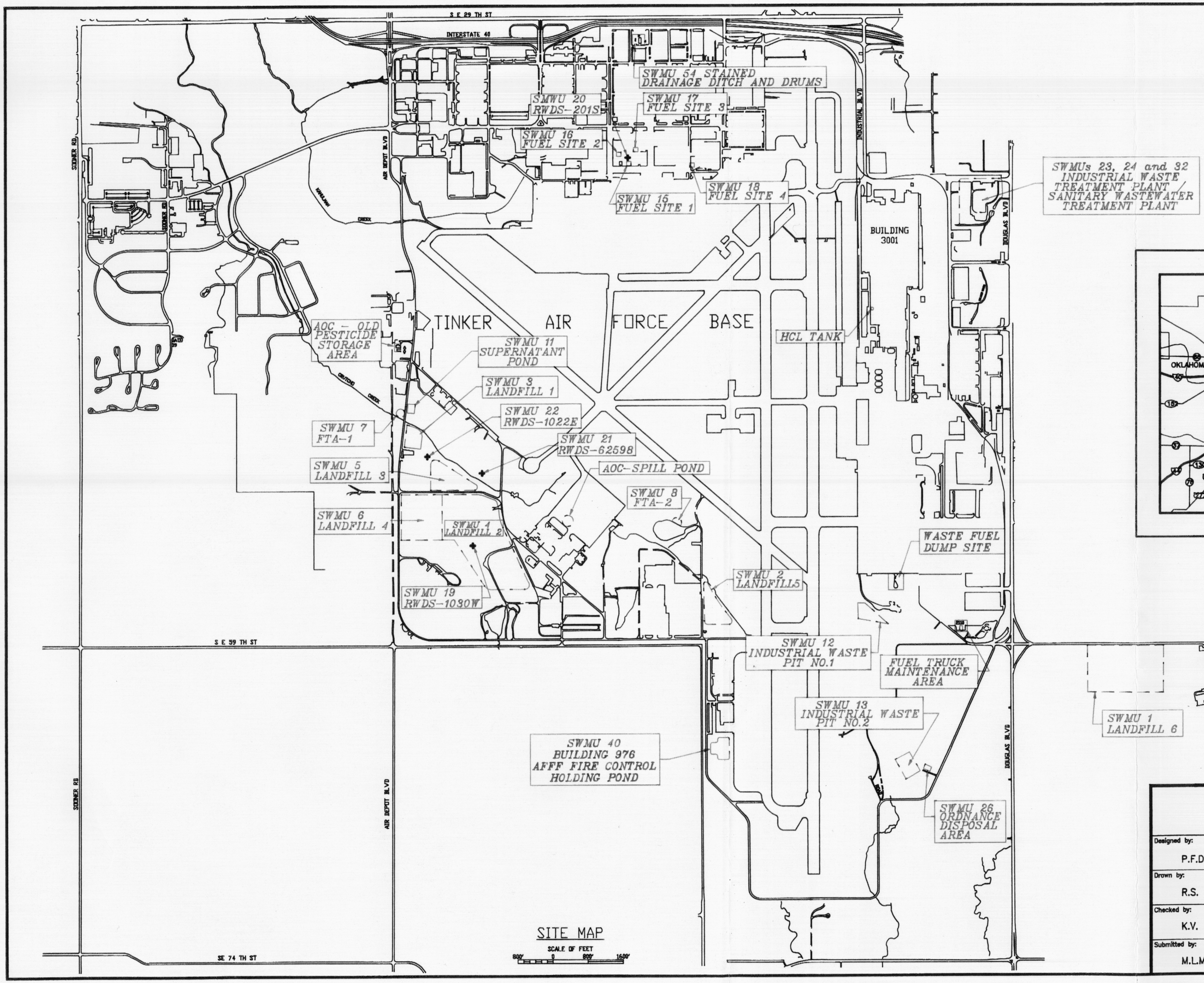
Table 1 (continued)

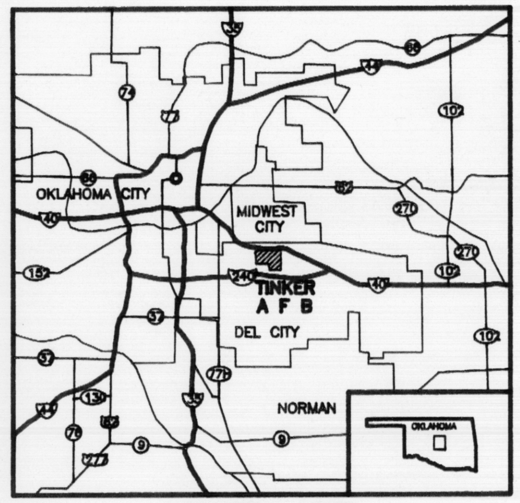
NOTES:

1 All No. 24 SWMUs are part of the IWTP
2 All No. 32 SWMUs are part of the former IWTP/current SWTP
3 SWMU added by Current Conditions report

TABLE 2
RFI Schedule

Activity	Start/Due Date
Submit revised RFI Work Plan	As determined by EPA; usually 30 calendar days after receipt of notification of deficiency
Begin Phase I RFI	Upon EPA final approval of revised Work Plan
Investigation for Fuel Truck Maintenance Area and Waste Fuel Dump Site	3 months following EPA final approval of Work Plan (6 months)
Investigation for HCl Tank	3 months following EPA final approval of Work Plan (2 months)
Investigation for SWMUs 24 and 32	5 months following EPA final approval of Work Plan (3 months)
Investigation for SWMU 26	8 months following EPA final approval of Work Plan (3 months)
Investigation for SWMU 40	9 months following EPA final approval of Work Plan (2 months)
Investigation for Old Pesticide Storage Area	11 months following EPA final approval of Work Plan (2 months)
Investigation for Spill Pond	11 months following EPA final approval of Work Plan (2 months)
Submit draft Phase I RFI Report and Summary Report to EPA	60 calendar days following completion of RFI activities (15 months following EPA final approval of Work Plan)
Submit revised Phase I RFI Report and Summary Report to EPA	30 calendar days after receipt of notification of deficiency.





VICINITY MAP

	TINKER AIR FORCE BAS OKLAHOMA CITY, OKLAHOM		
Designed by: P.F.D.	LOCATION OF RFI SWMU		
Drawn by: R.S.			
Checked by: K.V.	Scale: AS SHOWN	Project No.: 7902-025	
Submitted by: M.L.M.	Dwg. No.: FIG1.DWG	Date: 12/91	

DATA COLLECTION QUALITY ASSURANCE PLAN

PART I - SITE INVESTIGATION PLAN

PART II - SAMPLING AND ANALYSIS PLAN
QUALITY ASSURANCE PROJECT PLAN

PART I

SITE INVESTIGATION PLAN

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1.0 INTRODUCTION

This Site Investigation Plan presents the individual investigations for each Solid Waste Management Unit (SWMU) to be addressed in the RCRA Facility Investigation (RFI). This plan comprises Part I of the Data Collection Quality Assurance Plan. Part II of the Data Collection Quality Assurance Plan consists of a Sampling and Analysis Plan (SAP) and a Quality Assurance Project Plan (QAPP). The Site Investigation Plan outlines the basic components of the SWMU-specific investigations. Details of sampling procedures, analytical methods, and any other field activities are included in the SAP and QAPP.

As discussed in the Project Management Plan, the SWMUs to be addressed by this RFI have been divided into 3 groups. No further field investigation is proposed for the Installation Restoration Program (IRP) sites, with the exception of SWMUs 24 and 32, and the Spill Pond AOC. The rationale for this decision is presented in the Project Management Plan. Therefore, no investigations are discussed for the IRP sites in this Site Investigation Plan (with the exception of the sites noted previously). Instead, the work completed to date at this group of sites is summarized.

A phased approach has been taken for the site investigations presented herein. Phasing of the RFI is in accordance with the EPA RFI guidance and also is the most practical approach for sites where little or no information and/or data are available. The site investigations presented in this Site Investigation Plan are Phase I investigations. The overall objective of the Phase I investigations is to determine whether a release of contaminants to the environment occurred and to preliminarily evaluate the nature and extent of the contaminant release. Detailed evaluation of the nature and extent of a contaminant release will be conducted in a Phase II investigation.

The type of sampling presented in this Site Investigation Plan is typically of a "judgmental" nature, and not statistically based. In other words, sampling locations have been established based on the location of known or suspected contaminant releases to the environment. This is the most effective approach for a Phase I investigation, whose objectives are those stated above. The primary goal of the Phase I investigation is to collect samples that are representative of site conditions. The Phase II investigation will include a detailed description of the intended use of the data collected.

Phase I of the RFI will be conducted in order to gather information on the potential contaminants and concentrations that may be present at each SWMU. This will be accomplished by gathering existing data on the sites, including groundwater, surface water, soil/sediment, and air data. Along with a review of existing data, site inspections will be conducted, and limited judgmental soil, water, and air sampling will be performed in order to gain additional information on potential contaminants and expected maximum concentrations.

It is recognized that judgmental sampling will not allow for the determination of the accuracy and precision that would be needed for comparison with applicable regulatory limits; however, the information gathered will be valuable in designing a statistically-based, cost-effective, random sampling program that would provide the needed accuracy and precision. An expanded random sampling program will be conducted in any Phase II investigations of the SWMUs. Collection of samples that accurately represent site conditions in Phase II will be achieved and documented through the implementation of a random sampling approach. Such a statistically-based sampling program will be carried out in Phase II and will consist of simple or systematic random sampling, which may also include stratified random sampling depending upon the outcome of the data evaluation in Phase I.

The sampling and data evaluation carried out in Phase I will provide the information necessary to ensure that a statistically sufficient number of sampling and field measurement sites are identified in any Phase II investigations. This will be accomplished by determining the types and expected ranges for the contaminants on each site based on Phase I data, comparison of these values with applicable regulatory limits, and determining the appropriate confidence interval required. A confidence interval of 95% will be used to determine an upper and lower bound for which it will be possible to be 95% confident that the true value lies between the calculated bounds. By determining a reasonable estimate of maximum values for contaminants in Phase I, the number of samples necessary to ensure the needed precision can be more accurately determined for any Phase II sampling. Data collected during any Phase II investigations will be used to thoroughly evaluate the nature and extent of contamination at each SWMU, and to determine whether corrective action is necessary.

Section 2.0 of this Site Investigation Plan summarizes the site investigations that have been conducted to date for the IRP sites (Group 1 sites) and also presents the investigation for the Spill Pond AOC. RFI site investigations for the Industrial Waste Treatment Plant/Sanitary Waste Treatment Plant (IWTP/SWTP) sites (Group 2 sites - SWMUs 24 and 32, which are also IRP sites) are presented in Section 3.0. Section 4.0 presents the RFI site investigations for the Group 3 sites (miscellaneous sites).

2.0 GROUP 1 - IRP SITES

The Group 1 SWMUs include the following sites identified in the RCRA permit and shown on Figure 1 of the Project Management Plan:

SWMU Number	Site
1	Landfill 6
2	Landfill 5
3	Landfill 1
4	Landfill 2
5	Landfill 3
6	Landfill 4
7	Fire Training Area No. 1
8	Fire Training Area No. 2
11	Supernatant Pond
12	Industrial Waste Pit No. 1
13	Industrial Waste Pit No. 2
15	Fuel Site Number 1
16	Fuel Site Number 2
17	Fuel Site Number 3
18	Fuel Site Number 4
19	Radioactive Waste Disposal Site (RWDS) 1030W
20	RWDS 201S
21	RWDS 62598
22	RWDS 1022E
23	Industrial Waste Treatment Plant (IWTP) Abandoned Waste Tanks
24	IWTP sites
32	SWTP sites
54	Stained Drainage Ditch and Drums

SWMU Number	Site
AOC	Spill Pond

These SWMUs are grouped together because they are all IRP sites, and, with the exception of SWMUs 24, 32, and the Spill Pond AOC, have been the subject of numerous investigations. The IRP has been on-going at Tinker AFB since the early 1980s. IRP studies on the base are conducted according to IRP guidance, which is essentially the same as EPAs guidance for conducting remedial investigations (RI) and feasibility studies (FS) under CERCLA. With the exception of SWMUs 24, 32, and the Spill Pond AOC, the sites listed above have been the subject of an IRP remedial investigation; some of the sites have undergone additional investigations subsequent to preparation of the remedial investigation report, and some of the sites have been the subject of focused feasibility studies. Removal actions have been instituted at several of the sites. These investigations and removals have been closely monitored and approved by the CERCLA branch of EPA, who has received all available investigation reports.

Upon approval of the final RCRA permit for Tinker AFB, the IRP sites have come under the additional jurisdiction of the RCRA branch of EPA. As such, they have been identified as SWMUs, however, a great detail of work has already been performed at most of these sites under the IRP. Any additional work at these sites will continue to be performed under the IRP.

The remedial investigations for most of these sites were summarized in the Summary of Previous Investigations report, recently submitted to EPA. The work accomplished to date at the IRP sites is briefly outlined below. This is followed by the proposed RFI site investigation for the Spill Pond AOC. Proposed RFI site investigations for SWMUs 24, and 32 (Group 2 - IWTP/SWTP sites) are presented in Section 3.0.

2.1 SUMMARY OF WORK PERFORMED AT IRP SITES

- SWMU 1; Landfill 6 - A draft IRP RI report is available for this site (September 1990). More than two dozen monitoring wells are in place to sample both the perched and regional aquifers. Investigation of chloride and sulfate contamination is on-going. Interim actions have included a clay cap on the landfill. A Decision Document for the cover system was finalized in July 1990.

  The investigation of chloride and sulfate contamination is part of a focused FS for Landfill 6. As part of the study, six upgradient monitoring wells were installed east of the landfill in July 1991. These wells plus six additional wells were sampled in July 1991. The purpose of the sampling was to evaluate possible movement of chloride and sulfate into the landfill from upgradient sources. Results will be submitted to EPA when available.

  Additional reports available for Landfill 6 include: Construction Report, Landfill 6, Extension to Clay Cap Cover System (U.S. Army Corps of Engineers, September 1989) and Results of Chemical Analysis of Water Samples, Landfill 6 (U.S. Army Corps of Engineers, December 1990). Repair of the clay cap on the landfill was completed in July 1991. A perimeter fence has also been installed around the landfill.

  The final remedial action for Landfill 6 is planned to include contaminated groundwater recovery and treatment.

- SWMU 2; Landfill 5 - A draft IRP RI report and draft IRP Response Action report are available for this site (November 1990 and December 1989). The site is monitored by up and down gradient wells. A clay cap was placed on the landfill in August 1990. A Decision Document for the cover system was finalized in September 1990.

The cover system includes an 18-inch thick compacted clay cap overlain by a 12-inch thick layer of top soil. Additional reports available for the site include: Results of Chemical Analysis of Water samples, Landfill 5 (U.S. Army Corps of Engineers, December 1990).

- SWMUs 3, 4, 5 and 6; Landfills 1, 2, 3 and 4 - A draft IRP RI report was completed in November 1991. The final report will be submitted to EPA when available. Cover systems have been placed on Landfills 1 and 3. A concrete retaining wall has been constructed along the south side of Landfill 3 as an interim remedial action.

  Additional reports for the landfills include: Landfill 1 Cap Design, Specification and Design Analysis (Black and Veatch, May 1990), Landfill 3 Cap Design, Specification and Design Analysis (Black and Veatch, May 1990), Landfill 3 Cover Design, Design Analysis (Black and Veatch, June 1990), and Design Cost Comparison Study, Landfills 1, 2, 3 and 4 (Black and Veatch, 1989).

  A review of the draft RI report will be scheduled to complete the final RI report. The cover system design for Landfills 2 and 4 was completed October 1992. A Decision Document for Landfills 2 and 4 is projected to be finalized in FY92. Two interim remedial actions are proposed for Landfills 2 and 4. One involves the installation of a clay cap on each landfill with vegetative cover to minimize surface water infiltration and slow the flow of groundwater toward the southwest. The second action includes the installation of a groundwater recovery and treatment system and an in-situ remediation system to manage the groundwater contaminant plume beneath all the landfills.

- SWMU 7; Fire Training Area No. 1 - A draft IRP RI report is available for this site (November 1990). A draft risk assessment report was submitted to Tinker AFB in March 1991 for review. Proposed Phase II RI work includes the installation and sampling of monitoring wells. This work is tentatively scheduled to be completed in 1993. A Decision Document and Closeout Document were issued for this site in September 1992.

- SWMU 8; Fire Training Area No. 2 - A final IRP Response Action report is available for this site (December 1988). A Decision Document was finalized for this site in the third quarter of FY91. No further action was recommended for this site based upon the findings of no significant contamination. Installation of four new long term monitoring wells is planned for FY93.

- SWMU 11; Supernatant Pond - A draft IRP RI report is available for this site (December 1990). A final RI report was submitted to Tinker AFB for review in November 1991. An Innovative Technology demonstration of stabilization and solidification was utilized at this site. Remediation of the site was completed in November 1992.

- SWMU 12; Industrial Waste Pit No. 1 - This site was investigated early in the IRP. A Decision Document was finalized for the site in FY91. No further action was recommended for the site. The site has been added to the basewide groundwater monitoring schedule for FY92 and FY93.

- SWMU 13; Industrial Waste Pit No. 2 - A draft IRP RI report is available for this site (November 1990). A Decision Document was finalized for the site in FY91. No further action was recommended for the site. The site has been included in the basewide groundwater monitoring schedule for FY92 and FY93.

- SWMU 15; Fuel Site Number 1 - A Phase I IRP remedial investigation is in progress for the four fuel sites. One piezometer was installed in the perched aquifer near SWMU 15, and both soil and groundwater samples were collected and analyzed for hydrocarbons and solvents. An interim RI report was completed in September 1991. Additional Phase II work will be conducted after the Phase I results are evaluated.

- SWMU 16; Fuel Site Number 2 - A Phase I IRP remedial investigation is in progress for the four fuel sites. One piezometer was installed in the perched aquifer near SWMU 16, and both soil and groundwater samples were collected and analyzed for hydrocarbons and solvents. No tank has been located at this SWMU to date. An interim RI report was completed in September 1991. Additional Phase II work will be conducted after the Phase I results are evaluated.

- SWMU 17; Fuel Site Number 3 - A Phase I IRP remedial investigation is in progress for the four fuel sites. One piezometer was installed in the perched aquifer near SWMU 17, and both soil and groundwater samples were collected and analyzed for hydrocarbons and solvents. An upgradient piezometer (east of Building 201) was also installed and sampled to evaluate conditions upgradient of SWMUs 15, 16 and 17. An interim RI report was completed in September 1991. Additional Phase II work will be conducted after the Phase I results are evaluated.

- SWMU 18; Fuel Site Number 4 - A Phase I IRP remedial investigation is in progress for the four fuel sites. Three piezometers were installed in the perched aquifer near SWMU 18, and both soil and groundwater samples were collected and analyzed for hydrocarbons and solvents. The exact location of this tank has still not been identified. An interim RI report was completed in

September 1991. Additional Phase II work will be conducted after the Phase I results are evaluated.

- SWMU 19; RWDS 1030W - A records search and non-intrusive surveys of the site were performed in 1990. Excavation of the site began in July 1992. The removal action involves excavation and removal of low level radioactive wastes from this site. A Work Plan for the removal action was completed in May 1992 and forwarded to EPA.

- SWMU 20; RWDS 201S - A records search and non-intrusive surveys of the site were performed in 1990. An intrusive survey and risk assessment of the site began in mid 1992. This involves drilling of borings and analysis of soil samples to determine the migration potential of any radioactive waste and the extent of the contamination. When available, the Work Plan and investigation results will be forwarded to EPA. The site is projected to be closed in 1993.

- SWMU 21; RWDS 62598 - The site was excavated in July 1991. The extent of soil contamination was defined prior to the removal. No radioactivity was identified at the site. The closure report was submitted to EPA in December 1991. A Decision Document for the site was finalized in fourth quarter FY91.

- SWMU 22; RWDS 1022E - The site was excavated in July 1991. The extent of soil contamination was defined prior to the removal. The closure report was submitted to EPA in December 1991. A Decision Document for the site was finalized in fourth quarter FY91.

- SWMU 23; IWTP Abandoned Waste Tanks - An IRP report is available for the IWTP (1989). A Work Plan was prepared for the removal of the tanks and issued to the regulatory agencies. The closure was completed in the first quarter FY93. The proposed soil cleanup levels were met during the removal of all 11 tank groups.

- SWMU 54; Stained Drainage Ditch and Drums - The site was investigated and excavation was performed. No contaminants were found in any of the samples. A Final Decision Document (Tinker, 1992) and a Closeout Document were issued in September 1992.

As available, additional plans and investigation results for these sites will be forwarded to EPA.

The results of all the above investigations will be presented and discussed in the RFI report. The actual reports will be appended to the RFI report. The investigations and results will be presented and discussed in light of the objectives of the RFI (determining the nature and extent of contamination at each SWMU and collecting adequate information to determine the need for corrective measures).

2.2 INVESTIGATION FOR SPILL POND AOC

This AOC was recently added to the IRP, and no work has yet been conducted at the site.

The Spill Pond is a drainage area with a concrete spillway (PRC, 1989). The drainage is located behind and east of Building 1030. Building 1030 is located east of Landfill 2 in the southwestern part of the base. The spillway has a manually operated valve for flood control (PRC, 1989). The drainage area may receive runoff from Building 1030 wash water, however Tinker AFB personnel have indicated that wash water from the building flows to the sanitary sewer (PRC, 1989).

If discharge to the Spill Pond ever occurred, the potential for a release of contaminants to soil, groundwater, and surface water may be high, depending on the characteristics of the pond bottom, the depth to groundwater, and the topography of the site.

Plan of Investigation

The Phase I investigation for this area of concern will focus on determining whether a release from the pond has occurred. Specific activities are as follows.

- The use of the pond will be determined by interviews with building personnel, examination of records, and evaluation of the building drain system. It is not presently known whether the pond actually receives runoff from Building 1030. If it is determined that the pond receives runoff or discharge from the building, the nature of the runoff will be investigated also be interviews and record evaluations prior to any sampling of the runoff/discharge.

- The occurrence of a single or isolated release to the pond from the building will also be evaluated based on interviews with site personnel and examination of records.

- The pond will be visually inspected for staining, stressed vegetation etc. The configuration of the pond and spillway including where an overflow would discharge to will be evaluated by examination of the pond and topographic maps.

- No sampling of pond sediments/soils will be conducted until Phase I site reconnaissance is completed. There is not currently enough information available for the pond to design any further investigation of the site.

3.0 GROUP 2 — INDUSTRIAL WASTE AND SANITARY WASTEWATER TREATMENT PLANTS

Group 2 consists of 20 SWMUs that comprised the industrial waste treatment plant (IWTP) and the sanitary waste treatment plant (SWTP). These sites are also IRP sites. Investigations are proposed for these IRP sites because very little work has been performed at these sites to date. These SWMUs are grouped together because they are components of the two facilities and, therefore, are in close proximity to one another. The IWTP is a process treatment plant for all the industrial wastewater generated at Tinker AFB. The SWTP also contains a single-stage trickling filter for the treatment of domestic sewage generated on the east side of the base. The IWTP/SWTP facility is located in the northeast corner of the base and contains two outfalls for the discharge of treated effluent—under NPDES permits—to East Soldier Creek. The treatment of industrial waste began in 1963, treating 290,000 gallons per day (gpd). Additional lines were added in 1969; and in 1971, improvements to the system increased the plant's capacity to 1.8 million gpd. Figure 3-0 depicts the location of the IWTP site.

The industrial waste system included units for the batch processing of phenols, cyanides, and chrome solutions. The plant also has oil/water separators, equalization basins, chemical reduction units, solids contact clarifiers, biological treatment, and chlorine contact chambers.

The release controls for the processing systems at the IWTP are composed of concrete tanks, overflow indicators, and containment devices. Contamination at the site has been documented in the Tinker AFB RFA. A groundwater plume is known to exist under the site of the IWTP and is believed to be due, in part, to past activities at the plant.

Some minor soil contamination has been discovered around four of the abandoned waste tanks. Emissions of volatile and semi-volatile compounds to the atmosphere are possible due to the open-top design of many of the treatment tanks. Contaminant transport to adjacent surface streams is possible and has been documented in the past due to overflows and broken wastewater lines.

From 1963 to 1971, the current sanitary wastewater treatment plant was designed to treat industrial and sanitary wastewaters generated at the air base. Since 1971, the waste treatment plant has received only sanitary wastewater generated from the eastern section of the base. Because this facility managed hazardous wastes, from 1963 to 1971, potential contaminants and media pathways were discussed in the Tinker AFB RFA. Of the eight SWMUs associated with this facility, seven are believed to have such a low probability for release that no further action is recommended for them in this plan. The sludge drying beds are believed to have a high potential for contaminating the soil column and, consequently, both surface and groundwater.

3.1 ENVIRONMENTAL SETTING

Four types of potential releases were identified for SWMU 24 (SWMUs 24.1-24.19) and SWMU 32 (SWMUs 32.1-32.8) (which comprise Group 2). These are: soil and groundwater; subsurface gas; surface water; and air. Soil and groundwater releases range in potential from unknown to high, depending on the specific component. Because of the close proximity (to each other) of all of the components, the site geology and hydrogeology will be discussed in this section in order to provide the environmental setting for this type of release. Subsurface gas release potential is low for most components, however the aforementioned discussion of site geology and hydrogeology also provides the environmental setting for these releases. Releases to surface water range in potential from unknown to moderate and primarily take the form of component overflow or broken above ground components (eg. pipes, tanks). A discussion of site topography provides the setting for this type of release. Finally, the potential for releases to the air is high for most components due to the open top design utilized. Wind direction and speed is highly variable at this site and does not lend itself to either general or specific discussion. Air releases can be quantified, however, within a changing environmental setting and are addressed in this RFI Work Plan.

All of the components in Group 2 (SWMUs 24 and 32) are located near the northeast corner of Building 3001. The area in the vicinity of Building 3001 and east to Douglas Boulevard is generally flat. East Soldier Creek, a tributary to Soldier Creek, flows to the north between East Drive and Douglas Boulevard, forming a shallow valley with a maximum elevation drop of approximately 40 feet. SWMUs 24 and 32 are situated on the west slope of this shallow valley, with two small drainages truncating the site to the east and south (see Figure 3-1). Surface topography indicates the site generally slopes downward a relatively short distance to East Soldier Creek.

All of the Group 2 SWMU components (including the SWMU 32 drying beds) are underlain by the Garber-Wellington Formation, also known as the Central Oklahoma Aquifer. This aquifer is present beneath all of Tinker AFB and consists of the Garber Sandstone and Wellington Formation, which are not easily distinguished from each other. The Garber-Wellington Formation is considered to be one hydrologically connected unit. It supplies much of the drinking water for the residents of Oklahoma and Cleveiand Counties (U.S. Army Corps of Engineers, 1991) and is the single most important source of potable water in the Oklahoma City area. The average depth to water in the producing zone (deeper sandstone strata) of this aquifer is approximately 250 feet.

Groundwater occurs above the producing zone in what is known as the Regional Aquifer zone (U.S. Army Corps of Engineers, 1987). This groundwater zone generally occurs within the upper sandstone strata of the Garber-Wellington Formation. The hydraulic gradient within this aquifer is generally downward and to the southwest. The average depth to water is approximately 50 feet.

In places, the Garber-Wellington Formation is overlain by Quaternary fluvial-alluvial deposits ranging from 5 to 15 feet deep. These deposits consist of unconsolidated and interfingered lenses of sand, silt, and clay and are found across the site. Because of shifting channels and changing currents during deposition, detailed correlation of lithologic units is only possible over very short distances. The alluvial deposits in the Tinker AFB area are also water bearing. They are generally hydrologically connected to perched groundwater systems which are found over parts of the base (U.S. Army Corps of Engineers, 1991). Flow in the perched groundwater systems is generally toward streams. Depth to perched groundwater at the Group 2 SWMUs ranges from approximately 15 to 30 feet.

3.2 SWMU DESCRIPTIONS

3.2.1 IWTP

The IWTP (SWMU 24 and associated components) at Tinker AFB was built to treat industrial wastewaters generated by Tinker's operations. These wastewaters include chromic and cyanide acids from the plating shops and wastewaters (i.e., alkaline precleaner, alkaline rust remover, emulsion cleaner, phosphoric acid, and potassium permanganate) from the engine parts cleaning facility. There are 13 SWMU components associated with this facility, and a brief physical description of each one follows. The nature of the operations at the facility indicates the possible contaminants to be metals, volatile organic compounds (VOCs), semi-volatiles, and phenolic compounds. There have been no samples collected from any of these sites, and thus, no analytical data to identify possible contaminants. Concomitantly, no verification of potential releases has been documented. The only information on the integrity of the structures is from the RFA (PRC, 1989) and includes only a release potential based on observations made during the 1989 visual inspection.

Table 3-1 summarizes the potential for contaminant transport from each SWMU component via soils/groundwater, surface water, and air as indicated in the RFA (PRC, 1989).

3.2.1.1 SWMU 24.1—Lift Station No. 2

Lift Station No. 2 receives an industrial waste stream containing metals and organic compounds from aircraft maintenance operations throughout Tinker AFB. It began operation in 1976 and is presently active. A secondary waste stream consisting of high strength phenol wastes from paint stripping operations—enters the industrial treatment plant and is blended in Tanks D-1 and D-2. Lift Station No. 2 is located in a concrete building with a below-ground concrete lined wet well. The building enclosing the lift station has a positive pressure ventilation system to release any accumulating gases. Fans pull any buildup of volatile organic vapors from the lift station and discharge them to the atmosphere.

The RFA indicated that no visual evidence of releases have been noted from the unit (PRC, 1989). Organic gases, however, are vented to the atmosphere. The potential for release of hazardous waste or hazardous constituents to all media but air is low (Table 3-1). The design of the unit, maintenance of adequate freeboard, and visual observation that the unit is well maintained were reported in the RFA and justifies the low potential rating.

The potential for release to air is high based on the presence of volatile compounds in the wastewater and the use of the fans to vent the unit to the atmosphere.

3.2.1.2 SWMU 24.2—Tank D-1 and Tank D-2

Tanks D-1 and D-2 have been used as blending tanks since the 1960s to segregate and temporarily store waste streams that contained high concentrations of phenols. These two tanks are approximately 80% below-ground and are located near the northwestern side of the IWTP, with D-1 just north of D-2. These tanks receive high phenol laden wastewaters from operations within Buildings 2280 and 2122 and the AWAC facility.

The tanks are each 60 feet in diameter with 12-foot side walls and flat bottoms. The tanks are constructed of concrete and have a capacity of 250,000 gallons each. Each tank is open topped with aeration piping located near its base.

The blending tanks are operated in series, and a valve on the influent pipe allows the flow to be directed to either tank. The two tanks are connected by an equalization line, which allows the level to balance between the two tanks. The equalization line is valved so that the two tanks can be isolated. The liquid in the north tank (D-1) is pumped to the Oil Separator by a time-controlled pump.

The RFA reports that there have been no known releases from these tanks (PRC, 1989). However, during a 1989 inspection, stain areas to the south and west of Tank D-1 were noted. The release potential (Table 3-1) to soil and groundwater noted in the RFA is high based upon this observation (PRC, 1989). Likewise, the release potential to surface water is moderate due to the staining and the proximity of the tanks to Soldier Creek. The open-top construction of this unit may allow volatile compounds to be released to the atmosphere.

3.2.1.3 SWMU 24.3—Oil Separator

The Oil Separator began operation in 1971 and provides primary removal of oils and greases. The separator receives wastewater containing metals and organic compounds from Tank D-1 and Lift Station No. 2. The separator includes a surface skimmer and rake mechanism to facilitate removal of floating and settled material. The skimmed and settled materials are deposited in an oil collection sump and are transferred via a belt skimmer to transportable waste soil containers and disposed off-site.

The Oil Separator is a single, above-ground 60-foot diameter by 9-foot side water depth, concrete open-top tank. The principal flow to the Oil Separator is received from Lift Station No. 2. This flow enters the bottom center of the Oil Separator, flows upward through the center support pier 1, and discharges inside the effluent well.

The secondary flow stream from the blending Tanks D-1 and D-2 discharges directly into the effluent well of the Oil Separator. The level in this unit is maintained by pumps and several daily inspections. Effluent leaving this unit passes over weirs and gravity flows to the Valve Vault.

The release potential to soil and groundwater indicated in the RFA is high (Table 3-1). This conclusion is based on observations of stained soil and gravel surrounding this unit during the 1989 survey (PRC, 1989). The resulting soil contamination also may provide a source for surface water contamination, while the open-top construction of this unit may provide a pathway for volatile organic compounds to be discharged to the air.

3.2.1.4 SWMU 24.4—Valve Vault

The purpose of the Valve Vault is to control wastewater flow into the Equalization Basins. Wastewater leaving the Oil Separator gravity feeds to the vault and is controlled as it gravity feeds to the Equalization Basins. This unit is a below-ground, covered concrete structure, the construction design and integrity of which has not been determined.

The wastewater stream contains heavy metals, suspended solids, and organics. Because of the below-ground design of the unit, the ability to determine the integrity of the unit is limited and thus potential contaminant release is unknown except for the air pathway, which according to the RFA, is low based on the closed-top construction of the unit.

3.2.1.5 SWMU 24.5—Equalization Basins

The Equalization Basins began operation in 1971 to allow pH adjustments and consistent quality batch flow to the chromium reduction and activated sludge process. The basins receive a metal and organic compound contaminated wastewater stream from the Oil Separator by way of the Valve Vault.

The Equalization Basins are two, 500,000-gallon concrete tanks. Four surface aeration pumps mix each of the open-top tanks. A caustic tank and caustic feed pump are located on the northeast side of the Equalization Basins. During filling, the pH is checked and if less than 7.2, the pH is adjusted with caustic. Normally, the pH is greater than 7.2, so caustic additions are not normally required. The two tanks adjoin one another and are separated by a concrete wall.

The RFA indicates that the design and operation of the unit makes releases to all media but air unlikely (PRC, 1989). The release potential to air is high because of the volatile organic compounds in the wastewater and the open-top construction of this unit.

3.2.1.6 SWMU 24.6—Main Flow Valve

The Main Flow Valve regulates the flow from the Equalization Basins to the Mixing Basins. This unit is a below-ground, closed-top concrete structure that began operation in 1971. The unit is approximately 10 feet by 10 feet by 10 feet and has removable metal lids on the top surface, which is at ground level.

This wastewater stream contains heavy metals, suspended solids, and organics. The unit is below-ground and, as such, the integrity of the unit and consequently the potential for release of contaminants is indicated as unknown in the RFA (Table 3-1).

3.2.1.7 SWMU 24.7—Mixing Basins 1, 2, and 3

Mixing Basins 1, 2, and 3 allow the addition of chemical additives to enhance metal reduction of wastewater previously treated in the Equalization Basins. Wastewater containing heavy metals, suspended solids, and organics enters the first of these three Mixing Basins where sodium sulfide is added. In the second basin, ferrous sulfate and sulfuric acid additions are made, and a cationic polymer is added in the third basin. The three mixing basins provide the chemical and physical environment needed for the reduction and precipitation of chrome and other metals. The polymer is added as a flocculation aid for the subsequent clarification process.

Mixing Basin No. 1 is a concrete tank (13 feet by 14 feet by 16 feet), which contains an axial flow impeller mixer. Basin No. 2 borders Basin No. 1 and is separated by a concrete wall. Basin No. 2 is a 13-feet by 14-feet by 16-feet concrete tank. Basin No. 3 is separated from Chamber No. 2 by a concrete divider and is 9 feet by 9 feet by 10 feet. All three basins are open-topped, below-ground basins.

The potential for release to air is high based on the volatiles present in the wastewater and the open-top construction of this unit (Table 3-1). Release potential for other media were identified to be low in the RFA due to the design and operation of the unit.

3.2.1.8 SWMU 24.8—Solids Contact Clarifier

The Solids Contact Clarifier (SCC) began operation in 1971 to flocculate and settle precipitated metals. The SCC receives treated wastewater containing heavy metals, suspended solids, and organics from Mixing Basin No. 3 by gravity through an underground pipe.

The SCC is an open-top concrete tank, 55 feet in diameter. The unit is about 90 percent below-ground and is comprised of a mixing chamber (14 feet in diameter and 6 feet deep) in the center of the unit, which receives the wastewater influent. Surrounding the chamber is a flocculation skirt (18 feet in diameter at the top, 33 feet in diameter at the bottom, and 7 feet deep). The SCC also includes a sludge rake and skimmer mechanism with a scum collection box. Anionic polymer is added to the mixing chamber of the SCC to assist in particulate flocculation. Liquids move under a scum baffle and over the peripheral collection weirs into the effluent trough and into the Wet Well Lift Station. Sludge from the SCC is pumped to the Sludge Thickener.

The release potential of hazardous waste to air is high based on the volatile organics present in the wastewater and the open-top construction of this unit. All other media are ranked as low in the RFA (Table 3-1) due to the design and operation of the unit.

3.2.1.9 SWMU 24.9—Wet Well Lift Station

The Wet Well Lift Station is used to transfer effluent from the Solids Contact Clarifier to the Softener Basin. This system consists of three lift pumps designed to pump wastewater to the Softener Basins at a flow rate equal to the clarified overflow from the Solids Contact Clarifier.

The unit is an open-top concrete well about 90 percent constructed below grade. The wet well is approximately 20 feet by 20 feet by 12 feet deep. The release potential of volatile and semi-volatile organic compounds, metals, and phenols to the soil, groundwater, and surface water is low due to the construction design of the facility.

Releases to air, however, are high based on the volatiles present in the wastewater and the open-top construction of this unit.

3.2.1.10 SWMU 24.10—Softener Basins

The Softener Basins were originally used for water softening but have been used primarily as an additional clarifier. This unit began operation in 1984 and is currently active only as a flow-through chamber between the Wet Well Lift Station and the Activated Sludge Unit. The Softener Basins consist of two side-by-side steel tanks, 11 feet by 62 feet by 11 feet deep. The basins rest on a concrete pad that is at grade level. When the unit was operational, solids settled to the bottom of the basins and were collected in a hopper located at the bottom. Presently, wastewater flows from the basins over two weirs into an outlet box at the effluent end of the unit and gravity feeds to the Activated Sludge Unit. The release potential was identified in the RFA to be low for all media except air (PRC, 1989) (Table 3-1).

3.2.1.11 SWMU 24.11—Activated Sludge Unit

The Activated Sludge Unit provides for the removal of soluble organic substrates (primarily phenol) from the wastewater by converting dissolved nutrients into sludge. The result of this process is a reduction in the biological oxygen demand of the wastewater.

This unit consists of an aeration system containing two parallel operated above-ground concrete basins that are 70 feet long by 20 feet wide, with an 18-foot side water depth, and 4-feet of freeboard. Each basin has a volume of about 190,000 gallons. Aeration and mixing are provided by a static aeration system consisting of centrifugal blowers and static aeration located on 8-foot centers at the bottom of each basin. Nitrogen as ammonia and phosphate as phosphoric acid are added to the wastewater prior to entering the aeration basins. The release potential was identified in the RFA to be low for all media except air (Table 3-1).

3.2.1.12 SWMU 24.12—Secondary Clarifiers

The Secondary Clarifiers consist of one, 45-foot-diameter (west unit), and one, 55-foot diameter (east unit) suction type clarifiers. Both clarifiers are constructed of concrete, open-top, and approximately 90% below-ground units. The clarifiers are operated in parallel with flow to each unit proportioned by a weir box at the outlet of the aeration basins. Sludge collecting at the bottom of the clarifiers is primarily (96 percent) recycled to the inlet of the Activated Sludge Unit. About 4 percent of the sludge is pumped to the Sludge Thickener. Clarified liquids from these clarifiers flows over weirs to the Chlorine Contact Chamber. The release potential is high for air and low for all other media (Table 3-1).

3.2.1.13 SWMU 24.19—Industrial Sludge Drying Beds

This SWMU consists of six inactive sludge drying beds. Located in the southwestern section of the IWTP, these beds were used from 1942 to 1971 for drying industrial wastewater sludge. The beds are constructed of concrete bottoms and sides. These drying beds are the southern-most beds at the IWTP. The beds were constructed side by side, divided by 3 foot high concrete walls, and each bed is about 15 feet wide by 120 feet long. The beds at the time of the RCRA inspection had collected rainwater. The beds were reported to have been cleaned out prior to becoming inactive (PRC, 1989). Cracks were observed in the concrete walls of the drying beds. These drying beds managed sludges generated by industrial wastewater treatment. Presently, drums of new product and paint chip wastes are on pallets within the old drying beds.

These beds are believed to have contributed to the contamination of East Solider Creek. It is uncertain if releases from this unit have been documented. Cracks in the concrete walls were noted during the 1989 inspection, however, the integrity of the concrete bottoms because they were under water could not be determined (PRC, 1989). The potential for release of hazardous waste or hazardous constituents to soil, groundwater and surface water, is high based on the documented groundwater contamination in the area, construction of the unit, and the possibility of past overflow and spills.

3.2.2 THE SANITARY WASTEWATER TREATMENT PLANT

SWMU 32 is comprised of eight separate units that were identified in the RFA. From approximately 1963 to 1971 the facility was used to treat sanitary and industrial wastes. Prior to 1962 and following 1971 the treatment plant received only sanitary wastewater generated from the eastern section of the base. The release potential from each SWMU component to each media pathway is summarized in Table 3-2. With the exception of SWMU 32.8, a low release potential was identified in the RFA for all media at each SWMU 32 component. This is because these components have not handled industrial wastes since 1971. Brief descriptions of each SWMU component follow.

3.2.2.1 SWMU 32.1—Parshall Flume

This unit is a below-ground concrete flume which was used to receive industrial and sanitary wastewaters from the air base. This unit operated from 1963 to 1971 as part of the industrial wastewater treatment plant. From 1942 to 1963 and since 1971, this unit has been active as part of the sanitary wastewater treatment plant. The flume, constructed of concrete, is 16 inches deep by 52 inches in length. The unit is covered by removable boards for easy access. Presently, only sanitary wastewater from the eastern area of the base flows through the flume where it empties into the Flocculation Chamber (Unit #32.2). The release potential for this unit was indicated to be low for all media in the RFA due to the design and operation of the unit.

3.2.2.2 SWMU 32.2—Flocculation Chamber

This unit is a below-grade, closed-top concrete tank located inside Building 62505. The unit used to receive industrial and sanitary wastewater from the Parshall Flume. This unit operated from 1963 to 1971 as part of the industrial wastewater treatment plant. Prior to 1963 and since 1971, this unit has been active as part of the sanitary wastewater treatment plant. No information was available on unit construction specification. Wastewater effluent from this chamber flows to the Primary Clarifier; sludge collected in this unit is pumped to the Digester. There is a low release potential for all media (Table 3-2) identified in the RFA due to the design and operation of the unit.

3.2.2.3 SWMU 32.3—Primary Clarifiers

The unit consists of two Primary Clarifiers which used to receive industrial and sanitary wastewater after it passed through the Flocculation Chamber. This unit operated from 1963 to 1971 as part of the industrial wastewater treatment plant. From 1942 to 1963 and since 1971, this unit has been active as part of the sanitary wastewater treatment plant. These two parallel operated Primary Clarifiers are open-top concrete tanks each about 10 feet by 50 feet by 10 feet deep. Clarified wastewater flows from the unit to the Trickling Filters. Sludge collected in this unit is pumped to the Anaerobic Digester. Presently, only sanitary wastewater is treated in the unit. Release potential indicated in the RFA is low for all media.

3.2.2.4 SWMU 32.4—Trickling Filters

Two Trickling Filters operating in parallel receive wastewater from the Primary Clarifiers. This unit operated from 1963 to 1971 as part of the industrial wastewater treatment plant. Prior to 1963 and since 1971, this unit has been active as part of the present sanitary wastewater treatment plant. These units are circular open-top concrete tanks, about 35 feet in diameter and 7 feet deep, containing 6 feet of flint rock. These filters are 90 percent below ground. Wastewater is sprayed over the flint rock for biological treatment. Wastewater flows through the flint rock to a collection system at the base of the filters and then to the Final Clarifiers. The unit used to receive industrial and sanitary wastewater. Presently, only sanitary wastewater is treated in the unit. Release potential identified in the RFA was low for all media based on the design and operation of the unit (Table 3-2).

3.2.2.5 SWMU 32.5—Final Clarifiers

Two adjacent Final Clarifiers receive gravity fed wastewater from the Trickling Filters. The clarifiers operate in parallel, separated by only a concrete wall. The unit is an open-top, below-ground concrete structure, 100 feet by 40 feet by 10 feet deep. Effluent leaving the clarifiers flows to the Chlorine Contact Chamber. Sludge collected in the clarifiers is pumped to the Anaerobic Digester. The unit used to receive industrial and sanitary wastewater. Presently, only sanitary wastewater is treated in the unit. There is a low release potential identified in the RFA for all media due to the design and operation of the unit.

3.2.2.6 SWMU 32.6—Former Chlorine Contact Chamber

The original purpose of this unit was for chlorination of treated industrial and sanitary wastewater. Since 1971, the unit has only treated sanitary wastewater. The Chlorine Contact Chamber consists of a below-ground open-top concrete tank about 8 feet by 20 feet by 8 feet in depth. From the Chlorine Contact Chamber, wastewater was formerly discharged directly to Soldier Creek. Currently, since 1984, the wastewater is pumped to two (2) pressure filters and then discharged to Soldier Creek. There is a low release potential for all media.

3.2.2.7 SWMU 32.8—Drying Beds

The Sludge Drying Beds are used to dewater sludges discharged from the Anaerobic Digester (Unit #32.7). The drying beds are located at the IWTP northeast of SWMU 24.19. The unit consists of nine adjoining shallow concrete pits. The beds are each about 3 feet deep by 10 feet wide by 100 feet long. After a drying time of about 6 months, sludges from the drying beds are removed and disposed. Base representatives were not certain where sludges were disposed during the period 1942 to 1971. Currently, sludges from this unit are hauled off-site by contractors for disposal.

These drying beds operated from approximately 1963 to 1971 as part of the IWTP. Since 1971, this unit has been active as part of the present sanitary wastewater treatment plant. Between 1942 and 1963, the unit managed sanitary waste sludges.

No known release controls are associated with the unit. Cracks were observed in the concrete sidewall of the drying beds during the RFA site inspection (PRC, 1989). The history of releases from the unit is unknown. The potential for release of contaminants to soil, soil gas, and groundwater was indicated to be high in the RFA, and to surface water, was indicated to be moderate (PRC, 1989).

3.3 PLAN OF INVESTIGATION

This section describes the plan of investigation for the Group 2 SWMUs. Included are the various components of the investigation, sampling strategy and analytical parameters. Specifics of procedures, methods, and quality assurance/quality control (QA/QC) all presented in the overall SAP and QAPP for the RFI.

A phased approach, as described in Section 1.0, will be used for the investigation of the Group 2 SWMUs. The investigation presented herein constitutes Phase I. The objective of the Phase I investigation is to determine if a release ever occurred from the SWMUs. The data gathered during the Phase I investigation will be used to make a preliminary characterization of the nature and extent of the releases, the direction and rate of migration, and potential receptors. If necessary, more detailed characterization will be undertaken in a Phase II investigation of the Group 2 SWMUs.

The field investigation is focused on air, soil, groundwater and surface water since these are the media with the greatest potential for impact from a release.

Assumptions specific to the investigation of the Group 2 SWMUs are as follows:

- All wastes generated by the investigation, including excess borehole cuttings, and personal protective equipment (PPE), will be drummed and disposed of off-site. The contractor(s) performing the investigation will be responsible for the disposal. Additional information regarding this disposal is included in the RFI SAP. Whether wastes are managed as hazardous wastes will be determined based on waste characterization, as discussed in the RFI SAP.

- Accurate base maps will be available to identify underground utilities that may impact the placement of soil borings. Proposed locations will be modified as necessary. Clearance from base utilities personnel will be obtained prior to any drilling.

- Samples collected during the site investigation will be shipped to the analytical laboratory as "environmental samples".

The field investigation for the Group 2 SWMUs will focus on the following activities:

- The open-top concrete design of many of the facilities associated with the IWTP and the organic compound loading of the wastewater stream combine to rank high for the potential release of volatile contaminants to the atmosphere. An air monitoring system will be established to sample for volatile and semi-volatile organic emissions from these facilities. Use will be made of high-volume particulate samplers and charcoal filters for the collection of organic compounds. Specific methods for collecting these samples are described in the SAP. The sampling scheme is shown in Figure 3-1. The design is such that emissions from the entire facility can be measured as well as the contribution from any single SWMU. Two background sampling stations, ASB-1 and ASB-2, will be located near enough to the facility to be representative of the site background. The background stations will also be located far enough away from the facility to assure no interference from facility emissions. Each of the stations associated with individual units will be located in a downgradient (downwind) orientation to the extent possible. In order to provide reliable data regarding wind direction and speed during the sampling activities, a wind measurement station will also be established onsite. This device will record the wind direction and speed at pre-set intervals throughout the sampling period. Initial placement of the individual sampling stations will be based on a two-day record from the wind measurement station. In addition, the individual sampling stations can be moved to accommodate changes in wind conditions that are noted at the wind measurement station. In order to be more representative, three 24-hour air samples will be collected from each monitoring station and submitted to the laboratory for chemical analyses. Samples will be analyzed for volatile and semi-volatile organic compounds due to the medium (air) and contaminants suspected at the site. Correlation of the wind data with the individual sample station results (from the three 24-hour sampling periods) will provide a more detailed insight into the source of any emissions detected. Procedures for collecting air samples and analytical methods are presented in the RFI SAP.

- The high potential for contamination of soils generally is based on visual observation of ground staining around a SWMU or as with the sludge drying beds, cracks in the concrete walls of the beds. During Phase I of the RFI, "surface" soil samples (generally a sample collected between the surface and a depth of 18 inches; although it may be necessary to hand auger to a depth of 3 to 5 feet to obtain a representative sample) will be collected to ascertain whether or not releases have occurred. Based on these results, a determination will be made on whether or not to undertake a soil boring effort to establish a vertical profile of contaminants. Methods for collecting the surface soils are described in the RFI SAP.

- Soil borings will be drilled around SWMUs 24.19, Sludge Drying Beds and 32.8, Drying Beds. Based on previous efforts at Tinker AFB, continuous soil sampling will occur. It is anticipated that a minimum of three soil samples will be submitted to the laboratory for chemical analysis from each boring. One sample will be collected for analysis from the zone directly above the water table, and two other samples will be selected based on screening for the presence of volatile organic compounds using a photoionization detector (PID) or based on visual examination of unsaturated zone materials. Collection of soil boring samples and use of a PID are presented in the RFI SAP.

- Each boring will be lithologically described and recorded on a Boring Log form. This procedure is described in the RFI SAP.

- One soil sample from each of these two SWMU areas will be submitted to a geotechnical laboratory for determination of particle size, vertical permeability, moisture content, cation exchange capacity and pH. Methods are included in the SAP for the RFI.

- Soil samples submitted to the laboratory for chemical analysis will be analyzed for Target Compound List volatile and semi-volatile organic compounds and metals. These parameter choices are based on background information for the site. Analytical methods are described in the SAP for the RFI.

- The presence of a groundwater contamination plume beneath the IWTP site is known. Before installing any additional groundwater monitoring wells, data from existing wells will be correlated with results from the soil sampling. By fingerprinting the source with the contaminant plume, the need for and location of additional groundwater wells can be determined more precisely.

- Surface water/sediment sampling locations associated with the IWTP are shown in Figure 3-2. One background station, SC 24.0 will be located on East Soldier Creek upstream of potential contaminant discharge areas. Creek sampling stations will be located downgradient of the IWTP. Procedures for surface water/sediment sampling are presented in the RFI SAP. Samples will be analyzed for Target Compound List volatile and semi-volatile organic compounds and metals. Analytical methods are presented in the RFI SAP.

- A soil gas survey will be conducted at SWMU 32.8, Drying Beds, according to procedures in the RFI SAP. Samples will be analyzed for volatile organic compounds using a field GC.

3.3.1 SWMU 24.1

This SWMU will be investigated by the air monitoring system with the sampling station located at AS 24.1 (Figure 3-1).

3.3.2 SWMU 24.2

This SWMU will also be investigated by the air monitoring system. The air monitoring station for this site is located at AS 24.2 (Figure 3-1). Surficial soil samples will be obtained at sites SS 24.2A and SS 24.2B to the south and west of tank D-7, respectively (Figure 3-2). These locations were chosen to investigate a possible release from the tanks. Surface water/sediments will be collected from East Soldier Creek at location SC 24.2 (Figure 3-2). Sediment samples will be taken at the point in the creek bed where accumulation of sediments is likely.

3.3.3 SWMU 24.3

Three surficial soil samples will be collected from the stained area (SS 24.3) around the oil separator unit at the locations shown on Figure 3-2 (SS 24.3A, B and C). The East Soldier Creek sampling locations SC 24.3 (Figure 3-2), will be sampled in conjunction with possible releases from this SWMU. The system air monitoring station is designated as AS 24.3 shown on Figure 3-1. All samples will be collected according to procedures found in the RFI SAP.

3.3.4 SWMU 24.4

The Phase I activity for this SWMU will be to attempt to inspect the vault. If this is not possible, one soil boring on the mid point of each side of the vault will be made to a depth three feet below the vault bottom. Analysis of samples from these locations will be used to determine if further investigation is warranted.

3.3.5 SWMU 24.5

The system air monitoring station is located at AS 24.5 (Figure 3-1).

3.3.6 SWMU 24.6

Phase I activity will be an inspection of the valve structure.

3.3.7 SWMU 24.7

The system air monitoring station is located at AS 24.7 (Figure 3-1).

3.3.8 SWMU 24.8

The system air monitoring station is located at AS 24.8 (Figure 3-1).

3.3.9 SWMU 24.9

The system air monitoring station is located at AS 24.9 (Figure 3-1).

3.3.10 SWMU 24.10

The system air monitoring station is located at AS 24.10 (Figure 3-1).

3.3.11 SWMU 24.11

The system air monitoring station is located at AS 24.11 (Figure 3-1).

3.3.12 SWMU 24.12

The system air monitoring station is located at AS 24.12 (Figure 3-1).

3.3.13 SWMU 24.19

Eighteen soil borings will be drilled at the locations shown on Figure 3-3. The borings will be drilled as close to the beds as possible (1-3 feet) and will extend to a depth to be determined by field analysis with a PID. Incidental water encountered during drilling will be collected according to the RFI SAP and submitted for chemical analysis. The surface water/sediment location SC 24.19 is shown on Figure 3-2.

3.3.14 SWMU 32.1

Since all release potentials are low (see Section 3.2.2), no further action is recommended.

3.3.15 SWMU 32.2

Since all release potentials are low (see Section 3.2.2), no further action is recommended.

3.3.16 SWMU 32.3

Since all release potentials are low (see Section 3.2.2), no further action is recommended.

3.3.17 SWMU 32.4

Since all release potentials are low (see Section 3.2.2), no further action is recommended.

3.3.18 SWMU 32.5

Since all release potentials are low (see Section 3.2.2), no further action is recommended.

3.3.19 SWMU 32.6

Since all release potentials are low (see Section 3.2.2), no further action is recommended.

3.3.20 SWMU 32.8

Ten soil borings will be drilled around SWMU 32.8 at the locations shown on Figure 3-3. The surface water/sediment sampling station SC 32.8 shown on Figure 3-2 has been located to correspond with the overland or subsurface movement of contaminants in the same direction. A soil gas survey will also be conducted around the SWMU. Interstitial gas measurements will be performed according to the RFI SAP.

TABLE 3-1
RELEASE POTENTIAL FOR MEDIA PATHWAYS FROM IWTP SWMUS
(as indicated in RFA)

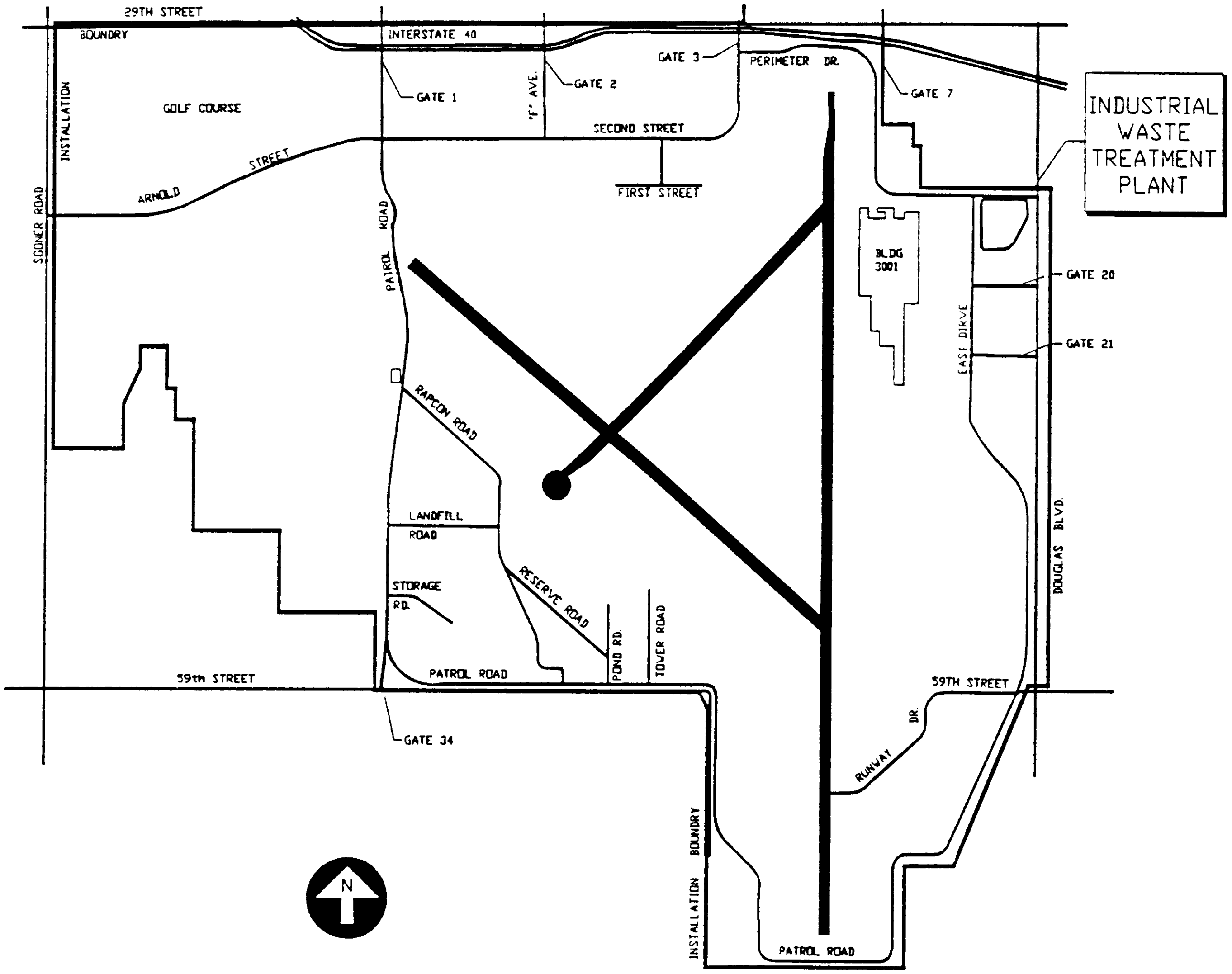
SWMU	Air	Soil	Groundwater	Surface Water	Soil Gas
24.1 Lift Station	H	L	L	L	L
24.2 Tanks D-1 & D-2	H	H	H	M	L
24.3 Oil Separator	H	H	H	M	L
24.4 Valve Vault	L	U	U	U	U
24.5 Equalization Basin	H	L	L	L	L
24.6 Main Flow Valve	L	U	U	U	U
24.7 Mixing Basins 1, 2, 3	H	L	L	L	L
24.8 Solids Clarifier	H	L	L	L	L
24.9 Wet Well Lift Station	H	L	L	L	L
24.10 Softener Basins	H	L	L	L	L
24.11 Activated Sludge Unit	H	L	L	L	L
24.12 Secondary Clarifier	H	L	L	L	L
24.19 Sludge Drying Beds	L	H	H	H	L

H = High, M = Moderate, L = Low, U = Unknown

TABLE 3-2
RELEASE POTENTIAL FOR MEDIA PATHWAYS FROM SWTP SWMUS
(as indicated in RFA)

SWMU	Air	Soil	Groundwater	Surface Water	Soil Gas
32.1 Parshall Flume	L	L	L	L	L
32.2 Flocculation Chamber	L	L	L	L	L
32.3 Primary Clarifiers	L	L	L	L	L
32.4 Trickling Filters	L	L	L	L	L
32.5 Final Clarifiers	L	L	L	L	L
32.6 Chlorine Contact Chamber	L	L	L	L	L
32.8 Drying Beds	L	H	H	M	H

H = High, M = Moderate, L = Low, U = Unknown

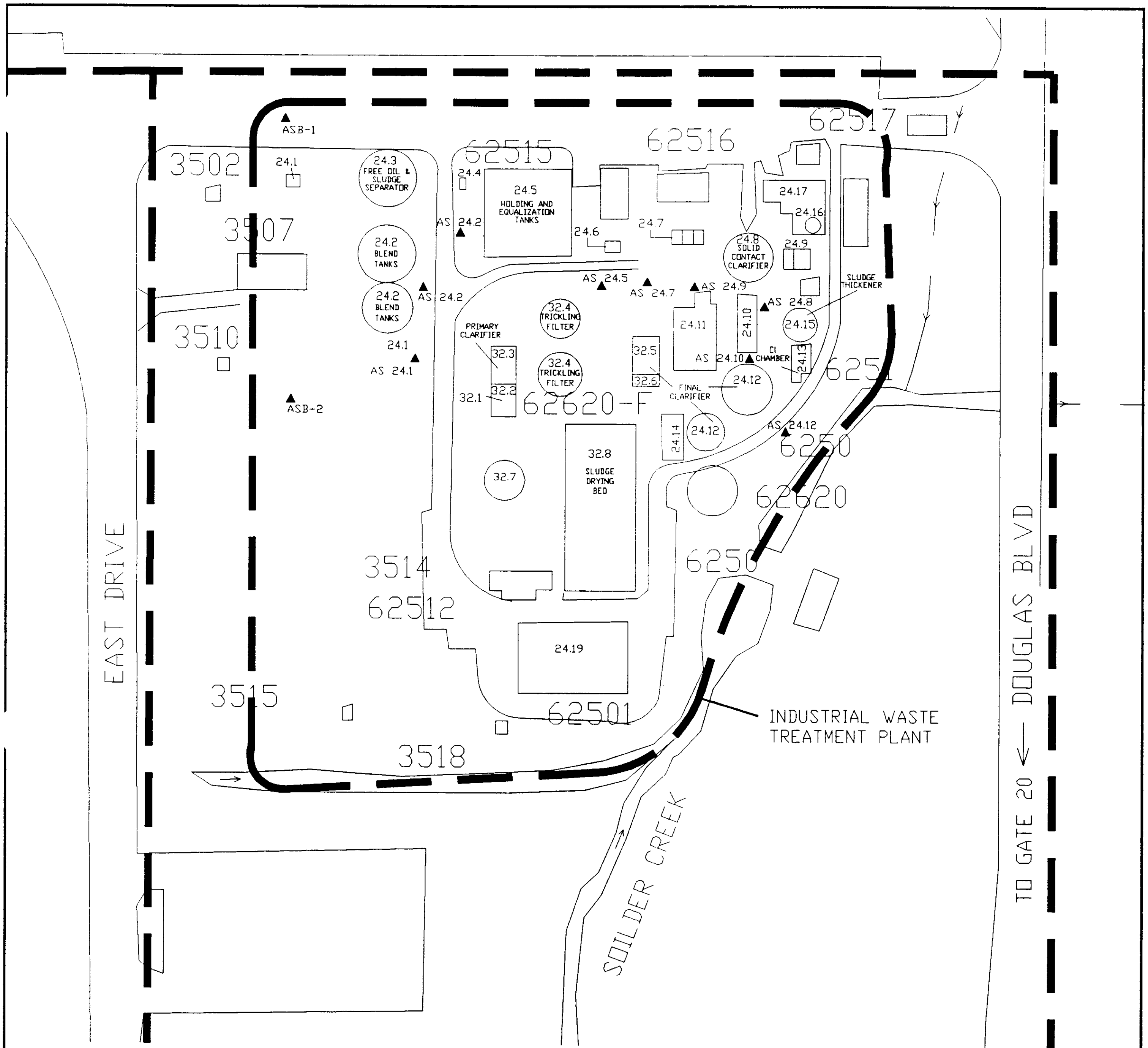


SITE MAP

SCALE OF FEET

2400′ 0′ 2400′ 4800′

TINKER AIR FORCE BASE RFI WORK PLAN	
LOCATION PLAN	
	Figure: 3-0 Date: 26NOV91 Filename: TINKSITE



INDUSTRIAL WASTE TREATMENT PLANT

Legend:

Sample Types

N

▲ AS (Air Sample)

SCALE OF FEET

0' 200' 400' 600'

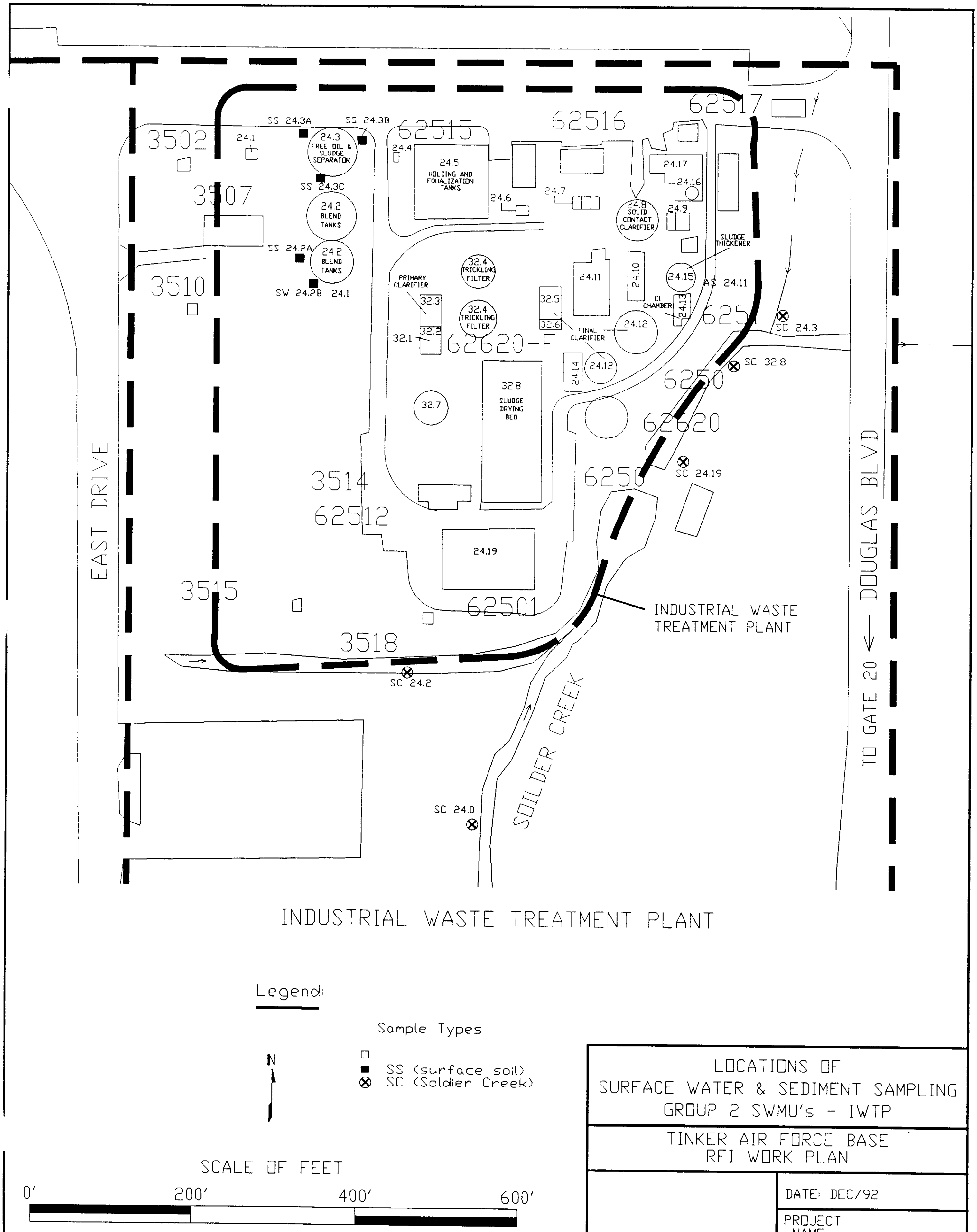
LOCATIONS OF AIR SAMPLING STATIONS
GROUP 2 SWMU's - IWTP

TINKER AIR FORCE BASE
RFI WORK PLAN

DATE: DEC/92

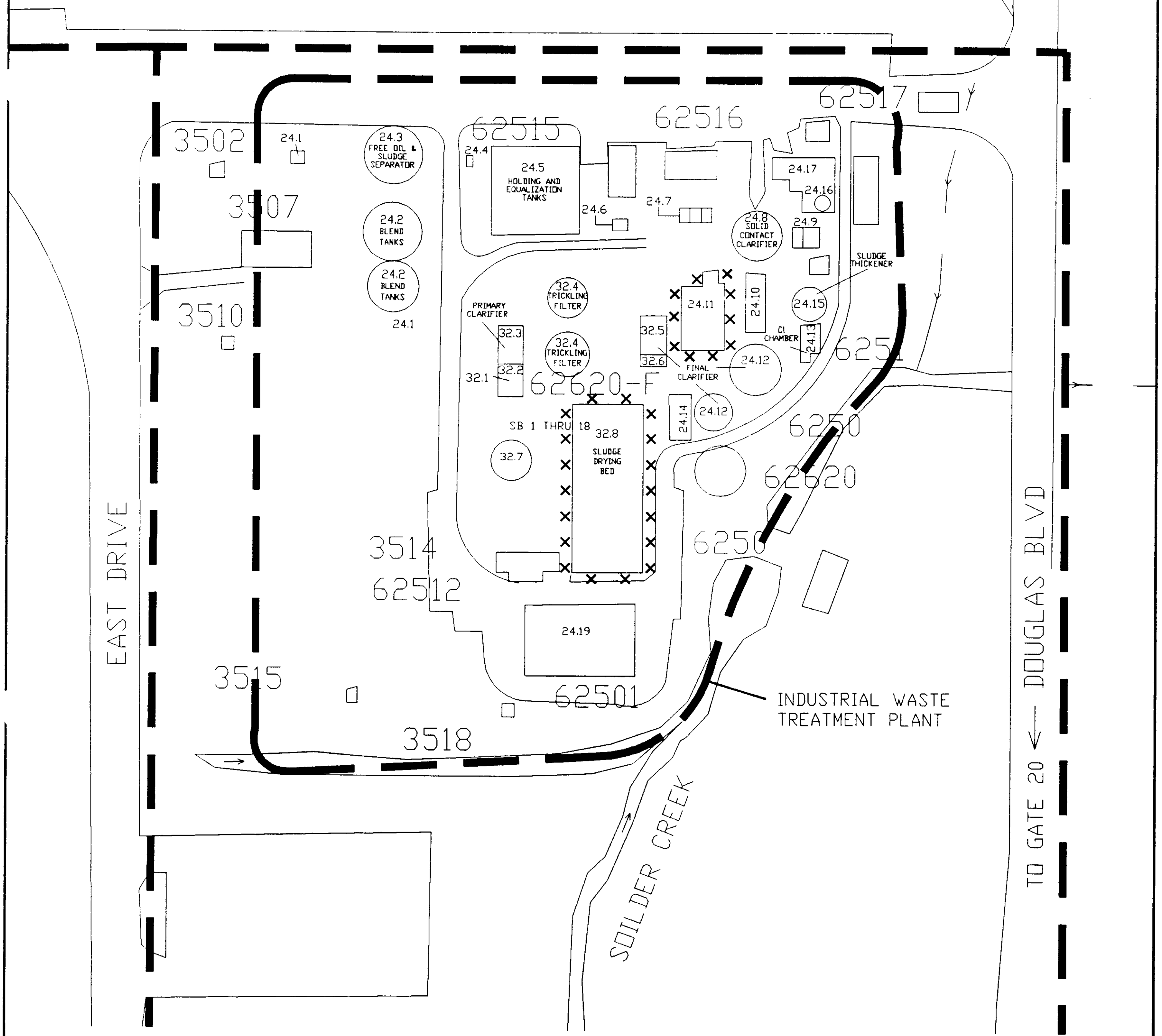
PROJECT NAME:

FIGURE: 3-1



INDUSTRIAL WASTE TREATMENT PLANT

LOCATIONS OF SURFACE WATER & SEDIMENT SAMPLING GROUP 2 SWMU's - IWTP	
TINKER AIR FORCE BASE RFI WORK PLAN	
	DATE: DEC/92
	PROJECT NAME:
	FIGURE: 3-2



INDUSTRIAL WASTE TREATMENT PLANT

Legend:

Sample Types

N

× SB (soil boring)

SCALE OF FEET

0' 200' 400' 600'

LOCATION OF SOIL BORINGS GROUP 2 SWMU's - IWTP	
TINKER AIR FORCE BASE RFI WORK PLAN	
	DATE: DEC/92
	PROJECT NAME:
	FIGURE: 3-3

4.0 GROUP 3 - MISCELLANEOUS SITES

Group 3 is comprised of two SWMUs identified in the RCRA permit: the Ordnance Disposal Area (number 26) and the Building 976 AFFF Fire Control Pond (number 40); one area of concern identified in the RCRA permit: the Old Pesticide Storage Area; and three additional SWMUs added by the Current Conditions Report: the Fuel Truck Maintenance Area, the Waste Fuel Dump Site, and the HCl Tank. These sites are "miscellaneous" sites grouped together for convenience sake only. They are not IRP sites. Each one will be investigated separately as described below. Environmental settings are discussed for each site, along with available background information, as appropriate.

The objective of the Group 3 investigations is to determine whether a release to the environment has occurred at each SWMU, and to preliminarily determine the nature and extent of the release. The RFA indicated that the potential for a release to soil and groundwater was high for the Ordnance Disposal Area and the Building 976 AFFF Fire Control Pond, and that the potential for a release to surface water was high for the Fire Control Pond (PRC, 1989). The RFA did not indicate the potential for a release to the environment at the area of concern. Based on the available information, it is likely that the potential for a release to any media from the Pesticide Storage Area may be low. Based on the history of the Fuel Truck Maintenance Area and Waste Fuel Dump Site, it appears that a release of contaminants to soil has already occurred, and it is likely that the potential for a release to groundwater is high. A release to soil has also occurred at the HCl Tank, and the potential for a release to groundwater may also be high.

PLAN OF INVESTIGATIONS

The following sections describe the plan of investigation for the Group 3 SWMUs. Included are the various components of the investigations, sampling strategy, and analytical parameters. Specifics of procedures, methods, and QA/QC are presented in the RFI SAP and QAPP.

A phased approach will be taken for the investigation of the Group 3 SWMUs. The investigations discussed below are Phase I investigations, the objective of which is to verify that a release occurred from the SWMUs. The objective of the Group 3 investigation is to determine whether a release to soil and groundwater occurred at each SWMU and to preliminarily determine the nature and extent of such a release. The data gathered during the Phase I investigations will be used to make a preliminary characterization of the nature and extent of the releases, their direction and rate of migration, and potential receptors. If necessary, more detailed characterization will be undertaken in a Phase II investigation of the Group 3 SWMUs.

Assumptions specific to the investigation of the Group 3 SWMUs are as follows:

- All wastes generated by the investigation, including excess borehole cuttings, will be drummed and disposed of off-site. The contractor(s) performing the investigation will be responsible for disposal.

- Accurate base maps will be available to identify underground utilities that may impact the placement of soil borings. Proposed locations will be modified as necessary. Clearance from base utilities personnel will be obtained prior to any drilling.

- Samples collected during the site investigation will be shipped to the analytical laboratory as "environmental samples".

4.1 SWMU 26 - ORDNANCE DISPOSAL AREA

4.1.1 BACKGROUND

According to the RFA, the Ordnance Disposal Area is located at the southeast end of the north-south runway, 150 feet east of Industrial Waste Pit number 1 (PRC, 1989). However, the IRP Phase I Records Search for Tinker AFB (Engineering Science, 1982) identifies an ordnance disposal area east of Industrial Waste Pit number 2. According to the RFA, the area was used as an ordnance burning pit and is located adjacent to an igloo-shaped protective bunker (PRC, 1989). Small arms munitions, blasting caps, flares, pyrotechnics, and egress items were burned in the pit. Burnings occurred between the early 1960s and 1972 at a frequency of less than once per month. The IRP Phase I Records Search (Engineering Science, 1982) shows the pit as a square measuring no more than 50 feet by 50 feet.

Although no visual evidence of a release at this site has been observed, the RFA indicates that the potential for a release to soil and groundwater is high (PRC, 1989). Conceptually, burning activities within the pit may have released contaminants (metals, organic compounds) to the surface soil. Depending on the infiltration characteristics of the unsaturated zone and the depth to groundwater in the area, contaminants may have migrated downward into the unsaturated zone and to the groundwater beneath the site.

The hydrogeologic setting for the Ordnance Disposal area will be similar to that of Industrial Waste Pits 1 and 2. The area is underlain by the Hennessey Formation. From 20 to 60 feet of clay/shale comprise the Hennessey Formation in this area, at Industrial Waste Pits 1 and 2, respectively (Radian Corporation, 1985 and U.S. Army Corps of Engineers, 1990a). The Hennessey Formation is underlain by sandstone interbedded with shale of the Garber-Wellington Formation.

Perched groundwater has been encountered sporadically in the clay zone extending from the ground surface to the consolidated shale at the two industrial waste pits (Radian Corporation, 1985 and U.S. Army Corps of Engineers, 1990a). Perched groundwater is encountered so infrequently in these areas that it is not considered a major aquifer in this area. Groundwater occurs in the regional Garber-Wellington aquifer in the sandstone below the Hennessey Formation shale. The depth to groundwater in the regional aquifer in this area ranges from 40 feet at Industrial Waste Pit 1 to 63 to 77 feet at Industrial Waste Pit 2 (Radian

Corporation, 1985 and U.S. Army Corps of Engineers, 1990a). Flow in the regional aquifer is to the southwest.

4.1.2 SITE INVESTIGATION

The media with the greatest potential to be contaminated by a release from this SWMU are soil and groundwater. The Phase I investigation will focus on soil, in order to determine if a release occurred. If necessary, groundwater beneath the site will be characterized in a Phase II investigation.

Specific activities are as follows:

- The location and dimensions of the burn pit will be determined by examination of aerial photographs, discussions with base personnel and examination of records. As much information as possible will be gathered on the operation of the site prior to the initiation of any field work. This will include information on the potential for unexploded ordnance (UXO) to be present and information regarding the fuel used in burning activities.

- A magnetic survey of the site will be conducted to locate possible surficial or buried ordnance or metal that might pose a safety risk and/or interfere with drilling activities. Magnetic procedures are discussed in the RFI SAP.

- Based on current available information that the pit is 250 square feet in area, five soil borings will be drilled in and around the pit. Four borings will be drilled within the pit and one boring will be drilled outside of the pit boundaries to provide information on background conditions. Preliminary locations for the borings are shown on Figure 4-1. These locations are subject to change based on visual examination of the site, historical aerial photos, geophysical results, and any other information. The locations are also subject to change based on the presence of buried utilities or other obstructions. The borings will be drilled using hollow stem auger methods described in the RFI SAP. The borings will be drilled to a depth of 5 feet beneath the site.

- A split spoon sampler lined with 6-inch long brass sleeves will be used to collect subsurface samples. In general, samples will be collected from the 0 to 1, 2 to 3, and 4 to 5-foot intervals below ground surface. However, these intervals may be modified depending on visual observations during drilling or measurements made during drilling with a PID. Split-spoon sampling is described in the RFI SAP.

- The three samples from each boring will be submitted to the laboratory for chemical analysis. The actual samples submitted to the laboratory may be modified in the field based on screening for the presence of volatile organic compounds using a PID or based on visual examination of the subsurface materials. Use of a PID is described in the RFI SAP.

- Each boring will be lithologically described and recorded on a Boring Log Form. This procedure is described in the RFI SAP.

- Due to the history of the site and as a result, the possible contaminants, samples submitted to the laboratory for chemical analysis will be analyzed for Target Compound List volatile organic compounds, semi-volatile organic compounds, and metals. Analytical methods are presented in the RFI SAP.

- One subsurface sample from the site will be submitted to a geotechnical laboratory for determination of particle size, vertical permeability, moisture content, cation exchange capacity and pH. Methods are presented in the SAP for the RFI.

4.2 SWMU 40 - BUILDING 976 AFFF FIRE CONTROL POND

4.2.1 BACKGROUND

According to the RFA, this SWMU is located 30 feet from the south edge of Building 976 in the AWACs Alert Facility (PRC, 1989). The pond measures 40 by 50 feet and was constructed with sloping concrete sides and a vegetated bottom that is clay lined. It is not known if the roots of the vegetation penetrate the clay liner. The pond was constructed in 1988 to temporarily contain fire suppression foam (AFFF) released within Building 976, the AWACs Alert Maintenance Hangar (PRC, 1989). Wash rack drains located in the hangar can transport the biodegradable foam to the pond. There it would be stored until it has degraded to the point where it can be released to drainage culverts that flow to Crutcho Creek (PRC, 1989).

There was a release of aircraft wash rack wastewater to the pond in April 1989 (PRC, 1989). The release occurred because the design of the hangar wash rack is not sufficient to always handle normal wash rack operations and flow rates. Normal wash rack operations should discharge to the industrial waste sewer system, but if the capacity of the sewer system is exceeded, wastewaters will discharge to the fire control pond. In April 1989, such a release caused the pond to fill completely and overflow into Crutcho Creek (PRC, 1989). The discharge was dammed up and captured downstream by Tinker AFB personnel. The wastewater may have contained small amounts of oil and grease.

The RFA indicates that the potential for a release to soil, groundwater, and surface water is high at this site (PRC, 1989). Conceptually, the release of the wastewater to the pond may have released contaminants directly to surface soils within the pond and to surface waters in Crutcho Creek. Depending on the permeability of the clay liner in the pond and the depth to groundwater in the area, contaminants may have migrated downward into the unsaturated zone and to the groundwater beneath the site. Contaminants may also have been released to sediments in Crutcho Creek.

The hydrogeologic setting for the Fire Control Pond is probably similar to that for Industrial Waste Pit 2 and Landfill 5. The area is underlain by the Hennessey Formation. From 10 to 60 feet of clay/shale comprise the Hennessey Formation in this area. The Hennessey is underlain by sandstone interbedded with shale of the Garber-Wellington Formation. Perched groundwater may be encountered in the Hennessey Formation; however it is not considered a major aquifer in this area. Groundwater occurs in the regional Garber-Wellington aquifer in the sandstone below the Hennessey Formation shale. The depth to groundwater in the regional aquifer in this area ranges from 63 to 77 feet. Flow in the regional aquifer is to the southwest.

4.2.2 SITE INVESTIGATION

The Phase I investigation for this SWMU will focus on determining the nature of the release to the pond and the nature and extent of possible surface soil contamination. Since only one release of possibly contaminated water to the pond occurred, it is unlikely that subsurface materials or groundwater contamination has resulted.

Specific activities are as follows:

- The site will be visually examined for stressed vegetation, etc. The location of where the April 1989 release was dammed up, the discharge of the release, and the location of the drainage(s) to Crutcho Creek will be determined by discussion with base personnel and evaluation of records. After the site is inspected, precise locations for surficial soil samples will be determined.

- Unless chemical analyses are available or operations information indicates what contaminants may be of concern, a sample of wash rack wastewater will be collected and analyzed for Target Compound List volatile and semi-volatile organic compounds, metals, and oil and grease. (It is assumed that a sample of current wash rack wastewaters will be representative of past wash rack wastewaters). Procedures for collection of the wastewater sample are included in the RFI SAP. Analytical methods are presented in the RFI SAP.

- Surficial soils and sediments (0 to 18 inches, unless it is necessary to collect a deeper sample using a hand auger to obtain a representative sample) from the pond bottom (assuming it is empty), drainage ditch(es) (if not concrete), and Crutcho Creek (as far as the release progressed), will be collected for chemical analysis. The procedures for collecting surficial soil/sediment samples are presented in the RFI SAP. The number of surficial soil samples will depend on the visual examination of the site. It is presently estimated that four samples will be collected from the pond bottom, two samples will be collected from the drainage ditch leading to the creek, and two samples will be collected from Crutcho Creek. Each surficial sample will be a composite of three subsamples collected in a specific sampling area, as outlined in the RFI SAP. The number of samples may change as a result of visual observation of staining or stressed vegetation, based on the length of drainage ditch(es) and Crutcho Creek that was involved in the release, and/or based on the actual discharge in the ditch and creek at the time of the release. Sediment samples will be collected from those points in the drainages where accumulation of sediments is likely.

- Soil/sediment samples submitted to the laboratory for chemical analysis will be analyzed for those compounds deemed to be relevant after the chemical composition of the wastewater is determined.

4.3 AREA OF CONCERN - OLD PESTICIDE STORAGE AREA

4.3.1 BACKGROUND

The Old Pesticide Storage area is located in Building 1005 north of Fire Training Area number 1, at the inactive Sewage Treatment Plant on the west side of the base (PRC, 1989). Pesticides were formerly stored and mixed in the building, which is a 30 by 60 foot concrete block structure with a concrete floor. According to the RFA, no pesticides are currently stored or mixed at this location (PRC, 1989).

It is not known whether any releases to the environment occurred at this site. Since the pesticides were apparently contained in a concrete building with a concrete floor, the potential for a release to any media would have been extremely low.

The environmental setting for this site would be similar to that of Fire Training Area number 1. Fire Training Area number 1 was the subject of a remedial investigation (U.S. Army Corps of Engineers, 1990b).

4.3.2 SITE INVESTIGATION

The Phase I investigation of this area of concern will focus on determining whether a release form the storage area occurred. Specific activities are as follows:

- The storage building and surrounding area will be visually inspected for staining. The topography around the building will be evaluated to determine the potential fate of any spills.

- The history of the storage area will be evaluated by interviews with base personnel and evaluation of records. Information on the operation of the storage area and spill history will be gathered and evaluated as best as possible.

- No soil sampling will be conducted until the initial Phase I investigation is completed.

4.4 FUEL TRUCK MAINTENANCE AREA

4.4.1 BACKGROUND

The Fuel Truck Maintenance Facility is located at Building 2110 in the southeastern part of the base. Building 2110 is located east of Industrial Waste Pit 1, about 980 feet west of Douglas Boulevard.

Building 2110 houses the fuel truck maintenance and repair facility. It is a metal building, about 40 by 80 feet in area, with separate bays for mechanical repairs and cleaning of the fuel tanks. The floor of the building is concrete and slopes inward to a drainage trench extending the length of the building. The trench leads to a lift station from where liquids are pumped to a sewer line that leads to the IWTP.

This facility has been operational since at least 1975. When a truck is brought into the facility, the contents of its tank are dumped and channelled through the trench to the lift station. The tank, hose, truck body, and engine parts are then washed clean. Rinse water flows over the floor to the trench and drains to the lift station. When the lift station nears capacity, oil and fuel are skimmed from the surface, pumped to a holding tank, and later disposed. Remaining water is pumped to the IWTP. The lift station is to be replaced by an oil-water separator.

The floor of Building 2110 consists of several separately poured concrete slabs with grout in the gaps between the slabs. Visual examination has indicated that the grout is absent in several places. There are also cracks in the concrete slabs. Releases to soil have occurred as seepage through the cracks and gaps in the floor.

During construction operations in Building 2110 in November 1990, soil and water contamination was discovered under the concrete floor. As trenches were being dug to install new drains, water mixed with diesel oil and JP-4 aircraft fuel began to flow into the trenches from the soil under the floor. Apparently wash water containing oil and fuel has been seeping into and accumulating in the soil beneath the building. Operations at the building were terminated upon discovery of the release and remained so until recovery was completed. Oil and fuel were skimmed from the water surface in the trenches and pumped to the holding tank for disposal. Fifteen gallons of oil/fuel were recovered. The water in the trenches was pumped to a sewer line leading to the IWTP. Seven hundred gallons of water were removed before seepage into the trenches ceased.

There has obviously been a release of contaminants to the soil beneath the building. Depending on the permeability of the unsaturated zone and the depth to groundwater, contaminants may have migrated downward to groundwater beneath the site.

The hydrogeologic setting for the Fuel Truck Maintenance Area is probably similar to that of Industrial Waste Pit 1. The area is underlain by about 20 feet of clay/shale comprising the Hennessey Formation (Radian Corporation, 1985). The Hennessey Formation is underlain by sandstone of the Garber Wellington Formation.

Perched groundwater may be encountered in the shallow clay materials above the shale in this area (Radian Corporation, 1985). Groundwater occurs in the regional Garber Wellington aquifer in the sandstone below the Hennessey Formation shale. The depth to groundwater in the regional aquifer in this area is about 40 feet (Radian Corporation, 1985). Flow in the regional aquifer is to the southwest.

4.4.2 SITE INVESTIGATION

The media most likely to be contaminated at this SWMU are soil and groundwater beneath the building. It is already known that contaminants have been released to soil beneath the building; depending on the depth to groundwater, contaminants may have also migrated through the unsaturated zone to groundwater beneath this SWMU. The Phase I investigation will focus on soil and groundwater.

Specific activities are as follows:

- The concrete floor, drainage trenches, lift station, and holding tank will be visually inspected for staining, cracks, gaps between slabs, etc. Based on the inspection, soil sampling locations will be determined.

- For purposes of this Work Plan, it is preliminarily estimated that eight soil borings will be drilled inside the building, beneath the floor at locations of cracks, gaps, and stains. Three additional borings will be located outside the building, one upgradient and two downgradient. These three outside borings will be made into groundwater monitoring wells. Preliminary locations for the borings are shown on Figure 4-2. Locations are subject to change based on visual examination of the site and the presence of buried utilities or other obstructions. The borings will be drilled using hollow stem auger methods described in the RFI SAP. The outside boreholes, which are to be drilled into the regional aquifer, will be advanced using air rotary drilling methods, also described in the SAP. Procedures for advancing the boreholes through the concrete floor are also described in the RFI SAP. The building borings will be drilled to a depth of 10 feet beneath the building, which should be well into the Hennessey shale formation.

- A split spoon sampler lined with 6-inch long brass sleeves will be used to collect subsurface material samples. It is anticipated that five samples will be collected from each borehole located beneath the building and the upgradient boring. In general, samples will be collected at 2-foot intervals (starting just below the building); however specific sampling intervals will be determined in the field based on visual observations of subsurface materials made during drilling, screening for the presence of volatile organic compounds during drilling using a PID, and any occurrence of perched groundwater (if perched groundwater is encountered, a sample will be collected from just above the water table in order to provide information on the possibility of groundwater contamination). Split spoon sampling and use of a PID are described in the RFI SAP.

- The samples from each boring will be submitted to the laboratory for chemical analysis. Due to the presence of fuel at the site, the samples will be analyzed for aromatic volatile organic compounds, total petroleum hydrocarbons and Target Compound List metals. Analytical methods are presented in the RFI SAP.

- Each boring will be lithologically described and recorded on a Boring Log form. This procedure is described in the RFI SAP.

- One subsurface material sample from beneath the building and one from the upgradient monitoring well boring will be submitted to a geotechnical laboratory for determination of particle size, vertical permeability, moisture content, cation exchange capacity and pH. Methods are described in the RFI SAP.

- If shallow perched groundwater is encountered beneath the building, monitoring wells will be constructed in the soil borings to provide information on possible groundwater contamination beneath the building. The wells will be completed in the perched aquifer, and screened as appropriate. If perched groundwater is encountered beneath the building, three additional monitoring wells will be installed in the perched aquifer outside the building, one upgradient, and two downgradient of the building, in order to provide additional information on groundwater contamination associated with the facility. Subsurface materials in these outside borings will not be sampled for chemical analyses. Procedures for monitoring well completion and development are presented in the RFI SAP.

- Three monitoring wells will be completed in the regional Garber-Wellington aquifer, up and down gradient of the maintenance area. The borings for the wells will be drilled to a depth of approximately 50 feet, and completed in sandstone of the regional aquifer. These boreholes will be advanced by auguring to 10 feet, and by air rotary drilling to total depth. These wells will provide information on background and downgradient contaminant conditions in the regional aquifer. Depending on the severity and depth of soil contamination beneath the building and the presence/absence of contamination in any perched groundwater, monitoring wells may be installed in the regional aquifer beneath the building in a Phase II investigation. The three outside monitoring well borings will be logged lithologically. The first 10 feet of the upgradient boring will be sampled as described previously. The downgradient borings will not be sampled for chemical analyses because it is unlikely that shallow soils outside the building have been impacted by contaminant release beneath the building.

- The up and down gradient monitoring wells will be screened no more than 10 feet in the regional aquifer. Procedures for monitoring well completion and development are presented in the RFI SAP.

- Depth to groundwater and free product (if present) will be measured in all monitoring wells. Procedures for making such measurements are outlined in the RFI SAP.

- Each monitoring well will be sampled for chemical analysis according to procedures presented in the RFI SAP. Since fuel has been released at the site, samples will be analyzed for aromatic volatile organic compounds, total petroleum hydrocarbons and Target Compound List metals. Analytical methods are included in the RFI SAP.

4.5 WASTE FUEL DUMP SITE

4.5.1 BACKGROUND

The Waste Fuel Dump Site is located in the east central part of Tinker AFB, about 400 feet southwest of Building 2121 and about 2,000 feet west of Douglas Boulevard. The site is situated 500 feet northeast of Industrial Waste Pit Number 1.

The Waste Fuel Dump Site operated between 1975 and October 1990. The site was a holding facility for JP-4 and JP-5 fuel that had been drained from tanks of aircraft that were undergoing maintenance and repair. The drained fuel was ultimately disposed of or sold for energy recovery.

The operation involved transfer of fuel from a truck into a rectangular metal bunker about 6 feet by 8 feet by 2 feet deep. The bunker sat entirely above ground on 1.5-foot high metal posts. An overflow port, designed to allow the dumped fuel to settle, lead into a pipe that extended down a moderate slope about 200 feet to two above ground horizontal, cylindrical holding tanks. Approximately one-third of the pipe length was buried underground.

The metal bunker and tanks were located on bare soil. The bunker was immediately adjacent to an asphalt pad about 60 by 80 feet in area. A steel ramp sat on the edge of the asphalt pad adjacent to the metal bunker. Truck loaded with fuel would be driven onto the ramp and hoses extended to the bunker in order to dump the fuel. This operation was sometimes carelessly performed resulting in spills around the metal bunker and onto the asphalt pad where the spilled fuel would flow off and into adjacent soil.

Operations at this facility ceased in October 1990. Equipment was dismantled and moved off-site so that construction to upgrade the facility could begin. Plans were made to remove the asphalt pad and obviously contaminated soil, to pour a concrete ramp for the trucks, and to install proper spill containment for the bunker and tanks.

Soil Investigations

In support of upgrading the facility, 11 boreholes were drilled to a depth of 10 feet in the vicinity of the bunker (see Figure 4-3). Soil samples from just below the surface and at two-foot intervals were collected from each boring for analysis of aromatic volatile organic compounds, total petroleum hydrocarbons and lead. It was found that the extent of contamination was much larger than previously believed. An additional five boreholes were drilled and sampled to a depth of 4 feet in the same area (see Figure 4-3).

Although most contamination was generally observed in near surface soil samples, deeper contamination (to 10 feet in several borings) by organic compounds was indicated in samples from borings BH-3, BH-4, (the 8 to 10-foot interval only), BH-6, BH-7, BH-9, BH-11, BH-14, and BH-15. These results, along with preliminary contaminant contour maps, can be found in the Current Conditions report recently submitted to EPA. The extent of soil contamination was not fully delineated based on the results of this investigation.

Groundwater Investigations

Groundwater conditions in the area of the Waste Fuel Dump Site have not been evaluated. There is a water supply well (WS 22) located about 500 feet east of the site. This well was last sampled in January 1990. Concentrations of all organic compounds were below drinking water standards at that time.

Removal

Contaminated soil in the Bunker area was removed in June 1991 to a depth of 12 feet in an area 22 feet by 36 feet (see the Current Conditions report for the location of the area of soil removal). Five soil samples were collected from the bottom of the excavation and analyzed for indicator organic compounds. Contamination by total petroleum hydrocarbons and aromatic volatile organic compounds was still found to exist at this depth at all locations sampled in the removal area. These chemical results are provided in Attachment 1.

Environmental Setting

The hydrogeologic setting for the Waste Fuel Dump Site is likely similar to that of Industrial Waste Pit Number 1. The area is underlain by about 20 feet of clay/shale comprising the Hennessey Formation (Radian Corporation, 1985). The Hennessey Formation is underlain by sandstone of the Garber-Wellington Formation.

Perched groundwater may be encountered in the shallow clay materials above the shale in this area (Radian Corporation, 1985). Groundwater occurs in the regional Garber Wellington aquifer in the sandstone below the Hennessey Formation shale. The depth to water in the regional aquifer in this area is about 40 feet (Radian Corporation, 1985). Flow in the regional aquifer is to the southwest.

Water in usable quantities at Tinker AFB is usually found at depths exceeding 200 feet. The base producing wells (including WS 22) are typically screened at depths between 250 and 700 feet below ground surface.

Release Potential

Based on the investigation results to date at the Waste Fuel Dump Site, it is apparent that a release of contaminants to soil has occurred. Contaminants have been released to soil by spills from trucks in the bunker area. It is also possible (but unknown at this time) that contaminants were released to soils by leaks along the pipeline leading to the two holding tanks and/or by leakage from the holding tanks or spills during transfer operations at the holding tanks. Depending on the permeability of the unsaturated zone and the depth to groundwater in the area, contaminants may have migrated downward to groundwater beneath the site.

4.5.2 SITE INVESTIGATION

The media most likely to be contaminated at this SWMU are soil and groundwater. It is already known that contaminants have been released to soils in the area; depending upon the permeability of the unsaturated zone and the depth to groundwater, contaminants may have also migrated to groundwater. Given the work that has already been completed at the site, the following site investigation is a continuing Phase I investigation, which will focus on soil and groundwater. It is not yet considered a Phase II investigation because judgmental sampling is still being proposed to define the nature and extent of soil contamination, and also because no groundwater has been sampled. The investigation is divided into three parts as follows:

1. Bunker area
2. Pipeline and Holding Tank areas
3. Groundwater.

Specific activities are as follows for each component of the investigation.

<u>Bunker Area</u>

- Contaminated soils were removed to a depth of 12 feet inside a 22 by 36-foot area (see the Current Conditions report for location of soil removal). Based on sampling performed following the removal, it appears that soil contamination extends deeper than 12 feet. The depth of soil contamination should be verified by sampling subsurface materials in the most contaminated areas to a depth of 20 feet. Five borings will be drilled near existing borings BH-14, BH-11 and BH-15, and near the location of the east removal area soil sample and the west removal area soil sample (removal area sample locations are identified with the letter R on Figure 4-3). The borings will be located in the area of soil removal to evaluate the depth of contamination in this area. The locations of these borings are shown on Figure 4-3.

- The lateral extent of soil contamination will be further delineated by drilling and sampling soil borings located outside the area of proposed soil removal and areas already known to be contaminated. The purpose of this sampling is to further delineate the extent of soil contamination at this site, based on existing soil data and observations made to date. A total of 32 boreholes is proposed, as shown on Figure 4-3. The purpose of the borings and proposed depths are summarized on Table 4-1. Additional locations may be identified based on visual inspection of the site. All locations are subject to change based on visual examination of the site and the presence of buried utilities or other obstructions.

- Borings will be drilled using hollow stem auger methods described in the RFI SAP.

- A split spoon sampler lined with 6-inch long brass sleeves will be used to collect subsurface material samples. The minimum number of samples anticipated to be collected from each borehole is shown on Table 4-1. In general, samples will be collected from just below the surface followed by 2-foot intervals; however, specific sampling intervals will be determined in the field based on visual observations of subsurface materials, screening for volatile organic compounds using a PID, and any occurrence of perched groundwater (if perched groundwater is encountered, a sample will be collected from just above the water table to evaluate the potential for groundwater contamination). Split spoon sampling and use of a PID are described in the RFI SAP. For the borings located in the soil removal area, samples will be collected at depth, from the 10 to 12, 13 to 15, 16 to 18, and 19 to 20-foot intervals, to verify the depth of contamination in this area.

- The samples from each boring will be submitted to the laboratory for chemical analysis. Since a release of fuel has occurred at the site, the samples will be analyzed for aromatic volatile organic compounds, total petroleum hydrocarbons and Target Compound List metals. Analytical methods are presented in the RFI SAP.

- Each boring will be lithologically described and recorded on a Boring Log form. This procedure is described in the RFI SAP.

- Three samples will be submitted to a geotechnical laboratory for determination of particle size, vertical permeability, moisture content, cation exchange capacity, and pH. Methods are described in the RFI SAP.

Pipeline and Holding Tank Areas

It is not presently known whether any contaminant releases occurred in these areas. The Phase I investigation consists of the following:

- The pipeline and holding tank areas will be visually inspected for evidence of any contaminant releases. The history and use of these areas will be investigated as much as possible through interviews with base personnel and examination of records. Based on this information, exact soil sampling locations will be determined.

- It is estimated that six shallow soil borings will be drilled and sampled in this area, two along the pipeline, and two near each holding tank. The locations of these proposed boreholes are shown on Figure 4-4. The borings will be drilled to a depth of 5 feet, and soil samples will be collected for chemical analysis. The resulting data will provide a preliminary characterization of the nature and extent of any releases in these areas. Additional locations may be identified based on visual examination of the site. All locations are subject to change based on visual examination of the site and the presence of buried utilities or other obstructions. Borings will be drilled using hollow stem auger methods described in the RFI SAP.

- Samples will be collected as described previously. In general, samples will be collected from just below the surface followed by 2-foot intervals. It is anticipated that three samples will be collected from each borehole. Specific sampling intervals will be determined in the field based on visual observations, PID screening, and any occurrence of perched groundwater. Sampling methods are presented in the RFI SAP.

- Samples will be analyzed for aromatic volatile organic compounds, total petroleum hydrocarbons, and Target Compound List metals.

- Each boring will be lithologically described as presented in the RFI SAP.

Groundwater

Groundwater has not been evaluated at the Waste Fuel Dump Site. The Phase I investigation will focus on determining whether a contaminant release to groundwater has occurred in the bunker area.

- Four monitoring wells will be installed in borings drilled in the bunker area at the locations shown on Figure 4-3. One well will be located upgradient of the site, and three will be located downgradient of the site near the locations of existing soil borings with deep occurrences of contamination (near BH-3, between BH-7 and 9, and near BH-11). These wells will be screened in the perched aquifer, assuming one exists in this area. Procedures for monitoring well completion and development are presented in the RFI SAP.

- Two additional borings (at an upgradient location and a downgradient location between BH-7 and BH-9; see Figure 4-3) will be drilled into the regional aquifer and completed as monitoring wells. These borings will be drilled to a depth of approximately 50 feet, and completed as monitoring wells in sandstone of the regional aquifer. The boreholes will be advanced by auguring to 10 feet, and by air rotary drilling to total depth. The wells will provide information on background and downgradient contaminant conditions in the regional aquifer. The deeper borings will be logged lithologically, but subsurface materials from the borings will not be sampled for chemical analyses. The wells will be screened no more than 10 feet in the regional aquifer. Procedures for monitoring well completion and development are included in the RFI SAP.

- Depth to groundwater and free product (if any) will be measured in all monitoring wells. Procedures for making such measurements are described in the RFI SAP.

- Each monitoring well will be sampled for chemical analysis according to procedures presented in the RFI SAP. Samples will be analyzed for aromatic volatile organic compounds, total petroleum hydrocarbons, and Target Compound List metals. Analytical methods are presented in the RFI SAP.

- Additional monitoring wells may be necessary in a Phase II investigation, based on the results of the Phase I investigation.

4.6 HCL TANK

4.6.1 BACKGROUND

The HCl Tank is located in the Building 3001 Electroplating Facility at Column G-54. This is in the southwestern part of Building 3001 near door 17. The tank which is the subject of this investigation was an 8-foot diameter, 14-foot high steel shell, rubber lined vessel. The tank stored HCl used in process operations. The 4,000-gallon tank was located in a concrete containment area with associated piping and pumps.

A release from the HCl tank was observed on December 12, 1990. Apparently a check plate on the tank ruptured. Some of the HCl released leaked through a hole eroded into the concrete containment area into the underlying soil. The HCl which leaked into the soil underlying the containment area eventually flowed laterally into a nearby electrical system conduit as evidenced by the presence of HCl in manholes associated with the electrical system. Lateral flow into the electrical tunnel was also subsequently confirmed by a dye test performed on December 27, 1990. It was estimated that 540 gallons of HCl were lost to the electrical conduit. An unknown amount of HCl was lost to the soil under the tank and/or under the electrical conduit.

The acid spill was neutralized with soda ash, and the remaining HCl in the tank was drained to the IWTP. The electrical conduit was also neutralized. Both the electrical system and HCl tank and associated equipment were replaced. Soil under the tank was found to be contaminated to a depth of six inches. The contaminated soil was excavated and placed into eight barrels for disposal on February 6, 1991.

Environmental Setting

This area of Building 3001 is underlain by interbedded sandstones, siltstones, and shales of the Garber-Wellington Formation. Typically in this area, unconsolidated sand, silt, and clay grade into a sandstone that extends to a depth of 25 to 40 feet below ground surface (U.S. Army Corps of Engineers, 1988). The thickness of the unconsolidated deposits ranges from 6 to 16 feet in the vicinity of the HCl tank. Below the sandstone occurs a shale layer that separates an upper perched aquifer from a lower regional aquifer in the Garber-Wellington Formation.

A perched groundwater system occurs in the upper sandstone and unconsolidated materials. The depth to groundwater in this system is typically 15 feet in the area of the HCl tank (U.S. Army Corps of Engineers, 1988). The direction of groundwater flow in the perched aquifer is to the west-southwest in this area.

Release Potential

A contaminant release from the HCl tank occurred in December 1990. It is known that a great deal of the release flowed via a hole in the containment area laterally through the soil just under the building floor into an electrical conduit. This was verified by soil sampling which showed contamination only in the top six inches of soil below the tank, by observation of acid in the electrical conduit, and by a dye test. However, soil sampling beneath the tank only occurred to a depth of three feet. Given the greater density of HCl as compared to water, there is a possibility that some of the acid released migrated further downward into the subsurface materials of the unsaturated zone. It is also possible that shallow groundwater may have been impacted. Also, there is the potential that HCl leaked out of the electrical conduit through cracks etc. into underlying subsurface materials.

4.6.2 SITE INVESTIGATION

The media most likely to be contaminated at this SWMU are soil and possibly, groundwater. It is already known that contaminants have been released to soils; depending upon the depth to groundwater and permeability of the unsaturated zone, contaminants may have also migrated to groundwater. The following Phase I site investigation is focused on soil. If necessary, groundwater will be evaluated in a Phase II investigation.

Specific activities are as follows:

- Unsaturated zone materials beneath the HCl tank containment area and the affected electrical conduit will be sampled to a depth of approximately 15 feet (the presumed depth to groundwater). Two borings will be located at the HCl Tank, near the location where the release flowed into the soil, and four borings will be located along the 150-foot electrical conduit. The purpose of sampling at these locations is to evaluate the potential depth of contamination associated with the December 1990 release. The borings along the electrical conduit will be located after a review of available information concerning the potential for leakage from the conduit. Additional boreholes may be required based on visual inspection of the site and discussion with base personnel. All locations are subject to change based on visual examination of the site and the presence of buried utilities or other obstructions.

- Borings will be drilled using hollow stem auger methods described in the RFI SAP. Procedures for drilling through concrete are also included in the SAP.

- A split spoon sampler lined with 6-inch long brass sleeves will be used to collect subsurface material samples. It is anticipated that samples will be collected from just below the building floor or conduit, followed by 2-foot intervals to groundwater. Thus, approximately seven samples will be collected from each borehole. Specific sampling intervals will be determined in the field based on visual observations of subsurface materials and the occurrence of perched groundwater. An attempt will be made to collect a sample from just above the water table to evaluate the potential for groundwater contamination. Split spoon sampling is described in the RFI SAP.

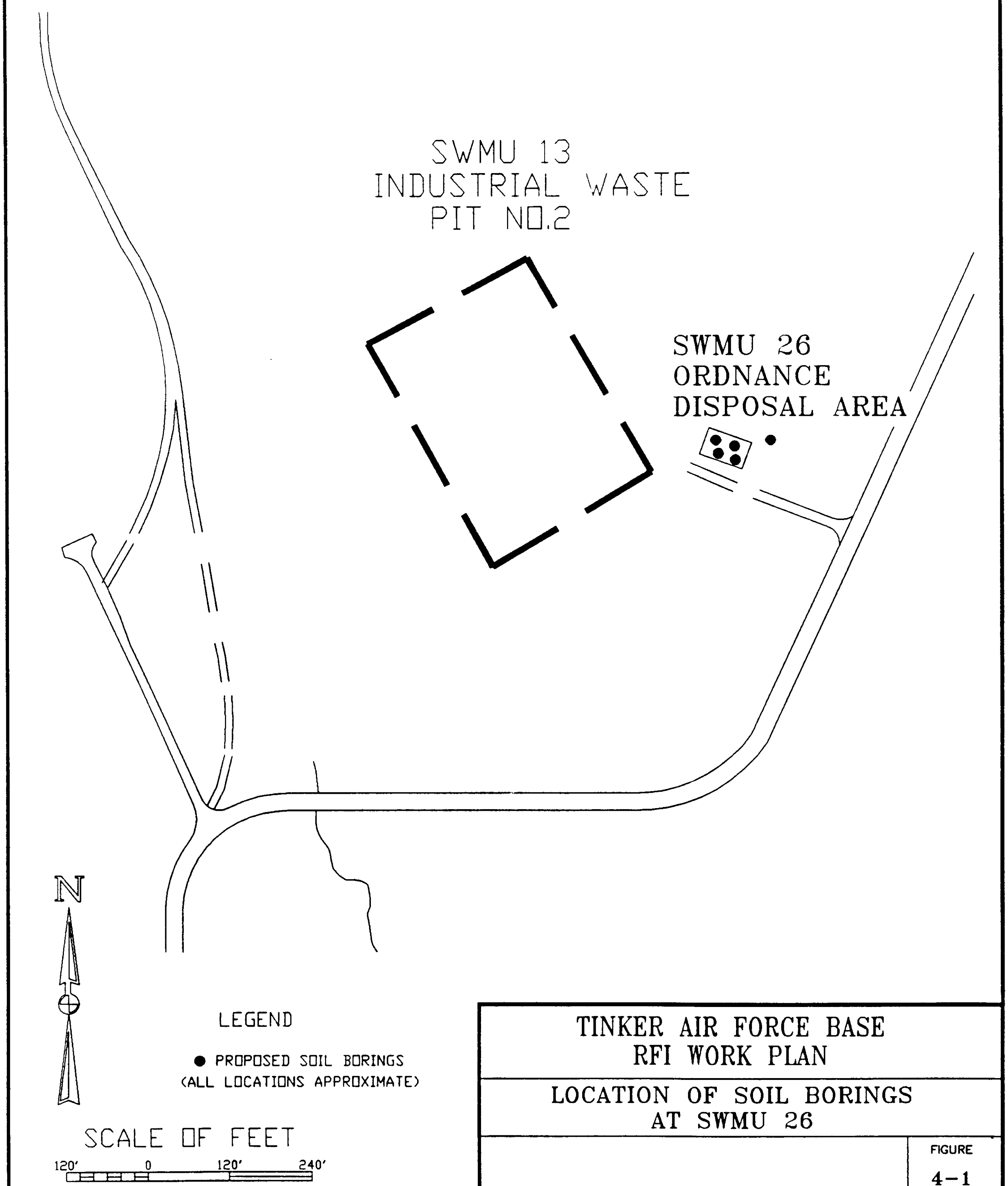
- The samples from each borehole will be submitted to the laboratory for chemical analysis. Since HCl is the contaminant of concern at this site, The samples will be analyzed for pH, chloride, and metals. Analytical methods are presented in the SAP.

- Each boring will be lithologically logged in accordance with procedures specified in the RFI SAP.

- Two soil samples will be submitted to a geotechnical laboratory for determination of particle size, vertical permeability, moisture content and cation exchange capacity. Methods are described in the RFI SAP.

TABLE 4-1
Proposed Bunker Area Soil Borings
Purpose and Depth

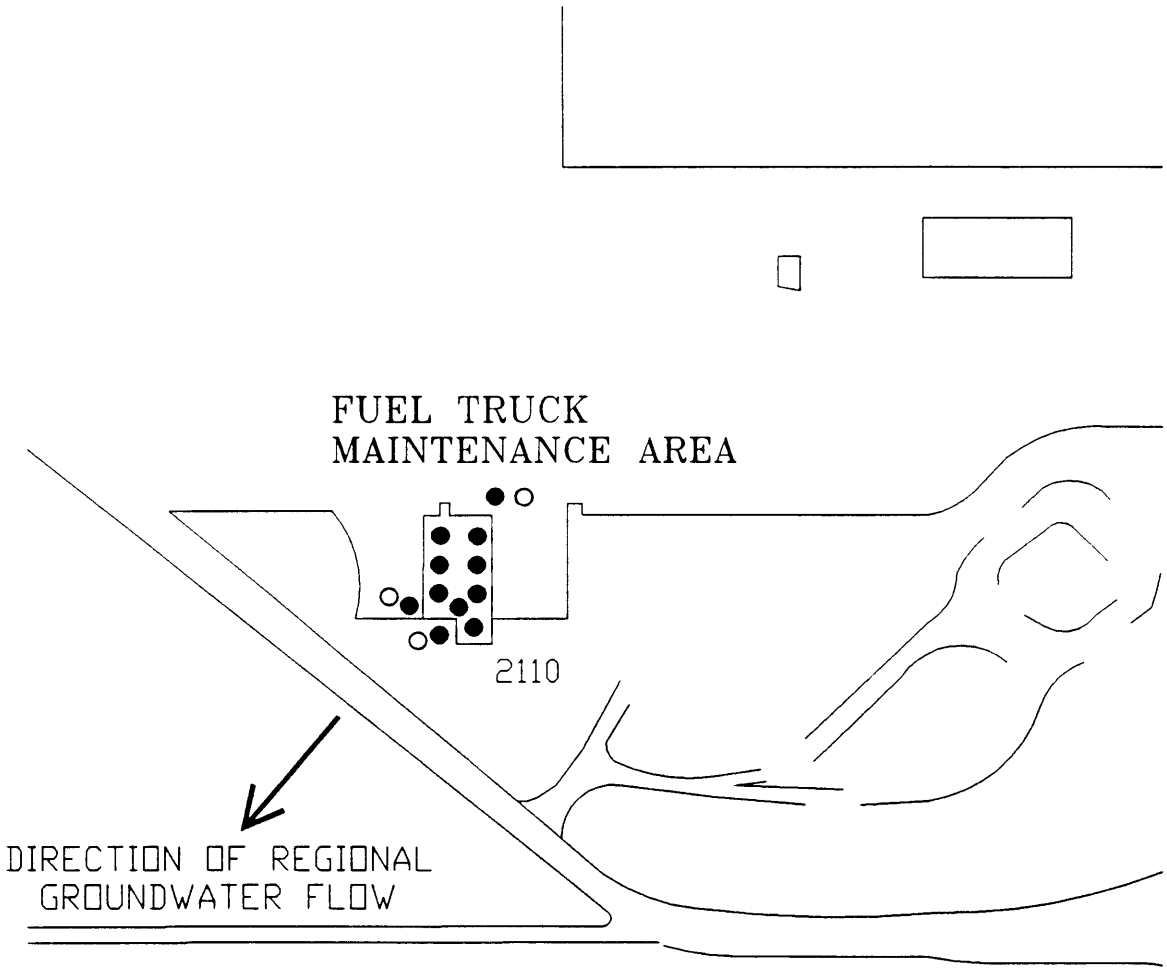
Location	Number	Depth (feet)	Purpose	Number of Samples from each Boring
Near BH-11, BH-14, BH-15, east removal area sample, and west removal area sample	5	20	Verify depth of contamination in soil removal area	4
Near BH-6	3	12	BH-6 showed contamination to 10 feet. Delineate extent between BH-6 and BH-2 which showed no contamination.	6
Between BH-6 and BH-5	1	12	Delineate contamination outside soil removal area.	6
Near BH-5	3	6	BH-5 showed shallow contamination only. Delineate extent between BH-5 and BH-2.	3
Northeast portion of site	3	10	Delineate contamination upgradient and outside soil removal area in area with no previous data.	5
Near BH-10	3	6	BH-10 showed shallow contamination only. Delineate extent.	3
Near BH-1	3	4	BH-1 showed surface contamination only. Delineate extent.	2
Near BH-8	3	4	BH-8 showed surface contamination only. Delineate extent.	2
Near BH 3, 7, and 9	9	12	These borings showed contamination to 10 feet. Delineate extent between them and BH-13 and BH-16, which showed no contamination.	6
Near BH-12	3	4	These borings showed surface contamination. Delineate extent.	2
Near BH-4	1	12	Verify data for BH-4 that only showed contamination at depth.	6



TINKER AIR FORCE BASE
RFI WORK PLAN

LOCATION OF SOIL BORINGS
AT SWMU 26

FIGURE
4-1



N

LEGEND

● PROPOSED SOIL BORINGS / SHALLOW MONITORING WELLS

○ PROPOSED REGIONAL AQUIFER MONITORING WELLS

(ALL LOCATIONS APPROXIMATE)

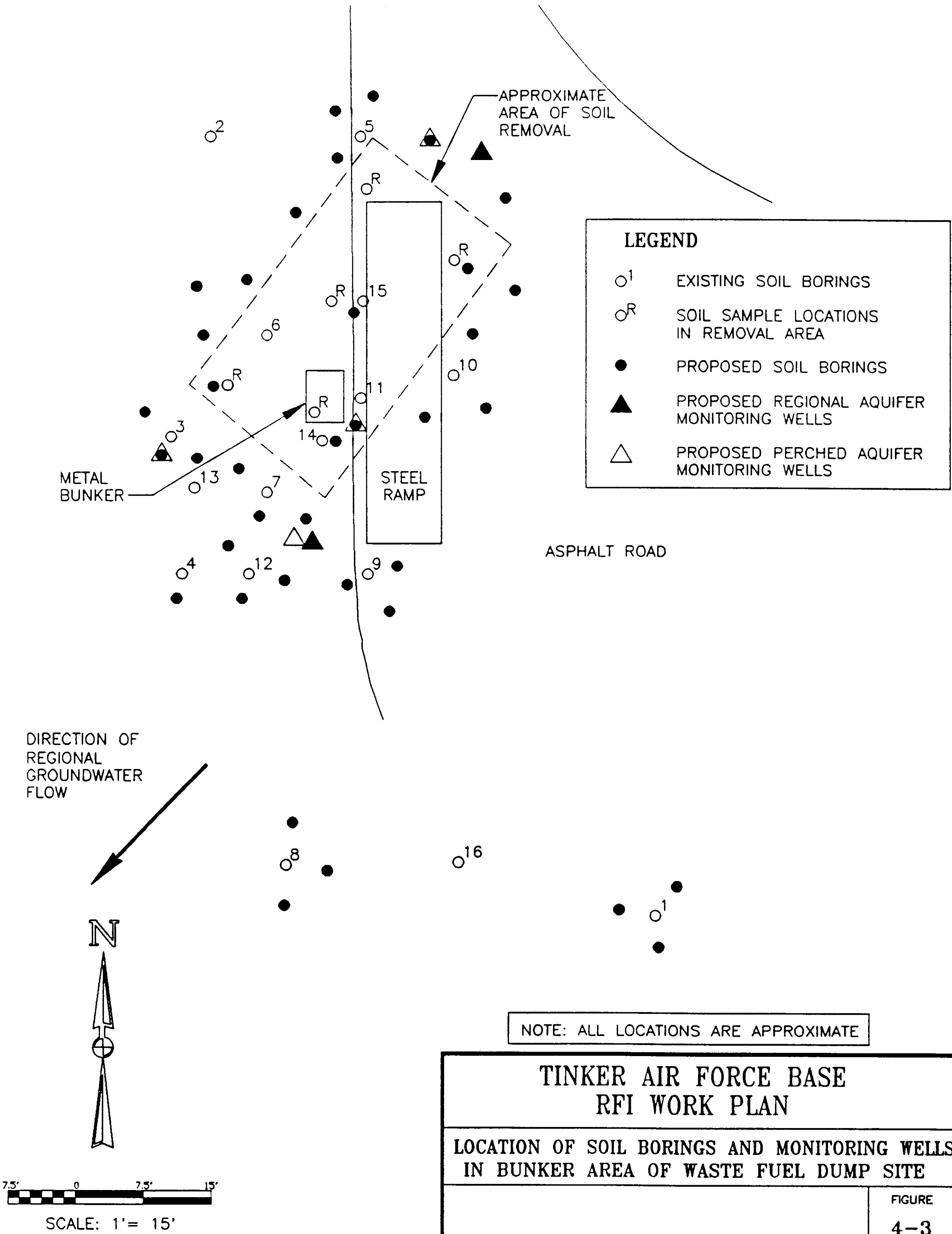
SCALE OF FEET

60' 0 60' 120'

TINKER AIR FORCE BASE
RFI WORK PLAN

LOCATION OF SOIL BORINGS AND MONITORING WELLS AT FUEL TRUCK MAINTENANCE AREA

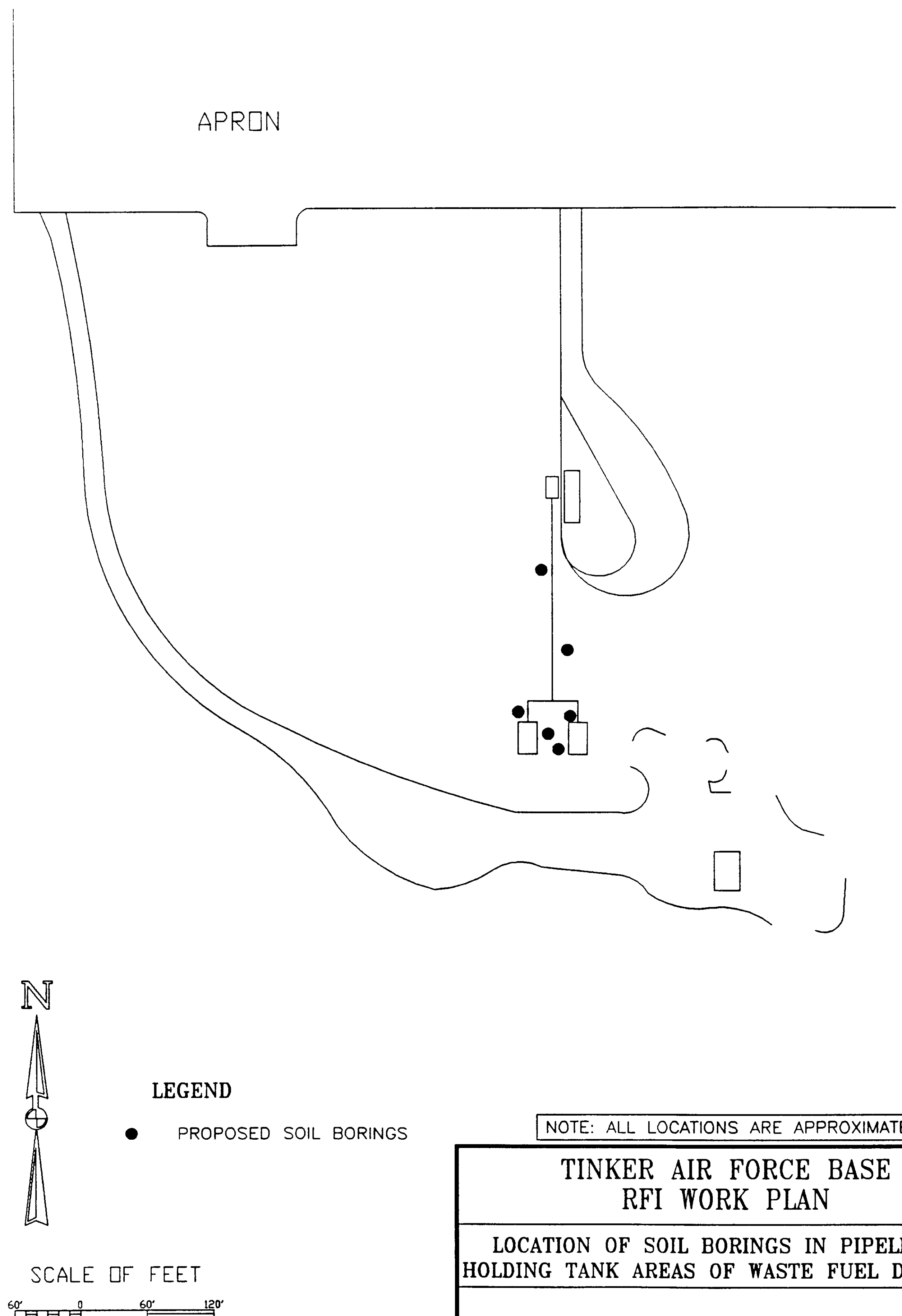
FIGURE
4-2



TINKER AIR FORCE BASE
RFI WORK PLAN

LOCATION OF SOIL BORINGS AND MONITORING WELLS IN BUNKER AREA OF WASTE FUEL DUMP SITE

FIGURE 4-3



NOTE: ALL LOCATIONS ARE APPROXIMATE

TINKER AIR FORCE BASE
RFI WORK PLAN

LOCATION OF SOIL BORINGS IN PIPELINE & HOLDING TANK AREAS OF WASTE FUEL DUMP SITE

FIGURE 4-4

5.0 REPORTING

The results of the Phase I RFI will be presented in the RFI report. Per the schedule in the Project Management Plan, the draft RFI report will be submitted to EPA for review within 60 days of completion of RFI activities. The RFI report will present all the information and data gathered during the RFI, including the results of previous IRP investigations. The RFI report will describe procedures, methods, and results associated with all the investigations of SWMUs and their releases. The report will discuss the nature and extent of contamination at each SWMU, sources of contamination, migration pathways and actual/potential receptors. The report will identify all relevant and applicable standards for the protection of human health and the environment, and the report will also make recommendations for Phase II investigations. The RFI report will be revised per any comments received according to the schedule in the Project Management Plan.

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ATTACHMENT 1

CHEMICAL ANALYSIS RESULTS
FOR SOIL SAMPLES IN WASTE
FUEL DUMP SITE REMOVAL AREA

ANA-LAB CORP.
THE COMPLETE SERVICE LAB

2600 DUDLEY ROAD — KILGORE, TEXAS 75662 — 903/984-0551 — FAX 903/984-5914

Analytical Chemistry • *Utility Operations*

06/28/91

Department of the Air Force
OC-ALC/EMC
Engineering Building
Tinker AFB, OK 73145
Attention: Dan Luton

Sample Identification: GM910226 Waste Fuel Center
Collected By: GM/MP
Date & Time Taken: 06/10/91 1400

Lab Sample Number: 188972 **Received:** 06/12/91 **Client:** TAFB

PARAMETER	RESULTS	UNITS	TIME	DATE	METHOD	BY
TCLP Extraction - Solids	Completed.		1200	06/20/91	40 CFR Part 268	LW
Hydrocarbons	820	mg/kg	1630	06/17/91	EPA Method 418.1	BC
Hydrocarbon Sonication Extract.	Completed		1300	06/13/91	EPA Method 3550 *MOD	BTW
Benzene	310	ug/kg	0800	06/17/91	EPA Method 8020	KB
Ethyl benzene	1600	ug/kg	0800	06/17/91	EPA Method 8020	KB
Toluene	1600	ug/kg	0800	06/17/91	EPA Method 8020	KB
Xylenes	1700	ug/kg	0800	06/17/91	EPA Method 8020	KB

The following analyses were performed on the extract obtained using the TCLP extraction procedure.
This procedure is in accordance with 40 CFR Part 268 Appendix I ChI of the 7-01-90 Edition of the Federal Register.

PARAMETER	RESULTS	UNITS	TIME	DATE	METHOD	BY
TCLP Lead	<.1	mg/l	1700	06/26/91	EPA Method 6010	GK
TCLP Benzene	<.005	mg/l	1400	06/20/91	EPA Method 8240-TCLP	KB

Quality Assurance for the SET with Sample 188972

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Hydrocarbons								
	Blank	<5	PPM						
	Standard	47	PPM	50			1630	06/17/91	BC
188859	Duplicate	200	PPM	200		106	1630	06/17/91	BC
						100	1630	06/17/91	BC
	Benzene								
	Blank	<5.0	ug/l				0800	06/17/91	KB
	Standard	113		100		112	0800	06/17/91	KB
189195	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/17/91	KB

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Quality Assurance for the SET with Sample 188972

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
189195	Spike				100	97	0800	06/17/91	KB

Ethyl benzene

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<5.0	ug/l				0800	06/17/91	KB
	Standard	121		100		119	0800	06/17/91	KB
189195	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/17/91	KB
189195	Spike				100	90	0800	06/17/91	KB

Toluene

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<5.0	ug/l				0800	06/17/91	KB
	Standard	123		100		121	0800	06/17/91	KB
189195	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/17/91	KB
189195	Spike				100	94	0800	06/17/91	KB

Xylenes

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<5.0	ug/l				0800	06/17/91	KB
	Standard	115		100		114	0800	06/17/91	KB
189195	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/17/91	KB
189195	Spike				100	87	0800	06/17/91	KB

TCLP Lead

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Standard	1.1	mg/l	1.0		110	1700	06/26/91	GK
	Standard	5.2	mg/l	5.0		104	1700	06/26/91	GK
188968	Duplicate	2.0	mg/l	100		292	1700	06/26/91	GK
188969	Spike		mg/l		2.0	99	1700	06/26/91	GK
188970	Spike		mg/l		2.0	102	1700	06/26/91	GK
188971	Spike		mg/l		2.0	98	1700	06/26/91	GK
188972	Spike		mg/l		2.0	100	1700	06/26/91	GK
189263	Spike		mg/l		2.0	100	1700	06/26/91	GK

TCLP Benzene

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<.005	mg/l				1400	06/20/91	KB
	Standard	55	ug/l	50		110	1400	06/20/91	KB

I hereby certify that these results were obtained using the methods specified in this report.

Bill Perry

C. H. Whiteside, Ph.D., President

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Analytical Chemistry • Utility Operations

06/28/91

Department of the Air Force
OC-ALC/EMC
Engineering Building
Tinker AFB, OK 73145
Attention: Dan Luton

Sample Identification: GM910222 Waste Fuel Area North
Collected By: GM/MP
Date & Time Taken: 06/10/91 1400

Lab Sample Number: 188968 **Received:** 06/12/91 **Client:** TAFB

PARAMETER	RESULTS	UNITS	TIME	DATE	METHOD	BY
TCLP Extraction - Solids	Completed		1200	06/19/91	40 CFR Part 268	LW
Hydrocarbons	<5	mg/kg	1630	06/17/91	EPA Method 418.1	BC
Hydrocarbon Sonication Extract.	Completed		1300	06/13/91	EPA Method 3550 *MOD	BTW
Benzene	450	ug/kg	0800	06/13/91	EPA Method 8020	KB
Ethyl benzene	850	ug/kg	0800	06/13/91	EPA Method 8020	KB
Toluene	550	ug/kg	0800	06/13/91	EPA Method 8020	KB
Xylenes	1000	ug/kg	0800	06/13/91	EPA Method 8020	KB

The following analyses were performed on the extract obtained using the TCLP extraction procedure.
This procedure is in accordance with 40 CFR Part 268 Appendix I Chl of the 7-01-90 Edition of the Federal Register.

PARAMETER	RESULTS	UNITS	TIME	DATE	METHOD	BY
TCLP Lead	<.1	mg/l	1700	06/26/91	EPA Method 6010	GK
TCLP Benzene	<.005	mg/l	1500	06/19/91	EPA Method 8240-TCLP	KB

Quality Assurance for the SET with Sample 188968

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Hydrocarbons								
	Blank	<5	PPM				1630	06/17/91	BC
	Standard	47	PPM	50		106	1630	06/17/91	BC
188859	Duplicate	200	PPM	200		100	1630	06/17/91	BC
	Benzene								
	Blank	<5.0	ug/l				0800	06/13/91	KB
	Standard	100		100		100	0800	06/13/91	KB
	Ethyl benzene								

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Quality Assurance for the SET with Sample 188968

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<5.0	ug/l				0800	06/13/91	KB
	Standard	1001		100			0800	06/13/91	KB
	Toluene								
	Blank	<5.0	ug/l				0800	06/13/91	KB
	Standard	100		100		100	0800	06/13/91	KB
	Xylenes								
	Blank	<5.0	ug/l				0800	06/13/91	KB
	Standard	100		100		100	0800	06/13/91	KB
	TCLP Lead								
	Standard	1.1	mg/l	1.0		110	1700	06/26/91	GK
	Standard	5.2	mg/l	5.0		104	1700	06/26/91	GK
188968	Duplicate	2.0	mg/l	100		292	1700	06/26/91	GK
188969	Spike		mg/l		2.0	99	1700	06/26/91	GK
188970	Spike		mg/l		2.0	102	1700	06/26/91	GK
188971	Spike		mg/l		2.0	98	1700	06/26/91	GK
188972	Spike		mg/l		2.0	100	1700	06/26/91	GK
189263	Spike		mg/l		2.0	100	1700	06/26/91	GK
	TCLP Benzene								
	Blank	<.005	mg/l				1500	06/19/91	KB
	Standard	86	ug/l	100		115	1500	06/19/91	KB

I hereby certify that these results were obtained using the methods specified in this report.

C. H. Whiteside, Ph.D., President

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Analytical Chemistry • Utility Operations

06/28/91

Department of the Air Force
OC-ALC/EMC
Engineering Building
Tinker AFB, OK 73145
Attention: Dan Luton

Sample Identification: GM910223 Waste Fuel Area East
Collected By: GM/MP
Date & Time Taken: 06/10/91 1400

Lab Sample Number: 188969 **Received:** 06/12/91 **Client:** TAFB

PARAMETER	RESULTS	UNITS	TIME	DATE	METHOD	BY
TCLP Extraction - Solids	Completed.		1200	06/19/91	40 CFR Part 268	LW
Hydrocarbons	240	mg/kg	1630	06/17/91	EPA Method 418.1	BC
Hydrocarbon Sonication Extract.	Completed		1300	06/13/91	EPA Method 3550 *MOD	BTW
Benzene	<5.0	ug/kg	0800	06/14/91	EPA Method 8020	KB
Ethyl benzene	210	ug/kg	0800	06/14/91	EPA Method 8020	KB
Toluene	70	ug/kg	0800	06/14/91	EPA Method 8020	KB
Xylenes	240	ug/kg	0800	06/14/91	EPA Method 8020	KB

The following analyses were performed on the extract obtained using the TCLP extraction procedure.
This procedure is in accordance with 40 CFR Part 268 Appendix I Chl of the 7-01-90 Edition of the Federal Register.

PARAMETER	RESULTS	UNITS	TIME	DATE	METHOD	BY
TCLP Lead	.1	mg/l	1700	06/26/91	EPA Method 6010	GK
TCLP Benzene	<.005	mg/l	1400	06/20/91	EPA Method 8240-TCLP	KB

Quality Assurance for the SET with Sample 188969

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
				Hydrocarbons					
	Blank	<5	PPM				1630	06/17/91	BC
	Standard	47	PPM	50		106	1630	06/17/91	BC
188859	Duplicate	200	PPM	200		100	1630	06/17/91	BC
				Benzene					
	Blank	<5.0	ug/l				0800	06/14/91	KB
	Standard	100		94		106	0800	06/14/91	KB
189022	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/14/91	KB

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Quality Assurance for the SET with Sample 188969

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
189022	Spike				100	90	0800	06/14/91	KB
				Ethyl benzene					
	Blank	<5.0	ug/l				0800	06/14/91	KB
	Standard	100		103		103	0800	06/14/91	KB
189022	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/14/91	KB
189022	Spike				100	83	0800	06/14/91	KB
				Toluene					
	Blank	<5.0	ug/l				0800	06/14/91	KB
	Standard	100		95		105	0800	06/14/91	KB
189022	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/14/91	KB
189022	Spike				100	96	0800	06/14/91	KB
				Xylenes					
	Blank	<5.0	ug/l				0800	06/14/91	KB
	Standard	100		101		101	0800	06/14/91	KB
189022	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/14/91	KB
189022	Spike				100	77	0800	06/14/91	KB
				TCLP Lead					
	Standard	1.1	mg/l	1.0		110	1700	06/26/91	GK
	Standard	5.2	mg/l	5.0		104	1700	06/26/91	GK
188968	Duplicate	2.0	mg/l	100		292	1700	06/26/91	GK
188969	Spike		mg/l		2.0	99	1700	06/26/91	GK
188970	Spike		mg/l		2.0	102	1700	06/26/91	GK
188971	Spike		mg/l		2.0	98	1700	06/26/91	GK
188972	Spike		mg/l		2.0	100	1700	06/26/91	GK
189263	Spike		mg/l		2.0	100	1700	06/26/91	GK
				TCLP Benzene					
	Blank	<.005	mg/l				1400	06/20/91	KB
	Standard	55	ug/l	50		110	1400	06/20/91	KB

I hereby certify that these results were obtained using the methods specified in this report.

Bill Ray

C. H. Whiteside, Ph.D., President

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Analytical Chemistry • Utility Operations

06/28/91

Department of the Air Force
OC-ALC/EMC
Engineering Building
Tinker AFB, OK 73145
Attention: Dan Luton

Sample Identification: GM910224 Waste Fuel Area South
Collected By: GM/MP
Date & Time Taken: 06/10/91 1400

Lab Sample Number: 188970 **Received:** 06/12/91 **Client:** TAFB

PARAMETER	RESULTS	UNITS	TIME	DATE	METHOD	BY
TCLP Extraction - Solids	Completed.		1200	06/20/91	40 CFR Part 268	LW
Hydrocarbons	410	mg/kg	1630	06/17/91	EPA Method 418.1	BC
Hydrocarbon Sonication Extract.	Completed		1300	06/13/91	EPA Method 3550 *MOD	STW
Benzene	<5.0	ug/kg	0800	06/14/91	EPA Method 8020	KB
Ethyl benzene	370	ug/kg	0800	06/14/91	EPA Method 8020	KB
Toluene	45	ug/kg	0800	06/14/91	EPA Method 8020	KB
Xylenes	490	ug/kg	0800	06/14/91	EPA Method 8020	KB

The following analyses were performed on the extract obtained using the TCLP extraction procedure.
This procedure is in accordance with 40 CFR Part 268 Appendix I CHI of the 7-01-90 Edition of the Federal Register.

PARAMETER	RESULTS	UNITS	TIME	DATE	METHOD	BY
TCLP Lead	<.1	mg/l	1700	06/26/91	EPA Method 6010	GK
TCLP Benzene	<.005	mg/l	1400	06/20/91	EPA Method 8240-TCLP	KB

Quality Assurance for the SET with Sample 188970

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
				Hydrocarbons					
	Blank	<5	PPM				1630	06/17/91	BC
	Standard	47	PPM	50		106	1630	06/17/91	BC
188859	Duplicate	200	PPM	200		100	1630	06/17/91	BC
				Benzene					
	Blank	<5.0	ug/l				0800	06/14/91	KB
	Standard	100		94		106	0800	06/14/91	KB
189022	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/14/91	KB

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Quality Assurance for the SET with Sample 188970

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
189022	Spike				100	90	0800	06/14/91	KB

Ethyl benzene

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<5.0	ug/l				0800	06/14/91	KB
	Standard	100		103		103	0800	06/14/91	KB
189022	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/14/91	KB
189022	Spike				100	83	0800	06/14/91	KB

Toluene

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<5.0	ug/l				0800	06/14/91	KB
	[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
189022	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/14/91	KB
189022	Spike				100	96	0800	06/14/91	KB

Xylenes

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<5.0	ug/l				0800	06/14/91	KB
	Standard	100		101		101	0800	06/14/91	KB
189022	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/14/91	KB
189022	Spike				100	77	0800	06/14/91	KB

TCLP Lead

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Standard	1.1	mg/l	1.0		110	1700	06/26/91	GK
	Standard	5.2	mg/l	5.0		104	1700	06/26/91	GK
188968	Duplicate	2.0	mg/l	100		292	1700	06/26/91	GK
188969	Spike		mg/l		2.0	99	1700	06/26/91	GK
188970	Spike		mg/l		2.0	102	1700	06/26/91	GK
188971	Spike		mg/l		2.0	98	1700	06/26/91	GK
188972	Spike		mg/l		2.0	100	1700	06/26/91	GK
189263	Spike		mg/l		2.0	100	1700	06/26/91	GK

TCLP Benzene

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<.005	mg/l				1400	06/20/91	KB
	Standard	55	ug/l	50		110	1400	06/20/91	KB

I hereby certify that these results were obtained using the methods specified in this report.

Bill Peery

C. H. Whiteside, Ph.D., President

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Analytical Chemistry • Utility Operations

06/28/91

Department of the Air Force
OC-ALC/EMC
Engineering Building
Tinker AFB, OK 73145
Attention: Dan Luton

Sample Identification: [illegible] Waste Fuel Area West
Collected By: [illegible]
Date & Time Taken: 06/10/91 1400
Lab Sample Number: 188971 Received: 06/12/91 Client: TAFB

PARAMETER	RESULTS	UNITS	TIME	DATE	METHOD	BY
TCLP Extraction - Solids	Completed.		1200	06/20/91	40 CFR Part 268	LW
Hydrocarbons	540	mg/kg	1630	06/17/91	EPA Method 418.1	BC
Hydrocarbon Sonication Extract.	Completed		1300	[illegible]	EPA Method 3550 [illegible]	[illegible]
Benzene	[illegible]	ug/kg	0800	06/17/91	EPA Method 8020	KB
Ethyl [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Toluene	210	[illegible]	0800	[illegible]	[illegible]	[illegible]
Xylenes	600	[illegible]	0800	[illegible]	[illegible]	[illegible]

The following analyses were performed on the extract obtained using the TCLP extraction procedure.
This procedure is in accordance with 40 CFR Part 268 Appendix I CHI of the 7-01-90 Edition of the Federal Register.

TCLP Lead	<.1	mg/l	1700	06/26/91	EPA Method 6010	GK
TCLP [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Quality Assurance for the SET with Sample 188971

Sample #	Description	Result	Units	Spiked/Std Value	Sub Conc	Percent	Time	Date	By
	Hydrocarbons								
	Blank	<5	PPM				[illegible]	[illegible]	[illegible]
	Standard	47	PPM	50		106	1630	06/17/91	BC
188859	Duplicate	200	PPM	200		100	1630	06/17/91	BC
	Benzene								
	Blank	<5.0	ug/l				0800	06/17/91	KB
	Standard	[illegible]	[illegible]	100		11[illegible]	0800	06/17/91	KB
189195	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/17/91	KB

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2600 DUDLEY ROAD — KILGORE, TEXAS 75662 — 903/984-0551 — FAX 903/984-5914

Analytical Chemistry • Utility Operations

Quality Assurance for the SET with Sample 188971

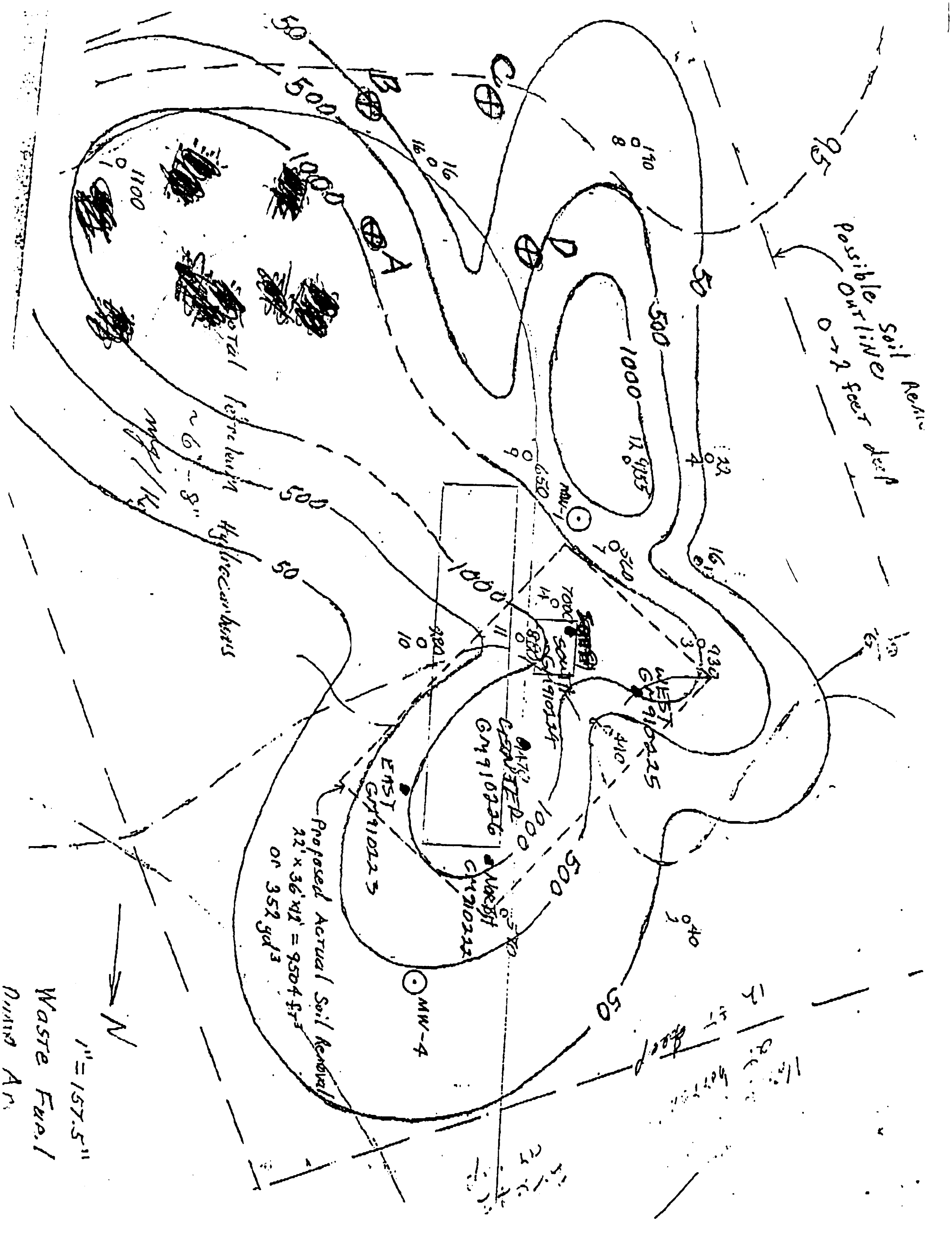
Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
189195	Spike				100	97	0800	06/17/91	KB
	Ethyl benzene								
	Blank	<5.0	ug/l				0800	06/17/91	KB
	Standard	121		100		119	0800	06/17/91	KB
189195	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/17/91	KB
189195	Spike				100	90	0800	06/17/91	KB
	Toluene								
	Blank	<5.0	ug/l				0800	06/17/91	KB
	Standard	123		100		121	0800	06/17/91	KB
189195	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/17/91	KB
189195	Spike				100	94	0800	06/17/91	KB
	Xylenes								
	Blank	<5.0	ug/l				0800	06/17/91	KB
	Standard	115		100		114	0800	06/17/91	KB
189195	Duplicate	<5.0	ug/kg	<5.0		100	0800	06/17/91	KB
189195	Spike				100	87	0800	06/17/91	KB
	TCLP Lead								
	Standard	1.1	mg/l	1.0		110	1700	06/26/91	GK
	Standard	5.2	mg/l	5.0		104	1700	06/26/91	GK
188968	Duplicate	2.0	mg/l	100		292	1700	06/26/91	GK
188969	Spike		mg/l		2.0	99	1700	06/26/91	GK
188970	Spike		mg/l		2.0	102	1700	06/26/91	GK
188971	Spike		mg/l		2.0	98	1700	06/26/91	GK
188972	Spike		mg/l		2.0	100	1700	06/26/91	GK
189263	Spike		mg/l		2.0	100	1700	06/26/91	GK
	TCLP Benzene								
	Blank	<.005	mg/l				1400	06/20/91	KB
	Standard	55	ug/l	50		110	1400	06/20/91	KB

I hereby certify that these results were obtained using the methods specified in this report.

Bill Pea

C. H. Whiteside, Ph.D., President

DEC-05-'91 05:31 ID: TEL NO: #127 P12



PART II

SAMPLING AND ANALYSIS PLAN

QUALITY ASSURANCE PROJECT PLAN

SAMPLING AND ANALYSIS PLAN
FOR
RCRA FACILITY INVESTIGATION
WORK PLAN

TINKER AIR FORCE BASE

LIST OF ACRONYMS

CAS	Cost Accounting Standards
CLP	Certified Laboratory Program
COC	Chain of Custody
DQOs	Data Quality Objectives
FAR	Federal Acquisitions Regulations
GPR	Ground Penetrating Radar
HASP	Health & Safety Plan
IEM	Induced Electro-Magnetic
IWTP	Industrial Waste Treatment Plant
ODC	Other Direct Costs
OSC	On-Scene Coordinator
OSWER	U.S. EPA Office of Solid Waste & Emergency Response
OVA	Organic Vapor Analyzer
PID	Photoionization Detector
PPE	Personal Protection Equipment
QA	Quality Assurance
QAMS	Quality Assurance Management Staff
QAPP	Quality Assurance Program Plan
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act

LIST OF ACRONYMS (CONT'D)

SAP	Sampling & Analysis Plan
SEMI-VOCs	Semi-Volatile Organic Compounds
SHSC	Site Health & Safety Coordinator
SOP	Standard Operating Procedure
SWMU	Solid Waste Management Unit
Tinker AFB	Tinker Air Force Base
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOCs	Volatile Organic Compounds

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NOTE: Tables follow each section.

1.0 INTRODUCTION

1.1 OBJECTIVES

Tinker AFB is required by their RCRA permit to perform a RCRA Facility Investigation (RFI). This Sampling and Analysis Plan (SAP) was prepared to support the RFI Work Plan which outlines the various site investigations. Specifically this SAP and associated Quality Assurance Project Plan (QAPP) that follows this SAP comprise Part II of the Data Collection Quality Assurance Plan. Part I of the Data Collection Quality Assurance Plan is the Site Investigation Plan. The Site Investigation Plan outlines the individual site investigations for the SWMUs to be investigated. The details of procedures and methods are included in this supporting SAP.

The objective of this SAP is to present all procedures and methods that would be followed in the RFI field investigations. It includes procedures for sample collection, field measurements, sampling documentation, chain of custody, sample shipping and analytical methods. The purpose of this SAP is to support the RFI work plan and address the details of methods and procedures required by EPA's RFI guidance. This SAP will govern all RFI work.

1.2 SCOPE OF WORK

The scope of work for the RFI is presented in Part I, the Site Investigation Plan. The Site Investigation Plan outlines the field investigations for the Group 1, 2 and 3 SWMUs. The elements of the various investigations include borehole drilling and sampling, monitoring well installation and sampling, and air sampling.

1.3 ASSUMPTIONS

Assumptions specific to each SWMU investigation are presented in the Site Investigation Plan.

2.0 BACKGROUND

Available background information for each SWMU to be investigated is provided in the Site Investigation Plan.

3.0 FIELD SAMPLING PROGRAM

3.1 OVERVIEW

The Site Investigation Plan presents the field activities to be conducted at each SWMU. The elements of the various investigations include borehole drilling and sampling, monitoring well installation, groundwater sampling, and air sampling.

3.2 SAMPLING RATIONALE

As discussed in Section 1.0 of the Site Investigation Plan, the investigations described in this RFI Work Plan are Phase I investigations. The objectives of the Phase I investigations are to determine whether a release of contaminants to the environment occurred, and to preliminarily determine the nature and extent of the releases. The Phase I investigations are geared to evaluate those media at each SWMU with the greatest potential to be impacted by a contaminant release. The investigations are based on available information and data for each SWMU.

Summaries of all sampling activities are found in Tables 3-1 and 3-2.

3.3 SAMPLE LOCATIONS AND FREQUENCY

Sampling locations and frequency are addressed in the Site Investigation Plan under the individual SWMU investigations.

3.4 LABORATORY ANALYSIS

The analyte concentrations to be measured in soil, ground water and air samples include volatile and semi-volatile organics and metals. The analytes to be determined at each SWMU are based on available information for the particular SWMU. Where no information is available for a particular site, a larger, more comprehensive list of parameters will be measured in samples. Analytes to be measured at each SWMU are discussed in the Site Investigation Plan. Analytical methods are presented in Section 5.0 of this SAP. The rationale behind the choice of parameters for each SWMU can be found in the Site Investigation Plan in the discussions of the individual SWMUs.

3.5 FIELD CONDITIONS FOR CONDUCTING SAMPLING AND FIELD MEASUREMENTS

Field conditions under which sampling and field measurements will be conducted are addressed in the Site Investigation Plan, under the individual SWMU investigations, and in the Health and Safety Plan.

TABLE 3-1
Sampling Summary
(by Sample Type)

Sample Type	Total Number Samples	Parameters	Number
Soils - split spoons and surficial soils (SWMUs 24, 26, 32, Fuel Truck Maintenance Area, Waste Fuel Dump Site, and HCL Tank)	368	VOCs Semi-VOCs Metals TPH[1] pH Chloride Geotech[2]	326 108 368 218 42 42 10
Duplicates[3]	22	same as particular site analyses	22
Rinsates	22	same as particular site analyses	22
Groundwater (Fuel Truck Maintenance Area and Waste Fuel Dump Site) (includes any borehole water encountered at SWMUs 24.19 and 32.8)	22	VOCs Semi-VOCs Metals TPH[1]	22 2 22 20
Duplicate[3]	3	same as particular site analyses	3
Rinsates	3	same as particular site analyses	3
Washwater (Building 976 AFFF Fire Control Pond)	1	VOCs Semi-VOCs Metals Oil and Grease	1 1 1 1
Duplicates[3]	1	same as sample	1
Rinsates	1	same as sample	1
Air (SWMU 24)	30	VOCs and Semi-VOCs	30
Field Blanks[3]	2	same as particular site analyses	2
Surface Water (SWMUs 24 and 32)	5	VOCs Semi-VOCs Metals	5 5 5
Duplicate[3]	1	same as particular site analyses	1
Rinsate	1	same as particular site analyses	1

1. Total petroleum hydrocarbons
2. Geotechnical analyses
3. A minimum of 1 in 20 samples

TABLE 3-2
Sampling Summary
(by SWMU)

SWMU	Sample Type	Parameter	Number
SWMU 24	Soil	VOCs	63
		Semi-VOCs	63
		Metals	63
		Geotech[2]	1
	Duplicates[3]	same as sample	4
	Rinsates	same as sample	4
	Surface Water	VOCs	4
		Semi-VOCs	4
		Metals	4
	Duplicates[3]	same as sample	1
	Rinsates	same as sample	1
	Air	VOCs	30
		Semi-VOCs	30
	Field Blanks[3]	same as sample	2
	Groundwater (if encountered)	VOCs	1
		Semi-VOCs	1
		Metals	1
SWMU 32	Soil	VOCs	30
		Semi-VOCs	30
		Metals	30
		Geotech[2]	1
	Duplicates[3]	same as sample	2
	Rinsates	same as sample	2
	Surface Water	VOCs	1
		Semi-VOCs	1
		Metals	1
	Groundwater (if encountered)	VOCs	1
		Semi-VOCs	1
		Metals	1
	Duplicates[3]	same as sample	1
	Rinsates	same as sample	1
SWMU 26	Soil	VOCs	15
		Semi-VOCs	15
		Metals	15
		Geotech[2]	1
	Duplicates[3]	same as sample	1
	Rinsates	same as sample	1

Table 3-2 continued

SWMU	Sample Type	Parameter	Number
SWMU 40	Washwater	VOCs	1
		Semi-VOCs	1
		Metals	1
		Oil and Grease	1
	Duplicates[3]	same as sample	1
	Rinsates	same as sample	1
Fuel Truck Maintenance Area	Soil	Aromatic VOCs	45
		TPH[1]	45
		Metals	45
		Geotech[2]	2
	Duplicates[3]	same as sample	3
	Rinsates	same as sample	3
	Groundwater	Aromatic VOCs	14
		TPH[1]	14
		Metals	14
	Duplicates[3]	same as sample	1
	Rinsates	same as sample	1
Waste Fuel Dump Site	Soil	Aromatic VOCs	173
		TPH[1]	173
		Metals	173
		Geotech[2]	3
	Duplicates[3]	same as sample	9
	Rinsates	same as sample	9
	Groundwater	Aromatic VOCs	6
		TPH[1]	6
		Metals	6
	Duplicates[3]	same as sample	1
	Rinsates	same as sample	1
HCl Tank	Soil	pH	42
		Chloride	42
		Metals	42
		Geotech[2]	2
	Duplicates	same as sample	3
	Rinsates	same as sample	3

1. Total Petroleum Hydrocarbons
2. Geotechnical Analyses
3. 1 in 20 samples, minimum

4.0 FIELD PROCEDURES

This section presents the methods and procedures that will be used to collect samples and conduct measurements in the field. Included in this section are methods for:

4.1 Hollow Stem Auger Drilling
4.2 Rotary Drilling and Rock Coring
4.3 Drilling through Pavement
4.4 Borehole Logging
4.5 Subsurface Soil Sample Collection
4.6 Groundwater Sample Collection through Auger
4.7 Monitoring Well and Piezometer Installation
4.8 Monitoring Well Development
4.9 Well Cap Opening
4.10 Measurement of Static Water Level Elevations and Immiscible Layers
4.11 Monitoring Well Sampling
4.12 Measurement of Conductance and Temperature
4.13 Measurement of pH
4.14 Surface Soil Sample Collection
4.15 Surface Water Sample Collection
4.16 High-Volume Air Sampling for Airborne Contaminants
4.17 Soil Gas Sample Collection
4.18 Calibration and Operation of the Photoionization Detector
4.19 Operation of Metal Detection Instruments
4.20 Sample Identification
4.21 Sample Handling and Shipping
4.22 Chain of Custody Records
4.23 Use and Maintenance of Field Notebooks
4.24 Equipment Decontamination
4.25 Management and Disposal of Contaminated Wastes
4.26 Field QC Samples

This section is accompanied by an appendix that provides examples of field forms for documenting all field activities:

Appendix A - Examples of Field Forms

- Boring Log
- Monitoring Well Construction Form

- Sample Label
- Chain of Custody Record
- Custody Seal
- Fluid Level Measurement Form
- PID Field Calibration Log
- Field Notebook Entry Format

4.1 HOLLOW-STEM AUGER DRILLING

All shallow boreholes will be drilled with a hollow-stem auger rig in accordance with the drilling methods for a hollow-stem auger as described in "A Compendium of Superfund Field Operation Methods" EPA/540/P-87/001, Section 8.1.6.1.3, Hollow Stem Augers. The following is a summary of methods and procedures to be used:

- An experienced drilling subcontractor with knowledge of the local geologic conditions will be selected.

- The rig and the hollow-stem augers will be decontaminated using a steam cleaner prior to drilling each borehole. Steam cleaning will be performed at a location designated by the base Point-of-Contact.

- The hollow-stem auger will be either a hydraulically or mechanically powered drill rig which simultaneously rotates and axially advances a hollow-stem auger column. Each of the joints between auger sections will be properly connected to prevent contaminants from entering the auger.

- A split-spoon sampler with basket retainer and shoe, and lined with three six-inch-long, 2-1/2 inch O.D. brass sleeves, will be used to collect samples for lithologic description and chemical analyses. The contents of each split-spoon sample will be logged by the on-site geologist. Lithologic observations will be recorded on the Boring Log Form (see Section 4.4).

- For each borehole, soil samples will be collected from the borehole at the depths designated in the Site Investigation Plan. Sample collection procedures are discussed in Section 4.5.

- In addition to completing the Boring Log Form for each boring, the on-site geologist will maintain a Field Logbook which will document the following: date; time entered site; temperature; weather conditions; names and titles of personnel present; names and titles of any visitors on site; arrival time of driller and other subcontractors; feet drilled; materials used; references to the Boring Logs; decontamination activities; and any potential problem areas or incidents. The entries into the logbook will be signed daily by the on-site geologist.

- If the survey instrument readings, in the opinion of the FPC on-site geologist, show that the soils from the boreholes are clean, drill cuttings will be placed back in the borehole, and then each borehole will be grouted to the surface with cement (minimum of three feet of grout will be used at the top of each borehole)

- Contaminated drill cuttings will be placed in a 55 gallon drum and left on-site for disposition following characterization of the site soils.

4.2 ROTARY DRILLING AND ROCK CORING

This section describes procedures for rotary drilling and rock coring, using air and water as drilling media. Methods and procedures will be in accordance with those specified in "A Compendium of Superfund Field Operations Methods", EPA/540/P-87/001, Section 8.1, Geologic Drilling.

Rotary drilling and rock coring may be used for advancing boreholes with or without environmental sampling in zones of hard material which cannot be penetrated with hollow-stem augers. The use of air or water as a drilling media for rotary drilling and coring methods can alter analytical chemistry or physical property test results by altering sample moisture, by volatilizing contaminants (in case of air), or by washing them away (in case of water). Using water can also alter the groundwater chemistry in the vicinity of the borehole, and needs to be accounted for during well development.

In general, air will be the drilling medium when it is necessary to penetrate cemented zones of rock in auger borings drilled for environmental sampling. Water will be typically used as the drilling medium when drilling relatively deep bedrock wells and when obtaining rock core exclusively for geologic logging.

The following is a list of equipment and materials for rotary drilling:

- Drill rig with appropriately sized bits and rods
- Portable recirculating tanks for water rotary
- Preapproved water for water rotary
- Conveyance equipment (pumps and hoses)
- Air compressor with appropriate air filter(s)
- High pressure steamer/sprayer
- Wash/rinse tubs and brushes
- Weighted tape measure
- Phosphate-free, lab grade detergent (e.g., Liquinox)
- Water level probe
- Appropriate health and safety equipment
- Drums for containment of cuttings and fluids
- Boring Log Form

The following is a list of additional equipment for rock coring:

- Core barrel assembly
- Wire line or core rods
- Core boxes with wooden blocks
- Measuring tape
- Core barrel rack
- Plastic wrap for core
- Marking pen, black, permanent

The following are general procedures to be used for rotary drilling and rock coring:

1. Boreholes will be drilled using a rig equipped with rotary drilling equipment capable of advancing the borehole to the specified depth. All drilling

equipment, including the rig, water transportation tanks, bits, and drill rods, will be decontaminated according to Section 4.24, Equipment Decontamination. Decontamination procedures will also be followed between boreholes.

2. Drilling equipment will be inspected to ensure that hydraulic system and fuel leaks do not introduce organic contamination on site or into the borehole. Any leaks that may introduce such contamination will be repaired before drilling.

3. Water transportation tanks and conveyance equipment will be contaminant free. Portable decontamination recirculation tanks will be used for water rotary operations and will be decontaminated according to Section 4.24, Equipment Decontamination.

4. Conventional air compressors used for air rotary methods contain oil for lubricating moving parts and compress air and oil in their operation. To avoid introducing contaminants into the borehole, a filtration system designed to provide oil-free air will be used.

5. Continuous core samples collected using rock coring methods will be extracted from the core barrel, placed on core racks, and logged by a geologist according to Section 4.4, Borehole Logging. All information will be recorded on the Borehole Log Form in accordance with Section 4.4, Borehole Logging. The borehole log will include information on subsurface material classification and lithology.

6. Rock core to be saved for geotechnical testing or further geologic observations will be placed in plastic wrap and then placed in core boxes with appropriately sized dividers to protect and preserve the orientation of the core during transportation and storage. Coring equipment will also be decontaminated according to Section 4.24, Equipment Decontamination.

7. Decontamination will be conducted between individual sampling points to minimize cross-contamination. During drilling and sampling, decontaminated equipment will be placed on clean plastic or racks until it is used. At least two sets of samplers will be available so that one set can be used while the other is being decontaminated.

8. Decontamination of augers, drill stems, drill bits, and other downhole equipment will be conducted after each boring is complete. The drill rig will be decontaminated when moving to a new borehole/well site.

4.3 DRILLING THROUGH PAVEMENT

Concrete or asphalt pavement often covers the location chosen for borehole drilling and/or well installation. Drilling through pavement generally proceeds according to normal drilling procedures, however one of several initial steps may be required to facilitate the penetration of the drill bit or auger. In addition, attention should be given to health and safety protection which may not otherwise be required.

The following procedure for drilling through concrete or asphalt will be followed:

- Mark the location of the borehole on the pavement using spray paint, chalk, crayon, or other marker.
- Don eye, foot, and hearing protection if not already wearing them. Drilling through concrete can be **very** loud.
- If using the borehole drilling rig, slowly lower the drill bit or auger to the pavement and commence drilling at a slow speed, both revolutions and axial advancement.
- If using an electric or pneumatic concrete boring tool, anchor the machine by drilling and bolting the foundation to the pavement. Proceed with the anchor drilling and the pavement boring slowly.

- Lubricate the drill bit or auger as necessary using water.

- Keep away from the immediate area of the drill bit while drilling as drill bits and augers commonly bind and "kick out" of the hole.

- After drilling completely through the pavement, remove the drill bit from the hole and away from the hole. Remove any pavement chips or debris from the hole and continue using procedures found in Section 4.1, Hollow-Stem Auger Drilling.

4.4 BOREHOLE LOGGING

All boreholes will be logged in accordance with the methods for geologic logging as described in: "A Compendium of Superfund Field Operation Methods", EPA/540/P-87/001, Section 8.3.5.2, Geologic Logging. Description of soils will be done in accordance with the Unified Soil Classification System (U.S.C.S.) as described in ASTM D2487-69 (1975), "Test Methods for Classification of Soils for Engineering Purposes", and by Item 10.1 in ASTM D2488, "Description and Identification of Soils (Visual-Manual Procedure)". The liquid limit, dilitancy, and dry strength will not be included because they are neither practical to do in the field nor applicable to lithologic logging.

When drilling in soils or unconsolidated material, the following information should be entered on the Boring Log Form:

- Project name and number
- Boring or well number
- Location
- Elevation
- Name of drilling contractor
- Drilling method and equipment

- Water level
- Start and finish time
- Name of logger

The following technical information will also be recorded on the Bore Logging Form:

- Depth of sample below ground level
- Sample interval
- Sample type and number
- Length of sample recovered
- Standard penetration test (ASTM-D1586) results if applicable
- Soil description and U.S.C.S. classification
- Graphic soil symbols
- Blow count

Soil descriptions will be recorded in a consistent order and format. The following order is as given in the Superfund procedure:

1. Soil name
2. Gradation or plasticity
3. Particle size distribution
4. Color
5. Moisture content
6. Relative density of consistency
7. Soil texture and structure (ASTM D2488)

8. Relative permeability
9. Local geologic name
10. Group symbol

When coring in rock the basic information will include the following data:

- Depth
- Core length
- Coring rate in minutes per foot
- Fluid gain or loss
- Core loss
- Percentage of recovery
- Core breakage due to inconsistencies
- Total core breakage
- Number of breaks per foot
- Rock classification lithology

The order of the description of rock, recommended in the Superfund procedure, is as follows:

1. Lithology and texture
2. Color
3. Hardness
4. Weathering
5. Grain size

6. Description of bedding or of joint or fracture spacing

7. Discontinuity descriptions

8. Local geologic name

4.5 SUBSURFACE SOIL SAMPLE COLLECTION

All subsurface soil samples are to be collected in accordance with procedures in a "Compendium of Superfund Field Operations Methods" EPA/540/P-87/001, Section 8.1.6.2, Sampling Techniques. The following is a summary of the field methods to be followed.

With the hollow-stem auger rig, soil sampling will be conducted using a split-spoon sampler lined with three six-inch long, 2-1/2 inch O.D. brass sleeves.

The sampling procedure will be as follows:

1. The hollow-stem auger will be used to drill to the depth to be sampled.

2. Decontaminate the split-spoon sampler using the procedures described in Section 4.24.

3. Lay down one half of the split-spoon on clean, unused aluminum foil. Place the brass sleeves within this half. Place the other half of the split tube over the brass sleeves. Place the catcher rim down into one end of the spoon. Screw the drive shoe onto the end which has the catcher. Screw the head onto the assembly.

4. Attach the split-spoon sampler to the sampling rods and lower into the borehole. Do not allow the sampler to simply drop onto the soil to be sampled.

5. Attach the anvil to the top of the sampling rods and position the hammer above the sampling rods. This may be done before the sampling rods and sampler are lowered into the borehole.

6. Rest the dead weight of the sampler rods, anvil, and drive weight on the bottom of the boring and apply a seating blow.

7. Mark the drill rods in three successive 6-inch increments so that the advancement of the sampler under the impact of the hammer can be easily observed for each 6-inch increment.

8. Drive the sampler with blows from a 140-pound hammer falling 30 inches. Count the number of blows applied in each 6-inch increment until one of the following occurs:

    a. A total of 50 blows have been applied during any one of the three 6-inch increments.

    b. A total of 100 blows have been applied.

    c. There is no observed advance of the sampler during the application of 10 successive blows of the hammer.

    d. The sampler is advanced the complete 18 inches without the limiting blow count occurring as described above.

10. Record the blow counts for each 6-inch increment on the Boring Log Form.

11. Raise the sampler to the surface and open it.

12. Screen the exposed soil at the ends of each of the brass sleeves using the Photoionization Detector (PID). If a positive reading is obtained, cover each end of the brass sleeve with aluminum foil and then cap the ends with polyethylene lids and tape the lids in place. Label the sleeve according to the procedures in Section 4.20, place it in a Ziploc™ bag, and store in a sample cooler at 4 degrees C.

13. Record the sample number and other information in the field log book according to the procedures described in Section 4.23.

14. Samples will be prepared for shipment according to procedures described in Section 4.21.

15. Record the percent recovery or the length of the sample recovered. Describe the soil samples recovered regarding texture, color, composition, moisture content, and Unified Soil Classification System symbol. Record this information on the Boring Log Form.

4.6 GROUNDWATER SAMPLE COLLECTION THROUGH AUGER

In general, ground water will be sampled in accordance with "Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition" EPA-600/4-84-076, Section 3.4.3, Method III-9, except for the modifications contained herein.

A bottom-loading teflon bailer will be used for sampling. The sampling will be as follows:

1. Label the sample bottle with an appropriate tag. Be sure to complete the tag with all necessary information.
2. Attach the pre-cleaned bailer to cable or line for lowering.
3. Lower bailer slowly until it contacts the water surface.
4. Allow bailer to sink and fill with a minimum of surface disturbance.
5. Slowly raise bailer to the surface, winding the line as it is pulled from the hole. Do not allow bailer line to contact ground.
6. Open bailer stop-cock to allow slow discharge to flow gently down the side of the sample bottle with minimum entry turbulence.
7. Repeat steps 2-5 as needed to acquire sufficient volume to fill all sample bottles of a sample bottle set.
8. Selected sample bottles and preserve the sample, if necessary, according to the guidelines in Section 5.0.
9. Check that a Teflon™-liner is present in cap of the sample bottle, if required. Secure the cap tightly.
10. Label the sample bottle with an appropriate tag. Be sure to complete the tag with all necessary information. Record the information from the pre-labeled bottle tags in the field logbook and complete all chain-of-custody documents.
11. Thoroughly decontaminate the bailer and associated line or cable that has contacted groundwater after each use according to Section 4.24.

4.7 MONITORING WELL AND PIEZOMETER INSTALLATION

All monitoring wells will be installed in accordance with the RCRA Groundwater Monitoring Technical Enforcement Guidance Document, EPA, OSWER 9950.1. Groundwater monitoring wells and open-pipe piezometers (observation wells) will be constructed in boreholes drilled and logged in accordance with Sections 4.1, Hollow-Stem Auger Drilling, Section 4.2, Rotary Drilling and Rock Coring and Section 4.4, Borehole Logging. All drilling and sampling equipment will be decontaminated according to Section 4.24, Equipment Decontamination and protected from the ground surface with clear plastic sheeting or will be placed on clean drill racks.

The following is a list of equipment and well material required for well installation:

- Drill rig with appropriately sized drill bit augers, and/or rods
- High pressure steamer/sprayer
- Sand bailer
- Long-handled bristle brushes
- Wash/rinse tubs
- Nonphosphate, lab grade detergent (e.g., Liquinox)
- Weighted tape measure
- Solonist water level probe
- Distilled water
- Drums for containment of cuttings
- Appropriate Health and Safety equipment
- Field notebook
- Location map

- Boring Log Form
- Groundwater observation well report
- Fluid Level Measurement Form

Boreholes will be drilled by using a drill rig and drilling methods capable of completing the well to the depth specified in this Site Investigation Plan. All drilling equipment, including the drill rig, water tanks, and all down-hole equipment will be decontaminated according to Section 4.24, Equipment Decontamination. The same decontamination procedure will be followed between boreholes.

Before drilling, test borings/wells will have been numbered, located, and identified by using stakes, or spray painted on paved surfaces. Drilling locations will be cleared for buried metal objects and utility interferences. Boreholes will be advanced from the ground surface to a predetermined target depth. Boreholes drilled for wells will be logged stratigraphically by examination of the sample cuttings or core samples according to Section 4.5, Subsurface Soil Sample Collection.

During the drilling process, the center bit will be removed slowly to prevent sand from entering (blowing into) the bottom auger. In the event of sand blow-in, approved water may be added to the inside of the augers to equalize the hydrostatic pressure of the formation water. A record of the amount of water placed in the well will be kept so that it can be taken into account during well development.

The inside diameter (I.D.) of the auger or rotary bit will be approximately 4-inches or more larger than the outside diameter (O.D.) of the casing, resulting in a 2-inch annulus around the casing. Similarly, a 2-inch annulus will be provided around well screens and casings when wells are constructed in open portions of boreholes. In open-hole installations (wells constructed in uncased boreholes), the use of casing centralizers will be required to ensure the 2-inch annulus is maintained. Centralizers should be provided above and below the well screen, but not within the bentonite seal. Depending on the well depth and diameter, centralizers may also be required at intervals along the riser to provide a 2-inch grout annulus. When hollow-stem augers are used, centralizers will only be required if the auger flights are not a sufficient size to ensure a 2-inch minimum annulus diameter an all sides of the screen.

During the drilling operation, the cuttings and formation water from the boring will be placed in waste drums according to Section 4.25, Management and Disposal of Contaminated Wastes. Single-cased wells will be used in shallow aquifer completions. Double casings will be required for deeper wells installed in areas of potentially contaminated perched groundwater. Surface casing will be installed through the perched aquifer, as appropriate.

Well casings will consist of new, threaded, flush-joint, schedule 40 polyvinylchloride (PVC) pipe. The well casing will extend from the top of the well screen to approximately 2-feet above ground surface. The tops of all well casings will be fitted with slip-on or threaded PVC caps which can be easily removed by hand. All joints within the casing string will be threaded. Heat-welded joints, solvents, and/or gaskets will not be used. Polytetraflouroethylene (PFTE) tape will be wrapped around the joint threads to improve the seal. All well casings will be free of foreign material and will be steam-cleaned with potable water before use. Steam-cleaned casings will be stored in plastic sleeves prior to use.

Well screens will consist of new, threaded, PVC pipe with factory-machined slots or wrapped screen as specified in this SAP. All well screens will have an I.D. equal to or greater than that of the well casing. The wall thickness of PVC screen will be the same as that of the well casing. All screen bottoms will be fitted with a threaded or slip-on cap secured with stainless steel screws within 0.5 feet from the bottom of the screened interval. A 2-foot-deep sediment sump will be used beneath the screen. Well screen and/or blank casing with stamped or stenciled nomenclature will not be used. Screened intervals will be 10 feet or less, depending on site conditions.

The filter pack material will be chemically inert, rounded, silica sand designed to be of appropriate size for the well screen and host environment. The filter pack will extend approximately 2-feet above the top of the screen unless otherwise specified. The final depth to the top of the filter pack will be measured directly by using a weighted tape measure and not by using volumetric calculation methods.

A bentonite seal will be installed above the filter pack. The seal will consist of a layer of commercially available bentonite pellets that is at least 3 feet thick when measured immediately after placement, without allowance for swelling.

The annular space between the well casing and the borehole will be grouted from the top of the bentonite seal to the ground surface. The grout will consist of reduced pH bentonite grout (American Colloid Pure Gold or equivalent) mixed in a powdered mechanical grout mixer according to the grout manufacturer's recommendations. The grout will contain at least 30 percent solids by weight and have a minimum density of 9.9 pounds per gallon after mixing.

Grout will be placed outside of the monitoring well casing using a tremie pipe located just above the top of the bentonite seal. The grout will be pumped through the pipe until undiluted grout flows from the annular space at the ground surface. The tremie pipe will then be removed and more grout added to compensate for settling. After 24 to 48 hours, the site will be checked for grout settlement and more grout added to fill any depressions.

The installation procedure for piezometers and monitoring wells is as follows:

1. Monitoring well installation will begin after formation water and fine grained sediment have been bailed using a sand bailer until the water is relatively clear and free of sediments. If granular soils do not blow into the bottom of an auger, raising the auger 1- to 2-feet above the bottom of the hole can help with the removal of muddy water from outside of the augers. This will not work if the hole bottom caves or blows in.

2. The borehole will then be measured to the nearest 0.10-foot and the well assembly will be measured to the nearest 0.01-foot. The portion of the well casing cut off at the top will be measured and subtracted from the total length supplied to determine the total well assembly length.

3. Once the well assembly is in place, the filter pack will be added slowly to the zone below the water level in the borehole by tremie pipe. If filter pack material is placed in wells above the water level in the borehole, a tremie pipe will not be required inside of hollow-stem augers. A tremie pipe will be required for all filter placement in open hole completions. The filter pack will be added in 1- to 2-foot increments. Similarly, augers will be raised in 1- to 2-foot increments so that the sand level is always at or slightly above the bottom of the augers. Depth measurements of the top of the filter material will be taken continuously in the well annulus as the filter is placed. The final depth to the top of the filter pack will be approximately 2-feet above the top of the well screen and will be directly measured by a weighted tape measure. The weight on the measure tape will be stainless steel in the event that it accidently becomes imbedded in the filter pack. If bridging of the filter material occurs in the well annulus or tremie pipe during placement, the bridged material will be broken loose mechanically by shaking augers and/or well assembly. Bridged material in the annulus may also be broken loose by probing with a 1-inch-diameter tremie pipe. If both of these methods are unsuccessful, distilled water may be pumped through the 1-inch tremie pipe to dislodge the bridged material. A record of the amount of water placed in the well will be kept so that it can be taken into account during well development.

4. A minimum 3-foot bentonite seal (before swelling) will be installed immediately above the filter pack. If the bentonite pellet seal will be placed below the water table, it will be installed through a tremie pipe. The bentonite pellets will be added slowly to reduce the chance for bridging of the pellets

inside the tremie pipe. Augers will be raised approximately 1-foot above the filter pack prior to adding the bentonite pellets. The top of the bentonite seal should never be above the base of the augers. If the bentonite seal is placed above the water level in the borehole, the pellets may be allowed to free-fall into the borehole if hollow-stem augers are being used. The bentonite will be hydrated using 5-gallons of distilled water after the base of the augers are raised approximately 1-foot above the top of the bentonite seal. The completed bentonite seal will be allowed to hydrate for approximately 30 minutes before proceeding with the grouting operation.

5. Bentonite grout backfill will be placed from the top of the bentonite seal to the ground surface. The grout mixture will conform to specifications outlined previously. The grout will be tremied into the well annulus until it is completely full. After settlement of the bentonite grout has been allowed for 24 to 48 hours, the protective steel casing will be embedded in cement-bentonite grout or nonshrink concrete. The cement-containing grout will occupy the upper 1 1/2- to 3-feet of the well annulus to anchor the protective casing. This may require removing some of the bentonite grout from the upper 1 1/2- to 3-feet of the well annulus. If the upper grout surface is dehydrated, it will either be removed or rehydrated by adding water and waiting for approximately 30 minutes.

Deeper monitoring well installations will be similar to shallow well installations except that a surface casing will be provided through the upper material to guard against potential cross-contamination of lower aquifers by contaminated perched groundwater. The surface casing will extend from the ground surface to at least 3-feet below the contact between upper and lower aquifers.

When rotary drilling methods are required, installation procedures will be similar except that the well will be completed in an open hole instead of inside of hollow-stem augers. The well string will be suspended approximately 2-inches above the top of the bottom of the borehole prior to installing the filter pack. This will reduce bending of the well assembly and minimize the potential for collapse of the casing due to the weight of fluid in the annulus. Stainless steel centralizers will be placed at 20-foot-maximum spacing for wells completed in open boreholes.

Between 24 and 48 hours after initial grout placement, with a minimum 8-inch I.D. for 4-inch wells and a minimum 6-inch I.D. for 2-inch wells, a 5-foot long protective steel casing with hinged and locking steel cap will be installed over the monitoring well riser that protects above the ground surface. The well designation will be welded on the protective casing.

The annulus between the well riser and the steel protective casing will be filled with cement grout or nonshrink concrete to a minimum of 12-inches above the ground surface, and a 1/4-inch-diameter hole will be drilled in the protective cover to allow drainage.

An external concrete collar approximately 3-feet-square will be placed around the protective casing at the ground surface. The well designation will be scribed in the concrete before it sets. The collar will be graded to slope away from the casing in all directions.

The locations of all new monitoring wells will be surveyed to USGS datum. Measuring points for water level elevations will be established to a vertical accuracy of ±0.1 feet.

When traffic conditions or vegetation warrant extra protection, four 3-inch-diameter painted steel posts will be installed. The posts will be located radially from the well casing at a distance of approximately 4-feet. They will be embedded in concrete 3 feet below the ground surface with a minimum of 3-feet sticking up above the ground. Installation is required within 48 hours of well installation. In areas of high vegetation, the posts will be flagged.

The installation of monitoring wells and piezometers will be documented on groundwater monitoring well and piezometer construction forms (see Appendix A). Drilling information will be documented on Borehole Log Forms. Besides the drilling and borehole information required, the following documentation must be recorded:

- Elevation of ground surface
- Elevation of top of surface casing/riser pipe
- Height of top of surface casing/riser pipe above ground surface
- Depth of surface seal below ground level
- Type of surface seal
- Type and size of surface casing
- Depth of surface casing below ground
- Types/depths of centralizers
- Type and size of riser pipe
- Diameter of borehole
- Depth of borehole
- Type of backfill
- Elevation/depth bottom of seal
- Type of filter pack
- Depth of top of filter pack
- Elevation/depth top of screened section
- Type of screened section
- Screen openings
- I.D. of screened section
- Elevation/depth bottom of screened section

- Length of blank section below screen
- Elevation/depth bottom of plugged blank section
- Elevation/depth bottom of sand column
- Type of backfill below observation pipe
- Elevation/depth of hole

4.8 MONITORING WELL DEVELOPMENT

All monitoring wells will be developed in accordance with procedures in the RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, EPA, OSWER 9950.1, Section 3.4, except for the modifications contained herein.

Monitoring well development is the process by which the well drilling fluids and mobile particulates are removed from within and adjacent to the newly installed wells. This process can also be used to remove sediment or other built-up material from an older well. The objective of a completed well development activity is to provide groundwater inflow that is as physically and chemically representative as possible of the aquifer that is open to the well or piezometer.

The following is a list of well development and associated equipment:

- Stainless steel or Teflon™ bailer
- Mechanical reel equipped with a stainless steel cable, teflon or polyethylene cord
- Inertial pump
- Water quality test kit (pH, specific conductance (SC) and temperature)
- Wash/rinse tubs

- Long-handled brushes
- Plastic sheeting
- Disposable latex or vinyl gloves
- Nonphosphate, lab detergent (e.g., Liquinox)
- Containers for development water
- Electronic water level probe - sufficiently accurate to measure water levels to the nearest 0.01 foot
- Weighted tape measure - sufficiently accurate to measure depths to within 0.10 foot
- Distilled water
- Field notebook and field forms
- Photoionization Detector (PID)
- Calculator

The following procedure will be followed for well development for newly installed wells:

1. Well development for new wells will be conducted no sooner than 48 hours and no longer than 2 weeks after installation. New wells will be developed utilizing low-energy methods. The equipment of choice for well development is an inertial pump or bottom discharge/filling bailer. High-energy methods such as submersible pumps, surge blocks, over-pumping, backwashing and well jetting will not be used due to the possibility of formation fines clogging the well screen.

2. All newly installed wells will be checked for the presence of immiscible layers prior to well development. The method for detection these layers in monitoring wells is discussed in Section 4.10, Measurement of Static Water Level

Elevations and Immiscible Layers. If an immiscible layer of 5 mm or greater has been detected in a newly installed well, well development procedures will not continue until the Project Manager has been notified. In the case where an immiscible layer is not identified, a water level measurement will be taken according to Section 4.10, Measurement of Static Water Level Elevations and Immiscible Layers, and well development activities will continue. The water level measurement along with the total depth measurement will be used to determine the volume of water in the well casing.

3. Formation water and fines will be evacuated by slowly lowering and raising the inertial pump or bailer intake throughout the water column. The inertial pump may be placed inside a decontaminated 1-inch diameter PVC pipe if the pump intake cannot be lowered to the bottom of the well. The PVC pipe will prevent the inertial pump intake from bending prior to reaching the desired depth. PID readings are described in Section 4.18, Calibration and Operation of the Photoionization Detector. If a bailer is used for well development, it will be protected from the ground surface by clear plastic sheeting. Development equipment, including bailers and pumps, will be decontaminated before well development begins and between well sites according to Section 4.24, Equipment Decontamination.

4. Estimated recharge rates will be measured following the procedures outlined in Section 4.10, Measurement of Static Water Level Elevations and Immiscible Layers. Decontamination and development water will be handled according to Section 4.25, Management and Disposal of Contaminated Wastes.

Development shall proceed in the manner described herein and continue until the following are met:

- Removal of minimum of 5 well casing volumes. Typical well casing volume calculations include:

  a. 2-inch diameter well:
  0.16 gal/ft x ___ (linear ft of water) = gallons of water

  b. 4-inch diameter well:
  0.65 gal/ft x ___ (linear ft of water) = gallons of water

  c. 6-inch diameter well:
  1.5 gal/ft x ___ (linear ft of water) = gallons of water

Graduated containers will be used to measure the amount of water removed.

- Three consecutive well casing volume readings of pH, temperature, and specific conductance are recorded (i.e., consecutive temperatures that are within 1°C, pH readings are within 0.2 units) and consecutive conductivity readings are within 10 percent of each other. The calibration and use of these field instruments are described in Sections 4.12 and 4.13.

- If water is used during monitoring well drilling, the total fluid added will be calculated, and five times the fluid lost in the borehole during drilling will be recovered in addition to the five casing volumes.

- The sediment in the well has been completely removed. One week following initial development, the well will be checked for the accumulation of additional sediment. Any additional sediment will be removed at the time of measurement.

- In low-yielding, water-bearing formations, distilled water may be introduced into the well to facilitate development. The amount of distilled water must be recovered from within the well within 8 hours or 3 times the amount prior to ceasing development activities.

A pre-existing monitoring well will be redeveloped in a manner similar to the well development for new wells. The equipment and procedures used for redevelopment will also be consistent with the equipment and procedures for the development of new wells.

The criteria to be followed for redevelopment of pre-existing well will be:

- The removal of sediment inside the well.
- If the accumulated sediments cannot be removed, the goal of redevelopment will be to obtain stable field parameters after removing three well casing volumes.
- If the above mentioned results cannot be obtained, five well casing volumes will be removed.

The following well development information will be recorded for newly installed wells:

- Well I.D. and location survey coordinates
- Well designation
- Date(s) of well installation
- Date(s) and time of well development
- Static water level from measuring point
- Total depth from measuring point
- Quantity of water used during drilling
- Volume of well casing
- Field measurements of pH, specific conductance (SC), and temperature, taken in at least half-casing volumes
- Screened interval
- Depth from top of well casing to top of sediment inside of the well, before and after development
- Physical description of removed water throughout development (color and turbidity)
- Type of pump/or bailer
- Well stick-up

- Quantity of water removed and time for removal (incremental and total volumes)

4.9 WELL CAP OPENING

Each well will be opened in accordance with the following procedures:

- Calibrate the photoionization detector (PID) according to Section 4.18, Calibration and Operation of the Photoionization Detector.

- With a two-person team, approach the well from an upwind direction (wind at back).

- Monitor breathing zone around well housing with PID. Proceed after taking any necessary safety precautions (for example donning a respirator). Record readings in field notebook.

- Open the well housing. As an added precaution, one should keep their head to the side (not over housing) when opening the lid.

- Monitor the air space on the inside of the housing and at the well head before proceeding. Record reading in field notebook.

- Don respirator before opening well cap/cover.

- Remove well cap/cover <u>slowly</u>! As an added precaution, one should keep their head to the side (not over the well head) during cap removal.

- Monitor the airspace immediately at and around the well head opening. Record readings in field notebook.

- Move away from the well until safe conditions exist and remove respirator.

- Repeat these procedures for all monitoring wells in close proximity that are to be measured and sampled. This will allow additional gases/vapors to escape before sampling begins.

4.10 MEASUREMENT OF STATIC WATER LEVEL ELEVATIONS AND IMMISCIBLE LAYERS

Prior to the collection of samples from groundwater monitoring wells the static water elevation will be determined. In general, the elevation will be determined in accordance with "RCRA Groundwater Monitoring Technical Enforcement Guidance Document", OSWER-9950.1, Section 4.2.1, except for the modifications contained herein.

Field measurements typically include depth to standing water and the total depth of the well. Water level measurements will be recorded to the nearest 0.01 foot. The method will also be adequate to attain an accuracy of 0.05 foot. In addition, the following conditions must be considered in order to obtain acceptably accurate groundwater level measurements:

- Water levels in piezometers will be allowed to stabilize for a minimum of 24 hours after well construction and development, prior to measurement. Water levels require varying time periods to reach static conditions in new wells; therefore, the date and time of construction will be noted along with the initial water level measurement, and the date and time of the initial water level measurement.

- Multiple sampling events of the same well may occasionally occur over only a few days. If some of these wells are slow recharge wells, water levels may not be representative of static conditions. In order to prevent a misinterpretation of static water levels due to this scenario, the date of the last sampling or well purging event will be documented in the water level measurement database.

- Static water levels will be measured with electronic water level probes.

- Each well must have a permanent, easily identified notched measuring point (MP) on the north side of the inner casing from which the depth to water is consistently measured. The MP should be established by a licensed surveyor and typically is located and marked at the top of the inner well casing. The MP should be established in relation to an established benchmark such as those provided by the U.S. Geological Survey and/or a National Geodetic Vertical Datum (NGVD). The survey will also note the well location coordinates and the coordinates of any temporary benchmark.

- For comparability, water level measurements must be referenced to the same datum (elevation). The MP is measured in reference to land surface datum (LSD) and is the most convenient place to measure the water level in a well. A MP correction of a water level measurement converts the measurement to a distance above or below land surface at the well.

- The MP must be as permanent as possible, clearly defined, marked, and easily located. If at all possible, position the point so that a leveling rod can be set on it directly over the well and the measuring tape can hang freely when it is in contact with the MP.

- The reference point (RP) for water level measurements is an arbitrary datum established by a permanent benchmark set on or near the well. It is used to check the measuring point, and its greatest value is in reestablishing a MP if one is destroyed or changed.

- Because the potential may exist for the presence of immiscible organic compounds at some locations, procedures have been established to detect the presence of these compounds and to sample them, if present. The first step in this process is the determination of a positive response using the PID in the well head, and then the determination of the presence and thickness of any light/dense non-aqueous phase liquids (LNAPL/DNAPL). The air in the well head will be analyzed according to procedures in Section 4.18, Calibration and Use of the Photoionization Detector.

- In the areas where a potential may exist for non-aqueous phase organic liquids, this procedure will be implemented along with the measurement of static water elevations in each well prior to each sampling event.

The determination of immiscible layers and static water level measurement using an interface probe will be as follows:

1. Well measurement equipment will be constructed of stainless steel, Teflon™, or other inert materials. Extraneous contaminant materials can be introduced into the water or soil at a site during water level measurements. Trace quantities of contaminant materials thus transported may later be captured in a sample and lead to false positive analytical results and, ultimately, to an incorrect assessment of the contaminant conditions associated with the site. Decontamination procedures for water level measurement equipment and for the personnel who use the equipment are performed for the dual purposes of minimizing cross-contamination and of providing a safe and healthy working environment. Equipment will be decontaminated before and after use at each well. Procedures for decontamination are set forth in Section 4.24, Equipment Decontamination.

2. Follow the manufacturer's instructions for utilization of the interface probe. As with other water level measurements, the probe will be sufficiently precise to measure water levels to the nearest 0.01 foot and the accuracy of repeated measurements must agree within 0.05 foot. When lowering the probe, care will be taken to minimize rubbing of the tape against the well casing.

3. Typically, the interface probe will have differing sound tones or patterns to distinguish between aqueous and non-aqueous organic layers. When measuring the depth to aqueous or non-aqueous phases, results will be recorded to the nearest 0.01 foot. Results will be measured from the appropriate MP on the inner well casing.

4. The probe will be moved up and down to locate the point where the appropriate indicator tone or sound is reproducible obtained. Measurements from three consecutive readings must not differ more than ± 0.05 foot. The three readings will be taken by two different individuals, with one person typically taking the first and third readings and another individual taking the second reading. An average of the reproducible readings will be utilized for the determination of the water level. Once the water level and immiscible if any) has been determined and recorded, the probe will be carefully retrieved, to ensure minimal rubbing of the tape against the inside well casing. The probe and cable will be decontaminated between use at each well following procedures given in Section 4.24, Equipment Decontamination.

5. Due to the difficulty in decontamination of the interface probe after passing through a non-aqueous organic phase, the interface probe will not be used to measure total depth to the bottom of the well when light non-aqueous phase liquids (LNAPLs) are present. Instead, a steel tape will be utilized. The procedure for use of the steel tape is as follows:

   a. Graduated steel tapes will normally only be used for determination of the total well depth for wells containing LNAPLs. The graduated steel tape method is considered an accurate method for measuring the water level in non-flowing wells (National Handbook of Recommended Methods for Water-Data Acquisition, 1977, pp. 2-8). A slender weight will be attached to the end of the tape to create tautness and to permit some feel for obstructions. The tape will be lowered to the bottom of the well and the tape read from the MP on the inner well casing.

b. The tape is read at the point being held at the MP. As an accuracy check, three measurements will be made. If the three measurements do not agree within 0.05 foot, continue to measure until the reason for the lack of agreement is determined or until the results are shown to be within 0.05 foot.

c. Before and after each well measurement, that part of the tape measure, that becomes wetted will be decontaminated. Decontamination procedures are discussed in Section 4.24, Equipment Decontamination.

The frequency of measurements depends on the objectives for a given project and accuracy desired in measuring changes in water level. The frequency of measurements will be guided by the accuracy of changes in water level needed to meet these objectives.

All data will be recorded on a Fluid Level Measurement Form and in the field notebook before leaving the well site.

The electronic sounders will be calibrated quarterly by following the manufacturer's instructions or by suspending the sounder and measuring it against a steel tape if no other calibration instructions are supplied. Results will be recorded on the water level measurement form and marked as a calibration measurement.

The following information shall be recorded for each observation-well site:

- The Tinker AFB Project Number.
- The date and time of the water level measurements.

- The names of personnel performing the measurements.
- The equipment manufacturer, model, and serial number.
- The last calibration date and the date due for the next calibration.
- The last date the well was sampled or purged.
- The name of the QC reviewer and the date of the QC review.

Individual measurements are entered onto the Fluid Level Measurement Form and in the Field Notebook as the measurements are performed. The information is recorded as follows:

1. Record the well number.

2. Record the top of the well casing elevation in the second column (TOWC Elevation).

3. Measure and record the depth to water from the measuring point in the third column (DW). The measurement will be taken a total of three times by two different individuals, with one person typically taking the first and third readings and another individual taking the second reading. Measurements from the three readings must agree within 0.05 foot. If the three measurements do not agree within 0.05 foot continue to measure until the reason for the lack of agreement is determined or until three consecutive readings are shown to agree within 0.05 foot. An average of the reproducible readings will be utilized for the determination of the water level.

4. Calculate and record the groundwater elevation by subtracting the depth to water from the MP from the top of well casing elevation (GW Elevation).

5. Record the initials of the individual who checks the calculation done in Step 4.

6. Measure the total depth of the well from the MP and record this value (MTD). The measurement will be taken a total of three times by two different individuals, with one person typically taking the first and third readings and another individual taking the second reading. Measurements from the three readings must agree within 0.05 foot. If the three measurements do not agree within 0.05 foot continue to measure until the reason for the lack of agreement is determined or until three consecutive readings are shown to agree within 0.05 foot. An average of the reproducible readings will be utilized for the determination of the water level.

7. In some devices the length of the probe end may not have been taken into consideration when marking the measuring tape. In this case the length of the probe end will need to be added to the measured total depth in order to determine the total depth of the well from the MP. Record the length of the probe end in column seven (Probe end).

8. Determine the total depth of the well from the measuring point by adding the length of the probe end to the measured total depth (TD) from the MP and record this value.

9. Record the initials of the individual who checks the calculation done in Step 8.

10. Record weather conditions and comment such as significant features or activities near the well that could affect the water level.

4.11 MONITORING WELL SAMPLING

In general, groundwater will be sampled in accordance with "Characterization of Hazardous Waste Sites - A Methods Manual: Volume II - Available Sampling Methods, Second

Edition" EPA-600/4-84-076, Section 3.4.3, Method III-9, except for the modifications contained herein.

Sampling will take place immediately after purging, using either a bailer or bladder pump. Sampling equipment will be constructed of materials which will not affect sample integrity during withdrawal from the well. A decontamination, sample preparation, and support area will be set up near the well head. All sampling equipment and instruments that come in contact with water samples will be decontaminated prior to sampling each well and kept on plastic sheeting. Decontamination procedures are discussed in Section 4.24, Equipment Decontamination.

The sampling procedure will be as follows:

- Completely fill out the appropriate sample labels in advance. Be sure to complete the label with all required information. Time of sampling may be completed after samples are taken.

- Open the monitoring well in accordance with Section 4.9, Well Cap Opening.

- Purge the appropriate amount of water from the well prior to sampling. Three casing volumes, calculated using the procedure found in Section 4.8, Monitoring Well Development, are typically recommended.

- Record all information regarding purging in the logbook. All purge water will be contained. The volume purged must be closely monitored.

- Temperature, pH, and specific conductance will be monitored during purging to ensure that they have stabilized before sampling. These measurements should be made at a frequency of 10 percent of purge volume (for example, every 10 gallons for a 100-gallon purge volume). Procedures for making these measurements are contained in Sections 4.12 and 4.13. Field measurements should be stabilized over three readings prior to sample collection (pH within ±.2 units, temperature within ± 1°C, and specific conductance within ± 10 percent). If these measurements have not stabilized, continue purging until the conditions are met or five well casing volumes have been purged.

- Decontaminated sampling equipment will be lowered into the well on a stainless steel wire, nylon rope, or teflon/polyethylene tubing for sample withdrawal. When nylon rope is used, a stainless steel leader will be used between the bailer and the rope so that only inert materials enter the well water.

- If using a bailer, lower the bailer slowly until it contacts the water surface, then allow it to sink and fill with a minimum of surface disturbance to prevent aeration of the sample. Carefully remove the bailer and transfer sample into the sample containers.

- When removed, the bailer should not come in contact with any materials outside of the well casing, the bailer line should not be allowed to make contact with the ground.

- If using a bladder pump, lower the pump into the well to within the screened interval and begin pumping. The sample will be pumped to the surface though freshly decontaminated tubing made of inert material (for example, polyethylene lined with teflon) directly into the appropriate sample containers. Repeat the above steps as needed to acquire sufficient volume to fill all sample bottles of a sample bottle set.

- Containers for volatile organic compound (VOC) analysis will be filled first by slowly filling the vials to the top with no headspace. The cap will be put on and the container inverted to check for air bubbles. If bubbles are present the sample will be discarded and the sample container refilled. VOC samples will immediately be placed on ice in a cooler before proceeding to the next step.

- Containers for remaining analytical parameters will then be filled in the following order: semi-volatile organic compounds, and total metals.

- The remaining samples will then be placed on ice in a cooler.

- Once all the sample containers have been filled the necessary QC samples will be collected in accordance with procedures in Section 4.26, Field QC Samples.

- Once all analytical samples have been collected, collect an additional sample amount for the measurement of field parameters. Record data into field notebook.

- Samples will be labeled and packed for shipment following procedures in Sections 4.20 and 4.21. All sampling information will be recorded in the field notebook and on the appropriate forms. Chain-of-custody records and other necessary shipping documentation will be prepared as discussed in Section 4.22, Chain-of-Custody Records.

4.12 MEASUREMENT OF CONDUCTANCE AND TEMPERATURE

This procedure describes the method for determining the conductivity and temperature of unknown solutions using a conductivity meter. Generally meters have a readability as low as 2.5 umhos/cm, and a range between 0 to 50,000 umhos/cm. The following procedures are applicable to most conductivity meters. However, field personnel will consult the manufacturers instruction manual for the specific instrument they will use.

Setup

1. Adjust meter zero (if necessary) by turning the zero adjusting knob screw on the meter face so that the meter needle coincides with the zero on the conductivity scale.

2. Turn the MODE control to REDLINE and adjust the REDLINE control so the meter needle lines up with the redline on the meter face. If this cannot be accomplished, replace the batteries.

3. Plug the probe into the probe jack on the side of the instrument.

Conductivity Measurement

1. Perform calibration check at beginning and end of each day of sampling.

2. Put the probe in the solution to be measured so that there are no obstructions near the probe. Also, be certain the probe is immersed so that the vent hole is submerged.

3. Switch the MODE control to the x100 scale. If the reading is below 50 on the 0-500 range, switch to the x10 scale. If the reading is still below 50, switch to the x1 scale. Read the meter scale and multiply the reading appropriately to get the conductivity in umhos/cm. Record value in field notebook and/or on appropriate form.

4. When measuring on the x100 and x10 scales, depress the CELL TEST button. The meter reading should fall less than 2%; if greater, the probe is fouled. Clean the probe and re-measure. The CELL TEST does not function on the x1 scale.

5. Rotate switch to OFF position. Rinse the probe with deionized (or distilled) water before reinserting it in the next solution.

Temperature Measurement

1. Repeat setup steps 1-3, if necessary.

2. Set MODE control to TEMPERATURE.

3. Place probe into solution to be measured. Allow time for the probe temperature to come to equilibrium with that of the water before reading.

4. Read the temperature on the bottom scale in degrees celsius.

5. Record value in field notebook and/or on appropriate form.

Maintenance

1. When the cell test indicates low reading, the probable cause is dirty electrodes. For normal cleaning, soak the probe for five minutes with a locally available bathroom tile cleaning preparation. For stronger cleaning, a five minute soak in a solution made of 10 parts distilled water, 10 parts isopropyl alcohol and one part HCl can be used. Rinse the probe with distilled water after cleaning and before storage.

2. Probes are best stored in deionized (or distilled) water. If the probe has been stored dry, soak with deionized (or distilled) water before use.

Calibration Check

Conductivity meters are calibrated to absolute accuracy using a standard solution of 0.001 molal KCl. Standard solutions are available from vendors and can be substituted into the following method if available. To prepare a standard solution:

1. In a one liter flask, dissolve 0.745 grams of pure dry KCl until the solution is one kilogram in weight.

2. Use table below and the temperature of the water to determine the conductivity of the solution just prepared. Note: This table shows conductivity as if the distilled water was nonconductive. Since even high purity distilled water is slightly conductive, the measured conductivity will be higher by an amount equal to the water's conductivity.

Calibration check with 0.01 dermal KCl solution.

Temperature °C	Conductivity umhos/cm
15	1141.5
16	1167.5
17	1193.6
18	1219.9

19	1246.4
20	1273.0
21	1299.7
22	1326.6
23	1353.6
24	1380.8
25	1408.1
26	1436.5
27	1463.2
28	1490.9
29	1518.7
30	1546.7

3. Place probe in solution and measure conductivity. The conductivity of the solution plus the conductivity of the distilled water should not vary from the meter reading by ± 1.5%. If the reading is greater than 1.5%, clean the probe and then recheck the conductivity. If after cleaning it is not possible to measure the conductivity of the calibration solutions within ± 1.5%, the probe and instrument should be returned to the manufacturer for calibration and maintenance.

4. When using a vendor standard solutions place the probe in the solution and measure conductivity and temperature. Correct conductivity measurement to 25°C with the following formula.

$$C_{25} = Co/(1+0.0191\ (t-25)$$

where: C_{25} = Conductivity at 25°
C_o = Observed conductivity
t = Sample temperature in °C

Compare C_{25} of the sample with the C_{25} of the standard solution. Observe any difference and record results in the field logbook and/or appropriate form.

4.13 MEASUREMENT OF pH

Field pH meters are used to measure the pH of natural waters. A field pH meter should have a shock resistant case, be water proof, and there it should have the capacity to be calibrated to standard pH buffered solutions. The following procedures can be applied to most field pH meters. Field personnel will be familiar with the operation of the specific pH meter that they will use. A manufacturer's operator's manual will be provided with every instrument and calibration, operation, and maintenance procedures found in the manual will be followed.

Setup and Meter Check-Out

All field pH meters run on batteries; new batteries should be installed at the beginning of each field session and replacement batteries should always be on hand. The meter case should be inspected for damage which might comprise the integrity of the meter. The pH electrode should also be inspected for cracks, damaged tip, and electrolyte solution (AgCl). If the electrode is damaged, a replacement should be found; if the electrolyte solution is low, it should be emptied and refilled.

Calibration and Measurement

There are two types of pH meters; one meter type has Automatic Temperature Compensation (ATC), and the other type of meter needs to have its readings adjusted for temperature. For the latter type of meter the best method of use is to calibrate the meter with pH buffered standard solutions at the same temperature as the sample water to be measured. This adjusts the meter to the correct sample temperature and gives readings that are temperature compensated. The best method of getting the standard solutions to same temperature as the water samples is to place the bottles containing the standard solutions in a large container and allow the water to be sampled to run over it until the water and standards are at the same temperature. The temperature can be measured with a standard lab thermometer. When the pH buffered standard solutions are at the same temperature as the water samples other the two buffer calibration or the single buffer calibration specified in the operator's manual will be followed.

4.14 SURFICIAL SOIL SAMPLE COLLECTION

Surface soil samples will be collected in accordance with "Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition," EPA-600/4-84-076, Section 2.2.1, Method II-1, except for the modifications contained herein.

The sampling procedure will be as follows:

1. Label the sample container with the appropriate sample tag. Be sure to label the tag carefully and clearly, addressing all the categories or parameters listed on the tag.

2. Carefully remove the top layer of soil to the desired sample depth with a precleaned shovel (if necessary).

3. Using a precleaned stainless steel scoop or trowel, remove and discard a thin layer of soil from the area which comes in contact with the shovel.

4. Transfer sample (minimum of 500 grams) into an stainless steel mixing bowl with a stainless steel lab spoon.

5. Sample as above in three locations, then mix the contents of the bowl together until a homogenous mixture is formed.

6. Place a sample of the mixture into an appropriate jar (enough to fill jars specified in Table 5-4 for chemical analysis). Checking that a Teflon™-liner is present in the cap if required, secure the cap tightly.

7. Complete all Chain-of-Custody documents and record in the field log book.

8. Prepare sample for shipping in accordance with Section 4.21.

9. Decontaminate equipment after use and between sample locations. For specific decontamination guidelines, consult Section 4.24 of this document.

4.15 SURFACE WATER SAMPLE COLLECTION

Surface water samples will be collected in accordance with "Characterization of Hazardous Waste Sites - A Methods Manual: Volume II. Available Sampling Methods, Second Edition," EPA-600/4-84-076, Method III-1, except for the modifications contained herein.

The sampling procedures will be as follows:

1. Label the sample bottle with an appropriate sample tag. Be sure to label the tag carefully and clearly, addressing all the categories or parameters on the tag.

2. Submerge a precleaned stainless steel dipper or other suitable device with minimal surface disturbance.

3. Allow the device to fill slowly and continuously.

4. Retrieve the dipper/device from the surface water with minimal disturbance.

5. Remove the cap from the sample bottle and slightly tilt the mouth of the bottle below the dipper/device edge.

6. Empty the dipper/device slowly, allowing the sample stream to flow gently down the side of the bottle with minimal entry turbulence.

7. Continue delivery of the sample until the bottle is almost completely filled. Leave adequate room to allow for expansion.

8. Select appropriate bottles and preserve the sample if necessary as per guidelines in Section 5.0.

9. Check that a Teflon™ liner is present in the cap if required. Secure the cap tightly.

10. Once all analytical samples are collected, collect an additional sample amount for the measurement of field parameters.

11. Record all information in the field logbook and complete the chain-of-custody form.

12. Properly clean and decontaminate all equipment used prior to reuse or storage (Section 4.24).

4.16 HIGH-VOLUME AIR SAMPLING FOR AIRBORNE CONTAMINANTS

High-volume air samplers are one method used to collect airborne particulate samples from ambient air. This method is especially effective for sampling contaminants with a tendency to be transported by airborne particulates. It may also be used to collect samples of airborne mists, gases, and organic vapors when the appropriate filter medium is used.

The sample is collected as air is drawn into a covered housing and passed through a filter using a high flow-rate suction motor. Airborne particulate matter, organic vapors, mists, or fumes are collected on a filter. The flow rate of the air is determined over a designated period of time. For this investigation, the period of air sampling is 24 hours. The filter is then analyzed for the specific constituents of concern.

A number of interferences can bias the sampling results. Factors such as vapors, insects, large particles, heavy dust loading, and moisture can overload the filter and reduce the flow rate across the face of the filter. The location of high-volume air samplers near roads, soil stockpiles, pine trees, construction areas, and water bodies should be avoided unless these are the areas being monitored.

The following equipment and materials are needed for high-volume air sampling:

- High-volume air sampler - The sampler consists of a protective casing, electric high flow rate suction motor (40-60 ft^3/min.), and a filter holder able to support an 8 x 10 inch filter.

- Calibration kit - as specified by the manufacturer.

- Filter - A glass-fiber filter or silica-fiber filter is commonly used. The type is selected as appropriate for the analysis.

- Flow-rate recorder - The recorder, if used, must be able to record to the nearest 1.0 ft^3/min.

- Sample handling equipment - to include sample container, gloves, forceps, labels, and chain-of-custody form.

- Field logbook

- Sampling log forms

- Appropriate health and safety equipment

Personnel overseeing air sampling operations should have an appropriate amount of field experience and/or on-the-job training under the supervision of another qualified person. The personnel will be specifically trained to calibrate, set up, operate, and monitor the air sampling equipment. The personnel will be trained in field data collection and documentation in order to attain acceptable standards of accuracy, precision, comparability, representativeness, and completeness.

The following procedure will be used to obtain high-volume air samples:

1. Several factors must be determined prior to air sampling onsite. These include number of samplers, placement of samplers (location), height of samplers (from ground surface), duration of sampling activity, type of filter to be used and analyses to be performed. These factors must be incorporated into this procedure by air sampling personnel prior to onsite activities. Some of this information can be found in the Site Investigation plan.

2. Position the air samplers accordingly and check for stability. Air samplers should be placed or mounted so as not to be easily overturned by wind,

personnel, or equipment. Weigh filter if necessary, mount in the filter holder, and clamp onto the sampler unit in accordance with manufacturer's instructions. Calibrate the air sampler per the manufacturer's instructions and record calibration data in logbook and on log form (if provided). Start the air sampler motor and record the time, initial flow rate, temperature, and barometric pressure.

3. Air sampling personnel will periodically check the air samplers for proper operation. Record findings in logbook and on log form including time checked, flow rate, temperature, barometric pressure, and any changes in position or other disturbance of air sampler. Air sampling personnel will exercise care when approaching the sampling unit so as not to create dust which may skew the final results.

4. At the end of the specified sampling period, air sampling personnel will record final readings from the sampler in the field notebook and on the log form. These will include time, flow rate, temperature, and barometric pressure. Check for leaks in accordance with manufacturer's instructions and note if any found. Prepare to remove sample filter by donning protective equipment (according to health and safety plan) and placing sample container near sampler. Shut off sampler motor using caution to ensure loose material does not fall from filter when suction is discontinued. Carefully remove the filter using gloves and forceps and fold it up to collect all material inside the filter. Place in sample container. Labeling, packaging, and preparation for shipment will follow procedures as specified in Section 4.21, Sample Handling and Shipping. Complete field notebook, log forms, and chain-of-custody forms. Decontaminate air sampler unit as necessary in accordance with Section 4.24, Equipment Decontamination.

4.17 SOIL GAS SAMPLE COLLECTION

This procedure describes methods for obtaining soil gas samples. Methods and protocols will be in accordance with those specified in "A Compendium of Superfund Field Operations Methods", EPA/540/P-87/001, Appendix 7A.

Soil gas sampling for Volatile Organic Compounds (VOCs) in soils above the water table (vadose zone) will be accompanied by borings to obtain soil and/or groundwater samples in order to correlate the soil gas analytical data with actual field conditions. Soil gas samples will be obtained by collecting the gas directly from a probe inserted in the ground. This will be accomplished using an air sampling pump and calibrated air flow meter.

Sampling will be along an established grid at sites where the source(s) or general orientation of a subsurface plume are unknown. Where data are available which identify the source areas or plume characteristics, delineation of contamination edges is most effectively achieved by establishing a transect parallel to the direction of groundwater flow and sampling outward from the suspected source. Soil gas probes should not be located less than 50 feet apart. At distances less than 50 feet, the soil gas samples could be drawn from a subsurface area temporarily depleted of soil gas by a previous sample.

The following is a list of equipment and apparatus needed for soil gas collection and analysis:

- Soil gas probe; usually 1/4 to 1-inch diameter steel pipe equipped with perforations near the tip or a detachable drive point.
- Manual or mechanical driver to install (and remove) the soil gas probe.
- Field analytical instrument (i.e., portable gas chromatograph) with calibration gas of known concentration.
- Gas collection bags such as Teldar or five-layer bags with accessory tubing.
- Low flow air sampling (vacuum) pump with vacuum gauge.

- Sample containers with septum.
- Field notebook

The procedure for the collection of samples for soil gas analysis is as follows:

1. Clear the locale to be sampled of grass, leaves or debris being careful not to walk or drive over the area. Have utilities clearly marked.

2. Drive the soil probe into the ground to the desired depth (usually 3-ft.). If refusal occurs significantly before the sampling depth is reached, remove and clean the probe. Clear another sampling point within one foot of the first point, and insert the probe again. If refusal occurs, eliminate the area within ten square feet as a sampling point.

3. Once the sampling depth is reached, make a notebook entry of the depth, time and location of the sample. Make all field notebook entries following procedures outlined in Section 4.23, Use and Maintenance of Field Notebooks. The soil probe should be then be lifted 1-2 inches to expose the air sampling slots in the drive point.

4. Soil gas sampling can also be performed in augered boreholes or through the center of hollow-stem augers by driving the probe at least 2 feet deeper than the auger depth.

5. Attach adaptor with tubing and stainless steel sampling manifold to the top of the probe.

6. Connect adaptor tubing to the vacuum guage on the vacuum pump.

7. Run vacuum pump to purge the system and to displace the ambient air in the soil gas probe and tubing before sampling. If the applied vacuum exceeds 12 inches of mercury, the soil is either water saturated or does not have a sufficient air-filled porosity to produce a meaningful sample.

8. Collect gas samples from the tubing in a Teldar bag. The bag is then disconnected, sealed, and transported to the laboratory for analysis. An alternative grab sampling technique is to collect the sample with a glass syringe inserted into the extraction line on the intake side of the pump, and immediately inject into a field gas chromatograph located near the sampling site. The syringe must be capped if not immediately analyzed. The extraction line may also be directly connected to the portable GC.

9. Specific analytical method calibration procedures, standards concentrations, etc. are dependent on the method of analysis and analytes of interest. If multiple samples analyzed at one location have a large concentration variation, the analytical equipment should be recalibrated and the sampling system checked for leaks. A standard should be injected for internal standardization into a field GC after every three to five sample injections.

10. Record the time that the vacuum pump is operated before sample collection and pressure reading (vacuum guage) of soil gas probe line at the time of sampling.

11. The soil probe should be removed at each location after the soil gas has been analyzed. The hole should be backfilled with native soil or a soil/bentonite mixture to avoid creating a migration pathway. After removal of the soil probe, the distance between the sampling location and a known point should be measured and recorded.

4.18 CALIBRATION AND OPERATION OF THE PHOTOIONIZATION DETECTOR

A Photoionization Detector (PID) operates on the principle of photoionization. When a photon of ultraviolet (UV) radiation strikes a chemical compound, it ionizes a molecule of the compound if the radiation is equal to or greater than the ionization potential (IP) of the compound. Because ions are capable of conducting an electrical current, an electron flow can be generated within the instrument.

In a PID, an electrical pump, or fan, moves the gas being sampled past a UV source. The sample is ionized and ion pair production occurs for each molecule ionized. The free electrons produce a current directly proportional to the number of ions produced. The current is amplified, detected, and displayed on a meter. Chemical species having IPs less than or equal to the lamp rating will generate an appropriate instrument response. Chemical species that have IPs greater than the lamp rating will display a poor instrument response or no response at all.

The contaminants of concern dictate which lamp should be used. Employing an 11.7 electron volt (eV) rated lamp would provide a relatively wide range of detectable species; however, that lamp requires frequent replacement. More commonly, a 10.2 eV lamp is used. A 10.2 eV lamp offers relatively high radiation levels without frequent lamp replacement and will detect many species, with the notable exception of chlorinated aliphatics.

Keep in mind that the PID is typically calibrated to measure the concentration of a known calibration gas. The instrument can detect other volatile organic compounds, but the concentration will not be accurate. Therefore, these instruments are typically used to screen samples or to monitor the environment for health and safety purposes. They will not be used for the purpose of obtaining analytical chemistry data.

The typical PID consists of a probe, readout assembly, and a battery charger. The probe contains the sensing and amplifying circuitry, the readout assembly contains the meter controls, and the power supply is a rechargeable battery. PIDs must be used, calibrated, and maintained according to the manufacturer's instructions for each specific instrument.

The following equipment and materials are needed for the calibration and operation of the PID:

- Photoionization Detector
- Probe assembly with 10.2 eV (or other appropriate lamp)
- Battery charger adapter cord
- Calibration gas with control valve and tubing
- Periodic check source (marking pen)
- Field notebook
- Calibration/Survey log forms (see example in Appendix A)
- Appropriate health and safety equipment

Personnel overseeing the calibration and operation of the PID should have an appropriate amount of field experience and/or on-the-job training under the supervision of another qualified person. The personnel will be specifically trained to calibrate, set up, operate, and maintain the PID. The personnel will also be trained in field data collection and documentation. Personnel using the PID to measure volatile organic compounds are also required to have the appropriate health and safety training as specified in the site-specific Health and Safety Plan.

The following procedure will be used to calibrate and operate the PID:

1. The instrument user is responsible for properly calibrating and operating the instrument. When the instrument requires maintenance, this function should be conducted only by a qualified individual.

2. The PID will be calibrated prior to each use, or at least once per day when in use. Refer to the manufacturer's calibration instructions for the specific instrument in use. General calibration procedures are as follows:

- Check the function switch on the control panel to make sure it is in the OFF position. Attach the probe to the readout unit. Make sure the probe assembly is properly secured to the readout unit.

- Turn the function switch to the BATTERY CHECK position. Check that the indicator reads within the charged range on the meter. If the indicator is near or below the lower end of the charged range, the battery must be charged prior before using.

- Zero the instrument by turning the function switch to standby and turning the adjusting knob until the meter reads zero. Wait 15 to 20 seconds to confirm that the zero adjustment is stable. If it is not, then readjust.

- Set the function switch to the desired part per million (PPM) range. A violet glow from the UV lamp source should be observable at the sample inlet of the probe/sensor unit. (Do not look directly at the glow, as eye injury can result.)

- Listen for the fan/pump operation to verify function.

- Attach calibration gas to probe assembly using the valve and tubing. Open the valve slowly.

- The meter reading should correspond to the known PPM of the calibration gas. If it does not, adjust the span control until it does. If it cannot check be adjusted, check the probe assembly for blockage, particle filters, UV source lamp, and ionization chamber in accordance with the manufacturer's maintenance procedures. If the instrument still cannot be properly aligned, return it to the appropriate place for maintenance.

- Document all calibration data in field log book and on calibration log form.

3. Personnel operating the PID in the field will check the battery whenever the unit has not been used for an hour or more. Periodic operation checks will be made by placing the probe near the check source (marking pen) and checking the readout meter for movement. The readout meter should rise rapidly on a sensitive scale. If it does not, attempt the procedure again on a more sensitive

scale. If the unit still does not respond, return it to the calibration area for checking and maintenance.

4. Personnel may perform area or surface surveys by slowly moving the probe assembly (sample inlet) over the area or surface to be surveyed. The probe should remain within 1 to 2 inches of the area's surface. Care should be exercised in not letting the probe touch the surface being surveyed as particles or liquid will be drawn in and may clog the instrument or skew the results. The area or surface to be surveyed may be divided in sections or a grid in order to facilitate documentation of results.

5. Air quality or general environmental sampling for health and safety requirements may be performed using the PID by moving the probe slowly around the area of concern. This sampling can be done for volatile organic compounds (VOCs) in the ambient air or for releases due to intrusive activities. The PID can be used to survey the air in the worker's breathing zone for VOCs or can be set up down wind to monitor general VOC levels. The PID can be set to alarm at the action level or record the highest reading taken.

6. Personnel may use the PID to characterize individual samples for VOCs. This will be accomplished by inserting the probe (sample inlet) into the headspace of the sample container. Care will be exercised not to touch the sample so as not to draw particles or liquid into the PID. The results can be used to characterize the sample as containing VOCs or not. This method will not be used to provide analytical chemistry results due to the inherent inaccuracy of the PID.

When using a PID for health and safety monitoring, the instrument will be used continuously. The schedule for which the readings will be recorded will depend on a variety of factors including, but not limited to, the activity being performed, the levels being measured, and the stability of the readings. Readings will be recorded at least every 20 minutes or at least every 5 feet during drilling. During well cap opening, they will be recorded in accordance with Section 4.9 of the SAP. Measurements will also be recorded any time field activites change, or, if readings begin to rise, they will be recorded more frequently until they are stabilized. When levels approach action levels as specified in the Health and Safety Plan, measurements may also be recorded more frequently. Furthermore, these frequencies can be changed at the discretion of the Site Health and Safety Coordinator.

4.19 OPERATION OF METAL DETECTION INSTRUMENTS

Field personnel conducting a site survey for buried objects (metal) may use a combination of metal detecting instruments, depending on the depth of the objects. Generally, three instruments will be used to locate objects to a depth of approximately 15 feet. The three instruments typically include depth ranges of 0 to 3, 0 to 8, and 0 to 15 feet. Each instrument will be used to compliment the others in a manner which may allow the depth of the object to be approximated. For instance, if an object is detected with the three foot depth range instrument, it must be within three feet of the surface. It then follows that if an object is detected with the eight foot depth range instrument, and cannot be detected with the three foot instrument, it lies between three and eight feet deep.

The following equipment and materials are needed for the operational check and operation of metal detectors:

- Metal detectors suitable for project requirements
- Rechargeable nickel/cadmium batteries
- Battery charger
- Field logbook
- Survey log forms
- Appropriate health and safety equipment

Personnel operating metal detectors should have an appropriate amount of field experience and/or three days of on-the-job training under the supervision of another qualified person as specified in 29 CFR Section 1910.120. The personnel will be specifically trained to set up the equipment, perform the operational check, operate, and maintain metal detectors. Personnel using metal detectors on hazardous sites are also required to have the appropriate health and safety training as specified in the site-specific Health and Safety Plan.

The following procedures will be followed for the use of metal detection instruments:

1. Since metal detectors are not precision instruments, they cannot be calibrated in the normal sense. They can, however, be checked for proper operation. The instrument user is responsible for properly checking and operating the instrument.

2. Prior to each use check the batteries by turning the instrument's function switch to battery check. If the batteries are not fully charged, replace them with new or fully charged batteries.

3. Turn the function switch to the operating mode and zero the meter if necessary. Check the operation of the instrument by moving the probe within range of a metal source on the surface. If the instrument does not detect the metal within the limits of its range, return it to the appropriate person or facility for maintenance.

4. Personnel operating the metal detectors in the field will check the battery whenever the unit has not been used for an hour or more. Periodic operation checks will be made by placing the probe near the check source (metal) and checking the readout meter for movement. The readout meter should rise rapidly when the probe is placed near the source. If the unit still does not respond, return it for maintenance.

5. The survey may be conducted by using parallel survey lines four feet apart or by dividing the area into sections or a grid in order to facilitate documentation of results. Area or surface surveys will be conducted by slowly moving the probe assembly over the area or surface to be surveyed. If parallel lines are used, the instruments will be slowly swung from side to side (2 feet either side of the line), as the site is traversed. If sections are used, the same procedure will be used as for parallel lines with the parallel lines within the sections. This also applies for grids, however, if the grids lines are sufficiently close together they may be used as the parallel lines for survey purposes.

6. The initial survey will be conducted using the instrument with the least range (i.e., 0 to 3 feet). If an object is detected, its location and depth (less than 3 feet) should be documented for further investigation. If no objects are detected with this instrument, the next higher range instrument will be used. If an object is detected with this instrument, its location and depth (between 3 and 8 feet) should be documented. Repeat this process for the highest range instrument.

4.20 SAMPLE IDENTIFICATION

At a minimum, the following information will be included on each sample label:

- Site Name (e.g., Tinker AFB)
- Field sample identification number (see below)
- Date and time of sample collection
- Desired methods of analysis
- Samplers' initials

An example of a sample label is given in Appendix A.

Sample labels will be waterproof, written with black, indelible ink, and secured to the sample container with clear acetate tape.

All QC samples will be identified as QC samples in the field notebooks and not on the sample labels. This will ensure that the laboratory does not know which of the samples are QC samples.

Each sample will be identified by a unique field sample identification number which indicates the site name, sampling station, sample type, and sequence number. An example of the sample identification number is as follows:

RFI-BH1-SS-001

where RFI indicates the site name, BH1 indicates the sampling station, SS the sample type, and 001 the sequence number.

A three place alpha-numeric code will be used to identify each site under investigation. Samples collected during this investigation will be identified by the letter "S", followed by the designed SWMU number. For example S18 will identify samples from SWMU 18, or Fuel Site number 4.

A three digit alpha-numeric code will be used to identify the sampling station where a sample was collected. Sampling stations for the RFI will be as follows:

- For boreholes, sampling stations will be designated by BH1, BH2 ... BH5, etc., at each SWMU.
- For monitoring wells, sampling stations will be designated by MW1, MW2 ... etc., at each SWMU.
- For surface soil sampling locations, stations will be designated by GS1, GS2 ... etc., at each SWMU.
- For wastewaters, sampling stations will be designated by WW1, WW2 ... etc., at each SWMU.
- For air sampling stations, stations will be designated by AM1, AM2 ... etc., at each SWMU.

A two-letter designation will be used to identify the specific type of sample collected. The sample types which may be collected during site investigations include:

- SW - Surface water grab sample
- GW - Ground water sample
- SL - Surface soil sample
- SS - Subsurface soil sample (core barrel, split-spoon, hand auger)
- SD - Sediment or sludge sample
- CT - Drill cuttings

- AS - Air sample
- WS - Waste sample

The final sample identification code will be a three-digit sequence identifier. This number will be used to identify separate samples collected at the same sampling station, such as at different depth intervals (for soil samples) or time intervals, or for duplicate samples. These numbers will be sequential for each sampling station beginning with 001.

The sampling station, sample type, and sample sequence codes will be established by the onsite geologist for each sample.

The sample identification code for each sample will be recorded in the field notebook, along with other appropriate information, at the time the sample is collected. This number will also be included on the chain-of-custody form.

4.21 SAMPLE HANDLING AND SHIPPING

This section describes sample handling and shipping, including sample containers, preservatives used, and sample shipment procedures for all samples collected at the site. Methods and procedures will be in accordance with those specified in "A Compendium of Superfund Field Operations Methods", EPA/540/P-87/001, Section 6, Sample Containers, Preservation and Shipping.

Sample containers for shipment will be selected in accordance with Section 5.0 of this document. Sample containers will be placed in coolers containing ice immediately following collection, and will be kept at 4 degrees Celsius prior to and during shipment. Preservatives and holding times for the analytical methods to be used during this investigation are shown in Table 5-4. No preservatives will be added to soil samples.

Each sample container will be labeled as specified in Section 4.20. Container labels will contain all required information including sample number, time and date of collection, analyses requested, and the samplers' initials. Sealed containers will be placed inside polyethylene Ziploc™ bags, a Custody Seal placed on each bag opening, packed in large coolers using an absorbent material such as vermiculite, and chilled with ice contained in sealed polyethylene bags. The chain-of-custody form will be enclosed in a Ziploc™ bag and taped to the underside of each cooler lid. The shipping container will be sealed with custody tape to indicate potential tampering.

Since the samples to be collected during this project are expected to be "environmental samples", no precautionary notices are required on the package exterior. Shipments to the laboratory will be handled by an overnight carrier such as Federal Express. Other "cargo only" aircraft may be used but samples will not be transported by any carrier that also carries passengers. Samples may be transported by field personnel in private vehicles.

Samples will be shipped within 24 hours following collection, usually on the same day for volatile analysis. However, samples collected late in the day will be shipped the following day. Advance coordination will be required for any shipments on Friday (which will arrive at the lab on Saturday). Samples without holding time limitations will be held until the next critical shipment is ready in order to reduce shipping and handling costs.

4.22 CHAIN-OF-CUSTODY RECORDS

Chain-of-Custody procedures will be used to document the handling and processing of all samples from the time of collection until they are destroyed. Each shipment of samples will be accompanied by a Chain-of-Custody Record which documents all aspects concerning the time of collection, method of shipment, analysis requested, etc., for each sample. This written record may become especially important if the results of any analysis are used in litigation. A sample Chain-of-Custody Record is included in Appendix A. The following is a summary of Chain-of-Custody procedures:

- The following information will be supplied on the Chain-of-Custody form:

  - Project name
  - Signature of sampler
  - Sampling station number or sample number date and time of collection, grab or composite sample designation, and a brief description of the type of sample

- Individuals receiving the samples will sign, date, and note the time that they received the samples on the form matrix.

- Chain-of-Custody records initiated in the field will be placed in a plastic cover and taped to the inside of the shipping container used for sample transport from the field to the laboratory.

- Custody seals will be used on Ziploc™ bags containing individual samples when samples are shipped to the laboratory.

- When samples are relinquished to a shipping company for transport, the tracking number for the shipping bill/receipt will be recorded on the Chain-of-Custody form.

- The laboratory will maintain the Chain-of-Custody forms.

4.23 USE AND MAINTENANCE OF FIELD NOTEBOOKS

Field notebooks provide means for recording all data collecting activities performed at a site. As such, entries should be as descriptive and detailed as possible so that a particular situation could be reconstructed without reliance on the collector's memory.

Field notebooks shall be bound, 4 x 7 to 8 x 10.5 inch books with consecutively numbered pages. Notebooks shall be permanently assigned to field personnel, but are to be stored in site project files when not in use. Each notebook is identified by a document control number which indicates:

ZJX - FN - XXXXX - XX

(Site number - Field Notebook - Owner Identification - Sequence Number)

The cover of each notebook contains the following information:

- Person or organization to whom the book is assigned
- Book number
- Site name and number
- Start date
- End date

Entries into the field notebook may contain a variety of information. At the beginning of each entry the following information is recorded: the date; start time; weather; all field personnel present; level of personal protection being used on-site; and the signature of the person making the entry.

All measurements made and samples collected are recorded in the field notebook. All entries should be made in ink. No erasures are permitted. If an incorrect entry is made, the data will be crossed out with a single strike mark and initialled. Entries should be organized into easily understandable tables if possible. The format to be used is shown in Appendix A.

At each station where a sample is collected or a measurement made, a detailed description of the location of the station shall be recorded. A description of all photographs will also be noted.

All equipment used to make measurements will be identified by serial number, and will include the date on which the equipment was calibrated. See Section 12.0 of the QAPP for procedures concerning field notebook requirements.

Samples are to be collected following sampling procedures described in this SAP. The equipment used to collect samples should be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume and number or containers. In addition, the identification of the container number into which the sample is placed in the field will be recorded. Sample numbers will be assigned prior to going on-site. Duplicates, which receive an entirely separate sample number, will be noted under the sample description in the field notebook.

Entries into the field notebook will include notes of conversations with coordinating officials, deviations from QAPPs or other plans, and any other significant events or observations. Significant field notebook entries (samples collected, significant observations) must be countersigned by another member of the project team.

4.24 EQUIPMENT DECONTAMINATION

Equipment decontamination minimizes the risk of exposure to hazardous substances and cross-contamination and ensures the collection of representative samples. Equipment to be decontaminated includes pumps, bailers, field measurement probes, split spoons, etc.

The following is a list of equipment which may be required to decontaminate field sampling equipment:

- Plastic drop cloths
- Scrub brushes
- Potable water
- ASTM Type-II reagent or HPLC-grade water
- Methanol, reagent-grade

- Containers of various sizes (including wash tubs and/or window boxes equipped with a bottom grate to hold equipment above soil washed from samplers).

- Glass, Teflon™ or stainless steel squeeze bottles and sprayers

- Steam cleaner with laboratory-grade detergent.

- Disposable gloves

PROCEDURE:

Use only glass, Teflon™, or stainless steel devices to dispense water, alcohol, acid and solvent rinses. Plastic dispensing devices are prohibited. Do not clean rubber or plastic surfaces with methanol. Waste fluids must be collected in suitable containers and treated as hazardous waste unless otherwise directed. Disposable gloves must be worn during decontamination activities.

Equipment Decontamination Procedures for Soil, Sediment, Sludge and Water Sampling:

1. Decontaminate all sampling equipment before use, between samples, and upon completion of sampling operations.

2. To decontaminate a drill rig, pressure wash it with a steam cleaner upon mobilization, between drilling locations, and upon demobilization.

3. To decontaminate auger, drill rods and other downhole tools, pressure wash with a steam cleaner upon mobilization, between drilling locations, and upon demobilization. If necessary, scrub with laboratory- grade detergent and rinse with tap water.

4. To decontaminate sampling and field measurement equipment, scrub using brushes and a laboratory-grade detergent/potable water solution, followed by a

tap-water rinse, a pesticide-grade methanol rinse, and an ASTM Type II or HPLC water rinse. Allow to air dry before sampling and between samples. Wrap in aluminum foil or plastic before storage or transport, or reuse.

5. To decontaminate wash buckets, wash using a laboratory-grade detergent/water solution and potable water rinse upon mobilization, between drilling locations, upon demobilization, or as needed during sampling operations.

6. All downhole sampling equipment such as bailers and water level measuring equipment will be washed using a laboratory grade detergent/water solution and scrub brushes. Distilled water will be used to rinse all downhole sampling equipment before use or potable water may be used at the completion of sampling activities. Bailers and water level meters will be stored in plastic during transport.

4.25 MANAGEMENT AND DISPOSAL OF CONTAMINATED WASTES

Potential waste material generated during this investigation consists of three principal types:

1. Drill cuttings
2. Waste fluids and residues resulting from decontamination operations, well development, well purging and sampling activities
3. Personal protective equipment

As a precautionary measure, drill cuttings generated during the RFI will be placed in 55-gallon drums and left on-site for disposition following laboratory analysis and characterization of the site soils. To the extent feasible, an on-site qualitative analysis will be performed to segregate contaminated versus uncontaminated soils to aid in disposal.

Decontamination residues and other fluids generated during the RFI will be drummed on-site and handled the same way as the drill cuttings. Methanol will be allowed to evaporate in the container in which it is collected.

If personal protective equipment (PPE) is required during this investigation (due to contamination being encountered), the used PPE will be sealed in plastic trash bags and accumulated into separate barrels for disposal, and otherwise handled as described above.

Management of containers, which includes waste accumulation, handling, transport, storage, and disposal, will be in accordance with all Federal, State, local, and Tinker AFB rules and regulations.

4.26 FIELD QC SAMPLES

The following QC samples will be collected during the RFI.

1. Field Duplicate Samples

   One in every 20 soil samples collected will be a field duplicate sample. For volatile analyses (SW 8240), duplicate samples will consist of submitting two adjacent brass sleeves from the same split-spoon. Although this procedure does not allow the collection of a homogeneous duplicate sample, it prevents the loss of volatile that results from extruding the samples from their sleeves. For surficial soils, duplicate soil samples will consist of mixing a composite soil sample in a metal container and placing samples of the mixture in two glass containers. For water samples, one in every 20 samples will also be a field duplicate sample. Duplicate water samples will consist of pouring the water from each bailer into two sets of containers, or ladling surface water into two sets of containers. If a pump is used to collect a water sample, the duplicate will be collected by filling a second group of containers from the discharge line, filling the sample and duplicate consecutively for each specific parameter container. In all cases, duplicate samples shall be recorded in the field notebook as a sample and a duplicate sample. The sequence numbers for these two samples will be consecutive.

2. Trip Blanks

One field trip blank will be submitted with every cooler of regular volatile samples. A trip blank is a VOC sample bottle filled in the laboratory with ASTM Type II Reagent Grade Water, transported to the site, handled like a sample, and returned to the laboratory for analysis. Trip blanks shall not be opened in the field. Trip blanks will be analyzed by SW8240.

3. Rinsate Blanks

One rinsate blank will be submitted for every twenty regular samples collected. A rinsate blank will be prepared by pouring ASTM Type II Reagent Grade Water through a decontaminated sampling device, (a split-spoon lined with brass sleeves or a sampling pump, for example), rinsate blanks will be analyzed for the same analyses requested for regular samples.

4. Field Blanks

One in every 20 air samples collected will be a field blank. A field blank will consist of an unopened sampling canister that is carried around the field during a sampling day. The blank is then submitted to the laboratory for analysis.

5.0 LABORATORY ANALYTICAL PROCEDURES

This section presents the analytical methods to be used to analyze soil, water, and air samples collected during the RFI. These include volatile and semi-volatile organic compounds, metals, and geotechnical analyses. The organic and metal analytes to be analyzed in soil and water samples and associated analytical methods are summarized on Table 5-1. Methods for geotechnical analyses of soil samples are presented on Table 5-2. Analytes to be measured in air samples and associated methods are summarized on Table 5-3. Sample types, containers, preservatives, and holding times are summarized on Table 5-4.

TABLE 5-1
ANALYTES FOR SOIL AND WATER SAMPLES

Target Compound List - Volatile (Method SW8240 for water and soil, or Method 624 for water)

Chloromethane
Bromomethane
Vinyl Chloride
Chloroethane
Methylene Chloride
Acetone
Carbon Disulfide
1,1-Dichloroethene
1,1-Dichloroethane
total 1,2-Dichloroethene
Chloroform
1,2-Dichloroethane
2-Butanone
1,1,1-Trichloroethane
Carbon tetrachloride
Vinyl Acetate
Bromodichloromethane
1,1,2,2-Tetrachloroethane
1,2-Dichloropropane
trans-1,2-Dichloropropene
Trichloroethane
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
cis-1,2-Dichloropropene
Bromoform
2-Hexanone
4-Methyl-2-pentanone
Tetrachloroethene
Toluene
Chlorobenzene
Ethyle Benzene
Styrene
Total Xylenes

TABLE 5-1 (con't)

Target Compound List -- Semi-volatile (Method SW8270 for water and soil or Method 625 for water)

Phenol
bis(2-Chloroethyl)ether
2-Chlorophenol
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Benzyl Alcohol
1,2-Dichlorobenzene
2-Methylphenol
bis(2-Chloroisopropyl)ether
4-Methylphenol
N-Nitroso-Dipropylamine
Hexachloroethane
Nitrobenzene
Isophorone
2-Nitrophenol
2,4-Dimethylphenol
Benzoic Acid
bis(2-Chloroethoxy)methane
2,4-Dichlorphenol
1,2,4-Trichlorobenzene
Naphthalene
4-Chloroaniline
Hexachlorobutadiene
4-Chloro-3-methylphenol(para-chloro-meta-cresol)
2-Methylnaphthalene
Hexachlorocyclopentadiene
2,4,6-Trichlorophenol
2,4,5-Trichlorophenol
2-Chloronaphthalene
2-Nitroaniline
Dimethylphthalate
Acenaphthylene
3-Nitroaniline
Acenaphthene
2,4-Dinitrophenol
4-Nitrophenol
Dibenzofuran
2,4-Dinitrotoluene
2,6-Dinitortoluene

TABLE 5-1 (con't)

Diethylphthalate
4-Chlorphenyl Phenyl ether
Fluroene
4-Nitroaniline
4,6-Dinitro-2-methylphenol
N-nitrosodiphenylamine
4-Bromophenyl Phenyl ether
Hexachlorobenzene
Pentachlorophenol
Phenanthrene
Anthracene
Di-n-butylphthalate
Fluoranthene
Pyrene
Butyl Benzylphthalate
3,3'-Dichlorobenzidine
Benzo(a)anthracene
bis(2-ethylhexyl)phthalate
Chrysene
Di-n-octyl Phthalate
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene

Target Compound List -- Metals (Method 6010)

Antimony
Arsenic
Beryllium
Cadmium
Chromium
Copper
Lead
Nickel
Selenium
Silver
Thallium
Zinc

TABLE 5-1 (con't)

Other Analytes

Total Petroleum Hydrocarbons

Soil and Water - Method SW 8015 (modified*)

* Dichloromethane rather than methanol is used during sample extraction and different laboratory control standards are run, depending on the parameters being analyzed for.

Oil and Grease

Water - Method 413.1 (EPA-600)

Aromatic Volatile Organic Compounds (benzene, chlorobenzene, 1,4-dichlorobenzene, 1,3-dichlorobenzene, 1,2-dichlorobenzene, ethylbenzene, toluene, total xylenes)

Soil - Method 8020 (SW 846)

Water - Method 602 (EPA-600)

Chloride

Soil - Method 9252 (SW 846)

TABLE 5-2
GEOTECHNICAL ANALYSES

ANALYSIS	METHOD
Particle Size	ASTM D422
Permeability	SW 846 - Method 9100
Moisture Content	ASTM D2216
pH	SW 846 - Method 9045
Cation Exchange Capacity	SW 846 - Method 9081

TABLE 5-3
ANALYTES FOR AIR SAMPLES

Analysis	Method
Volatile Organic Compounds (same analytes as EPA Method 8010)	18 (SW 846) - SUMMA Canister
Semi-volatile Organic Compounds (same analytes as EPA Method 8020)	10 (SW 846) - XAD Resin
Both VOCs and semi-VOCs	5 (SW 846) - XAD, particulate filter, water

NOTE: Holding time is 2 weeks for methods 18 and 10; 7 days (until extraction) for Method 5.

TABLE 5-4
SAMPLE TYPES, CONTAINERS, PRESERVATIVES AND HOLDING TIMES
CHEMICAL ANALYSIS

Media	Method	Parameter	Container	Preservation	Holding time VTSR[1]
Soil	CLP-SOW (2/88) or SW-846 8240	Volatile Organics	4 oz. wide-mouthed jars	4° C	14 days
Soil	CLP-SOW (2/88) or SW-846 8270	Semi-volatile Organics	4 oz. wide-mouthed jars	4° C	Extract 5 days, Analyze 40 days
Soil	CLP-SOW (7/87) or SW-846 6010	Total metals	4 oz. wide-mouthed jars	4° C	180 days
Water	CLP-SOW (2/88) or Method 624	Volatile Organics	One 40-ml. glass vial w/Teflon cap	4° C	14 days
Water	CLP-SOW (2/88) or Method 625	Semi-volatile Organics	One 1-Lt. amber glass bottle	4° C	Extract 5 days, Analyze 40 days
Water	CLP-SOW (7/87) or SW-846 6010	Total metals	One 1-Lt. plastic bottle	4° C, pH,2, HNO^3	180 days
Soil	SW 8015 modified	Total petroleum hydrocarbons	4 oz. wide-mouthed jar	4°C	14 days
Water	SW 8015 modified	Total petroleum hydrocarbons	4 oz. amber glass	4°C	14 days
Water	413.1	oil and grease	1 lt. glass	4°C, pH, 2, H_2SO_4	28 days
Soil	8020	Aromatic VOCs	4 oz. wide-mouthed jar	4°C	14 days
Water	602	Aromatic VOCs	40 ml. glass vials w/Teflon cap	4°C	14 days
Soil	9252	Chloride	8 oz. wide-mouthed jar	4°C	28 days

APPENDIX A

EXAMPLES OF FIELD FORMS

BORING LOG	BORING/WELL NO.:	Page ______ of ______
Installation:		Site:
Project No.:	Client/Project:	
Contractor:	Drlg Contractor:	Driller:
Drlg Started: (: _ m)	Drlg Ended: (: _ m)	Borehole dia(s):
Drlg Method/Rig Type:		Elevation (ft):
Logged by:	E-Log (Y/N) From _______ to _______	Protection Level:

Depth (ft)	Sam-ple	Samp. No.	Lab Ana. Y/N	Org. Vap.	Rec. (ft)	Lithologic Description	USCS	Blw. 6 in.	Graph. Log	Well data	Water depth & Remarks

U = Thin wall tube | R = Rock coring ________________ | Field G/C (Make/Mod.) ____________

S = Split spoon(tube) | O = Other ________________ | G/C Oper.: ________________

C = Cuttings | Notes____

Well Construction Summary

Location: ______________________ Elevation: Ground Level ______________________

Personnel: ______________________ Top of Casing ______________________

DRILLING SUMMARY:

Total Depth ______________________

Borehole Diameter ______________________

____

Driller ______________________

____

Rig ______________________

Bit(s) ______________________

____

Drilling Fluid ______________________

____

Surface Casing ______________________

WELL DESIGN:

Basis:

Geologic Log ___ Geophysical Log ___

Casing String(s): C=Casing S=Screen

Casing: C1 ______________________

C2 ______________________

C3 ______________________

C4 ______________________

Screen: S1 ______________________

S2 ______________________

S3 ______________________

S4 ______________________

Centralizers ______________________

____

____

Filter Material ______________________

____

Cement ______________________

____

Other ______________________

____

____

____

CONSTRUCTION TIME LOG:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling:				
Geophys. Logging:				
Casing:				
Filter Placement				
Cementing:				
Bentonite Seal				
Other:				

Comments:

____

____

____

____

____

____

____

____

Key:

Bentonite

Cement/Grout

Sand Pack

Drill Cuttings

Gravel

Sand

Silt

Clay

Screen

Sample Label Example

Sample Label F6281

Sample ID Project Type Station Number Replicate

Code ______________________________

Hazardous ______________ Environmental ______________

Collected by ______________ Date __________ Time __________

Witnessed by ______________________________

Container Prepared by ______________ Preservative Yes No Type ____

References/Notes ______________________________

____

____

Laboratory ______________ Lab No. ______________

F6260

CHAIN OF CUSTODY RECORD

CDM Federal Programs Corporation

PROJECT NAME________________ PROJECT NUMBER________________

Field Log Book
Reference No.______

SAMPLE NUMBER	DATE	TIME	SAMPLE LOCATION	SAMPLE TYPE	ANALYSES	NUMBER OF CONTAINERS	LOG BOOK PG. NO	REMARKS

SAMPLED BY (SIGN)

____________ / ____________ / ____________ / ____________

RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)
① ______ DATE/TIME (/)	② ______ DATE/TIME (/)	______ DATE/TIME (/)	④ ______ DATE/TIME (/)	⑤ ______ DATE/TIME (/)
RECEIVED BY (SIGN)	RECEIVED BY (SIGN)	RECEIVED BY (SIGN)	RECEIVED BY (SIGN)	RECEIVED BY (SIGN)
① ______ DATE/TIME (/)	② ______ DATE/TIME (/)	③ ______ DATE/TIME (/)	④ ______ DATE/TIME (/)	⑥ ______ DATE/TIME (/)

METHOD OF SHIPMENT	SHIPPED BY (SIGN)	RECEIVED FOR LABORATORY BY (SIGN)	DATE/TIME
______	______	______	(/)

LEGEND: Original: Return to Sample Traffic Control Center Copies: Ship with Samples

Custody Seal

CUSTODY SEAL

Signature ______________________________

Date ___________________________________

FLUID LEVEL MEASUREMENT FORM

PROJECT ______________ INSTRUMENT MODEL ______________

SITE ______________ SERIAL NUMBER ______________

Well Number	Date	Time	TOC to Ground	TOC to Product	Ground to Product	TOC to Interface	Ground to Interface	Product Thickness	Operator	PID Reading

Reviewed by: ______________________________ Date: ______________

PID FIELD CALIBRATION LOG

Type of Instrument ______________________

Instrument Serial Number ______________________

Procedures Used: List Reference (i.e. Appendix B - RWDS 1022E and 62598 SAP)

Date	Time	Operator	Calibration					Calibration Gas			Corrective Action	Comments
			Battery	Machine Zeroed	Check	Initial Span	Final Span	Type	Conc.	Trace-ability		

FIELD NOTEBOOK ENTRY FORMAT

START TIME___________ DATE ____________

WEATHER: ____
____
____

FIELD PERSONNEL:

________________ ________________
________________ ________________
________________ ________________

LEVEL OF PERSONAL PROTECTION:________________________________
RECORDER'S SIGNATURE:____
EQUIPMENT (NAME/SERIAL NO.)__________________________________
CALIBRATION DATE:____
STATION NO./LOCATION DESCRIPTION:____________________________
____

FILM ROLL NO.________________ PHOTOGRAPH NO.____________

SAMPLING LOG

Date	Time	Sample Number	Personnel	Depth	Analyses	Type	Sample Comments

QUALITY ASSURANCE PROJECT PLAN
FOR
RCRA FACILITY INVESTIGATION
WORK PLAN

TINKER AIR FORCE BASE

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

LIST OF ACRONYMS

CAS	Cost Accounting Standards
CLP	Certified Laboratory Program
COC	Chain of Custody
DQOs	Data Quality Objectives
FAR	Federal Acquisitions Regulations
GAC	Granular Activated Carbon
HSP	Health & Safety Plan
IWTP	Industrial Waste Treatment Plant
ODC	Other Direct Costs
OSC	On-Scene Coordinator
OSWER	U.S. EPA Office of Solid Waste & Emergency Response
PID	Photoionization Detector
PPE	Personal Protection Equipment
QA	Quality Assurance
QAMS	Quality Assurance Management Staff
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling & Analysis Plan
SHSC	Site Health & Safety Coordinator
SOP	Standard Operating Procedures
TAFB	Tinker Air Force Base
U.S. EPA	United States Environmental Protection Agency

1.0 PROJECT DESCRIPTION

1.1 OBJECTIVES

Tinker AFB is required by their RCRA permit to perform a RCRA Facility Investigation (RFI). This Quality Assurance Project Plan (QAPP) was prepared to support the RFI Work Plan. Specifically this QAPP and associated SAP that precedes this QAPP comprise Part II of the Data Collection Quality Assurance Plan. Part I of the Data Collection Quality Assurance Plan is the Site Investigation Plan, which outlines the individual site investigations for the SWMUs being investigated. Details of procedures and methods are provided in the SAP.

The objective of the QAPP is to provide the information necessary for maintaining quality assurance/quality control (QA/QC) during the RFI. The QA/QC standards set in this QAPP will govern all RFI work. All RFI activities will be conducted in full compliance with all applicable federal, state and local laws and regulations. This will include all appropriate and applicable Tinker AFB regulations. All measurements and samples will be collected in accordance with U.S. EPA protocols and guidance, as specified in the RCRA permit.

1.2 SCOPE OF WORK

The scope of work for the RFI is presented in the Site Investigation Plan. Methods and procedures are outlined in the SAP. The scope of work includes water level measurements, as well as air, soil and groundwater chemical measurements. Data evaluation and reporting are discussed in the Data Management Plan.

1.3 TECHNICAL ASSUMPTIONS

Assumptions specific to each SWMU investigation are presented in the Site Investigation Plan. Additional assumptions are outlined in the SAP, as appropriate.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Overall project organization and responsibilities are discussed in the Project Management Plan. Project organization and responsibilities for field activities are assigned below.

Project Manager - The Project Manager will be responsible for the day-to-day management and coordination of the RFI. With respect to the project, Project Manager responsibilities will include:

- Communication and coordination of activities with Tinker personnel.
- Selecting and managing project subcontractors.
- Implementing quality control procedures specified in the QAPP and SAP.
- Assuring that all project personnel are qualified and properly trained for their work assignment and responsibilities.
- Preparation of monthly progress reports that will be used to:
  - a) track work progress against planned budgets and schedules, and
  - b) identify technical problems and/or issues.
- Conducting periodic reviews of problem reports, surveillance reports, and corrective actions to identify potential trends and problem areas
- Tracking work progress against planned budgets and schedules.
- Ensuring all project changes are documented and corrective actions are addressed.

Sample Custodian - Specific responsibilities of the Sample Custodian include:

- Ensuring that project personnel have and use the appropriate sample identification and custody records.
- Confirming that sample preparation, handling, and storage requirements are followed.

- Arranging for prompt shipment of samples to the analytical laboratory.
- Notifying the laboratory sample custodian of sample shipment.
- Maintaining all appropriate documentation of sampling activities.

QA Coordinator - The QA Coordinator will be responsible for:

- Directing the overall QA Program.
- Maintaining QA oversight.
- Reviewing QA sections in reports.
- Reviewing applicable QA/QC procedures.
- Conducting audits or surveillances of selected field activities.
- Initiating, reviewing, and implementing corrective actions as necessary.
- Conducting periodic reviews of problem reports, surveillance reports, and corrective actions to identify potential trends and problem areas.

3.0 TRAINING

All training and staff qualifications for the RFI will be documented. Copies of all training records will be maintained in the project files.

A training schedule will be prepared to identify required training and indoctrination for the RFI. Training will be conducted in the following areas:

- The QA Project Plan for the RFI.
- The Sampling and Analysis Plan for the RFI.
- The Health and Safety Plan for field activities for the RFI.
- The Site Investigation Plan for the RFI.

In addition, all personnel performing field activities or field surveillance activities must have completed the OSHA 40-hour training course, and the 8-hour refresher course, as applicable.

Training files for all personnel involved with the RFI will be documented and maintained in the project file.

4.0 DOCUMENT CONTROL

Distribution lists will be developed and the proper level of Peer, Technical, and Quality Assurance review will be performed for the various types of documents to be issued during the RFI. The contractor(s) performing the work will be responsible for maintaining any controlled documents.

The Technical Review, Peer Review, and Quality Assurance Review requirements for documents issued during the RFI are discussed in Section 17.0 of this QA Project Plan.

5.0 RECORDS CONTROL

All records will be maintained until written instructions for transmittal to a repository, or for disposal are provided.

This includes all project deliverables, QA records, incoming and outgoing correspondence, field and laboratory documentation, and project notebooks. QA records include audits, corrective action, non-conformance reports, calibration data, certificates of sample container purity and cleanliness, training records, review forms, and QA reports to management.

The files will be maintained in locking file cabinets within secure office areas. Only authorized personnel will have access to the files. All records that are placed into the files must be validated by the contractor(s) performing the work in accordance with standard EPA procedures. At a minimum, the records should be identified as legible and complete, and be assigned a document control number. A records file index will be interactively maintained and updated to allow for easy access and retrieval of documents.

6.0 CONTROL OF PURCHASED ITEMS AND SERVICES

Items and services purchased for the RCRA Facility Investigation will be controlled to assure conformance with specified requirements. Purchase control shall provide an evaluation and selection of supply sources. The primary methods of control are: the objective evaluation of evidence of quality furnished by the supplier; source inspection; auditing; and examination of items or services upon delivery of items or completion of services.

Supplies used in sampling activities, such as deionized water, standards, and sample containers, that may introduce contamination to samples will be accompanied by certification of purity or cleanliness. Sample containers will also be cleaned to EPA standards and will include full quality assurance certification. Bottles for samples requiring chemical preservation will be obtained from the laboratory performing the analyses and will include the required amount of the chemical preservative. Bottle labels will list the preservatives added and the analysis to be performed, minimizing the possibility for error. In addition, all supplies will be procured from vendors of known quality.

7.0 IDENTIFICATION AND CONTROL OF ITEMS

Controls will be implemented to ensure that correct and accepted items are used during the investigation, and that potentially hazardous wastes and materials are properly handled. New, unused materials will be maintained in their original packages or marked as such. Items which are decontaminated in the field will, if not immediately needed or used, be properly wrapped or covered and labeled as clean. Unacceptable items must be segregated from acceptable items.

All samples will be properly identified in the field and laboratory, and maintained under chain-of-custody procedures as specified in the RFI SAP.

Wastes generated on-site will be handled as outlined in the RFI Sampling and Analysis Plan.

8.0 TEST CONTROL

Tests to verify conformance of items or techniques used to fulfill the RFI to specified requirements will be planned, executed, and reported. Specific characteristics to be tested, test methods to be used, acceptance criteria, and documentation are included in the RFI SAP.

9.0 CONTROL OF MEASURING AND TEST EQUIPMENT

9.1 FIELD EQUIPMENT

Proper operation of measuring equipment shall be verified by calibration or other QA checks. A variety of sampling and monitoring equipment will be used during the RFI. These instruments include:

- Photoionization Detector
- Metal detector
- Air Samplers
- Combustible Gas Indicator

Appropriate procedures for calibration, frequency of calibration, and equipment maintenance are included in Appendix B of the RFI SAP to ensure that a copy of these procedures is available to each field technician working with the equipment. In general, operational calibration and preventative maintenance procedures will conform to the manufacturer's recommendations. Deviations will be noted as specified in Appendix B. Standards for calibration of field equipment will have a certificate of analysis to document acceptability.

9.2 LABORATORY EQUIPMENT

The subcontract analytical laboratory will be required to submit a QA Plan, prior to initiation of work on the RFI. This plan will include an acceptable description of calibration procedures, frequency, operational checks, equipment maintenance, provisions for corrective action, sample receipt and inspection, sample tracking and storage, standards traceability, training of laboratory personnel, and record keeping. These procedures will follow all laboratory guidelines in U.S. EPA analytical procedures for methods and frequency, at a minimum. All calibration activities must be adequately documented in logbooks to identify date and time of calibration, expected results, actual results, and analyst. These U.S. EPA procedures are U.S. EPA, Test Methods for Evaluating Solid Waste, SW-846, 3rd Edition, November 1986, and other procedures specified in the SAP.

10.0 SAMPLING PROCEDURES

The sampling procedures that will be used are based primarily on approved protocols developed by U.S. EPA, including those presented in the U.S. EPA document: A Compendium of Superfund Field Operations Methods (EPA/540/P-87-001, December 1987). The use of standard procedures will help assure the following:

- All field work will be performed utilizing sound technical guidelines.
- Work performed will consistently be of high quality, thus reducing the probability of error.
- All activities performed will be properly documented.
- All sampling will be performed in accordance with Tinker AFB Regulation 89-5, "Subsurface Construction" and draft Regulation 19-5, "Procedures for Compliance with RCRA of 1976".

A detailed description of sampling procedures is provided in the SAP.

10.1 REQUIREMENTS FOR FIELD PERSONNEL

All sampling and field measurement personnel will be required to read, understand, and have with them in the field, the following project-specific documents:

- Health and Safety Plan
- Sampling and Analysis Plan
- QA Project Plan
- Site Investigation Plan

11.0 ANALYTICAL PROCEDURES

11.1 FIELD MEASUREMENT PROCEDURES

Field measurements will be taken for both health and safety monitoring and for on-site screening of soils for contamination. The H & S monitoring will include the use of a combustible gas indicator and an OVA meter. Analytical screening of samples also will use both these instruments for surveying drill cuttings resulting from soil sampling from characterization boreholes. Field measurements and analytical activities are discussed in Section 13.2. Samples will be submitted to an off-site laboratory for analyses. Specifics associated with each subtask are discussed in the SAP. Any deviations to the procedures or methods referenced or appended to the SAP will be noted in the field logbook and discussed in the RFI report.

11.2 LABORATORY ANALYTICAL PROCEDURES

Laboratory analytical procedures are discussed in the RFI SAP and Section 13 of this QAPP. All laboratory methods for chemical analyses to be employed have been approved by the U.S. EPA. Analyses will be performed by a subcontract laboratory. The laboratory will submit an acceptable QA/QC Plan prior to initiation of analytical work. The plan will designate key QA individuals (such as sample custodian, QA officer, etc.) by name and will define their responsibilities. The QA/QC plan shall detail calibration and analytical procedures, quality control procedures, documentation procedures, qualifications of personnel, sample control, control of equipment, records control, corrective action, and designation of key individuals responsible for implementation of procedures (such as sample custodian, QA officer, section manager, analysts, technicians, etc.).

The laboratory may be subject to a surveillance of laboratory procedures, equipment and personnel prior to or during the initiation of analytical work to determine if the laboratory is capable of performing all necessary analytical activities.

12.0 SAMPLE HANDLING, STORAGE AND SHIPPING

12.1 CHAIN-OF-CUSTODY REQUIREMENTS

The purpose of chain-of-custody (COC) procedures is to document the identity and integrity of a sample, and its handling, from its first existence as a sample. Custody records trace a sample from its collection through all transfers of custody until it is transferred to an analytical laboratory. Internal laboratory records then document the custody of the sample through its final disposition. A sample or group of samples are considered to be in the custody of sampling, field, and laboratory personnel if they are: 1) in direct view; or 2) in direct possession; or 3) locked in a secure, restricted area.

A Sample Custodian will be designated for this project (see Section 2.0). The Sample Custodian has overall responsibility for sample custody and field document control. The Custodian will ensure that the sampling teams have and use the appropriate identification and custody records, will resolve custody problems in the field, and will handle the shipment of samples to the analytical laboratories. As a subcontract requirement, each laboratory will have a laboratory sample custodian identified.

Sample Labels - Each sample collected, including duplicates and trip or field blanks, will have a completely filled-in sample label securely attached. Sample collection labels will be pre-printed to ensure that space for the required information is provided on each tag. Figure 12-1 is an example of a preprinted label. The person who physically collects the sample is the Sampler and will sign the sample label.

Chain-of-Custody Record Sheets - Custody records will be used to record sample custody for this project. Both the Chain-of-Custody forms and the sample tags will be filled out completely. In addition, the unique Chain-of-Custody and sample label numbers will be cross-referenced on each of these documents. Figure 12-2 is an example of a custody record sheet. The Sampler or Sample Custodian will complete a two-part Chain-of-Custody Record to accompany each sample shipment sent from the field to the laboratory.

The custody records will be used for a packaged lot of samples, as more than one sample will usually be recorded on one form. More than one custody record sheet may be used for one package, if necessary. The purpose of the record sheets are to document the transfer of a group of samples traveling together. The original custody record travels with the samples, and the initiator of the record keeps a copy. When custody of the same group of samples changes hands several times, some people will not have a copy of the custody record. This is acceptable as long as the original custody record shows that each person who has been in custody of a sample or group of samples has properly relinquished custody by signing the form.

Using a Two-Part Custody Record Sheet

- The originator fills in all requested information from the sample labels and records the corresponding air bill number on the Chain-of-Custody form.
- The originator signs in the top left "Relinquished by" box and keeps the copy.
- The original record sheet travels with the samples.
- The person receiving custody checks the sample label information against the custody record. The individual receiving custody also checks sample condition and notes anything unusual in the "Remarks" section on the custody form.
- The person receiving custody signs in the adjacent "Received by" box and keeps the original.
- The Date/Time will be the same for both signatures since custody must be transferred to another person. When samples are shipped via common carrier (e.g., Federal Express), the date/time may not be the same for both signatures because the common carrier will not sign the custody form.
- When samples are shipped via common carrier, the original travels with the samples and the shipper (e.g., Field Sample Custodian) keeps the copy. The shipper also keeps all shipping papers, bills of lading, etc.

- In all cases, it must be documented that the same person receiving custody has subsequently relinquished it to the next custodian.
- If samples are left unattended or a person refuses to sign, this occurrence must be documented and explained on the custody record.

Questions/Problems Concerning Custody Records - If a discrepancy between sample tag numbers and custody records listings is found, the person receiving custody should document this fact and then properly store the samples. The samples should not be analyzed until the problem is resolved by contacting the field sample custodian.

The responsible person receiving custody should attempt to resolve the problem by checking all available information (other markings on sample container, type of sample, etc.). The responsible party should then document the situation on the custody record, and in their project logbook, and then notify the sample custodian by the fastest available means, followed by written notification.

Changes may be written in the "Remarks" section of the Custody record and should be initialed and dated. A copy of this record should accompany the written notification to the Sample Custodian.

Custody Seals - Custody seals are narrow strips of adhesive paper used to demonstrate that no tampering has occurred. They will be used on individual sample containers and on metal coolers used for sample transport. As an alternative to using custody seals on individual sample containers, samples may be placed inside a large plastic bag in a cooler and the bag sealed with a custody seal.

Laboratory Custody Procedures - Upon receipt at the laboratory, each sample shipment will be inspected to assess the condition of the shipping container and the individual samples. Shipping containers, custody seals, and samples will be inspected and their condition (intact or broken) noted. Damaged sample containers and overall condition will be noted on the

COC form in the remarks section and the Field Sample Custodian notified. The enclosed Chain-of-Custody records will be cross-referenced with all samples in the shipment; these records will be signed by the Laboratory Sample Custodian and placed in the laboratory project file. The Laboratory Sample Custodian will continue the chain-of-custody by assigning a unique laboratory number to each sample on receipt; this number identifies the sample through all further handling.

12.2 SAMPLE HANDLING AND SHIPMENT

Sample preservation and handling prior to shipment will follow procedures outlined in the SAP. Each sample will be identified with a sample identification tag, and will be listed on the Chain-of-Custody record completed for each sample shipping container. The Field Sample Custodian will notify the Laboratory Sample Custodian of sample shipment.

Sample storage and handling in the laboratory will be in accordance with laboratory requirements and will be adequate to ensure that the custody of the sample is maintained.

Specific procedures for handling, storing and shipping samples are detailed in the SAP for the RFI.

12.3 USE AND MAINTENANCE OF FIELD NOTEBOOKS

Field notebooks and field forms provide a means for recording all data collecting activities performed at a site. As such, entries should be as descriptive and detailed as possible, so that a particular situation could be reconstructed without reliance on the collector's memory.

Field notebooks shall be bound, 4 x 7 or 8 x 10.5 inch books with consecutively numbered pages. Notebooks shall be permanently assigned to field personnel, but are to be stored in site project files when not in use. Each notebook is identified by a document control number:

<u>ZJX</u> - FN - <u>XXXXX</u> - XX

(Site number - Field Notebook - Owner Identification - Sequence Number)

The cover of each notebook contains the following information:

- Person or organization to whom the book is assigned.
- Book number
- Site name and number
- Start date
- End date

Entries into the field notebook may contain a variety of information. At the beginning of each entry, the following information will be recorded at a minimum:

- Date
- Start time
- Weather
- Field personnel
- Level of personal protection
- Signature of person making the entry
- Equipment (name(s) and serial number(s))
- Equipment calibration results
- Station No. and/or location description (detailed if necessary)
- Photograph information
    - roll number
    - photograph number

- description
- lens size
- camera used

- Sampling log

    - date
    - time
    - label number
    - sample identification number
    - personnel
    - depth
    - comments

- Field Measurement

    - analysis
    - date
    - time
    - analyst
    - instrument ID number
    - sample location/number
    - results

Entries into the field notebook will also include notes of conversations with coordinating officials, deviations from QAPPs or other plans and any other significant events or observations. Significant field notebook entries (samples collected, significant observations) must be countersigned by another member of the project team.

All entries should be made in black pen. No erasures are permitted. If an incorrect entry is made, the data will be crossed out with a single strike mark and initialled. Entries should be organized into easily understandable tables if possible. A sample field notebook format is shown in Figure 12-3.

Additional field forms that may be needed during this project are the change request form and the field equipment log. Should a change in field procedures (or any SAP changes, etc.) be necessary, a change request form (see example in Figure 12-4) needs to be filled out in its entirety. A field equipment 109 form (see Figure 12-5) should be completed for instrumentation not having a specific calibration/maintenance form. The field equipment log should be completed for instrumentation not having a specific calibration/maintenance form. At a minimum, the following calibration data shall be recorded:

- Instrument ID
- Calibration personnel
- Calibration date(s)
- Calibration results
- Standard sources and reference values
- Procedure Used
- Range for acceptable results

Figure 12-1
Sample Label Example

Company Name Sample Label F6281

Sample ID Project Type Station Number Replicate

Code ____

Hazardous ____________________ Environmental ________________

Collected by ____________________ Date __________ Time ________

Witnessed by ____

Container Prepared by ________________ Preservative Yes No Type _____

References/Notes ______________________________________

____

____

Laboratory ____________________ Lab No. ________________

Figure 12-2
Chain-of-Custody Form

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME					NO. OF CON-TAINERS							REMARKS
SAMPLERS: (Signature)													
STAT. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION								

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

Figure 12-3
FIELD NOTEBOOK ENTRY FORMAT

START TIME ____________ DATE ______________

WEATHER: ____

____

____

FIELD PERSONNEL: ________________________ ________________________

________________________ ________________________

________________________ ________________________

LEVEL OF PERSONAL PROTECTION: ____

RECORDER'S SIGNATURE: ____

EQUIPMENT (NAME/SERIAL NO.) ____

STATION NO./LOCATION DESCRIPTION: ___________________________________

____

FILM ROLL NO. ______________________ PHOTOGRAPH NO. ______________

SAMPLING LOG

DATE	TIME	LABLE NUMBER	SAMPLE ID NUMBER	PERSONNEL	DEPTH	COMMENTS

Figure 12-4
CHANGE REQUEST FORM

Requested by: ______________________________ Date: ______________

Contract/Task No: ________________________ Task Mgr. __________

Applicable Document: ____

Circle: MAJOR/ MINOR Change

Description of change: ____

____

____

Reason for change: ____

____

____

Submit this form to task manager immediately. If major change, submit to QA Manager also.

==
[Required for all changes.]

Approved by: ______________________ (Task Mgr.) Date: ___________

==
[Required prior to implementation of major changes.]

Reviewed by: ____________________ (QA Mgr.) Date: _____________

Approved by: ____________________ (Pgm. Mgr) Date: _____________

==

cc: ____________________________ ________________________________

Figure 12-5
Field Equipment Log

Personnel ______________________________ Date ____________

Equipment Number ________________________ Page _____ of _____

Equipment Description ______________________________________

1. CALIBRATION 2. CLEANING 3. MAINTENANCE

Personnel Qualified to Operate and Maintain

Reviewed by ____________________________ Date/Time _________

Entries Complete? [Y or N] ________

13.0 DATA QUALITY OBJECTIVES

13.1 APPROACH

Data quality objectives (DQOs) are qualitative and quantitative criteria used to guide sample collection and analysis activities. The DQOs ensure that data of appropriate quality are generated to support the anticipated end use of those data. The goals of the RFI are to determine whether contaminant releases to the environment have occurred and to determine the nature and extent of any releases.

13.2 DQO DEVELOPMENT PROCESS

To ensure that the data gathered during investigation activities are adequate to support the RFI, a clear definition of the objective and the method by which decisions have been made will be established during the planning of field investigations. These determinations have been facilitated through the development of preliminary DQOs. The DQOs shown on Table 13.1 have been developed for Phase I of RFI. Activities undertaken throughout the work will involve using a variety of analytical levels (Table 13.2). The use of each of these levels is discussed in the following paragraphs.

Level I Field Screen data will be collected during the site investigations. These field instrument analyses will be conducted for health and safety reasons and to provide screening data for selecting samples to be submitted for subsequent off-site laboratory analyses. Temperature, pH, and conductivity will be measured during groundwater sampling to determine when purging is complete.

Precision and accuracy of PID and CGI measurements will depend on the detection limits as defined by the instrument and the range of contaminant levels at each site. As contaminant concentration levels increase, instrument accuracy will increase. Since PID and CGI instruments will be monitored continuously, precision will not be affected by the frequency of measurements for temperature, pH, and conductivity data; precision will increase with the frequency of measurements. Recommended monitoring frequencies are given in SAP Section 4.11. Completeness of PID and CGI data will not be greatly affected in the field since instrument readings are continuously monitored (they will be recorded at frequencies given in SAP Section 4.18). Fortunately, Level I, including temperature, pH, and conductivity data, would be expected to have lower completeness levels. However, since they are onsite measurement techniques providing results in real-time or after minimal delay, invalid measurments can be repeated easily. Representativeness and comparability are not issues with these types of data.

Level III analytical data will also be collected during the site investigations. These data will consist of laboratory analyses of water, soil and air samples. These analyses are presented in the SAP and will be used to determine the presence of specific chemicals at specific sites.

The PARCC (precision, accuracy, representativeness, comparability, and completeness) parameters associated with these samples are:

Precision = 20%

Accuracy = SW-846 specified control limits for the particular analysis

Completeness = 90%

Representativeness and comparability = evaluated as part of the data validation process

All data will be validated according to the procedures outlined in Section 16.0. Those data that are rejected during this process will not be used. These DQOs have been developed according to the base available information for the sites. However DQOs must be reviewed reevaluated based upon the results of the data collection activities and will be revised if necessary.

TABLE 13-1
RFI DATA QUALITY OBJECTIVES

SWMU	Data Needs	Sampling/Analysis Method	Analytical Level (a)	Data Use
SWMUs 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23 and Old Pesticide Storage Area AOC	No analytical data needed for Phase I investigation.			
Spill Pond AOC	Determine presence of VOCs and combustible gases (b).	Continuous monitoring with PID and CGI.	I	Health and safety support.
SWMUs 24 and 32	Determine presence of VOCs and combustible gases.	Field screening of samples for presence of VOCs (PID). Continuous monitoring with PID and CGI.	I	To determine presence of compounds onsite, for health and safety support and sample screening.
	Determine presence and/or concentrations of VOCs and semi-volatiles.	Collection of samples for analysis by EPA SW-846 Method 8240 (soil), and EPA Methods 624 (water) and TO-5 (air samples).	III	To establish presence and/or concentrations of possible contaminants onsite.
SWMU 26	Determine presence of ordnance or metal.	Magnetic survey.	I	To locate ordnance or metal that might pose a safety risk and/or interfere with drilling activities.
	Determine presence of VOCs and combustible gases (b)	Sample screening with a PID. Monitoring with a PID and a CGI.	I	Sample screening, health and safety support.
	Determine presence and/or concentrations of VOCs, semi-volatiles, and metals.	Collection of samples for analysis using EPA SW-846 Methods 8240, 8270, 6010, 9100, 9045, 9081.	III	To establish presence and/or concentrations of possible contaminants onsite.
	Soil geotechnical data.	ASTM Methods D422 and D2216.	III	To determine geotechnical characteristics of the site soil.

Table 13-1 continued

SWMU	Data Needs	Sampling/Analysis Method	Analytical Level (a)	Data Use
SWMU 40	Determine chemical composition of wastewater.	Collection of wastewater sample for analysis using EPA SW-846 Method 6010, and EPA Methods 624, 625 and 413.1.	III	To determine what analyses to perform onsite soil/sediment samples.
	Determine presence and/or concentrations of contaminants.	Analytical Methods will depend on results of wastewater analyses.	III	To establish presence and/or concentrations of possible contaminants onsite.
Fuel Truck Maintenance Area and Waste Fuel Dump Site	Determine presence of VOCs and combustible gasses (b).	Field screening of samples for presence of VOCs (PID). Continuous monitoring with PID and CGI.	I	Sample screening. Health and safety support.
	pH, temperature and conductivity measurements during well purging prior to groundwater sampling.	Measurement of temperature and conductivity with a conductivity meter, and pH with a pH meter.	I	Determine when well purging is complete by stabilization of parameters.
	Determine presence and/or concentrations of contaminants in soil and groundwater.	Collection of samples for analysis using EPA SW-846 Methods 8020 (soil), 8240 (soil), 8015 (soil and water), 9100 (soil), 9045 (soil) and 9081 (soil); and EPA Methods 624 (water) and 602 (water).	III	To establish presence and/or concentrations of possible contaminants onsite
	Soil geotechnical data.	ASTM Methods D422 (soil) and D2216 (soil).	III	Determine geotechnical characteristics of the site soil.
HCl Tank	Determine presence and/or concentrations of contaminants.	Collection of samples for analyses using EPA SW-846 Methods 9100, 9045, 9081, 9252 and 6010.	III	To establish presence and/or concentrations of possible contaminants onsite.

(a) See Table 13-2
(b) Health and Safety Monitoring may or may not be required depending on final Health and Safety Plans.

TABLE 13-2
Level of Analysis

Required Analytical Level	Task
Level I (Field Screens)	Screening for organics (OVA/PID)
Level II (Field Analyses)	Screening for organics (GC)
	Screening for metals (ICP)
Level III (Laboratory Analyses using EPA and ASTM Standard Methods)	Major ion analysis
	Organics analysis
	Inorganics analysis
	Geotechnical analysis
Level IV (Laboratory Analyses using Target Analyte List EPA CLP Methods)	Analysis of Target Compound List (TCL) and (TAL)
Level V (Non-standard Analyses)	Chemical analyses requiring modification of standard methods
	Special Analytical Services (SAS)

Source: U.S. EPA (1987). Data Quality Objectives for Remedial Response Activities; EPA/54/G-87/003. OSWER Directive 9355.0-7B

14.0 INTERNAL QUALITY CONTROL CHECKS

QC samples are samples analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. These internal quality control checks refer to both laboratory and field activities. The subcontract laboratory will follow standard QC procedures commensurate with the level of analysis specified in the appropriate CLP-SOW or SW-846 method. In most cases the requirements will conform to the CLP level of analysis. Specific analytical level requirements are shown in Section 13.2. QC samples collected and prepared in the field are discussed below. Numbers of QC samples are given in Table 3-1 of the SAP.

Field QC samples to be used in this field investigation include field duplicates, decontamination or rinsate blanks, and trip blanks (Table 14-1). Total QC samples will represent approximately 10 percent of the total samples collected. Analytical data from these samples will help to identify and diagnose problems related to sampling, shipment, and analysis. Procedures for creating QC samples are presented in the RFI SAP.

One duplicate for every twenty samples will be sent to the laboratory as a blind sample (i.e., not identified as duplicate sample). This sample will allow assessment of laboratory analytical data and sampling variability and representativeness.

A rinsate blank sample for every twenty samples will be collected from final rinse water following decontamination of soil sampling equipment in the field. Results of the rinsate blank sample will be used to evaluate the effectiveness of decontamination procedures.

A trip blank sample will be included in every cooler which has samples collected for VOC analyses. Results of the trip blanks will be used to evaluate the effectiveness of the prevention of cross-contamination.

Analytical data from the QC samples will be used in the data validation process as described in Section 16.0 of this QA Project Plan.

TABLE 14-1
QC SAMPLES TO BE USED IN THE FIELD INVESTIGATION

QC Sample Type	Frequency of QC Samples	Purpose
Duplicate	One in twenty	To assess laboratory analytical data, and sampling variability and representativeness.
Rinsate Blank	One in twenty	To evaluate the effectiveness of decontamination procedures.
Trip Blank	One per cooler of samples for VOC analysis	To evaluate the effectiveness of the prevention of cross contamination.

15.0 STATUS INDICATORS

The status of equipment, materials, data, or reports should be maintained through appropriate indicators (such as markings, labels, tags, or other suitable means). The following specific status indicators are relevant to the RFI:

- Calibration labels or logs which remain with field instruments will be maintained with current calibration data. All field calibration of instruments will be recorded in the Field Equipment Logs.
- Laboratory equipment will be calibrated as recommended by the manufacturer, using the appropriate U.S. EPA method, and all pertinent data will be recorded in a calibration logbook.
- Any materials or equipment determined to be deficient will be labeled or tagged appropriately, and separated to prevent inadvertent use.
- Non-validated data will be placed in an appropriately labeled envelope until validation is completed. Rejected data will be appropriately labeled.
- All reports will be marked "DRAFT" until final versions are produced.

16.0 DATA REDUCTION, VALIDATION, AND REPORTING

The field data and laboratory analytical results will be collated into a technical document that will serve to provide a record of the RFI. Screening and analytical data will be presented to support decisions made in the field affecting the quality of those data.

16.1 DATA RECORDING AND REDUCTION

All field measurements and observations made by field personnel will be recorded in controlled field notebooks as described in Section 12.3 of this QAPP.

Field data will be reduced to a table format, where applicable, including references to dates recorded, locations, and other pertinent information.

All laboratory analytical data will be cross-referenced to the appropriate field QC samples (i.e., field equipment blanks, split samples, and samples collected), background samples, and laboratory QC samples (e.g., method blanks, standards, matrix spikes) that were associated with that data. Data and sample identification will be cross-referenced in spreadsheet fashion manually and on computer files. In addition, all pertinent dates (i.e., dates samples were collected, received by the laboratory, extracted, and analyzed) for each sample will be referenced against the applicable holding times for each analytical method.

16.2 DATA VALIDATION

Validation of field data will be conducted through a qualitative evaluation of the representativeness and comparability of the data.

Validity of laboratory analytical data will be determined by calculation of values for precision, accuracy, and completeness, and by qualitative evaluation of representativeness and comparability. Guidance for evaluating analytical data are presented in U.S. EPA Laboratory

Data Validation Functional Guidelines for Evaluating Organics Analyses, (7/88), and U.S. EPA Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses, (7/88). The analytical laboratory will be required to flag data that do not meet QC requirements of the U.S. EPA methods used, or those requirements specified in this QAPP. Twenty percent of all data and associated flags, at a minimum, will be reviewed to assess the usability of the data. The validation percentage may be increased due to poor validation results, or at the discretion of QA staff. Data rejected during the validation process will not be used, qualified data may be used at the discretion of the Project Manager, and valid data is usable for all purposes.

Other items which will be considered during data validation include the following, at a minimum:

- Compliance with holding times.
- Field QC samples (including split, co-located samples, and blanks).
- Calculations and data transcriptions.
- Initial and continuing calibration data.
- Laboratory blanks.
- Spike recoveries.

Data found to be rejected during the validation process will not be used and will be documented as to why they were found to be unacceptable.

16.2.1 Precision

Precision will be evaluated by the analysis of replicate samples and will be expressed as the relative percent difference. This attribute will be calculated as follows:

$$RPD = 100 \frac{(D_1 - D_2)}{(D_1 + D_2)/2}$$

Where, RPD = relative percent difference
D_1 = the larger of the two observed values
D_2 = the smaller of the two observed values

16.2.2 Accuracy

Accuracy will be estimated from the analysis of QC samples whose true values are known, or from surrogate or matrix spike recoveries. Accuracy will be expressed as percent recovery. The formulas to calculate these values are:

For QC Samples:

$$\text{Percent Recovery} = 100 \frac{(\text{Measured Value})}{(\text{True Value})}$$

For Surrogate Spikes:

$$\text{Percent Recovery} = 100 \frac{(\text{Measured Value})}{(\text{True Value})}$$

For Matrix Spikes:

$$\text{Percent Recovery} = 100 \frac{C_i - C_o}{C_t}$$

Where C_o = value of unspike aliquot
C_i = value of spike aliquot
C_t = value for spike added

16.2.3 Completeness

Completeness will be reported as the percentage of all measurements made whose results are judged to be valid. Data will be validated in accordance with U.S. EPA requirements found in the "Laboratory Data Validation Functional Guidelines for Evaluation of Organic Analyses", and in the "Laboratory Data Validation Functional Guidelines for the Evaluation of Inorganic Analyses". The following formula will be used to estimate completeness:

$$C = 100 \frac{(V)}{(T)}$$

where C = percent completeness
V = number of measurements judged valid
T = total number of measurements

16.2.4 Representativeness and Comparability

Representativeness and comparability are qualitative attributes of a data set. Representativeness is the degree to which data accurately and precisely represent the true value of a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness of data will be assured through sampling technique and evaluation of results from co-located samples described in Section 14.0.

Comparability refers to the confidence with which one data set can be compared to another. Comparability may be assured by using approved sampling plans based on standardized analytical and field procedures, and by presenting data in identical units. Both representativeness and comparability will be evaluated as part of data validation.

17.0 TECHNICAL REVIEW/PEER REVIEW

The Draft RFI report will receive a technical review prior to submittal. Any other technical deliverables will also be subject to technical review prior to submittal and the review will be documented.

The Draft RFI report will also be subject to QA review prior to submittal. In addition, any other report that transmits measurement data will be subject to QA review prior to submittal and the review will be documented.

18.0 AUDITS/SURVEILLANCES

Audits and surveillances will be performed to ensure compliance with QA/QC requirements and project documentation procedures.

18.1 AUDITS

Due to the nature of the RFI, a field audit will be conducted during the investigation. Any audit conducted will include a careful evaluation of QC measures and adherence to the QAPP, Sampling and Analysis Plan, and other appropriate project documents.

18.2 SURVEILLANCES

A surveillance of the project files will be conducted to ensure compliance with QA/QC requirements. The surveillance will check on adherence to requirements specified in this QA Project Plan. A surveillance of field activities may also be conducted.

19.0 CONTROL OF NONCONFORMANCES/DEFICIENCIES

Items and services that are subject to nonconformance/deficiency control for the RFI include, but are not limited to:

- Surveying contractors
- Drilling contractors
- Excavation contractors and equipment
- Sampling equipment
- Sampling and shipping containers
- Laboratory contractors
- Analytical results

Inspection upon receipt of sampling equipment, sample containers and shipping containers, ensures that nonconformant equipment purchased from vendors is adequately identified, segregated, and disposed to prevent inadvertent use.

Laboratory data that are deficient are marked as rejected and may not be used for any purpose unless specified by the Project Manger.

All nonconformances and deficiencies must be documented and maintained in the project file.

20.0 CORRECTIVE ACTION

Each staff member is responsible for notifying the Project Manager, the QA Coordinator, or other responsible person when they discover a condition that may affect the quality of the work being performed. The following staff have specific corrective action responsibility:

- Project Manager - Overall responsibility for implementing corrective actions.

- QA Coordinator - Overall responsibility for tracking, accepting, and verifying corrective actions.

Immediate corrective actions will be noted in task notebooks, memoranda, or other documentation. Problems not immediately corrected will require formal corrective action.

Conditions that require corrective action include, but are not limited to:

- Failure to follow procedures established in the SAP, QAPP, or any other guidance documents that may apply to this task.
- Failure to meet Data Quality Objectives for field or laboratory activities.
- Response to surveillance or audit reports of RFI activities.

Project reports will contain a QA section that will include a discussion at a minimum of Data Quality Objectives, any deviations from the SAP or QAPP, and the results of any audits.

21.0 QA REPORTS TO MANAGEMENT

All levels of the project staff are responsible for preparing QA reports. These reports include:

- QA monthly activity reports - The QA Coordinator will submit a monthly activity report to Project Manager. Each report will summarize:

    - QA activities during the reporting period
    - Quality problems found
    - Corrective action(s) taken
    - System and performance audit or surveillance conducted
    - Activities schedules for the following month

- Audit/Surveillance Reports - The results of each QA audit or surveillance will be documented in a report that is distributed within 10 working days of the audit/surveillance.

- Annual QA report - A yearly review of all QA activities and an evaluation of possible trends that may affect the quality of task activities.

In addition to the above QA reports, all project reports will contain a QA section which discusses (as appropriate) the following:

- PARCCs for reported measurements
- Deviations from this QAPP
- Results of audits/surveillances

22.0 PROBLEM PREVENTION AND TREND ANALYSIS

Problems prevention procedures include the consideration of:

- Problem prevention
- Risk assessment
- Readiness

The Project Manager is responsible for reporting problems or potential problems to appropriate management personnel on a weekly basis.

Problem Prevention activities that may be undertaken include the institution of Project Quality Management Sessions or Technical Advisory Groups. These activities are designed to identify critical goals and potential problems and to propose preventative actions.

Technical Advisory Groups may also be utilized to evaluate potential risks associated with this task. Health and Safety issues, Environmental issues, Regulatory issues, and Conflict of Interest issues are discussed and adequately defined in project planning documents.

Readiness checklists may be utilized to ensure that active work is performed with appropriate equipment and procedures.

Trend Analysis of all problem prevention activities will be performed to identify and correct any potential problems.

23.0 WRITTEN PROCEDURES

The contractor(s) performing the work will use their own written procedures for activities affecting quality.

DATA MANAGEMENT PLAN

TABLE OF CONTENTS

This Data Management Plan contains procedures for documenting and tracking investigation data and results.

FIELD DATA

During RFI field activities, field logbooks will be kept in accordance with Section 4.9 of the SAP. These logbooks will contain information such as date, time, and location of sampling; field personnel present; sampling method; containers; preservation (if any); sample ID numbers; field measurements; weather conditions; and other pertinent information that would allow recreation without relying on the collectors memory. Each boring will be lithologically described and recorded on a Boring Log form as specified in Section 4.4 of the SAP.

TINKER AFB DATABASE

Data collected in the field as well as laboratory results will be entered into the Tinker AFB database which was recently developed and tested by CDM and delivered to Tinker AFB. Included with this Work Plan are copies of the Functional Specification for the database, the Procedure for Handling Data and Providing On-Going Support for the New Tinker AFB Database, and the Quality Assurance Project Plan for the database.

This database was prepared as a data management tool for Tinker AFB and currently contains historical data collected by Tinker Environmental Management and its subcontractors. These data were condensed and entered into the database by CDM personnel in accordance with Sections 3.0 and 4.0 of the Functional Specification. New data entry will occur in accordance with the Procedure for Handling Data, and software data will be maintained according to the Quality Assurance Project Plan for the database.

The different database files included in the Tinker AFB database and the information contained in each file are as follows:

- Location Definition Information - contains information such as location identification number, coordinates, location classification, elevation, depth and diameter (if a boring location).

- Lithologic Description Information - contains geologic information normally included in boring logs. Types, depths, and descriptions of strata encountered as well as any aquifers penetrated are included in this file.

- Well Completion Information - contains information such as well type, installation date, screen depths, zone penetrated, casing diameter and material, and total depth.

- Groundwater Level Data - contains data such as boring location measurement date, depth to water, and the name of the company making the measurement.

- Sample Event Database - contains information on each sampling event. This includes location, depth, medium and date sampled, as well as field measurements such as pH and conductivity.

- Analytical Results - contains laboratory results including laboratory name, sample number, method used, parameter tested, value obtained, detection limit, and units.

- Aquifer Analysis Data - contains information on aquifer tests performed and their results.

DATABASE ACCESS

Specific records can be accessed and browsed, exported, or printed by Tinker AFB personnel. Thus, records specific to the RFI can be copied to diskettes or printed as a report. Each data file has a standard report format as shown in Attachment 1. The user can select which fields to export to diskette. Printed reports and exporting can be done on short notice for data already in the database.

Tinker AFB personnel do not have the ability to change data in the database nor add new data. This is performed by CDM personnel in accordance with Section 4.3 of the Procedure for Handling Data and Providing On-Going Support. Update disks and reports containing any new data obtained during RFI activities (along with any other new or modified data) will be prepared on a quarterly basis. Data in each quarterly update report will be identified by sitecode and location identification, if its an old or new location, date, and a summary of what data were collected.

Since these updates are quarterly, it will take some time to get the RFI data into the database. However, once the information is entered into the database, it may be accessed quickly by Tinker AFB personnel.

PROJECT FILE REQUIREMENTS

Files containing data obtained during RFI activities will be maintained. These files will be located at the office of the Environmental Directorate at Tinker AFB in a locking file cabinet. Leaman Harris will be responsible for maintaining these files. The files will be organized by SWMU and will contain up-to-date information including raw data as well as printed reports when available. Any RFI data, including raw data not yet entered into the database (between quarterly updates), will be available in these files.

Also included in these files will be chain-of-custody forms (see SAP Section 4.23 and QAPP Section 12.1), lab reports, calibration records (see QAPP Section 12.3), training records (see QAPP Section 3.0), records on personnel medical exams, meeting minutes, surveillance and audit reports (see QAPP Section 18.0), and any other records associated with RFI activities. Data will be validated in accordance with Section 16.2 of the QAPP.

In addition to these files at Tinker AFB, the contractor performing the work will maintain files containing personnel training records, medical records, etc. These files will be maintained in accordance with the company's administrative procedure for records management.

CONCLUSIONS

Phase I conclusions drawn for each SWMU will include the determination of whether or not contamination was detected at that SWMU and a preliminary evaluation of the nature and extent of contamination. For SWMUs where site reconnaissance and background searches (not sampling) are planned, conclusions will consist of whether any evidence was uncovered suggesting the occurrance of a release of contaminants at each site, and an estimate of the nature and extent of suspected releases. For each SWMU, a determination will be made as to whether a Phase II investigation is required and, if so, the requirements of the Phase II investigation will be outlined. In addition, the results of the investigations summarized in Section 2.1 of the Site Investigation Plan will be presented and discussed in the RFI report.

Results and conclusions of the investigations will be detailed in the reports described in the following sections.

REPORTS

Three types of reports will be prepared during or immediately following RFI field activities. These are Progress Reports, RFI Reports, and Summary Reports. Each is discussed in the following sections. Reports will be subject to internal technical and QA/QC review, and will be checked for accuracy. Draft reports will be identified as such by having "DRAFT" stamped on them. Final RFI and Summary Reports will be submitted to EPA 30 days after receipt of comments on the draft reports. Approved, final RFI and Summary Reports will be mailed to all individuals on the facility mailing list within 15 days of receipt of approval from EPA.

PROGRESS REPORTS

Progress reports will be prepared and submitted quarterly in compliance with Section V of the RCRA Permit. These reports are required to contain the following:

- A description and estimate of the percentage of the RFI completed.
- Summaries of contacts pertaining to corrective action or environmental matters with representatives of the local community, public interest groups or State government during the reporting period.
- Summaries of problems or potential problems encountered during the reporting period.
- Actions being taken to rectify problems.
- Changes in key project personnel during the reporting period.
- Projected work for the next reporting period.
- Summaries of all findings to date, including summaries of laboratory data.
- Summaries of all changes made in the RFI during the reporting period.

RFI REPORT

Within 60 days after the completion of RFI activities, a draft RFI Report and a draft Summary Report will be submitted to EPA for review. As required by Section V of the RCRA Permit, the RFI Report will describe the procedures, methods, and results of all investigations of SWMUs and their releases, including information on the type and extent of contamination at the facility, sources and migration pathways, and actual or potential receptors. The RFI Report will present all information gathered under the approved RFI Work Plan. In addition, the results of the investigations summarized in Section 2.1 of the Site Investigation Plan will be presented and discussed in the RFI report and the actual reports will be appended to the RFI report. The investigations and results will be presented and discussed in light of the objectives of the RFI (determining the nature and extent of contamination at each SWMU and collecting adequate information to determine the need for corrective measures). Table 1 presents a suggested table of contents for the RFI Report.

The following data may be displayed in the reports in tabular form:

- Water table elevations
- Sampling location coordinates
- List of monitoring parameters with associated analytical measurements
- Comparisons of analytical results with background data

The following data may be included in graphical displays:

- Layout and topography
- Sampling locations and sampling grids
- Boundaries of sampling areas
- Stratigraphy and water table elevations (profiles, transects, or fence diagrams)
- Potentiometric contour maps of groundwater
- Groundwater flow nets
- Population plots and/or local residential maps
- Geographical extent of contamination
- Vertical distribution of contaminant(s)
- Contamination values, averages, or maxima at sampling locations
- Changes in concentration with distance from sources

Raw data will be presented in an appendix in the form of computer generated reports.

SUMMARY REPORT

The Summary Report will be similar to the RFI Report, but will have a more brief description of the procedures, methods, and results from the facility investigation.

TABLE 1
SUGGESTED RFI REPORT FORMAT

Executive Summary

1. Introduction
    - 1.1 Purpose of Report
    - 1.2 Site Background
        - 1.2.1 Site Description
        - 1.2.2 Site History
        - 1.2.3 Previous Investigations
    - 1.3 Report Organization

2. Study Area Investigation
    - 2.1 Includes field activities associated with site characterization. These may include physical and chemical monitoring of some, but not necessarily all, of the following:
        - 2.1.1 Surface Features (topographic mapping, etc.) (natural and manmade features)
        - 2.1.2 Contaminant Source Investigations
        - 2.1.3 Meteorological Investigations
        - 2.1.4 Surface Water and Sediment Investigations
        - 2.1.5 Geological Investigations
        - 2.1.6 Soil and Vadose Zone Investigations
        - 2.1.7 Groundwater Investigations
        - 2.1.8 Human Population Surveys
        - 2.1.9 Ecological Investigations
    - 2.2 If technical memoranda documenting field activies were prepared, they may be included in an appendix and summarized in this report chapter.

3. Physical Characteristics of the Study Area
    - 3.1 Includes results of field activities to determine physical characteristics. These may include some, but not necessarily all, of the following:
        - 3.1.1 Surface Features
        - 3.1.2 Meteorology
        - 3.1.3 Surface Water Hydrology
        - 3.1.4 Geology
        - 3.1.5 Soils
        - 3.1.6 Hydrogeology
        - 3.1.7 Demography and Land Use
        - 3.1.8 Ecology

TABLE 1 (continued)

4. Nature and Extent of Contamination
   4.1 Presents the results of site characterization for each SWMU investigated, both natural chemical components and contaminants in some, but not necessarily all of the following media depending on which media, if any, were sampled at that SWMU:
      4.1.1 Sources (washwater, etc.)
      4.1.2 Soils
      4.1.3 Groundwater
      4.1.4 Surface Water and Sediments
      4.1.5 Air

5. Contaminant Fate and Transport
   5.1 Potential Routes of Migration for each SWMU (i.e., air, groundwater, etc.)
   5.2 Contaminant Persistence
      5.2.1 If they are applicable (i.e., for organic contaminants), describe estimated persistence in the study area environment and physical, chemical, and/or biological factors of importance for the media of interest.
   5.3 Contaminant Migration
      5.3.1 Discuss factors affecting contaminant migration for media of importance (e.g., sorption onto soils, solubility in water, movement of groundwater, etc.)
      5.3.2 Discuss modeling methods and results, if applicable.

6. Baseline Risk Assessment
   6.1 Public Health Evaluation
      6.1.1 Exposure Assessment
      6.1.2 Toxicity Assessment
      6.1.3 Risk Characterization
   6.2 Environmental Assessment

7. Summary and Conclusions (for each SWMU)
   7.1 Summary
      7.1.1 Nature and Extent of Contamination
      7.1.2 Fate and Transport
      7.1.3 Risk Assessment
   7.2 Conclusions
      7.2.1 Data Limitations and Recommendations for Future Work
      7.2.2 Recommended Corrective Action Objectives

Appendices

A. Technical Memoranda on Field Activities (if available)
B. Analytical Data and QA/QC Evaluation Results
C. Risk Assessment Methods

ATTACHMENT 1

ATTACHMENT 1

SAMPLE REPORT
LOCATION DEFINITION INFORMATION

```
          1         2         3         4         5         6         7
01234567890123456789012345678901234567890123456789012345678901234567890123456789


                      TINKER AIR FORCE BASE DATABASE
                  LOCATION DEFINITION INFORMATION REPORT

 ----------------------------------------------------------------------------
  Date: 99/99/99                                                    Page: XX
 ----------------------------------------------------------------------------

                  LOCATION CROSS REFERENCE NUMBER: AAAAAAAAA

 ----------------------------------------------------------------------------
  Location Classification Code: BH   Classification: BOREHOLE

  Location Proximity: ON-BASE    Surface Elevation (ft): XXXXX.XX

  Coordinates: North: XXXXXXXX.XX  East: XXXXXXXX.XX

  Contracting Company: CDM FEDERAL PROGRAMS CORPORATION
  Drilling Company:    SAM DRILLING COMPANY
  Excavating Company:  ROBINSON CONSTRUCTION COMPANY

  Drilling/Excavation Method: REVERSE CIRCULATION ROTARY, WATER

  Borehole Depth (ft): XXXX.XX  Borehole Diameter (in): XX.XX

                         LOCATION DESCRIPTION:
  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
 ----------------------------------------------------------------------------

                  LOCATION CROSS REFERENCE NUMBER: AAAAAAAAA

 ----------------------------------------------------------------------------
  Location Classification Code: BH   Classification: BOREHOLE

  Location Proximity: ON-BASE    Surface Elevation (ft): XXXXX.XX

  Coordinates: North: XXXXXXXX.XX  East: XXXXXXXX.XX

  Contracting Company: CDM FEDERAL PROGRAMS CORPORATION
  Drilling Company:    SAM DRILLING COMPANY
  Excavating Company:  ROBINSON CONSTRUCTION COMPANY

  Drilling/Excavation Method: REVERSE CIRCULATION ROTARY, WATER

  Borehole Depth (ft): XXXX.XX  Borehole Diameter (in): XX.XX

                         LOCATION DESCRIPTION:
  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
  AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
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SAMPLE REPORT
GEOCHEMICAL ANALYSIS REPORT
ONE SAMPLE EVENT - ALL PARAMETERS

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          1         2         3         4         5         6         7
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Menu Option Line


                                          TINKER AIR FORCE BASE DATABASE
                                   GEOCHEMICAL ANALYSIS REPORT, ALL PARAMETERS

*-------------------------------------------------------------------------------
  Date:99/99/99                                                      Page:XX
*-------------------------------------------------------------------------------
    Site ID: AAA   Cross Reference:AAAAAAAAAA    Sample Depth - Begin:XXXX.XX
                                                                 End:XXXX.XX
        Date:99/99/99  Time:HHMM   Sampling Company:AAAA   Sample Matrix:AA

         Sample Method:AA   QC Sample Type:AA   QC Lot Control Number:AAAA

  Field Measurements:   Well Purge Volume:XXX.X  Units:AAAAAAAAAA   Temp:XX.XX

  pH:XX.XX                           Spec. Cond:XXXX.XXXX millimhos/cm
  Calibration Date:99/99/99          Calibr. Date:99/99/99 Std. Value:XXXX.XXXX
  Buffer 1:XX.XX  Buffer 2:XX.XX     Observed Value:XXXX.XXXX

     Eh:XXX mV   Calibration Date 99/99/99         Dissolved Oxygen:XX.XX mg/L
     Std.Value:XXX mV  Observed Value:XXX mV     Calibration Date:99/99/99
     Source:AAAA   Verify:A

   Parameter       Date      Value          Qualifier Basis Detection Limit
    AAAAAAAAAAAAAA 99/99/99 XXXXXXXXX.XXXX AA         A      XXXX.XXXX
    AAAAAAAAAAAAAA 99/99/99 XXXXXXXXX.XXXX AA         A      XXXX.XXXX
    AAAAAAAAAAAAAA 99/99/99 XXXXXXXXX.XXXX AA         A      XXXX.XXXX
    AAAAAAAAAAAAAA 99/99/99 XXXXXXXXX.XXXX AA         A      XXXX.XXXX
```

SAMPLE REPORT
GROUND WATER WELL LEVEL DATA

```
            1         2         3         4         5         6         7
  0123456789012345678901234567890123456789012345678901234567890123456789012345678 9
0
1
2
3 *---------------------------------------------------------------------------
4                                           TINKER AIR FORCE BASE
5                                           WELL WATER LEVEL DATA
6 *---------------------------------------------------------------------------
7  DATE:99/99/99                                                      PAGE XX
8 *---------------------------------------------------------------------------
9  Site  Location                Static     Total
10 Code: ID Number  Date     Time Depth(ft)  Depth(ft)  Company Remarks
11 AAAA  AAAAAAAAAA 99/99/99 HHMM XXXX.XX    XXXX.XX    AAAA    AAAAAAAAAAA
12 AAAA  AAAAAAAAAA 99/99/99 HHMM XXXX.XX    XXXX.XX    AAAA    AAAAAAAAAAA
13 AAAA  AAAAAAAAAA 99/99/99 HHMM XXXX.XX    XXXX.XX    AAAA    AAAAAAAAAAA
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SAMPLE REPORT
GROUND WATER WELL COMPLETION DATA

```
            1         2         3         4         5         6         7
  01234567890123456789012345678901234567890123456789012345678901234567890123456789
0
1
2*--------------------------------------------------------------------------
3                                          TINKER AIR FORCE BASE
4                                     GROUND WATER WELL COMPLETION DATA
5                                              SAMPLE REPORT
6*--------------------------------------------------------------------------
7  Site Code: AAAA   Site Name: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
8
9  Location ID Number: AAAAAAAAA    Installation Date: 99/99/99
10
11 Well Owner: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
12
13 Well Type: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
14
15 Completion Method: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
16
17 Well Development Method: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
18
19 Completion Zone: AAAAAAAAAAAAAAAAAAAAAAAAAAAAA
20
21 Aquifer: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
22
23 Measuring Point Elevation (ft): XXXXX.XX
24
25 Depth to Bottom of Seal (ft):   XXXX.XX
26 Filter Pack Length (ft):        XXXX.XX
27
28 Hole Diameter (inches):   XXX.XX
29 Total Depth of hole (ft): XXXX.XX
30
31 CASING
32 Inside Diameter (inches): XXX.XX
33 Casing Material: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
34
35 SCREEN
36 Screen Diameter (inches): XXX.XX
37 Begin Depth (ft):         XXXX.XX
38 Screen Length (ft):       XXX.XX
39 Slot Size (inches):       XXX.XX
40 Percent Open:             XX.X
41
42 REMARKS
43 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
44 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
45 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
46
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SAMPLE REPORT
LITHOLOGIC DESCRIPTION OF BOREHOLES

```
          1         2         3         4         5         6         7
01234567890123456789012345678901234567890123456789012345678901234567890123456789



*----------------------------------------------------------------------------
                                         TINKER AIR FORCE BASE
                                         BOREHOLE LITHOLOGIES
*----------------------------------------------------------------------------

  Location Reference:AAAAAAAAAA    Logging Date:99/99/99
  Logging Company:AAAA

  Depth
  Begin   End
  XXX.XXX XXX.XXX   Aquifer: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
                    Lithology: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
                    ASTM Soil Classification: AAAAAAAAAAAAAAAAAAAAAAA
                    Hydrogeologic Unit: AAAAAAAAAAAAAAAAAAAAAAAAAAAAA
                    Description: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
                                 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
                                 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
                                 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
  Depth
  Begin   End
  XXX.XXX XXX.XXX   Aquifer: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
                    Lithology: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
                    ASTM Soil Classification: AAAAAAAAAAAAAAAAAAAAAAA
                    Hydrogeologic Unit: AAAAAAAAAAAAAAAAAAAAAAAAAAAAA
                    Description: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
                                 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
                                 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
                                 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
```

SAMPLE REPORT
AQUIFER ANALYSIS SUMMARY DATA

```
          1         2         3         4         5         6         7
01234567890123456789012345678901234567890123456789012345678901234567890123456789 0


 *----------------------------------------------------------------
                                       TINKER AIR FORCE BASE
                                       AQUIFER ANALYSIS DATA
    DATE 99/99/99                                       PAGE XX
 *----------------------------------------------------------------

 LOCATION   DATE     TEST FORM. BGU    PARAMETER VALUE UNITS
 AAAAAAAAAA 99/99/99 AAAA AAAA  AAAAAA XXXXXXXXX.XXXX AAAAAAAAAA
 AAAAAAAAAA 99/99/99 AAAA AAAA  AAAAAA XXXXXXXXX.XXXX AAAAAAAAAA
```

COMMUNITY RELATIONS PLAN

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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION COMMUNITY RELATIONS PLAN

TINKER AIR FORCE BASE

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(continued)

RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION
COMMUNITY RELATIONS PLAN

<u>Appendices</u>

RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION

COMMUNITY RELATIONS PLAN

Tinker Air Force Base

I. OVERVIEW

The Resource Conservation and Recovery Act, as amended (RCRA), addresses the safe disposal of the large volumes of municipal and solid wastes generated nationwide. RCRA's ultimate goals include the reduction of waste, conservation of energy and natural resources, and expeditious and effective disposal of hazardous waste. In addition, a public participation program is an integral component of the RCRA hazardous waste corrective action planning, study, and implementation processes. The RCRA community relations program ensures that people who live and/or work in the communities surrounding facilities where corrective actions are being conducted, as well as people who work in or for these facilities, have opportunities for public participation in the environmental restoration process. The blueprint for public participation is the community relations plan (CRP). The CRP is a document that identifies the concerns of the public and suggests ways that those responsible for implementing the environmental restoration will respond to those concerns. It also documents how and when community relations activities required by RCRA are carried out.

A. Purpose of the Community Relations Plan

The purpose of this CRP is to communicate openly and effectively with concerned citizens the ways in which they can participate in the process of restoring the environment at Tinker Air Force Base (AFB). This CRP is designed as a planned approach to establishing and maintaining two-way communication between Tinker AFB and the surrounding community during a lengthy and complex technical process. An interactive communication system enables those implementing RCRA facility investigations (RFI) and corrective actions at Tinker AFB and the community to convey information to each other, provide responses to questions and concerns, and formulate more responsive actions. Thus, community relations activities benefit both local citizens and the Base by providing all parties with insight and first-hand information on the RFI and corrective actions proposed and implemented as a result of the investigation.

The CRP outlines a dynamic program integrated into the corrective action investigation, planning, and implementation processes that is responsive to technical developments and changing concerns of the public. It identifies a specific course of action that Tinker AFB environmental planning staff will implement to facilitate public involvement during the RFI and corrective action process.

B. RCRA Compliance

Each RCRA-permitted facility is required (1) to notify the U.S. Environmental Protection Agency (EPA) when it discovers a solid waste management unit (SWMU), and (2) to develop a plan for its study and restoration. As part of the RCRA permitting process, EPA conducts a search of all SWMUs at the facility. This search, known as a RCRA facility assessment (RFA), identifies and gathers data on suspected releases at the facility. SWMUs discovered during the RFA are further investigated under the RFI to determine whether the releases or suspected releases pose a threat to human health and the environment.

EPA granted Tinker AFB a RCRA Part B Permit on July 1, 1991. One condition of this permit is the development of an RFI work plan to investigate 43 SWMUs and two other areas of concern. During the RFI, adequate information will be gathered to support a corrective measures study of interim measures, if deemed necessary by EPA. This CRP is a required component of the RFI work plan. A summary list of the SWMUs addressed by the RFI work plan and this CRP is found in Appendix E.

C. Implementation

The RCRA community relations program, as one important component of the entire environmental restoration program at Tinker AFB, will be implemented by various representatives of the Base, the State of Oklahoma, and EPA. Tinker AFB will clearly define their respective roles and responsibilities to provide the public with an understanding of and confidence in the environmental restoration investigations and plans.

Task 1: Designating Roles and Responsibilities

Tinker AFB will identify specific individuals at the Base to accept lead responsibility for environmental restoration activities. A spokesperson for the RFI from the Directorate of Environmental Management will be designated as the Base's program manager for environmental matters. The Public Affairs Office (PAO) will designate staff with specific responsibilities to support this spokesperson. Appendix A provides information on Tinker AFB representatives, as well as other federal and state agency contacts.

Task 2: Coordinating with Agencies

Tinker AFB will coordinate with EPA, the State of Oklahoma, and local agencies to identify representatives who will be responsible for oversight and review of environmental restoration activities at the Base. These representatives will communicate to the public that the restoration process is a proactive and positive effort that is clearly visible and accessible to the public, and that is being directed in a manner that will assist in preserving the environment. Appendix B provides information on federal, state, and local elected and appointed officials. In addition, Appendix B contains maps of the Oklahoma Congressional districts and Oklahoma County State Senate and House of Representative districts, to assist citizens in identifying contact persons who represent them.

II. BACKGROUND

A. History of Tinker Air Force Base

Late in 1940, a group of Oklahoma business leaders learned that the War Department was considering the central United States as a location for an aircraft maintenance and supply depot. The group, which was known as the Local Industries Foundation, acquired 960 acres of land with an option on an additional 480 acres and offered the property to the War Department. The War Department awarded the aircraft maintenance and supply depot project to Oklahoma City in April 1941. The facility, which began operating in 1942, was later named after an officer who lost his life during a long-range strike against Japanese forces during the early months of World War II. Tinker AFB's mission is to serve as a worldwide repair depot for aircraft, weapons, and engines. Industrial operations in support of the Base's mission include aircraft maintenance, jet engine rebuilding and overhauling, and aircraft servicing.

Fully 52 percent of the 4,277 acres that now comprise Tinker AFB were donated by the community. Tinker AFB is one of Oklahoma's largest industries and the state's largest single employer, with an annual military and civilian payroll in excess of $676 million. More than 26,000 civilian and military personnel are assigned to the Base. In addition, Tinker AFB is one of the largest major military/industrial installations in the world.

B. History of Tinker AFB's Environmental Programs

In the early 1970s, the Environmental Protection Committee (EPC) was formed to track ongoing environmental concerns at Tinker AFB. Under the guidance and direction of the Oklahoma Air Logistics Center, the focus of the EPC is to oversee of all environmental activities at the Base. Membership of the EPC includes all major directorates of the Air Logistics Center, as well as all of the tenant organizations on the Base.

The Installation Restoration Program (IRP), which the Department of Defense (DOD) established at Tinker AFB in 1981, is the Air Force's phased program to identify, investigate, and correct problems at hazardous waste sites. The IRP is a comprehensive program funded and managed by DOD to address hazardous waste sites at DOD installations and at formerly used properties, focusing on the cleanup of contamination from past disposal practices. Numerous remedial investigations, feasibility studies, and response actions have been conducted for various sites since the IRP for the Base began.

According to the Superfund CRP for Tinker AFB, community concern regarding past disposal practices arose in 1982, when an EPA report noted that a very low level of industrial solvent was present in a ground water sample taken from a drinking well at the Base.

In September 1983, Tinker AFB was notified by the Oklahoma State Department of Health that contamination had been detected at an off-base well located on land that the Air Force had leased during the 1970s for the disposal of solid wastes. As a result of the state's discovery, a major sampling effort was undertaken within a 2-mile radius around the contaminated well. Samples were taken from 34 private and six public wells off-base, in addition to 12 Tinker AFB water supply and 30 waste disposal on-site monitoring wells. Reports indicated that two wells inside Building 3001 were contaminated, and the Base closed them immediately.

Results of these investigations prompted the July 1987 placement of Building 3001 and Soldier Creek on the National Priorities List (NPL). Placing these two sites on the NPL required them to be remediated in accordance with the Superfund law, known as the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Cleanup of hazardous waste sites mandated by CERCLA at federal facilities, such as Tinker AFB, are managed under the IRP.

The Superfund Amendments and Reauthorization Act of 1986 (SARA), which expanded the original Superfund law, requires that each federal facility on the NPL enter into an interagency agreement (IAG) with EPA. An IAG is a legally binding document that describes each agency's roles and responsibilities in managing, implementing, and overseeing the facility's long-term remediation. In December 1988, Tinker AFB, the State of Oklahoma, and EPA entered into an IAG for the Superfund actions planned at the Base. The IAG arranged for specific timetables to be established for the Superfund remediation of contaminated areas.

C. CERCLA Community Involvement

In September 1989, EPA sponsored an open house at the five Oklahoma City/Metro Area Superfund sites, one of which is Tinker AFB, to provide the public with an opportunity to meet with the project managers and discuss remedial alternatives. On April 5, 1990, Tinker AFB held a public meeting to present the proposed plan for remediating ground water contamination beneath Building 3001, along with proposed plans for remediating Pit Q-51 and the North Tank Fuel Area. Over 100 citizens attended the public meeting and were encouraged to participate in the discussions so that all comments could be considered before final plans were selected.

Other IRP sites at Tinker AFB are in the process of undergoing or have undergone remedial investigations/feasibility studies. The plans for addressing the restoration of these sites are described in detail in the December 1988 Superfund IAG. The Superfund CRP prepared by the Base in September 1991 that describes the activities associated with these sites is available for public review at the Public Affairs Office on the Base. The sites addressed under CERCLA are listed in Appendix E.

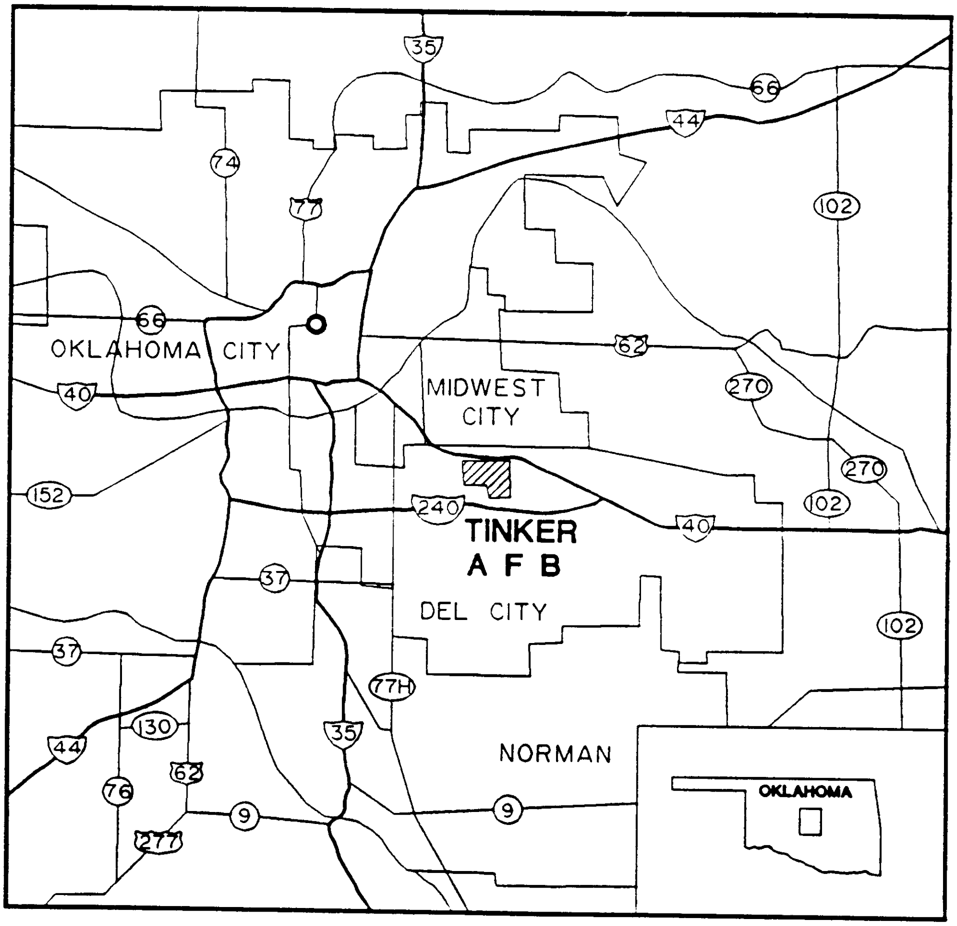
III. COMMUNITY BACKGROUND

A. Description of Surrounding Community

The Tinker AFB community is situated within the corporate limits of Oklahoma City and borders Midwest City and Del City, as shown in Exhibit 1. Oklahoma City was established on the afternoon of April 22, 1889, when thousands of pioneers crossed the borders of the "unassigned lands" at the sound of gunfire at high noon. By nightfall, thousands had staked their claims in the area known today as Oklahoma City. It has since grown to become the 28th largest city in the United States, covering over 620 square miles with a population of close to 450,000. Oklahoma City industries include oil processing and refining, livestock production, and agriculture. Oklahoma City has a manager-council form of government with eight councilmen and a mayor, all elected for staggered four-year terms and representing various wards.

Midwest City, which is located adjacent to Oklahoma City and north of Tinker AFB, has a population of almost 60,000 and covers a 25 square mile area. It is primarily residential, with a large number of its citizens employed at Tinker AFB. It has a mayor and a manager-council form of government with four council members elected to four-year terms from designated wards in the city.

Del City, which is located due south of Tinker AFB, has a population of 30,000 and covers eight square miles. It has a mayor, manager-council form of government with four council members elected to four-year terms from designated wards in the city. Like Midwest City, it is a residential community with many of its citizens employed at Tinker AFB.



VICINITY MAP

LOCATION OF TINKER AIR FORCE BASE

EXHIBIT 1

B. Community Concerns

This section of the CRP should describe community concerns related to the RCRA corrective action plans and measures. However, because Tinker AFB has not yet assessed the community's RCRA concerns, the Base will initiate the interview process described below during the early stages of the RFI to gain insight into the community's concerns.

The Community Interview Process

Tinker AFB will assess community concerns by interviewing selected members of the public to discuss its viewpoints, expectations, and informational needs. Tinker AFB will supplement this baseline assessment by maintaining an open relationship with the community throughout the RCRA corrective action planning and implementation process. In this manner, Tinker AFB will maintain continuous contact with the community and its changing needs.

During the community interview process, Tinker AFB will perform four separate tasks:

(1) planning the interviews
(2) conducting the interviews
(3) assessing interview results, and
(4) setting goals for the community relations program.

Each of these tasks is described below in detail.

Task 1: Planning the Interviews

Tinker AFB plans to conduct community interviews during the RFI, which is an early stage in the RCRA corrective action process. This timing will enable the public to have a meaningful role in making decisions about the environmental conditions at the Base from the start of the corrective action.

First, Tinker AFB will identify a list of about 50 individual interview candidates. The interview candidates will represent the full spectrum of views, including not only those of Tinker AFB employees, but also the concerns of other residents of the surrounding community. To select the interview candidates, Tinker AFB will not use statistical or scientific sampling methods but, rather, will include participants whose range of views adequately represent all concerned parties on the basis of affiliation, residence, or similar criteria. In particular, the interviews will assess the views of those citizens most directly and immediately affected by environmental conditions at the Base.

Tinker AFB will contact the following sectors of the community to identify potential participants:

- Citizens of Oklahoma City, Del City, and Midwest City (such as farmers, homemakers, public school employees, and manufacturing employees)
- Elected and appointed officials of these three cities, as well as Oklahoma County, Cleveland County, Pottawatomie County, and Canadian County (such as mayors, city managers, county and city council members, and land use planners, as outlined in Appendix B)
- Residents of barracks and other on-Base housing (such as enlisted personnel, Air Force officers, and dependents)
- Civilian employees of Tinker AFB (such as civilian facilities maintenance personnel and medical personnel)
- Representatives of environmental groups (such as the Audubon Society and the Sierra Club, as outlined in Appendix C)

- Representatives of community groups (such as the League of Women Voters, Jaycees, Senior Citizens Centers, as outlined in Appendix C)
- Media representatives (such as the editors of The Daily Oklahoman and The Midwest City Sun and general managers from television network affiliates and general audience radio stations, as outlined in Appendix D).

Second, Tinker AFB will contact the 50 individuals identified from these sectors of the community by sending them a one-page letter explaining the need for RCRA corrective action and the importance of community involvement. About one week later, the Base will telephone the 50 individuals to request their participation. The Base expects to schedule about 30 individual interviews, as well as some group interviews with print media representatives or city council members, for instance.

Third, Tinker AFB will prepare a detailed list of topics to be discussed during the interviews. This advance preparation will ensure that Tinker AFB asks all interview participants the same general questions, and that the questions will elicit the range of public concerns about the environmental restoration, such as:

- How familiar are you with the RCRA corrective actions program, in general?
- What is the extent of your knowledge of the installation restoration program being implemented at Tinker Air Force Base?
- What is the extent of your knowledge of RCRA corrective action-related activities, such as which SWMUs are of particular concern, types of contaminants found, perceptions of public health risks, any losses in property value, and your understanding of the role of EPA, the state, and contractors in the corrective action process?
- What are the best communication techniques for this community, such as how do most people get their information, how responsive is the Base, what types of public interaction activities would you participate in, has the information provided to date been too technical or not technical enough, how frequently do you wish to receive information, and any suggestions for information repository locations?

- Would you like to reiterate key concerns or voice new ideas not addressed during the interview?

Task 2: Conducting the Interviews

Tinker AFB will conduct the community interviews at participants' homes or offices, either during the day or evenings, if the participants indicate that these locations are convenient and comfortable for them. Alternatively, Tinker AFB will conduct interviews at "neutral" locations, such as local restaurants or meeting places. Tinker AFB will not conduct community interviews at the Base, unless participants specifically request to meet at this location.

During the interviews, Base staff will make it clear to participants that their opinions will be held in the strictest confidence. Tinker AFB staff will explain that their role is to listen to citizen concerns and record their views objectively, and that community interviews are a means for obtaining, not disseminating, information. Interview staff will refer all questions about the c ctive actions to the Base's restoration spokesperson to ensure that technical questions are answered by qualified personnel in a timely fashion.

Task 3: Assessing the Interview Results

Tinker AFB will identify common concerns expressed by the interview participants. At the conclusion of each interview, Base staff will summarize the interview and remove direct quotes and names of participants.

When all of the interviews are complete, Tinker AFB will develop a single summary of the community interviews. This summary will be an in-depth review of the interview results to identify common themes, such as:

- level of understanding in the community about the IRP and the RFI
- concerns expressed about ecological impacts of Base activities
- concerns expressed about health impacts

- problems identified in the current communication system, and
- suggested means of communicating with the public in the future.

For example, residents of cities surrounding the Base may have common perceptions of the Base's responsiveness to their environmental concerns. Elected officials and group representatives may suggest new ways to reach the public. Representatives of environmental groups may request more information on health risks, or presentations of information in less technical terms.

Issues of common concern may relate to real dangers presented by the conditions at the Base and/or may be unfounded perceptions of environmental restoration plans, which have resulted from a lack of information. Tinker AFB realizes that, regardless of the factual accuracy or inaccuracy, all issues identified as concerns to the community are worthy of the Base's attention and response.

Task 4: Setting Goals for the Community Relations Program

Based on these common themes, Tinker AFB will set two or three priority goals to accomplish in the community relations program. These goals will drive the implementation of a public information program suited to the needs of the community. The public information plan is outlined in Section IV of this CRP.

IV. PUBLIC INFORMATION PROGRAM

> Although a public information program is not typically developed until community interviews are concluded, Tinker AFB has outlined a public information program based upon prior knowledge of the community and RCRA community relations guidance that includes, but is not limited to, the following activities. Tinker AFB will re-evaluate this public information program based upon the information gathered during the community interview process detailed in Section III.

By assessing the community's concerns, Tinker AFB will gain a thorough understanding of the community needs that will drive its public information program. As the next step, Tinker AFB will identify appropriate techniques for interacting with the community. Public concerns and informational needs will change throughout the course of the RFI, corrective action planning, and implementation. For example, during the planning stages, the community may express a need for several informational meetings that will describe current conditions and risks. Once the corrective action is underway, the community may simply need periodic fact sheets and news articles to update them on sampling data and technical milestones. When the corrective action is complete, the community may want to see independent verifications of its long-term effectiveness and permanence.

Tinker AFB will employ a variety of communication techniques to address the community's concerns, as expressed during interviews and throughout the restoration process. At all times, Tinker AFB will communicate to the public that it is open, truthful, and responsive. This type of open relationship will be maintained throughout the environmental restoration to emphasize the effectiveness and permanence of the corrective action measures.

Task 1: Identify a Spokesperson

Tinker AFB will appoint a single, authoritative point of contact who will make it clear to the public that their concerns related to RCRA issues are significant to the Base and will be given serious consideration at the highest command levels. Tinker AFB will designate a senior staff member to lend both credibility and objectivity to the spokesperson's interactions with military personnel, civilians, and the media.

Task 2: Hold Public Meetings

Tinker AFB will conduct public meetings to facilitate community input on major decisions and provide the community with up-to-date, accurate information on the corrective actions. These meetings will be well publicized and held at central locations, such as hotel meeting rooms and libraries. The Base will not hold these meetings at the Base, to convey an effort to reach out to the public, rather than to make information inaccessible. Tinker AFB will hold two types of meetings: (1) general informational meetings, and (2) formal public hearings. The general informational meetings will be facilitated by the spokesperson and involve:

- a presentation of facts
- distribution of literature for public review
- a question-and-answer session, and
- identification of points of contact for further information or more technical details.

The formal public hearings will enable the community members to voice their concerns about the RFI work plan and, if requested, the proposed corrective action measures. Public meetings will be held following approval of the RFI Work Plan and the Corrective Measures Studies.

Task 3: Host Small Discussion Groups

Tinker AFB will host small discussion groups with local elected officials and community leaders throughout the restoration process. The primary purpose of these discussion groups is for Tinker AFB to learn more about specific communities or members' concerns. In addition, the discussion groups will keep community officials and representatives apprised of the progress of restoration activities. As needed, the Base will arrange to host these discussion groups at each group's typical gathering place to convey an outreach effort. These groups might include: the American Federation of Government Employees, the Company Grade Officers Association, the Airmen's Wives Club, the Lions Club, the American Legion, local Chamber of Commerce representatives, conservation groups, and farming and rural groups.

Task 4: Prepare Informational Publications

Tinker AFB will prepare informational publications to expand its public interaction efforts to include all members of the community, especially citizens who might not attend meetings. The Base will prepare brief fact sheets to update the community on its progress, such as sampling results, and detailed newsletters educating the community on such topics as contamination sources. The Base is required to prepare newsletters explaining to the public the RFI work plan, the proposed corrective action measures, and the corrective action designs. The topics, tone, and frequency of non-required publications will depend on community needs, as assessed by Tinker AFB during interviews, informational meetings, and its small discussion groups. These publications will avoid jargon and, in all cases, present information objectively and openly. The Base will compile and maintain a mailing list of interested parties based on responses from meetings, small discussion groups, and newsletter response cards. Tinker AFB will send all interested parties its final RFI Report within 15 days of EPA's approval. These individuals will also be notified of any RCRA permit modifications.

Tinker AFB will, at a minimum, prepare the following informational materials:

- Community Relations Plan (this document)
- RFI work plan fact sheet
- Public notice of proposed corrective action measure(s)
- Proposed corrective action measure fact sheet(s)

- Public notice of final corrective action measure(s), and
- Fact sheets on corrective action design.

Task 5: Work with the Media to "Spread the Word"

Tinker AFB will establish an open-door policy with local media to lend credibility to its actions and keep the restoration process visible. The spokesperson for the restoration action will be available to meet with reporters, make personal appearances, and escort reporters around the Base. Tinker AFB will prepare press releases and public service announcements periodically and when major events occur. In addition, the Base is required to publish advertisements in a widely read local newspaper to inform the public of the proposed corrective action measures and of a 30-day period for receiving public comments on each proposal. Upon selection of the final corrective action measures, EPA will publish notices describing the measures in the same local newspaper. Proposed RCRA permit modifications, if any, will also be published in the newspaper.

Task 6: Set up a RCRA Corrective Action Measures Hotline

Tinker AFB will establish a hotline for public and media use to ensure that all interested parties have both an avenue to express their concerns and to request and receive information in a timely fashion. This hotline will be located in the Public Affairs Office and be staffed by a knowledgeable community liaison during normal business hours. After hours, the hotline will be equipped with a message-recording capability to allow the community and the media to register their concerns and ask questions at any time. The Base will answer all telephone inquiries with a reasonable response within a 48-hour period. The hotline telephone number will be widely publicized through the media and in all Base literature related to corrective actions. The Public Affairs Office will keep a logbook of citizen requests and comments and include a statement of how each request is handled.

Task 7: Establish and Maintain Information Repositories and an Administrative Record

Tinker AFB will establish information repositories both on- and off-Base to enable the community to review RCRA documents at its own pace. Base staff will distribute fact sheets and limited relevant information on the corrective action program to the information repositories, which are public file centers established throughout the area at locations that are easily accessible and convenient to local residents. Each information repository will contain an index to the administrative record, which is a complete file of all documents, including technical reports, related to the corrective actions. The administrative record will be available for review at the Public Affairs Office. All reports will be available in the Midwest City Library by January 15, 1993.

APPENDIX A

FEDERAL AND STATE AGENCY REPRESENTATIVES

I. Tinker Air Force Base Representatives

Point of Contact
Diana Cramer
Office of Public Affairs
OC-ALC/PA
Tinker Air Force Base, Oklahoma 73145-5000
(405) 739-2215

Citizen Representative, Technical Review Committee
Peter Pierce, III
3727 Northwest Sixty-third Street
Oklahoma City, Oklahoma 73116
(405) 848-8022

II. U.S. Environmental Protection Agency Representatives

Susan Webster
Remedial Project Manager
U.S. Environmental Protection Agency
Region VI
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733
(214) 655-6730

RCRA Community Relations Coordinator
U.S. Environmental Protection Agency
Region VI
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733
(214) 655-6705

III. State of Oklahoma Agency Representatives

Damon Wingfield
Waste Management Services
Oklahoma State Department of Health
P.O. Box 53551
Oklahoma City, Oklahoma 73152
(405) 271-7047

Dave Dillon
Oklahoma Water Resource Board
P.O. Box 53585
1000 Northeast Tenth Street
Oklahoma City, Oklahoma 73152
(405) 271-2555

APPENDIX B

Ξ, AND LᴗCAL ELECTED AND APPOINTED OFFICIALS

:ials

. Office
enate Office Building
. 20510-3601

;on, Room 350
)klahoma 73102

Office
;
2ᴗ510-3601

Jee Avenue, Room 820
)klahoma 73102

. Inhofe (District 1)*

Office
e Office Building
20515-3601

ıite 305
74103

ıoma Congressional districts is provided on page B-4.

Representative Mike Synar (District 2)*

Washington, D.C. Office
2441 Rayburn House Office Building
Washington, D.C. 20515-3602
(202) 225-2701

District Office
125 South Main Street, Room 2B22
Muskogee, Oklahoma 74401
(918) 687-2533

Representative Bill Brewster (District 3)*

Washington, D.C. Office
1407 Longworth House Office Building
Washington, D.C. 20515-3603
(202) 225-5565

District Office
900 North Mississippi, Suite B
Ada, Oklahoma 74820
(405) 436-1980

Representative Dave McCurdy (District 4)*

Washington, D.C. Office
2344 Rayburn House Office Building
Washington, D.C. 20515-3604
(202) 225-6515

District Office
P.O. Box 1265
Norman, Oklahoma 73070
(405) 329-6500

Representative Mickey Edwards (District 5)*

Washington, D.C. Office
2330 Rayburn House Office Building
Washington, D.C. 20515-3605
(202) 225-2132

District Office
900 Northwest Sixty-third, Suite 105
Oklahoma City, Oklahoma 73116
(405) 231-4541

Representative Glenn English (District 6)*

Washington, D.C. Office
2206 Rayburn House Office Building
Washington, D.C. 20515-3606
(202) 225-5565

District Office
Old Post Office Building, Room 252
Oklahoma City, Oklahoma 73102
(405) 231-5511

II. State Elected Officials

Governor David Walters
State Capitol Building
Oklahoma City, Oklahoma 73105
(405) 521-2342

State Senator David Herbert (Senate District 42)*

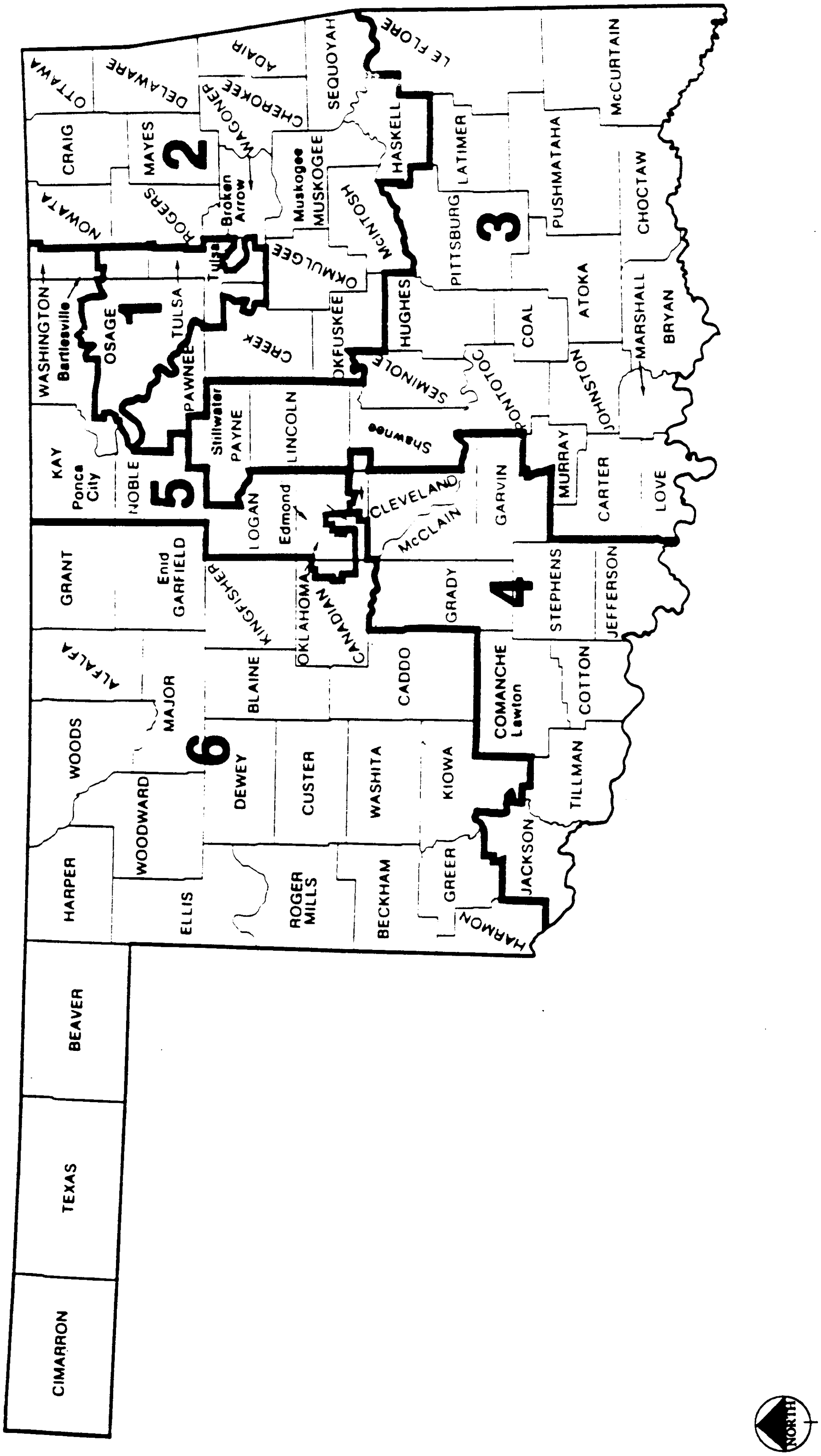
Capitol Office
State Capitol Building
Oklahoma City, Oklahoma 73105
(405) 524-0126

District Office
P.O. Box 30793
Midwest City, Oklahoma 73140
(405) 733-3346

State Senator Ben Brown (Senate District 43)*

Capitol Office
State Capitol Building
Oklahoma City, Oklahoma 73105
(405) 524-0126

OKLAHOMA CONGRESSIONAL DISTRICTS



Source: Congressional Yellow Book. Monitor Publishing Company, Spring 1991, Vol. XXIX, No.2.

District Office
2313 South Harvey
Oklahoma City, Oklahoma 73109
(405) 525-5101

State Senator Vicki Miles-LaGrange (Senate District 48)*

Capitol Office
State Capitol Building
Oklahoma City, Oklahoma 73105
(405) 524-0126

District Office
P.O. Box 18207
Oklahoma City, Oklahoma 73154
(405) 771-3132

State Representative Gary Bastin (House District 94)*

Capitol Office
State Capitol Building
Oklahoma City, Oklahoma 73105
(405) 524-2711

District Office
3035 Southeast Twentieth Street
Del City, Oklahoma 73115-1519
(405) 672-6460

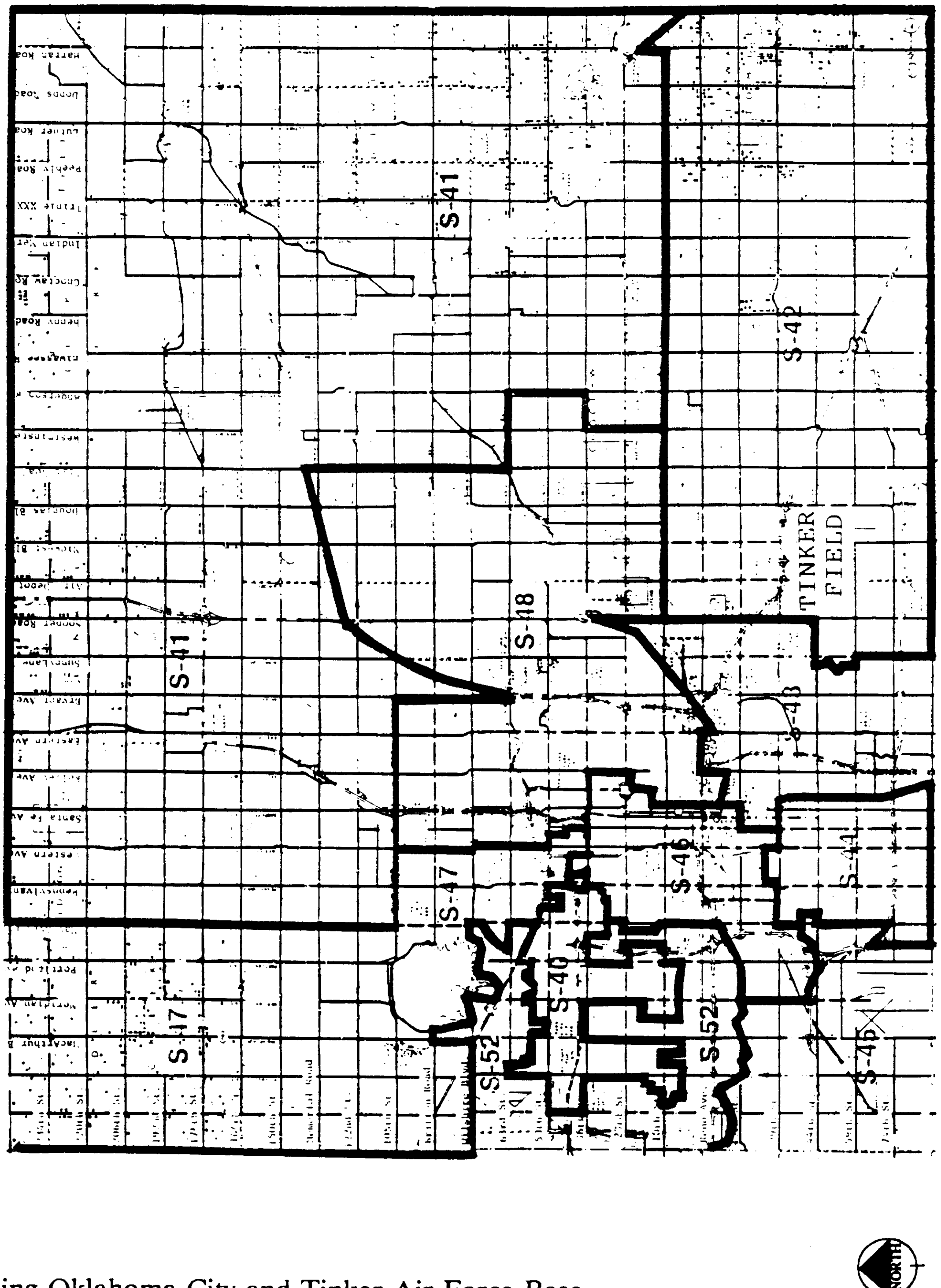
State Representative Jim Isaac (House District 95)*

Capitol Office
State Capitol Building
Oklahoma City, Oklahoma 73105
(405) 524-2711

District Office
5600 Ridgefield
Oklahoma City, Oklahoma 73150
(405) 737-5711

* **Note:** Maps of Oklahoma County State Senate and House of Representative districts are provided on pages B-6 and B-7.

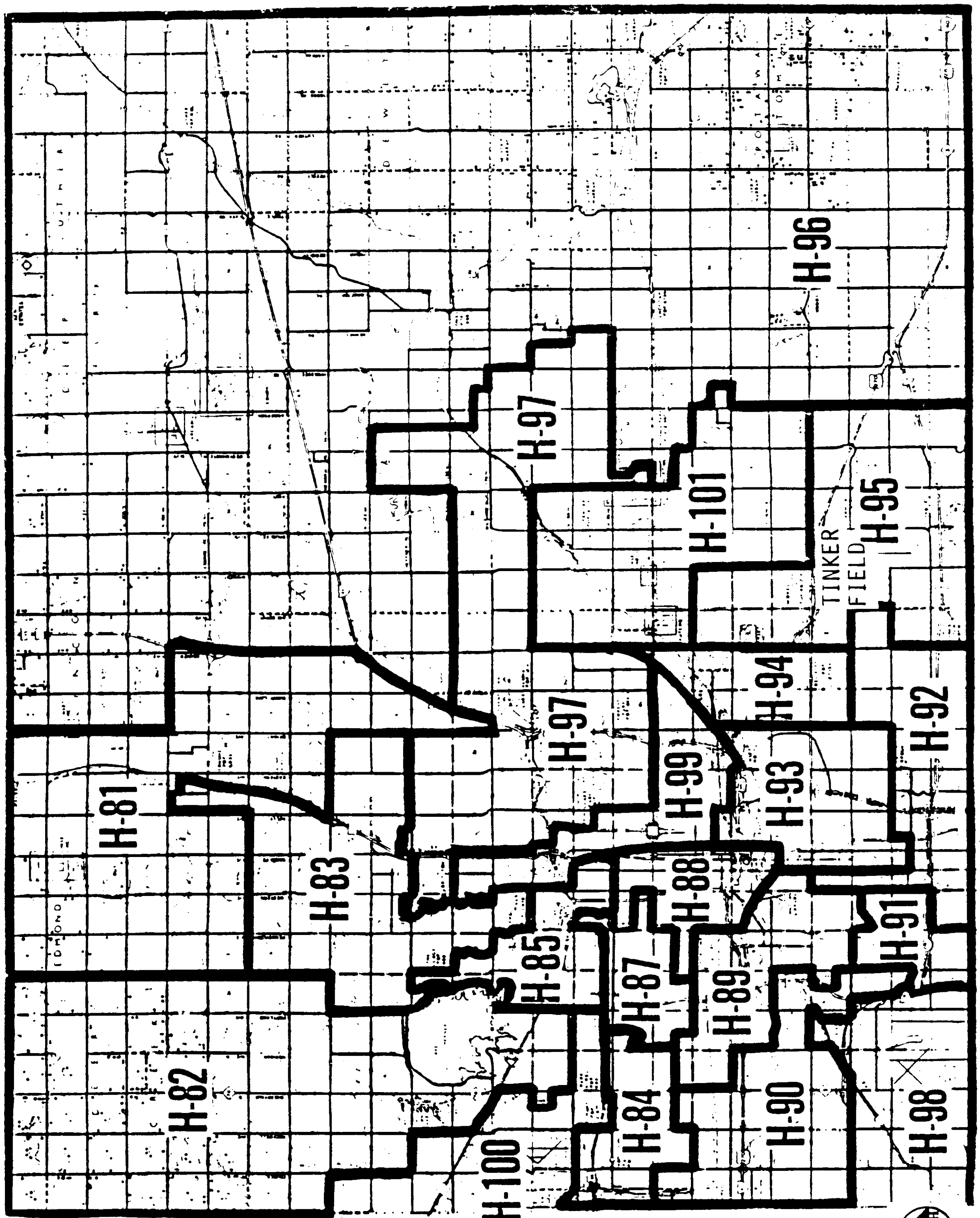
OKLAHOMA COUNTY STATE SENATE DISTRICTS*



* Including Oklahoma City and Tinker Air Force Base.

Source: Oklahoma State Election Board. Based on 1980 census.

OKLAHOMA COUNTY STATE HOUSE OF REPRESENTATIVE DISTRICTS*



* Including Oklahoma City and Tinker Air Force Base.

Source: Oklahoma State Election Board. Based on 1980 census.

State Representative Jeff Hamilton (House District 101)*

Capitol Office
State Capitol Building
Oklahoma City, Oklahoma 73105
(405) 524-2711

District Office
9608 Sonata Court
Midwest City, Oklahoma 73130
(405) 732-6416

III. Local Elected and Appointed Officials

Oklahoma City

Mayor Ronald Norick
Municipal Building
200 North Walker
Oklahoma City, Oklahoma 73102
(405) 231-2424

Ronald R. Brown
City Manager
Municipal Building
200 North Walker, Suite 302
Oklahoma City, Oklahoma 73102
(405) 297-2345

JoeVan Bullard
Assistant City Manager
Municipal Building
200 North Walker
Oklahoma City, Oklahoma 73102
(405) 671-2800

Nancy Wellhousen
City Treasurer
200 North Culver
Oklahoma City, Oklahoma 73102
(405) 297-2962

Jack Crockette
Director, Planning and Economic Development Division
Municipal Building
200 North Walker
Oklahoma City, Oklahoma 73102
(405) 297-3836

Mike Randall
Director, Neighborhood Services Department
501 Church Drive
Oklahoma City, Oklahoma 73102
(405) 297-2368

<u>Oklahoma City Council</u>

Council Member I.G. Purser (Ward 1)
Municipal Building
200 North Walker
Oklahoma City, Oklahoma 73102
(405) 297-2569

Council Member Mark Schwartz (Ward 2)
Municipal Building
200 North Walker
Oklahoma City, Oklahoma 73102
(405) 297-2402

Council Member Jack Cornett (Ward 3)
Municipal Building
200 North Walker
Oklahoma City, Oklahoma 73102
(405) 297-2404

Council Member Dan Fine (Ward 4)
Municipal Building
200 North Walker
Oklahoma City, Oklahoma 73102
(405) 297-2402

Council Member Jim Scott (Ward 5)
Municipal Building
200 North Walker
Oklahoma City, Oklahoma 73102
(405) 297-3884

Council Member Beverly Hodges (Ward 6)
Municipal Building
200 North Walker
Oklahoma City, Oklahoma 73102
(405) 297-3884

Council Member Goree James (Ward 7)
Municipal Building
200 North Walker
Oklahoma City, Oklahoma 73102
(405) 297-2569

Midwest City

Mayor John Johnson
Municipal Building
100 North Midwest Boulevard
Midwest City, Oklahoma 73110
(405) 739-1204

Charles Johnson
City Manager
Municipal Building
100 North Midwest Boulevard
Midwest City, Oklahoma 73110
(405) 732-2281

Dee Kise
Director, Economic Development Commission
100 North Midwest Boulevard
Midwest City, Oklahoma 73110
(405) 733-4600

Midwest City Council

Council Member Don Walker
1813 North Mitchell Drive
Midwest City, Oklahoma 73110
(405) 739-1204

Council Member Eileen M. Edwards
133 East Jarman
Midwest City, Oklahoma 73110
(405) 739-1204

Council Member John Morgan
1924 Turner Drive
Midwest City, Oklahoma 73110
(405) 739-1204

Council Member Eddie Reed
107 Orchard Drive
Midwest City, Oklahoma 73110
(405) 739-1204

Council Member Bill Case
P.O. Box 10570
Midwest City, Oklahoma 73140
(405) 739-1204

Council Member Frank Barnett
11516 Surrey Lane
Midwest City, Oklahoma 73139
(405) 739-1204

Del City

Mayor John Faught
P.O. Box 15177
Del City, Oklahoma 73155
(405) 677-5771

John Zakariassen
City Manager
P.O. Box 15177
Del City, Oklahoma 73155
(405) 677-5741

Dallas Gram
Assistant City Manager
4517 Southeast Twenty-ninth
Del City, Oklahoma 73155
(405) 671-2812

Richard Devaney
Director, Office of Planning and Zoning
4517 Southeast Twenty-ninth
Del City, Oklahoma 73155
(405) 671-2803

Laura Pollard
Conservation District Manager
1000 West Wilshire Boulevard
Oklahoma City, Oklahoma 73116
(405) 848-1933

Del City Council

Council Member Janet Addison (Ward 1)
3709 Veterans Lane
Dale City, Oklahoma 73115
(405) 672-8433

Council Member Joe Nichols (Ward 2)
13 Berkway
Dale City, Oklahoma 73115
(405) 672-1224

Council Member Bob McKnight (Ward 3)
4733 Woodview Drive
Dale City, Oklahoma 73115
(405) 677-8650

Council Member Ezra Williams (Ward 4)
4812 Vera Place
Dale City, Oklahoma 73115
(405) 677-1979

Oklahoma County

Director, Oklahoma City and County Health Department
921 Northeast Twenth-third
Oklahoma City, Oklahoma 73105
(405) 427-8651

Dr. Mehdi Azimi
320 Robert S. Kerr
Oklahoma City Oklahoma 73102
(405) 278-1361

Oklahoma County Commissioners

Shirley A. Darrel (District 1)
320 Robert S. Kerr
Oklahoma City, Oklahoma 73105
(405) 278-1501

F.G. Buck Buchanan (District 2)
320 Robert S. Kerr
Oklahoma City, Oklahoma 73105
(405) 278-1503

Fred Snyder (District 3)
320 Robert S. Kerr
Oklahoma City, Oklahoma 73105
(405) 278-1503

Canadian County

Stephen Rampe
Director, Canadian County Health Department
200 South Pickford
El Reno, Oklahoma 73036
(405) 354-4872

Canadian County Council

Council Member Larry LaFoe (District 1)
Route 3, Box 130B
El Reno, Oklahoma 73036
(405) 262-1070

Council Member Don Young (District 2)
5204 South Mustange Road
Mustange, Oklahoma 73064
(405) 262-1070

Council Member Charles Erandley
Route 1
El Reno, Oklahoma 73036
(405) 262-1070

APPENDIX C

CITIZEN GROUPS

Oklahoma City Chamber of Commerce
c/o Lloyd J. Lyles, President
One Santa Fe Plaza
Oklahoma City, Oklahoma 73102
(405) 278-8900

Midwest City Chamber of Commerce
c/o Pam Hall, President
P.O. Box 10980
Midwest City, Oklahoma 73140
(405) 733-3801

Del City Chamber of Commerce
c/o John Linville, President
P.O. Box 15055
Del City, Oklahoma 73115
(405) 677-1910

Garber-Wellington Association
c/o John Harrington
6600 North Harvey Place, Suite 200
Oklahoma City, Oklahoma 73116
(405) 848-8961

Association of Central Oklahoma Governments
c/o Zach Taylor
6600 North Harvey Place, Suite 200
Oklahoma City, Oklahoma 73116
(405) 848-8961

American Federation of Government Employees
c/o Kathryn Wells
4444 South Douglas Boulevard
Oklahoma City, Oklahoma 73150
(405) 733-3581

Environmentally Concerned Citizens, Inc.
c/o John Bowman, Chairman
1301 Martin Luther King Avenue
Oklahoma City, Oklahoma 73117
(405) 427-1330

National Toxics Campaign
c/o Earl Hatley
3000 United Founders Boulevard
Oklahoma City, Oklahoma 73112
(405) 843-1873

Oklahoma Wildlife Federation
c/o Phyllis Johnson
4545 Lincoln Boulevard
Oklahoma City, Oklahoma 73105
(405) 524-7009

Audubon Society of Central Oklahoma
518 Van Buren Avenue, Northwest
Piedmont, Oklahoma 73078
(405) 373-4531

Oklahoma City Sierra Club
4301 North Ann Arbor
Oklahoma City, Oklahoma 73109
(405) 721-5486

League of Women Voters of Oklahoma County
c/o Pat Melly, President
3016 Elmhurst Avenue
Oklahoma City, Oklahoma 73120
(405) 842-2413

Oklahoma City Jaycees
c/o Dilisa Wright, President
Post Office Box 10535
Oklahoma City, Oklahoma 73155
(405) 521-0540

Community Action Agency of Oklahoma City - Oklahoma and Canadian Counties, Inc.
c/o James Sconzo, Director
1900 Northwest Tenth Street
Oklahoma City, Oklahoma 73106
(405) 232-0199

Neighborhood Services Organization, Inc.
c/o Sam Bowman, Executive Director
431 Southwest Eleventh
Oklahoma City, Oklahoma 73109
(405) 236-0413

American Association of Retired Persons Senior Employment Service
c/o Rosemary Southern, Director
1411 North Classen Boulevard
Oklahoma City, Oklahoma 73106
(405) 525-8144

Del City Community Center
c/o Steve Yohn, Project Coordinator
450 Southeast Fifteenth
Del City, Oklahoma 73115
(405) 671-2867

Midwest City Senior Citizens Center
300 West MidAmerica
Midwest City, Oklahoma 73110
(405) 737-7611

APPENDIX D

MEDIA

I. Newspapers

The Daily Oklahoman
P.O Box 25125
Oklahoma City, Oklahoma 73125
Telephone: (405) 475-3311
Editor: Ed Kelly
Environmental Reporter: David Zizzo

The Midwest City Sun
6301 Tinker Diagonal
P.O. Box 3038
Midwest City, Oklahoma 73140
Telephone: (405) 737-3050
Managing Editor: John Martin
City Editor: Robin Maxey

The Journal Record
621 North Robinson
P.O. Box 26370
Oklahoma City, Oklahoma 73126-0370
Telephone: (405) 278-6055
Editor: David Page

The Edmond Evening Sun
123 South Broadway
P.O. Box 2470
Edmond, Oklahoma 73083
Telephone: (405) 341-2121
Editor: Carl Hartzog

The Shawnee News-Star
215 North Bell
Shawnee, Oklahoma 74081
Telephone: (405) 273-4200
Editor: Mike McCormick
Environmental Reporter: Chris Jones

II. U.S. Air Force Newspapers

Tinker Take Off
Building 3001, Area C
Tinker Air Force Base, Oklahoma 73145
(405) 739-2214

III. Television Stations

KTVY TV - Channel 4 (NBC Affiliate)
444 East Britton Road
P.O. BOx 14068
Oklahoma City, Oklahoma 73113
(405) 478-6333
General Manager: Bill Katsafanas

KOCO TV - Channel 5 (ABC Affiliate)
P.O. Box 14555
Oklahoma City, Oklahoma 73113
(405) 478-3142
General Manager: Tom Kirby
Assignments Editor: Dave Koester

KWTV - Channel 9 (CBS Affiliate)
7401 North Kelly
Oklahoma City, Oklahoma 73111
(405) 843-6731
General Manager: David Griffin

IV. Radio Stations

WKY (930 AM)
P.O. Box 14930
Oklahoma City, Oklahoma 73113
(405) 478-2930
General Manager: Jim Fisher

KTOK (1000 AM)
P.O. Box 1000
Oklahoma City, Oklahoma 73101
(405) 840-1948
General Manager: Jim Smith

KOMA (1520 AM)
P.O. Box 6000
Oklahoma City, Oklahoma 73153
(450) 794-5565
General Manager: Vance Harrison
Assignments Editor: Steve Bennett

KEBC (94.7 AM)
5101 South Shield
Oklahoma City, Oklahoma 73129
(405) 631-7561
General Manager: Don Boyles

KMGL (104 FM)
P.O. Box 14818
Oklahoma City, Oklahoma 73113
(405) 478-5104
General Manager: Rob Adair

KZBS (99 FM)
3545 Northwest Fifty-eigth, Suite 800
Oklahoma City, Oklahoma 73112
(405) 460-9936
General Manager: Debbie Barton

KXXY (1340 AM/96.1 FM)
101 Northeast Twenty-ninth
Oklahoma City, Oklahoma 73105
(405) 528-0833
General Manager: Bill Hurley

APPENDIX E

SOLID WASTE MANAGEMENT UNITS

The Solid Waste Management Units (SWMUs) at Tinker AFB have been divided into three groups:

- **Group 1** consists of 21 SWMUs and one AOC that are being addressed under the Tinker AFB IRP. Work at these SWMUs (remedial investigations, focused feasibility studies, and remedial actions) has been conducted under the Base's IRP (with the exception of the Spill Pond AOC), which parallels EPA's guidance for conducting RI/FSs under CERCLA. Investigations are proposed in this RFI Work Plan for the Spill Pond AOC. This work will be conducted under the IRP.

Group 2 and Group 3 SWMUs are the subject of this RFI.

- **Group 2** consists of SWMUs 24 and 32 (and associated components), which are referred to as the industrial and sanitary waste treatment plants. SWMUs in Group 2 are all components of the two wastewater treatment facilities and are all proximate to each other. Both of these SWMUs are also IRP sites. Investigations are also proposed for these two SWMUs in this RFI Work Plan which will be conducted under the IRP.

- **Group 3** SWMUs consist of two areas of concern, a fuel truck maintenance area, a waste fuel dump site, and the HCl tank. These miscellaneous sites have been grouped together for convenience. These sites are not IRP sites.

The components of each SWMU group are described in detail below.

GROUP 1 SWMUs:

SWMU Number	Site
1	Landfill 6
2	Landfill 5
3	Landfill 1
4	Landfill 2
5	Landfill 3
6	Landfill 4
7	Fire Training Area No. 1
8	Fire Training Area No. 2

11	Supernatant Pond
12	Industrial Waste Pit No. 1

SWMU Number	Site
13	Industrial Waste Pit No. 2
15	Fuel Site No. 1
16	Fuel Site No. 2
17	Fuel Site No. 3
18	Fuel Site No. 4
19	Radioactive Waste Disposal Site (RDWS) 1030W
20	RWDS 201S
21	RWDS 62598
22	RWDS 1022E
23	Industrial Waste Treatment Plant Abandoned Waste Tanks
54	Stained Drainage Ditch and Drums
AOC	Spill Pond

GROUP 2 SWMUs (IRP Sites):

SWMU 24 and Associated Components - Industrial Waste Treatment Plant (IWTP)

The IWTP, located in the northeast corner of the base, is a process treatment plant for all the industrial wastewater generated at Tinker AFB. It contains one outfall for the discharge of treated effluent to East Soldier Creek. The IWTP began operation in 1968; there are 13 SWMU components associated with this facility. Contaminants of concern are metals, volatile organic compounds (VOCs), semi-volatiles, and phenolic compounds.

SWMU 32 and Associated Components - Sanitary Waste Treatment Plant (SWTP)

From approximately 1963 to 1971, the current SWTP was designed to treat industrial and sanitary wastewaters generated at Tinker AFB. Prior to 1962 and following 1971, the sanitary waste treatment plant received only sanitary wastewater generated from the eastern section of the Base. Of the eight units associated with this facility, only one -- the sludge-drying beds -- are believed to have a high potential for contaminating the soil column and, consequently, both surface and ground water.

GROUP 3 SWMUs:

SWMU 26 - Ordnance Disposal Area

SWMU 26 is located at the southeast end of the north-south runway, 150 feet east of Industrial Waste Pit No. 1. The area, a square measuring no more than 50 feet by 50 feet, was used as an ordnance burning pit for small arms munitions, blasting caps, flares, pyrotechnics, and egress items between the early 1960s and 1972 at a frequency of less than once per month. Although no visual evidence of a release has been observed, burning activities may have released metals and organic compounds to the surface soil which may have migrated downward into the unsaturated zone and to the ground water.

SWMU 40 - Building 976 AFFF Fire Control Pond

SWMU 40 is located 30 feet from the south edge of Building in the AWACs Alert Facility. The pond was constructed in 1988 to temporarily contain fire suppression foam (AFFF) released within Building 976, the AWACs Alert Maintenance Hangar. Measuring 40 by 50 feet, the pond has sloping concrete sides and a vegetated, clay-lined bottom. In April 1989, a release of aircraft wash rack wastewater to the pond occurred when discharges to the industrial waste sewer system exceeded normal wash rack operations and flow rates. The pond filled completely and overflowed into Crutcho Creek. The discharge was dammed up and captured downstream. The wastewater may have contained small amounts of oil and grease. The potential for a release to soil, ground water, and surface water is high at this site.

Area of Concern - Spill Pond

The spill pond is a drainage area (presumably vegetated) with a concrete spillway located behind and east of Building 1030, which is located east of Landfill 2 in the southwestern part of the Base. The drainage area may receive run-off from Building 1030 consisting of wash water; however, wash water from the building flows to the sanitary sewer. If contaminants have been released to the drainage area, the potential for a release to soil, ground water, and surface water may be high, depending on the characteristics of the pond bottom, the depth to ground water, and the topography of the site.

Area of Concern - Old Pesticide Storage Area

The old pesticide storage area is located in Building 1005 north of Fire Training Area No. 1, at the inactive Sewage Treatment Plant on the west side of the Base. Pesticides were formerly stored and mixed in the 30 by 60 foot concrete structure with a concrete floor. If any releases to the environment occurred at this site, the potential for a release to any media would be extremely low, because the pesticides were apparently contained in a concrete building with a concrete floor.

Fuel Truck Maintenance Area

The fuel truck maintenance facility is located at Building 2110 in the southeastern part of the Base. Building 2110 is located east of Industrial Waste Pit 1, about 980 feet west of Douglas Boulevard. It is a 40 by 80 foot metal building, with separate bays for mechanical repairs and cleaning fuel tanks. The floor is concrete and slopes inward to a drainage trench extending the length of the building. The trench leads to a lift station from where liquids are pumped to a sewer line that leads to the IWTP. During construction operations in Building 2110 in November 1990, soil and water contamination was discovered under the concrete floor. Releases of wash water containing oil and fuel may have occurred with seepage through cracks and gaps in the floor. Depending on the permeability of the unsaturated zone and the depth to ground water, contaminants may have migrated downward to ground water beneath the site.

Waste Fuel Dump Site

The waste fuel dump site is located in the east central part of Tinker AFB, about 400 feet southwest of Building 2121 and about 2,000 feet west of Douglas Boulevard. The site is situated 500 feet northeast of Industrial Waste Pit No. 1. Operated between 1975 and October 1990, the site was a holding facility for JP-4 and JP-5 fuel that had been drained from aircraft tanks undergoing maintenance and repair. Fuel would be transferred from a truck into a rectangular metal bunker with an overflow port that lead into a pipe to two above-ground holding tanks. One-third of the pipe length was buried underground. Spills occurred around the metal bunker and onto an asphalt pad, from which the spilled fuel would flow off and into adjacent soil.

HCl Tank

The HCl Tank is located in the Building 3001 Electroplating Facility at Column G-54, in the southwestern part of Building 3001 near door 17. The 4,000-gallon tank stored HCl used in process operations and was located in a concrete containment area with associated piping and pumps. A release from the tank occurred on December 12, 1990 when a check plate on the tank ruptured. Some of the HCl released leaked through a hole eroded into the concrete containment area into the underlying soil. The leaked HCl eventually flowed laterally into a nearby electrical system conduit, where 540 gallons of HCl were lost. An unknown amount of HCl was lost to the soil under the tank and/or under the electrical conduit. Soil under the tank was found to be contaminated to a depth of six inches. Given the greater density of HCl as compared to water, some of the acid released may have migrated further downward into the subsurface materials of the unsaturated zone. Swallow ground water may have been impacted.

HEALTH AND SAFETY PLAN

TABLE OF CONTENTS

INTRODUCTION

The attached Health and Safety Plan (HSP) forms contain information for each site or group of sites involving similar chemicals and hazards. Attachments to the forms follow the forms.

These forms were prepared based on the information currently available and are not meant to be a field HSP, but rather to serve as a framework for a detailed HSP to be prepared and approved prior to any field work. This section sets forth content requirements and includes information currently available. The information presently available concerning amounts and types of contaminants is very limited. The contractor(s) performing the work will be responsible for preparing updated site-specific Health and Safety Plans prior to performing field work. Information on hazards, contaminants of concern, and protection levels must be reevaluated and updated as more information becomes available and after site reconnaissance.

The following is a list of major elements required by Section V of the RCRA Permit and where each element can be found in each site-specific HSP. Explanations are given for requirements not covered in the HSP forms.

- Facility description including availability of resources such as roads, water supply, electricity and telephone service.

  Maps of the facility can be found on page 11 of each HSP form and in the Project Management Plan. Available site-specific maps are on page 2 of each HSP form and in the Site Investigation Plan. Resource availability for each site must be determined prior to performing field work.

- A description of the known hazards and evaluation of the risks associated with the incident and with each activity conducted.

Hazards of concern are on page 3, hazardous materials and overall hazard evaluations are on page 4, and known contaminants with their exposure limits and symptoms of exposure are on page 5 of the HSP forms. It is important to note that the information in these sections is based on the limited information currently available and must be updated as more information becomes available.

- List key personnel and alternatives responsible for site safety, response operations, and for protection of public health.

  A personnel list is on page 6 of each HSP. Project Manager responsibilities are described in the QAPP and include overall project management including overall health and safety coordination. A site Health and Safety Coordinator will be identified for each site and will be responsible for coordinating health and safety at that site. Other staff will be responsible for performing field activities in accordance with this RFI Work Plan. Individuals will be named prior to implementation of field activities. All field personnel will have the required OSHA training and will comply with medical monitoring requirements.

- Delineate work area.

  Work areas are to be delineated by the contractor prior to performing field work.

- Describe levels of protection to be worn by personnel in work area.

  Page 6 of each HSP indicates the primary and contingency levels of protection for each task and their schedules of use. Page 7 of each form lists the types of protective equipment to be worn. Once again, these levels were based on available information and must be reevaluated prior to field activities.

- Establish procedures to control site access.

Site access is controlled by Tinker AFB security personnel. Additional controls may be needed on a site-specific basis. More information is available in the Project Management Plan.

- Describe decontamination procedures for personnel and equipment.

  Decontamination procedures for personnel are included in Attachment 2 to the HSP forms. Equipment decontamination procedures are covered in Section 4.24 of the SAP and Attachment 3 to the HSP forms. These procedures should be reevaluated on a site-specific basis once waste characteristics and concentrations have been determined.

- Establish site emergency procedures.

  Emergency phone numbers and directions to the Tinker AFB hospital are on Page 9, and maps showing the route to the hospital for each site are on page 10 of each HSP form. Phone numbers must be added and updated prior to any field activities.

- Address emergency medical care for injuries and toxicological problems.

  Same as above. An example policy on Lyme disease is included in Attachment 1 to the forms.

- Describe requirements for an environmental field monitoring program.

  Monitoring equipment, schedules of use, and action guidelines are on page 8 of each HSP form. This information may need to be updated as more information on contaminants of concern becomes available.

- Specify any routine and special training required for responders.

  Tinker AFB Fire Department personnel are trained in emergency response involving fire, chemical and medical emergencies.

- Establish procedures for protecting workers from weather-related problems.

  Guidelines for the prevention and treatment of both heat and cold stress are included in Attachment 4 to the HSP forms.

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PROJECT DOCUMENT #: ________

PROJECT NAME Tinker RFI Work Plan

JOBSITE ADDRESS Tinker AFB
Oklahoma City, Oklahoma

SITE CONTACT ________

PHONE # ________

WORK ASSIGNMENT # ________

REGION FPC/DEN

CLIENT Battelle Environmental Mgmt. Operations

PROJECT # 7902-025-HS-FPCX

CLIENT CONTACT Steve Kowall

PHONE # (509) 376-8322

All the information contained in this form must be updated and HSP must be approved prior to implementation of any field work.

OBJECTIVES: Summarize below

The objective of the RCRA Facility Investigation (RFI) is to characterize the nature, extent, and rate of migration of suspected releases of hazardous chemicals.

TYPE: Check as many as applicable

( ) Active	( ) Landfill	( ) Unknown
( ) Inactive	( ) Uncontrolled	( ) Other specify
( ) Secure	(x) Industrial	
( ) Unsecure	( ) Recovery	
( ) Enclosed space	( ) Well Field	

DESCRIPTION AND FEATURES: Summarize below. Include principal operations and unusual features (containers, buildings, dykes, power line, terrain, etc.)

The site is a drainage area with a concrete spillway. The spillway has a manually operated valve for flood control. It is located east of Building 1030.

SURROUNDING POPULATION: ( ) Residential (x) Industrial ( ) Rural ( ) Urban ( ) OTHER:

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THIS PAGE RESERVED FOR MAP

A site reconnaissance will be performed and a site map will be produced by the contractor performing the work prior to implementing field activities.

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HISTORY: Summarize below. In addition to history, include complaints from public, previous agency actions, known exposures or injuries, etc.

According to the RFA, the drainage area reportedly receives runoff from Bldg. 1030. During the week of the May 15, 1989 VSI, inspectors were unable to determine if wash water flowed to this area. Air Force personnel reported that the wash water flowed to the sanitary sewer.

WASTE TYPES: (x) Liquid ( ) Solid ( ) Sludge ( ) Gas ( ) Unknown ( ) Other specify:

WASTE CHARACTERISTICS: Check as many as applicable.

( ) Corrosive	( ) Flammable	( ) Radioactive	
( ) Toxic	( ) Volatile	( ) Reactive	To be determined prior to field work.
( ) Inert	( ) Unknown	( ) Other specify:	

HAZARDS OF CONCERN:

(x) Heat Stress attach guidelines (Attachment 4)	( ) Noise
(x) Cold Stress attach guidelines (Attachment 4)	( ) Inorganic Chemicals
( ) Explosive/Flammable	( ) Organic Chemicals
( ) Oxygen Deficient	( ) Other specify:
( ) Radiological	To be determined prior to field work.
( ) Biological	

PRINCIPLE DISPOSAL METHODS AND PRACTICES: **Summarize below:**

The drainage area reportedly receives wash water runoff from Bldg. 1030.

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HAZARDOUS MATERIAL SUMMARY: Circle waste type and estimate amounts by category

CHEMICALS: Amount/Units:	SOLIDS: Amounts/Units:	SLUDGES: Amounts/Units:	SOLVENTS: Amounts/Units:	OILS: Amounts/Units:	OTHER: Amounts/Units:
Acids	Flyash	Paint Pigments	Halogenated Solvents	Oily Wastes	Laboratory
Pickling Liquors	Asbestos	Metal Sludges	Non-halogenated Solvents	Other - Specify:	Pharmaceutical
Caustics	Milling/Mine Tailings	POTW Sludge	Other - Specify:		Hospital
Pesticides	Ferrous Smelter	Aluminum			Radiological
Dyes/Inks	Non-ferrous Smelter	Other - Specify:			Municipal
Cyanides	Other - Specify:				Other - Specify:
Phenols					
Halogens					
PCBs					
Metals					
Other - Specify:					

OVERALL HAZARD EVALUATION: ( ) High ( ) Medium ( ) Low ( ) Unknown (Where tasks have different hazards, evaluate each. Attach additional sheets if necessary)

JUSTIFICATION: To be determined prior to field work.

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium ( ) Low ( ) Unknown To be determined.

BACKGROUND REVIEW: ( ) COMPLETE (x) INCOMPLETE

Page 4 of 11

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KNOWN CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION (specify units and media)	IDLH PEL/TLV ppm or mg/m3 (specify)	IDLH ppm or mg/m3 (specify)	WARNING CONCENTRATION ppm	SYMPTOMS/EFFECTS OF ACUTE EXPOSURE	PHOTOIONIZATION POTENTIAL
To be determined prior to field work.						

NA = Not Available NE = None Established U = Unknown

S = Soil SW = Surface Water T = Tailings F = Flyash TK = Tanks
A = Air GW = Groundwater SL = Sludge D = Drums L = Lagoon

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FIELD ACTIVITIES COVERED UNDER THIS PLAN

TASK DESCRIPTION/SPECIFIC TECHNIQUE-STANDARD OPERATING PROCEDURES/SITE LOCATION (attach additional sheets as necessary)	TYPE	LEVEL OF PROTECTION Primary	LEVEL OF PROTECTION Contingency	SCHEDULE
1 Visual Inspection.	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	To be announced.
2	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	
3	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	
4	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	

PERSONNEL* AND RESPONSIBILITIES (Include subcontractors)

NAME	FIRM/REGION	OSHA TRAINING CERTIFICATION	RESPONSIBILTIES	On site?
PROJECT MANAGER			COORDINATE OVERALL HEALTH AND SAFETY	1 - 2 - 3 - 4
SITE HEALTH AND SAFETY COORDINATOR			COORDINATE HEALTH AND SAFETY FOR THIS SITE	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
STAFF			PERFORM FIELD ACTIVITIES	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4

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PROTECTIVE EQUIPMENT: Specify by task. Indicate type and/or material as necessary. Uses copies of this sheet if needed.

BLOCK A TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency
To be determined prior to field activities.

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ________
( ) APR: ________
( ) Cartridge: ________
( ) Escape Mask: ________
( ) Other: ________

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ________
( ) Face Shield: ________
( ) Goggles: ________
( ) Hard Hat: ________
( ) Other: ________

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ________
( ) Splash Suit: ________
( ) Apron: ________
( ) Tyvek Coverall: ________
( ) Saranex Coverall: ________
( ) Coverall: ________
( ) Other: ________

Gloves: ( ) Not Needed
( ) Undergloves: ________
( ) Gloves: ________
( ) Overgloves: ________
( ) Other - **Specify**

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ________

BLOCK B TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ________
( ) APR: ________
( ) Cartridge: ________
( ) Escape Mask: ________
( ) Other: ________

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ________
( ) Face Shield: ________
( ) Goggles: ________
( ) Hard Hat: ________
( ) Other: ________

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ________
( ) Splash Suit: ________
( ) Apron: ________
( ) Tyvek Coverall: ________
( ) Saranex Coverall: ________
( ) Coverall: ________
( ) Other: ________

Gloves: ( ) Not Needed
( ) Undergloves: ________
( ) Gloves: ________
( ) Overgloves: ________
( ) Other - **Specify**

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ________

BLOCK C TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ________
( ) APR: ________
( ) Cartridge: ________
( ) Escape Mask: ________
( ) Other: ________

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ________
( ) Face Shield: ________
( ) Goggles: ________
( ) Hard Hat: ________
( ) Other: ________

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ________
( ) Splash Suit: ________
( ) Apron: ________
( ) Tyvek Coverall: ________
( ) Saranex Coverall: ________
( ) Coverall: ________
( ) Other: ________

Gloves: ( ) Not Needed
( ) Undergloves: ________
( ) Gloves: ________
( ) Overgloves: ________
( ) Other - **Specify**

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ________

BLOCK D TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ________
( ) APR: ________
( ) Cartridge: ________
( ) Escape Mask: ________
( ) Other: ________

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ________
( ) Face Shield: ________
( ) Goggles: ________
( ) Hard Hat: ________
( ) Other: ________

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ________
( ) Splash Suit: ________
( ) Apron: ________
( ) Tyvek Coverall: ________
( ) Saranex Coverall: ________
( ) Coverall: ________
( ) Other: ________

Gloves: ( ) Not Needed
( ) Undergloves: ________
( ) Gloves: ________
( ) Overgloves: ________
( ) Other - **Specify**

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ________

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MONITORING EQUIPMENT: Specify by task. Indicate type as necessary. Attach additional sheets as necessary.

INSTRUMENT	TASK	ACTION GUIDELINES	COMMENTS (Includes schedules of use)
Combustible Gas Indicator	1 - 2 - 3 - 4	0-10% LEL No explosion hazard. 10-25% LEL Potential explosion hazard; notify SHSC. >25% LEL Explosion hazard; interrupt task/evacuate 21.0% O_2 Oxygen normal. <21.0% O_2 Oxygen deficient; notify SHSC. <19.5% O_2 Interrupt task/evacuate	( ) Not Needed Continuous monitoring.
Radiation Survey Meter	1 - 2 - 3 - 4	3X Background: Notify SHSC >2mR/hr: Interrupt task/evacuate	( ) Not Needed Note: Annual exposure not to exceed or 50 urem/hr average
Photionization Detector Type ________	1 - 2 - 3 - 4 ( ) 11.7 ev ( ) 10.2 ev ( ) 9.8 ev ( ) ____ ev	0-5 ppm above background - go upwind and evaluate situation > 5 ppm above background - evacuate area until situation is evaluated. If reading is greater than 5 ppm above background, exit area.	( ) Use continuously on site. ( ) Not Needed Continuously monitoring breathing zone.
Flame Ionization Detector Type ________	1 - 2 - 3 - 4	Specify:	( ) Not Needed
Detector Tubes/ Monitox Type ________ Type ________	1 - 2 - 3 - 4	Specify:	( ) Not Needed
Respirable Dust Monitor Type ________ Type ________	1 - 2 - 3 - 4	Specify:	( ) Not Needed
Other Specify To be determined prior to field work.	1 - 2 - 3 - 4	Specify:	Page 8 of 11

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DECONTAMINATION PROCEDURES		
ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, AND SUPPORT ZONES		
<u>Personalized Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. See Attachment 2 for Personnel Decontamination ( ) Not needed	<u>Sampling Equipment Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP. ( ) Not needed	<u>Heavy Equipment Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP and Attachment 2. ( ) Not needed
<u>Containment and Disposal Method</u> See Section 4.25 of the SAP for contaminated waste disposal procedures.	<u>Containment and Disposal Method</u> See Section 4.25 of the SAP.	<u>Containment and Disposal Method</u> See Section 4.25 of the SAP. Page 9 of 11

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EMERGENCY CONTACTS

Water Supply
Telephone
Radio
Other (specify)

Will be determined prior to the site investigation

CONTINGENCY PLANS Summarize below:

HEALTH AND SAFETY PLAN APPROVALS

Prepared by ______________________ Date ________

SHSC Signature ______________________ Date ________

HSM Signature ______________________ Date ________

EMERGENCY CONTACTS	NAME	PHONE:
24-Hour Emergency Line		
Health and Safety Manager	To be determined prior to field work	
Project Manager		
Site Health and Safety Coordinator		
Client Contact		
Other (specify)		
State Environmental Agency		
State Spill Contractor	Fire Department	ext. 47964
Fire Department		ext. 47964
Police Department		ext. 43768
State Police (Highway Patrol)		405-682-4343
Health Department (State)	Hal Cantwell	405-271-7158
Poison Control Center (Oklahoma City)		405-271-5454

MEDICAL EMERGENCY

Hospital Name: Base Hospital phone: ext. 43768

Hospital Address: Bldg. 5801

Name of Contact at Hospital:

Name of 24-Hour Ambulance: Base Fire Dept. phone: ext. 47964

Route to Hospital: (Attach map with route to hospital)

Take Landfill Road east to Patrol Road. Go north (right) on Patrol Road to Arnold Street. Go west (left) on Arnold Street to hospital.

Distance to hospital < 3 miles

Page 10 of 11

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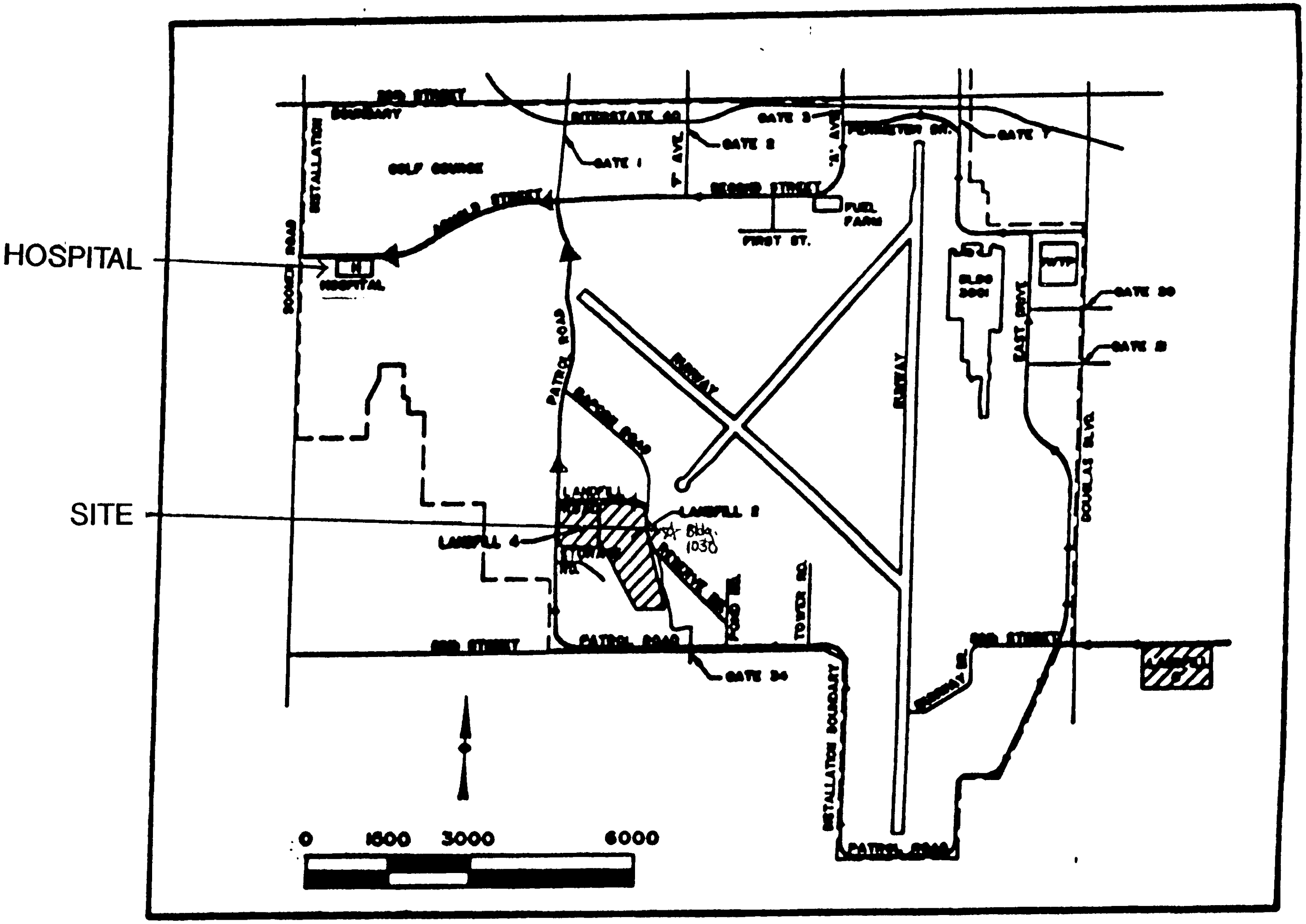
CDM FPC Health and Safety Program		



LOCATION PLAN

HEALTH AND SAFETY PLAN FORM

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PROJECT DOCUMENT #: ____________

PROJECT NAME: Tinker RFI Work Plan

JOBSITE ADDRESS: Tinker AFB
Oklahoma City, Oklahoma

SITE CONTACT: ____________

PHONE #: ____________

WORK ASSIGNMENT #: ____________

REGION: FPC/DEN

CLIENT: Battelle Environmental Mgmt. Operations

PROJECT #: 7902-025-HS-FPCX

CLIENT CONTACT: Steve Kowall

PHONE #: 509-376-8322

All the information contained in this form must be updated and HSP must be approved prior to implementation of any field work.

OBJECTIVES: Summarize below

The objective of the RCRA Facility investigation (RFI) is to characterize the nature, extent, and rate of migration of suspected releases of hazardous chemicals.

TYPE: Check as many as applicable

(x) Active	( ) Landfill	( ) Unknown
( ) Inactive	( ) Uncontrolled	( ) Other specify
( ) Secure	(x) Industrial	
( ) Unsecure	( ) Recovery	
( ) Enclosed space	( ) Well Field	

DESCRIPTION AND FEATURES: Summarize below. Include principal operations and unusual features (containers, buildings, dykes, power line, terrain, etc.)

The IWTP is used to treat industrial wastewater. A single stage trickling filter treatment facility located adjacent to the IWTP treats domestic sewage from the east base area. An activated sludge system which treated the domestic sewage from the north central and west parts of the base was closed in the early 1970's. The SWMU components in the RFI include for the IWTP - Lift Station No. 2, Tanks D-1 and D-2, oil separator, valve vault, Equilization Basins, Main Flow Valve, Mixing Basins 1-3, solids contact clarifier, wet well lift station, Softener Basins, Activated Sludge unit and secondary clarifiers; and for the old IWTP/current sanitary wastewater treatment plant - Parshall Flume, Flocculation chamber, Primary Clarifiers, trickling filters, final clarifiers, former chlorine contact chamber and drying beds.

SURROUNDING POPULATION: ( ) Residential (x) Industrial ( ) Rural ( ) Urban ( ) OTHER:

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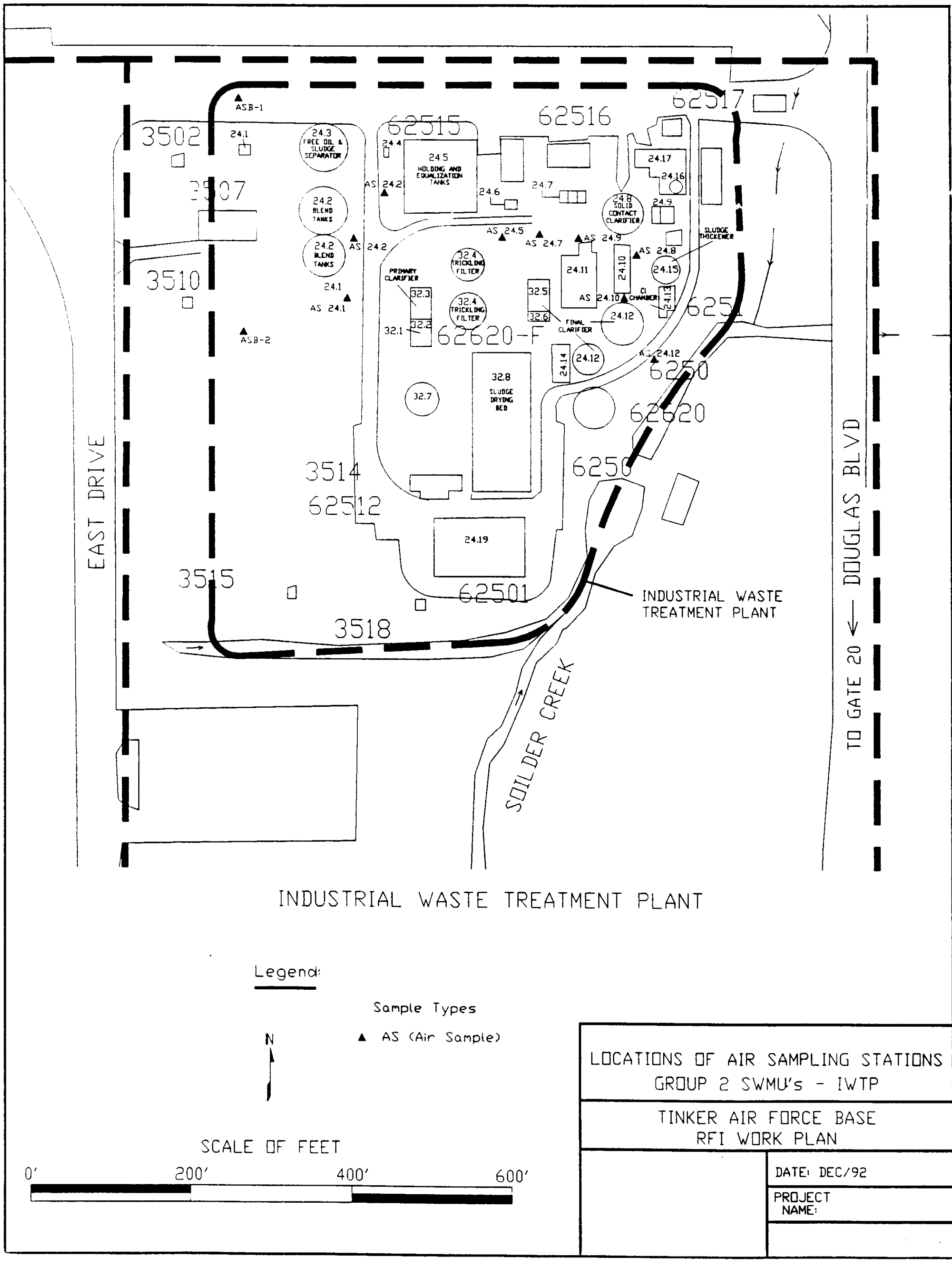

HEALTH AND SAFETY PLAN FORM

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HISTORY: Summarize below. In addition to history, include complaints from public, previous agency actions, known exposures or injuries, etc.

The history of the IWTP and the old IWTP/current sanitary treatment plant can be found in the Site Investigation Plan. The U.S. Army Corps of Engineers performed a Remedial Investigation and a site Groundwater Investigation (1988-1990) during which monitoring wells were installed and groundwater was monitored. The results indicate that the IWTP is a source of groundwater contamination (organic volitiles - 1, 2 - dichloroethene, chlorobenzene, trichloroethene and vinyl chloride, and the semivolatile - 1, 2 - dichlorobenzene). An IWTP Underground Storage Tanks Investigation was also performed by the C.O.E. in 1988.

WASTE TYPES: (x) Liquid (x) Solid (x) Sludge (x) Gas ( ) Unknown ( ) Other specify:

WASTE CHARACTERISTICS: Check as many as applicable.

( ) Corrosive	(x) Flammable	( ) Radioactive
(x) Toxic	(x) Volatile	( ) Reactive
( ) Inert	( ) Unknown	( ) Other specify:

HAZARDS OF CONCERN:

(x) Heat Stress attach guidelines (Attachment 4)	(x) Noise
(x) Cold Stress attach guidelines (Attachment 4)	(x) Inorganic Chemicals
(x) Explosive/Flammable	(x) Organic Chemicals
( ) Oxygen Deficient	( ) Other specify:
( ) Radiological	
( ) Biological	

PRINCIPLE DISPOSAL METHODS AND PRACTICES: **Summarize below:**

According to the RFA, the IWTP discharges treated effluent into East Soldier Creek under a National Pollutant Discharge Elimination System (NPDES) permit. Sludge from the IWTP has been disposed of off-base by a contract service. The sludge was occasionally disposed in base landfills through 1979.

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HAZARDOUS MATERIAL SUMMARY: Circle waste type and estimate amounts by category

CHEMICALS: Amount/Units:	SOLIDS: Amounts/Units:	SLUDGES: Amounts/Units:	SOLVENTS: Amounts/Units:	OILS: Amounts/Units:	OTHER: Amounts/Units:
Acids	Flyash	Paint Pigments	Halogenated Solvents	Oily Wastes	Laboratory
Pickling Liquors	Asbestos	Metal Sludges	Non-halogenated Solvents	Other - Specify:	Pharmaceutical
Caustics	Milling/Mine Tailings	POTW Sludge	Other - Specify:		Hospital
Pesticides	Ferrous Smelter	Aluminum			Radiological
Dyes/Inks	Non-ferrous Smelter	Other - Specify:			Municipal
Cyanides	Other - Specify:				Other - Specify:
Phenols					
Halogens					
PCBs					
Metals					
Other - Specify:					

OVERALL HAZARD EVALUATION: ( ) High ( ) Medium (x) Low ( ) Unknown (Where tasks have different hazards, evaluate each. Attach additional sheets if necessary)

JUSTIFICATION: Processes are currently in operation and there is little evidence of spills. (The equipment is generally well maintained.)

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium (x) Low ( ) Unknown

BACKGROUND REVIEW: (x) COMPLETE ( ) INCOMPLETE

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KNOWN CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION (specify units and media)	PEL/TLV ppm or mg/m3 (specify)	IDLH ppm or mg/m3 (specify)	WARNING CONCENTRATION ppm	SYMPTOMS/EFFECTS OF ACUTE EXPOSURE	PHOTOIONIZATION POTENTIAL
Chlorobenzene	1100 ug/LGW	75 ppm	2400 ppm	0.21 ppm	Irritation of skin and eyes, drowsiness.	9.07 eV
1, 2 - DCE	3300 ug/LGW	200 ppm	4000 ppm	1.09 ppm	Irritation of eyes, resp. system depression.	9.65 eV
PCE	430 ug/LGW	25 ppm	500 ppm	4.68-50 ppm	Irritation of eyes, nose, nausea, vert., dizziness.	9.32 eV
TCE	3800 ug/LGW	25 ppm	1000 ppm	21.4 ppm	Vert., tremors, vomiting, eye irritation.	9.45 eV
Vinyl Chloride	110 ug/LGW	1 ppm	NA	260 ppm	Weakness, abdominal pain, GI bleeding.	9.99 eV
Chromium	227 ug/LGW	0.5 mg/m^3	NE	NA	Nausea, vomiting, epigastric pain, substernal pain, cough.	NA
Phenol	NA	5 ppm (skin)	250 ppm	0.047-1.0 ppm	Eye, nose, throat irritation; weakness, musc. ache, pain, dark urine; skin burns, liver & kidney damage, tremor, convulsions, twitch.	8.50 eV

NA = Not Available NE = None Established U = Unknown

S = Soil SW = Surface Water T = Tailings F = Flyash TK = Tanks
A = Air GW = Groundwater SL = Sludge D = Drums L = Lagoon

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FIELD ACTIVITIES COVERED UNDER THIS PLAN

TASK DESCRIPTION/SPECIFIC TECHNIQUE-STANDARD OPERATING PROCEDURES/SITE LOCATION (attach additional sheets as necessary)	TYPE	LEVEL OF PROTECTION Primary	LEVEL OF PROTECTION Contingency	SCHEDULE
1 Surface Soil/Sediment/Surface Water Sampling. SWMU 24.2, 24.3, 24.19, 32.8	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	To be announced.
2 Subsurface soil (& possibly groundwater) sampling SWMU 24.4, 24.19, 32.8	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	To be announced.
3 Subsurface Gas Sampling SWMU 32.8	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	To be announced.
4 Air Sampling SWMU 24.1, 24.2, 24.3 24.5, 24.7-24.12	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	To be announced.

PERSONNEL* AND RESPONSIBILITIES (Include subcontractors)

NAME	FIRM/REGION	OSHA TRAINING CERTIFICATION	RESPONSIBILTIES	On site?
PROJECT MANAGER			COORDINATE OVERALL HEALTH AND SAFETY	1 - 2 - 3 - 4
SITE HEALTH AND SAFETY COORDINATOR			COORDINATE HEALTH AND SAFETY FOR THIS SITE	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
STAFF			PERFORM FIELD ACTIVITIES	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4

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PROTECTIVE EQUIPMENT: Specify by task. Indicate type and/or material as necessary. Uses copies of this sheet if needed.

BLOCK A TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
(x) Primary
( ) Contingency

Respiratory: (x) Not Needed
( ) SCBA, Airline: ______
( ) APR: ______
( ) Cartridge: ______
( ) Escape Mask: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
(x) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
(x) Hard Hat: ______
(x) Other: Hearing protection in noisy areas

Boots: ( ) Not Needed
(x) Boots: Leather steel-toed work boots
( ) Overboots: ______

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
(x) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Gloves: ( ) Not Needed
(x) Undergloves: Latex
(x) Gloves: Neoprene
( ) Overgloves: ______
( ) Other - **Specify**

BLOCK B TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
( ) Primary
(x) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ______
(x) APR: ______
(x) Cartridge: GMC-H
( ) Escape Mask: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
(x) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
(x) Hard Hat: ______
(x) Other: Hearing protection in noisy areas

Boots: ( ) Not Needed
(x) Boots: Leather steel-toed work boots
( ) Overboots: ______

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
(x) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Gloves: ( ) Not Needed
(x) Undergloves: Latex
(x) Gloves: Neoprene
( ) Overgloves: ______
( ) Other - **Specify**

BLOCK C TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
(x) Primary
(x) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ______
( ) APR: ______
( ) Cartridge: ______
( ) Escape Mask: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
( ) Hard Hat: ______
( ) Other: ______

Boots: ( ) Not Needed
( ) Boots: ______
( ) Overboots: ______

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
( ) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Gloves: ( ) Not Needed
( ) Undergloves: ______
( ) Gloves: ______
( ) Overgloves: ______
( ) Other - **Specify**

BLOCK D TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
( ) Primary
( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ______
( ) APR: ______
( ) Cartridge: ______
( ) Escape Mask: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
( ) Hard Hat: ______
( ) Other: ______

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ______

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
( ) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Gloves: ( ) Not Needed
( ) Undergloves: ______
( ) Gloves: ______
( ) Overgloves: ______
( ) Other - **Specify**

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MONITORING EQUIPMENT: Specify by task. Indicate type as necessary. Attach additional sheets as necessary.

INSTRUMENT	TASK	ACTION GUIDELINES	COMMENTS (Includes schedules of use)
Combustible Gas Indicator	1-2-3-4	0-10% LEL No explosion hazard. 10-25% LEL Potential explosion hazard; notify SHSC. >25% LEL Explosion hazard; interrupt task/evacuate 21.0% O_2 Oxygen normal. <21.0% O_2 Oxygen deficient; notify SHSC. <19.5% O_2 Interrupt task/evacuate	( ) Not Needed Continuous monitoring.
Radiation Survey Meter	1 - 2 - 3 - 4	3X Background: Notify SHSC >2mR/hr: Interrupt task/evacuate	(x) Not Needed Note: Annual exposure not to exceed or 50 urem/hr average
Photionization Detector Type HNu meter	1-2-3-4 ( ) 11.7 ev (x) 10.2 ev ( ) 9.8 ev ( ) ____ ev	0-1 ppm above background Level D 1-5 ppm above background go upwind and evaluate situation > 5 ppm above background evacuate area, evaluate possibility of upgrading to Level C.	(x) Use continuously on site. ( ) Not Needed Continuously monitor breathing zone.
Flame Ionization Detector Type ________	1 - 2 - 3 - 4	Specify:	(x) Not Needed
Detector Tubes/ Monitox Type Vinyl Chloride Type ________	1-2-3-4	Specify: 0-1 ppm Level D >1 ppm Evacuate area	( ) Not Needed Use when PID >1 ppm above background. Check periodically and with every 2 ppm increase thereafter.
Respirable Dust Monitor Type ________ Type ________	1 - 2 - 3 - 4	Specify:	(x) Not Needed
Other Specify	1 - 2 - 3 - 4	Specify:	

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DECONTAMINATION PROCEDURES		
ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, AND SUPPORT ZONES		
<u>Personalized Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. See Attachment 2 for Personnel Decontamination ( ) Not needed	<u>Sampling Equipment Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP ( ) Not needed	<u>Heavy Equipment Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP and Attachment 3. ( ) Not needed
<u>Containment and Disposal Method</u> See Section 4.25 of the SAP	<u>Containment and Disposal Method</u> See Section 4.25 of the SAP	<u>Containment and Disposal Method</u> See Section 4.25 of the SAP Page 9 of 11

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EMERGENCY CONTACTS

Water Supply — Will be determined prior to the site investigation.

Telephone

Radio

Other (specify)

CONTINGENCY PLANS Summarize below:

HEALTH AND SAFETY PLAN APPROVALS

Prepared by ______________________ Date ________

SHSC Signature ______________________ Date ________

HSM Signature ______________________ Date ________

EMERGENCY CONTACTS	NAME	PHONE:
24-Hour Emergency Line		
Health and Safety Manager		
Project Manager	To be determined prior to any field work.	
Site Health and Safety Coordinator		
EMO Contact		
Other (specify)		
State Environmental Agency	N/A	
Base Spill Contractor	Fire Department	ext. 47964
Fire Department		ext. 47964
Base Security		ext. 43768
State Police (Highway Patrol)		405-682-4343
Health Department (State)	Hal Cantwell	405-271-7158
Poison Control Center (Oklahoma City)		405-271-5454

MEDICAL EMERGENCY

Hospital Name: Base Hospital — phone: ext. 43768

Hospital Address: Bldg. 5801

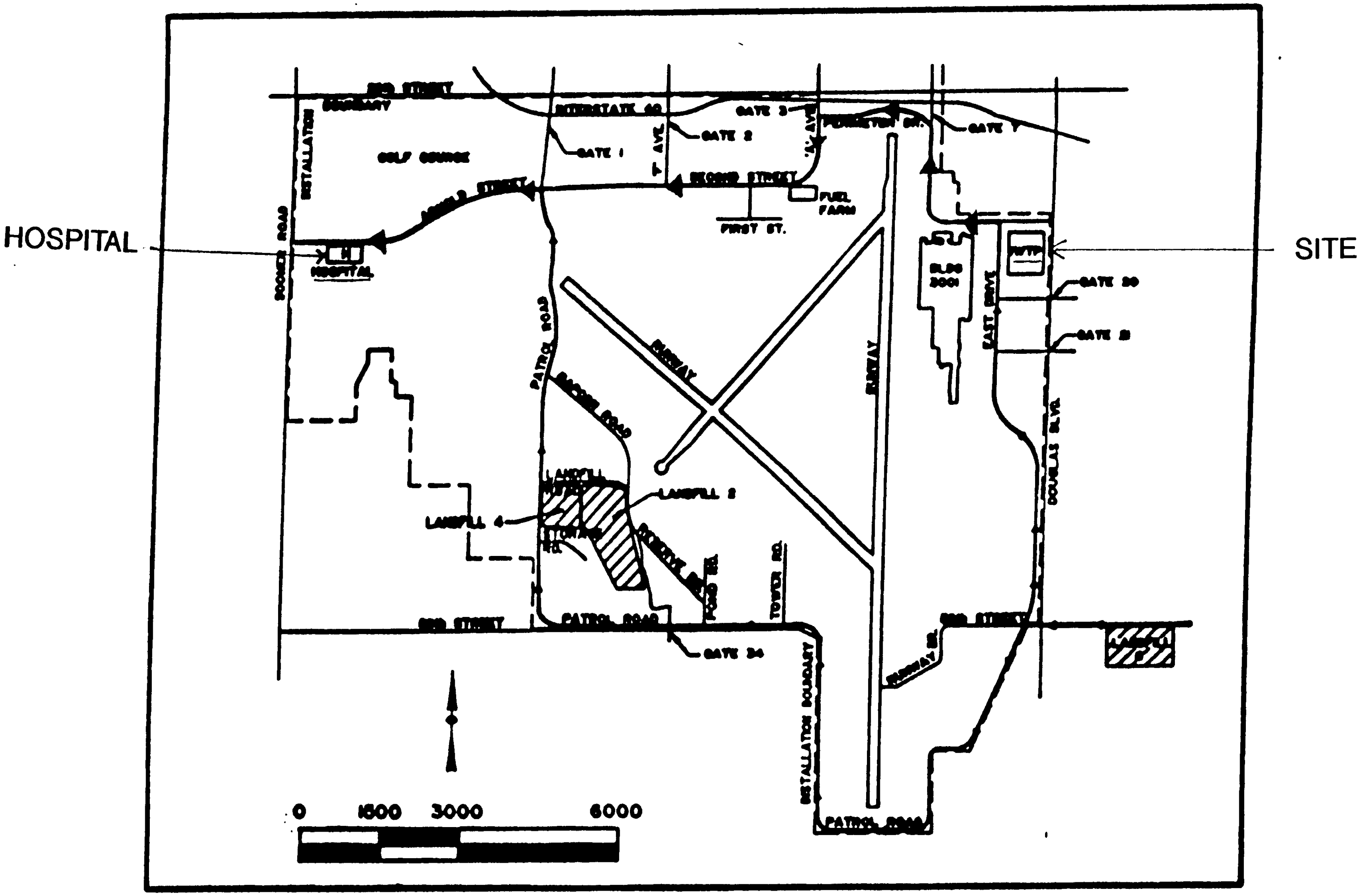
Name of Contact at Hospital:

Name of 24-Hour Ambulance: Base Fire Department — phone: ext. 47964

Route to Hospital: (Attach map with route to hospital)

Go north on East Drive until it ends, then turn left (west). Turn right (north) on Industrial Blvd., then left (west) on Perimeter Drive, left (south) on "A" Ave, and right (west) on second street. Go west on second Street (it turns into Arnold Street at Patrol Road) until you reach the hospital.

Distance to hospital < 4 miles



LOCATION PLAN

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PROJECT DOCUMENT #: ____________

PROJECT NAME Tinker RFI Work Plan

JOBSITE ADDRESS Tinker AFB

Oklahoma City, Oklahoma

SITE CONTACT ____________

PHONE # ____________

WORK ASSIGNMENT # ____________ REGION FPC/DEN

CLIENT Battelle Environmental Mgmt. Operations

PROJECT # 7902-025-HS-FPCX

CLIENT CONTACT Steve Kowall

PHONE # 509-376-8322

All the information contained in this form must be updated and HSP must be approved prior to implementation of any field work.

OBJECTIVES: Summarize below

The objective of the RCRA Facility Investigation (RFI) is to characterize the nature, extent, and rate of migration of suspected releases of hazardous chemicals.

TYPE: Check as many as applicable

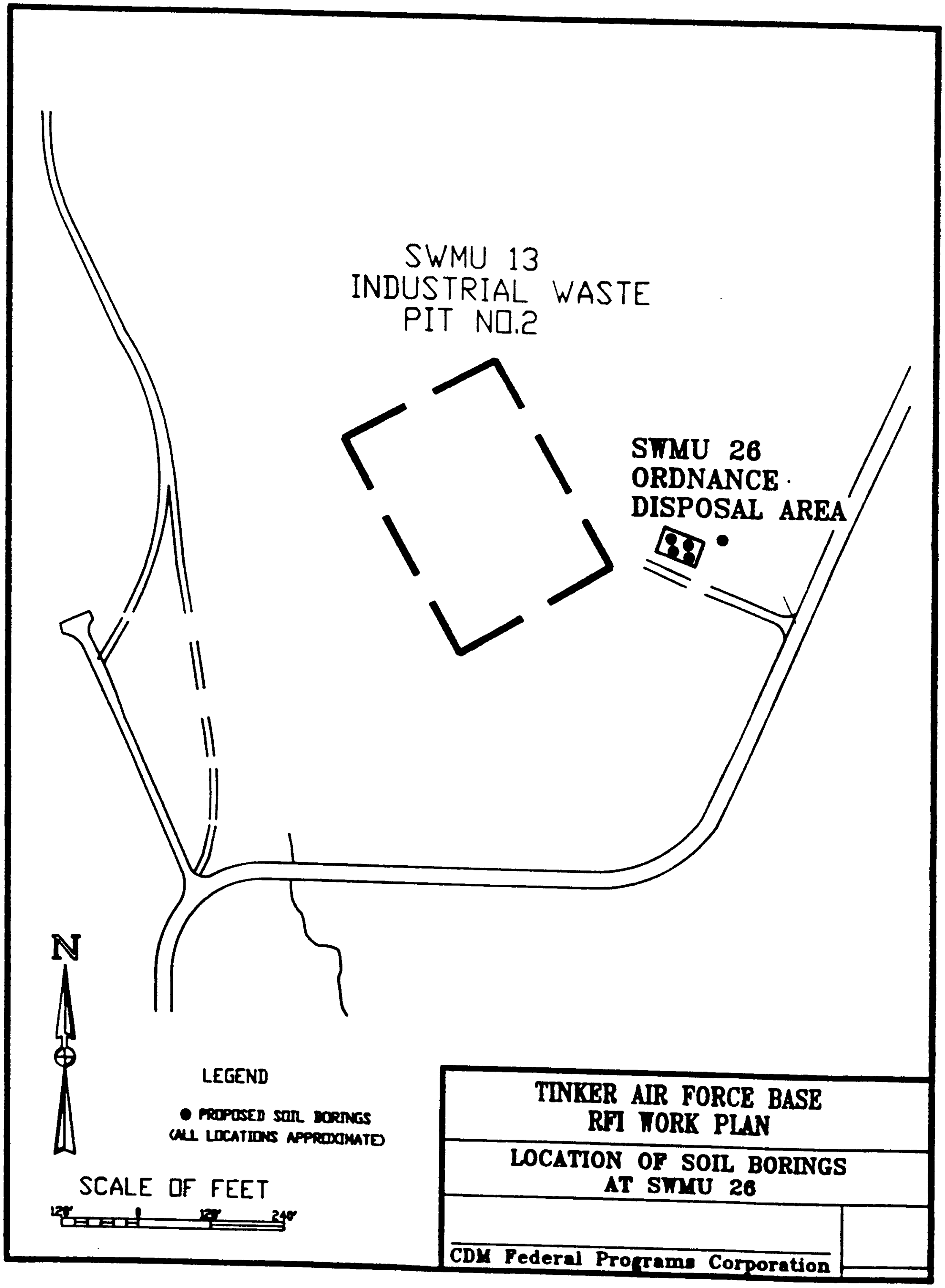
( ) Active	( ) Landfill	( ) Unknown
(x) Inactive	( ) Uncontrolled	( ) Other specify
( ) Secure	(x) Industrial	
( ) Unsecure	( ) Recovery	
( ) Enclosed space	( ) Well Field	

DESCRIPTION AND FEATURES: Summarize below. Include principal operations and unusual features (containers, buildings, dykes, power line, terrain, etc.)

The Ordnance Disposal Area is located approx. 150 feet east of Industrial Waste Pit No. 1 at the southeast end of the North-South Runway. It was a burn pit adjacent to an igloo-shaped protective bunker.

SURROUNDING POPULATION: ( ) Residential (x) Industrial ( ) Rural ( ) Urban ( ) OTHER:

Page 1 of 11


SWMU 13
INDUSTRIAL WASTE
PIT NO.2
SWMU 26
ORDNANCE
DISPOSAL AREA
N
LEGEND
● PROPOSED SOIL BORINGS
(ALL LOCATIONS APPROXIMATE)
SCALE OF FEET
120' 0 120' 240'
TINKER AIR FORCE BASE
RFI WORK PLAN
LOCATION OF SOIL BORINGS
AT SWMU 26
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HISTORY: Summarize below. In addition to history, include complaints from public, previous agency actions, known exposures or injuries, etc.

Ordnance burning was conducted between the early 1960's and 1972 with a frequency of less than once per month.

WASTE TYPES: ( ) Liquid (x) Solid ( ) Sludge ( ) Gas ( ) Unknown ( ) Other specify:

WASTE CHARACTERISTICS: Check as many as applicable.

( ) Corrosive	(x) Flammable	( ) Radioactive	
( ) Toxic	( ) Volatile	( ) Reactive	To be determined.
( ) Inert	( ) Unknown	(x) Other specify: Explosive	

HAZARDS OF CONCERN:

(x) Heat Stress attach guidelines (Attachment 4)
(x) Cold Stress attach guidelines (Attachment 4)
(x) Explosive/Flammable
( ) Oxygen Deficient
( ) Radiological
( ) Biological
( ) Noise
( ) Inorganic Chemicals
( ) Organic Chemicals
(x) Other specify: Lyme Disease: See Attachment 1

PRINCIPLE DISPOSAL METHODS AND PRACTICES: Summarize below:

Ordnance burning in this unit consisted of small arms munitions, blasting caps, flares, pyrotechnics, and egress items. These were burned in a pit at a frequency of less than once per month.

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HAZARDOUS MATERIAL SUMMARY: Circle waste type and estimate amounts by category

CHEMICALS: Amount/Units:	SOLIDS: Amounts/Units:	SLUDGES: Amounts/Units:	SOLVENTS: Amounts/Units:	OILS: Amounts/Units:	OTHER: Amounts/Units:
Acids	Flyash	Paint Pigments	Halogenated Solvents	Oily Wastes	Laboratory
Pickling Liquors	Asbestos	Metal Sludges	Non-halogenated Solvents	Other - Specify:	Pharmaceutical
Caustics	Milling/Mine Tailings	POTW Sludge	Other - Specify:		Hospital
Pesticides	Ferrous Smelter	Aluminum			Radiological
Dyes/Inks	Non-ferrous Smelter	Other - Specify:			Municipal
Cyanides	Other - Specify:				Other - Specify:
Phenols					
Halogens					
PCBs					
Metals					
Other - Specify:					

OVERALL HAZARD EVALUATION: ( ) High ( ) Medium ( ) Low ( ) Unknown (Where tasks have different hazards, evaluate each. Attach additional sheets if necessary)

JUSTIFICATION: To be determined prior to field work.

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium ( ) Low ( ) Unknown

BACKGROUND REVIEW: ( ) COMPLETE (x) INCOMPLETE

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HEALTH AND SAFETY PLAN FORM

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KNOWN CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION (specify units and media)	PEL/TLV ppm or mg/m3 (specify)	IDLH ppm or mg/m3 (specify)	WARNING CONCENTRATION ppm	SYMPTOMS/EFFECTS OF ACUTE EXPOSURE	PHOTOIONIZATION POTENTIAL
To be determined prior to field work.						

NA = Not Available   NE = None Established   U = Unknown

S = Soil   SW = Surface Water   T = Tailings   F = Flyash   TK = Tanks
A = Air   GW = Groundwater   SL = Sludge   D = Drums   L = Lagoon

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FIELD ACTIVITIES COVERED UNDER THIS PLAN

TASK DESCRIPTION/SPECIFIC TECHNIQUE-STANDARD OPERATING PROCEDURES/SITE LOCATION (attach additional sheets as necessary)	TYPE	LEVEL OF PROTECTION Primary	Contingency	SCHEDULE
1 Geophysical Survey	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	To be announced.
2 Drilling/subsurface soil sampling	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	To be announced.
3	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	
4	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	

PERSONNEL* AND RESPONSIBILITIES (Include subcontractors)

NAME	FIRM/REGION	OSHA TRAINING CERTIFICATION	RESPONSIBILTIES	On site?
PROJECT MANAGER			COORDINATE OVERALL HEALTH AND SAFETY	1 - 2 - 3 - 4
SITE HEALTH AND SAFETY COORDINATOR			COORDINATE HEALTH AND SAFETY FOR THIS SITE	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
STAFF			PERFORM FIELD ACTIVITIES	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4

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PROTECTIVE EQUIPMENT: Specify by task. Indicate type and/or material as necessary. Uses copies of this sheet if needed.

BLOCK A TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

To be determined prior to field activities

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ____
( ) APR: ____
( ) Cartridge: ____
( ) Escape Mask: ____
( ) Other: ____

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ____
( ) Face Shield: ____
( ) Goggles: ____
( ) Hard Hat: ____
( ) Other: ____

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ____

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ____
( ) Splash Suit: ____
( ) Apron: ____
( ) Tyvek Coverall: ____
( ) Saranex Coverall: ____
( ) Coverall: ____
( ) Other: ____

Gloves: ( ) Not Needed
( ) Undergloves: ____
( ) Gloves: ____
( ) Overgloves: ____
( ) Other - **Specify**

BLOCK B TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ____
( ) APR: ____
( ) Cartridge: ____
( ) Escape Mask: ____
( ) Other: ____

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ____
( ) Face Shield: ____
( ) Goggles: ____
( ) Hard Hat: ____
( ) Other: ____

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ____

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ____
( ) Splash Suit: ____
( ) Apron: ____
( ) Tyvek Coverall: ____
( ) Saranex Coverall: ____
( ) Coverall: ____
( ) Other: ____

Gloves: ( ) Not Needed
( ) Undergloves: ____
( ) Gloves: ____
( ) Overgloves: ____
( ) Other - **Specify**

BLOCK C TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ____
( ) APR: ____
( ) Cartridge: ____
( ) Escape Mask: ____
( ) Other: ____

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ____
( ) Face Shield: ____
( ) Goggles: ____
( ) Hard Hat: ____
( ) Other: ____

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ____

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ____
( ) Splash Suit: ____
( ) Apron: ____
( ) Tyvek Coverall: ____
( ) Saranex Coverall: ____
( ) Coverall: ____
( ) Other: ____

Gloves: ( ) Not Needed
( ) Undergloves: ____
( ) Gloves: ____
( ) Overgloves: ____
( ) Other - **Specify**

BLOCK D TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ____
( ) APR: ____
( ) Cartridge: ____
( ) Escape Mask: ____
( ) Other: ____

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ____
( ) Face Shield: ____
( ) Goggles: ____
( ) Hard Hat: ____
( ) Other: ____

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ____

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ____
( ) Splash Suit: ____
( ) Apron: ____
( ) Tyvek Coverall: ____
( ) Saranex Coverall: ____
( ) Coverall: ____
( ) Other: ____

Gloves: ( ) Not Needed
( ) Undergloves: ____
( ) Gloves: ____
( ) Overgloves: ____
( ) Other - **Specify**

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MONITORING EQUIPMENT: Specify by task. Indicate type as necessary. Attach additional sheets as necessary.

INSTRUMENT	TASK	ACTION GUIDELINES	COMMENTS (Includes schedules of use)
Combustible Gas Indicator	1 - 2 - 3 - 4	0-10% LEL No explosion hazard. 10-25% LEL Potential explosion hazard; notify SHSC. >25% LEL Explosion hazard; interrupt task/evacuate 21.0% O_2 Oxygen normal. <21.0% O_2 Oxygen deficient; notify SHSC. <19.5% O_2 Interrupt task/evacuate	( ) Not Needed Continuous monitoring.
Radiation Survey Meter	1 - 2 - 3 - 4	3X Background: Notify SHSC >2mR/hr: Interrupt task/evacuate	(x) Not Needed Note: Annual exposure not to exceed or 50 urem/hr average
Photionization Detector Type ______	1 - 2 - 3 - 4 ( ) 11.7 ev (x) 10.2 ev ( ) 9.8 ev ( ) ____ ev	0-5 ppm above background - go upwind and evaluate situation > 5 ppm above background - evacuate area until the situation is evaluated and the proper PPE determined.	(x) Use continuously on site. ( ) Not Needed Continuously monitoring breathing zone.
Flame Ionization Detector Type ______	1 - 2 - 3 - 4	Specify:	(x) Not Needed
Detector Tubes/ Monitox Type ______ Type ______	1 - 2 - 3 - 4	Specify:	(x) Not Needed
Respirable Dust Monitor Type ______ Type ______	1 - 2 - 3 - 4	Specify:	(x) Not Needed
Other Specify To be determined prior to field activities.	1 - 2 - 3 - 4	Specify:	

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DECONTAMINATION PROCEDURES		
ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, AND SUPPORT ZONES		
Personalized Decontamination Summarize below and/or attach diagram; discuss use of work zones. See Attachment 2 for Personnel Decontamination ( ) Not needed	Sampling Equipment Decontamination Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP ( ) Not needed	Heavy Equipment Decontamination Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP and Attachment 3. ( ) Not needed
These should be reevaluated after waste characteristics and concentrations are known.		
Containment and Disposal Method See Section 4.25 of the SAP	Containment and Disposal Method See Section 4.25 of the SAP	Containment and Disposal Method See Section 4.25 of the SAP
These should be reevaluated after waste characteristics and concentrations are known.		

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EMERGENCY CONTACTS

Water Supply	Will be determined prior to the site investigation.
Telephone	
Radio	
Other (specify)	

CONTINGENCY PLANS Summarize below:

HEALTH AND SAFETY PLAN APPROVALS

Prepared by ______________ Date ________

SHSC Signature ______________ Date ________

HSM Signature ______________ Date ________

EMERGENCY CONTACTS	NAME	PHONE:
24-Hour Emergency Line		
Health and Safety Manager		
Project Manager	To be determined prior to field work.	
Site Health and Safety Coordinator		
EMO Contact		
Other (specify)		
State Environmental Agency	N/A	
Base Spill Contractor	Fire Department	ext. 47964
Fire Department		ext. 47964
Base Security		ext. 43768
State Police (Highway Patrol)		405-682-4343
Health Department (State)	Hal Cantwell	405-271-7158
Poison Control Center (Oklahoma City)		405-271-5454

MEDICAL EMERGENCY

Hospital Name: Base Hospital phone: ext. 43768

Hospital Address: Bldg. 5801

Name of Contact at Hospital:

Name of 24-Hour Ambulance: Base Fire Department phone: ext. 47964

Route to Hospital: (Attach map with route to hospital)

Go east on 59th Street to Patrol Road. Turn right (south) on Patrol Raod and follow it around the installation boundary and north to Arnold Street. Go west (left) on Arnold Street to the hospital.

Distance to hospital ≈5 miles

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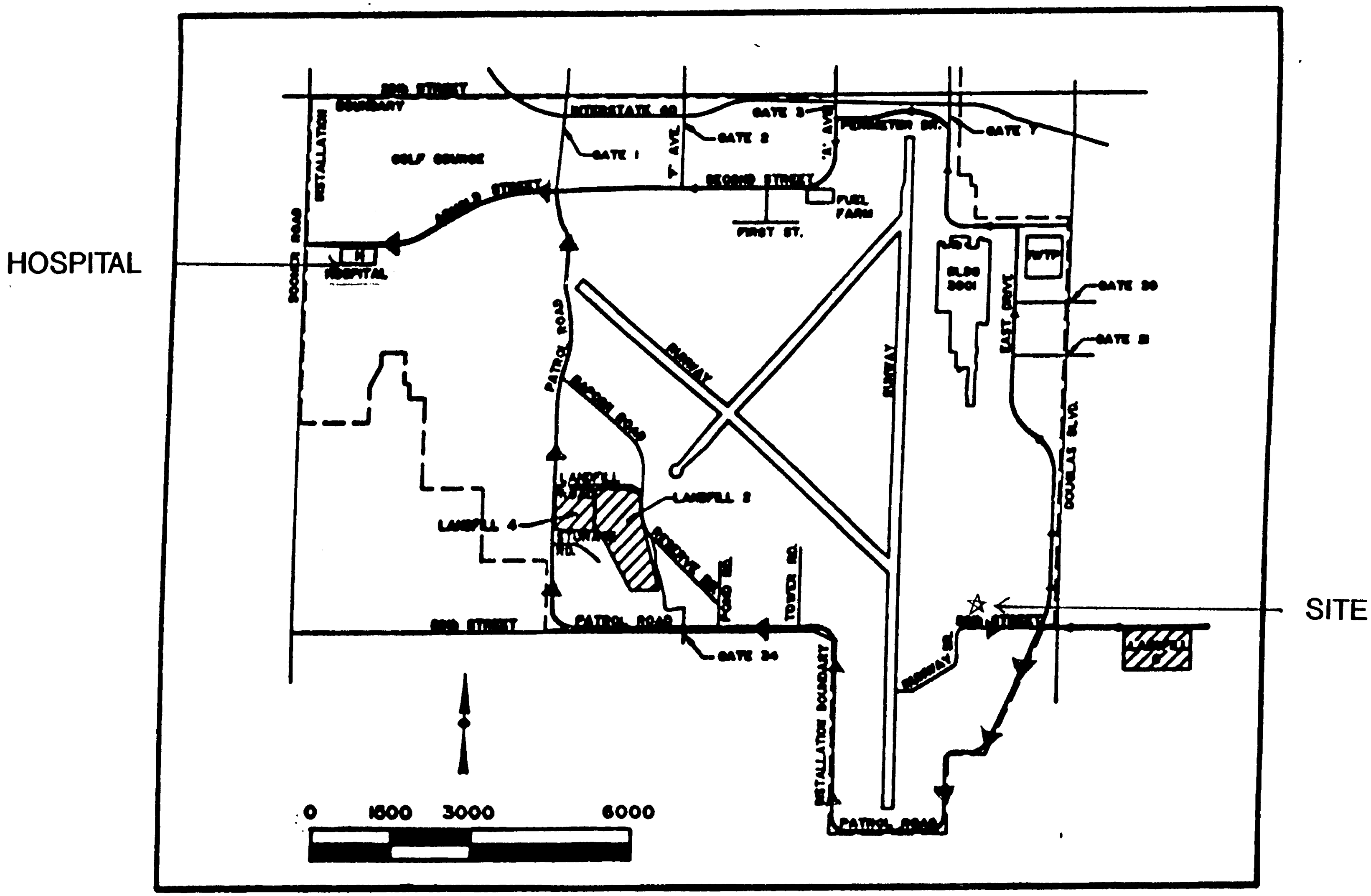

LOCATION PLAN

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PROJECT DOCUMENT #: ____________

PROJECT NAME Tinker RFI Work Plan

JOBSITE ADDRESS Tinker AFB
Oklahoma City, Oklahoma

SITE CONTACT ____________

PHONE # ____________

WORK ASSIGNMENT # ____________ REGION FPC/DEN

CLIENT Battelle Environmental Mgmt. Operations

PROJECT # 7902-025-HS-FPCX

CLIENT CONTACT Steve Kowall

PHONE # 509-376-8322

All the information contained in this form must be updated and HSP must be approved prior to implementation of any field work.

OBJECTIVES: Summarize below

The objective of the RCRA Facility Investigation (RFI) is to characterize the nature, extent, and rate of migration of suspected releases of hazardous chemicals.

TYPE: Check as many as applicable

(x) Active	( ) Landfill	( ) Unknown
( ) Inactive	( ) Uncontrolled	( ) Other specify
( ) Secure	(x) Industrial	
( ) Unsecure	( ) Recovery	
( ) Enclosed space	( ) Well Field	

DESCRIPTION AND FEATURES: Summarize below. Include principal operations and unusual features (containers, buildings, dykes, power line, terrain, etc.)

According to the RFA, the AFFF Fire Control Holding Pond is located 30 feet from the south edge of Bldg. 976 in the AWAC's Alert Facility. It is approximately 40 feet long by 50 feet wide, and is constructed with sloping concrete sides and a vegetated bottom. The pond was designed to hold fire extinguisher foam (AFFF) from wash rack drains in Bldg. 976. Drainage culverts that flow to Kuhlman Creek were built to transport the degraded foam.

SURROUNDING POPULATION: ( ) Residential (x) Industrial ( ) Rural ( ) Urban ( ) OTHER:

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THIS PAGE RESERVED FOR MAP

A site reconnaissance will be performed and a site map will be produced by the contractor performing the work prior to implementing field activities.

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HISTORY: Summarize below. In addition to history, include complaints from public, previous agency actions, known exposures or injuries, etc.

According to the RFA, the unit was designed to manage biodegradable fire suppression foam (AFFF). It was built in 1988 but has not been used for containment of AFFF foam. In April of 1989 there was a release of aircraft wash rack waste water to the pond which overflowed and drained into the creek. The flow was dammed down the creek by base personnel and wastes were vacuumed up by a contractor. The wastes may have contained small amounts of grease and oil along with mild alkaline wash waters. The pond has not been used since this event.

WASTE TYPES: (x) Liquid ( ) Solid ( ) Sludge ( ) Gas ( ) Unknown ( ) Other specify:

WASTE CHARACTERISTICS: Check as many as applicable.

( ) Corrosive	( ) Flammable	( ) Radioactive	
( ) Toxic	( ) Volatile	( ) Reactive	To be determined prior to field work.
( ) Inert	( ) Unknown	( ) Other specify:	

HAZARDS OF CONCERN:

(x) Heat Stress attach guidelines (Attachment 4)	( ) Noise
(x) Cold Stress attach guidelines (Attachment 4)	( ) Inorganic Chemicals
( ) Explosive/Flammable	( ) Organic Chemicals
( ) Oxygen Deficient	(x) Other specify: Lyme Disease: Attachment 1
( ) Radiological	
( ) Biological	

PRINCIPLE DISPOSAL METHODS AND PRACTICES: **Summarize below:**

In April 1989, a design flaw in Building 976 resutled in a release of aircraft wash rack waste water which overflowed the pond and drained into the nearby creek. Waters may have contained oil and grease.

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HAZARDOUS MATERIAL SUMMARY: Circle waste type and estimate amounts by category

CHEMICALS: Amount/Units:	SOLIDS: Amounts/Units:	SLUDGES: Amounts/Units:	SOLVENTS: Amounts/Units:	OILS: Amounts/Units:	OTHER: Amounts/Units:
Acids	Flyash	Paint Pigments	Halogenated Solvents	Oily Wastes	Laboratory
Pickling Liquors	Asbestos	Metal Sludges	Non-halogenated Solvents	Other - Specify: Wash water may have contained small amounts of grease and oil.	Pharmaceutical
Caustics	Milling/Mine Tailings	POTW Sludge	Other - Specify:		Hospital
Pesticides	Ferrous Smelter	Aluminum			Radiological
Dyes/Inks	Non-ferrous Smelter	Other - Specify:			Municipal
Cyanides	Other - Specify:				Other - Specify:
Phenols					
Halogens					
PCBs					
Metals					
Other - Specify: Mild alkaline wash waters.					

OVERALL HAZARD EVALUATION: ( ) High ( ) Medium ( ) Low ( ) Unknown (Where tasks have different hazards, evaluate each. Attach additional sheets if necessary)

JUSTIFICATION: To be determined prior to field work.

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium (x) Low ( ) Unknown

BACKGROUND REVIEW: ( ) COMPLETE (x) INCOMPLETE

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KNOWN CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION (specify units and media)	PEL/TLV ppm or mg/m3 (specify)	IDLH ppm or mg/m3 (specify)	WARNING CONCENTRATION ppm	SYMPTOMS/EFFECTS OF ACUTE EXPOSURE	PHOTOIONIZATION POTENTIAL
To be determined prior to field work.						

NA = Not Available NE = None Established U = Unknown

S = Soil SW = Surface Water T = Tailings F = Flyash TK = Tanks
A = Air GW = Groundwater SL = Sludge D = Drums L = Lagoon

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FIELD ACTIVITIES COVERED UNDER THIS PLAN

TASK DESCRIPTION/SPECIFIC TECHNIQUE-STANDARD OPERATING PROCEDURES/SITE LOCATION (attach additional sheets as necessary)	TYPE	LEVEL OF PROTECTION Primary	Contingency	SCHEDULE
1 Visual Inspection	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	To be announced.
2 Surface soil/sediment sampling	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	To be announced.
3	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	
4	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	

PERSONNEL* AND RESPONSIBILITIES (Include subcontractors)

NAME	FIRM/REGION	OSHA TRAINING CERTIFICATION	RESPONSIBILTIES	On site?
PROJECT MANAGER			COORDINATE OVERALL HEALTH AND SAFETY	1 - 2 - 3 - 4
SITE HEALTH AND SAFETY COORDINATOR			COORDINATE HEALTH AND SAFETY FOR THIS SITE	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
STAFF			PERFORM FIELD ACTIVITIES	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4

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PROTECTIVE EQUIPMENT: Specify by task. Indicate type and/or material as necessary. Uses copies of this sheet if needed.

BLOCK A TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

To be determined prior to field work.

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ____
( ) APR: ____
( ) Cartridge: ____
( ) Escape Mask: ____
( ) Other: ____

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ____
( ) Face Shield: ____
( ) Goggles: ____
( ) Hard Hat: ____
( ) Other: ____

Boots: ( ) Not Needed
( ) Boots: ____
( ) Overboots: ____

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ____
( ) Splash Suit: ____
( ) Apron: ____
( ) Tyvek Coverall: ____
( ) Saranex Coverall: ____
( ) Coverall: ____
( ) Other: ____

Gloves: ( ) Not Needed
( ) Undergloves: ____
( ) Gloves: ____
( ) Overgloves: ____
( ) Other - **Specify**

BLOCK B TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ____
( ) APR: ____
( ) Cartridge: ____
( ) Escape Mask: ____
( ) Other: ____

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ____
( ) Face Shield: ____
( ) Goggles: ____
( ) Hard Hat: ____
( ) Other: ____

Boots: ( ) Not Needed
( ) Boots: ____
( ) Overboots: ____

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ____
( ) Splash Suit: ____
( ) Apron: ____
( ) Tyvek Coverall: ____
( ) Saranex Coverall: ____
( ) Coverall: ____
( ) Other: ____

Gloves: ( ) Not Needed
( ) Undergloves: ____
( ) Gloves: ____
( ) Overgloves: ____
( ) Other - **Specify**

BLOCK C TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ____
( ) APR: ____
( ) Cartridge: ____
( ) Escape Mask: ____
( ) Other: ____

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ____
( ) Face Shield: ____
( ) Goggles: ____
( ) Hard Hat: ____
( ) Other: ____

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ____

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ____
( ) Splash Suit: ____
( ) Apron: ____
( ) Tyvek Coverall: ____
( ) Saranex Coverall: ____
( ) Coverall: ____
( ) Other: ____

Gloves: ( ) Not Needed
( ) Undergloves: ____
( ) Gloves: ____
( ) Overgloves: ____
( ) Other - **Specify**

BLOCK D TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ____
( ) APR: ____
( ) Cartridge: ____
( ) Escape Mask: ____
( ) Other: ____

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ____
( ) Face Shield: ____
( ) Goggles: ____
( ) Hard Hat: ____
( ) Other: ____

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ____

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ____
( ) Splash Suit: ____
( ) Apron: ____
( ) Tyvek Coverall: ____
( ) Saranex Coverall: ____
( ) Coverall: ____
( ) Other: ____

Gloves: ( ) Not Needed
( ) Undergloves: ____
( ) Gloves: ____
( ) Overgloves: ____
( ) Other - **Specify**

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MONITORING EQUIPMENT: Specify by task. Indicate type as necessary. Attach additional sheets as necessary.

INSTRUMENT	TASK	ACTION GUIDELINES		COMMENTS (Includes schedules of use)
Combustible Gas Indicator	1 - 2 - 3 - 4	0-10% LEL 10-25% LEL >25% LEL 21.0% O_2 <21.0% O_2 <19.5% O_2	No explosion hazard. Potential explosion hazard; notify SHSC. Explosion hazard; interrupt task/evacuate Oxygen normal. Oxygen deficient; notify SHSC. Interrupt task/evacuate	( ) Not Needed Continuous Monitoring
Radiation Survey Meter	1 - 2 - 3 - 4	3X Background: >2mR/hr:	Notify SHSC Interrupt task/evacuate	( ) Not Needed Note: Annual exposure not to exceed or 50 urem/hr average
Photionization Detector Type ______	1 - 2 - 3 - 4 ( ) 11.7 ev ( ) 10.2 ev ( ) 9.8 ev ( ) ____ ev	0-5 ppm above background - go upwind and evaluate situation > 5 ppm above background - evacuate area until the situation is evaluated and the proper PPE determined		( ) Not Needed Continuously monitoring breathing zone.
Flame Ionization Detector Type ______	1 - 2 - 3 - 4	Specify:		( ) Not Needed
Detector Tubes/ Monitox Type ______ Type ______	1 - 2 - 3 - 4	Specify:		( ) Not Needed
Respirable Dust Monitor Type ______ Type ______	1 - 2 - 3 - 4	Specify:		( ) Not Needed
Other Specify To be determined prior to field activities.	1 - 2 - 3 - 4	Specify:		

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DECONTAMINATION PROCEDURES		
ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, AND SUPPORT ZONES		
Personalized Decontamination Summarize below and/or attach diagram; discuss use of work zones. See Attachment 2 for Personnel Decontamination May need revision based on waste characteristics. ( ) Not needed	Sampling Equipment Decontamination Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP ( ) Not needed	Heavy Equipment Decontamination Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP and Attachment 3. ( ) Not needed
Containment and Disposal Method See Section 4.25 of the SAP for contaminated waste disposal procedures. May need revision based on waste characteristics.	Containment and Disposal Method See Section 4.25 of the SAP	Containment and Disposal Method See Section 4.25 of the SAP Page 9 of 11

HEALTH AND SAFETY PLAN FORM

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EMERGENCY CONTACTS

Water Supply	Will be determined prior to the site investigation.
Telephone	
Radio	
Other (specify)	

CONTINGENCY PLANS Summarize below:

HEALTH AND SAFETY PLAN APPROVALS

Prepared by ______________________ Date ________

SHSC Signature ______________________ Date ________

HSM Signature ______________________ Date ________

EMERGENCY CONTACTS	NAME	PHONE:
24-Hour Emergency Line		
Health and Safety Manager	To be determined prior to field work.	
Project Manager		
Site Health and Safety Coordinator		
EMO Contact		
Other (specify)		
State Environmental Agency	N/A	
Base Spill Contractor	Fire Department	ext. 47964
Fire Department		ext. 47964
Base Security		ext. 43768
State Police (Highway Patrol)		405-682-4343
Health Department (State)	Hal Cantwell	405-271-7158
Poison Control Center (Oklahoma City)		405-271-5454

MEDICAL EMERGENCY

Hospital Name: Base Hospital phone: ext. 43768

Hospital Address: Bldg. 5801

Name of Contact at Hospital:

Name of 24-Hour Ambulance: Base Fire Department phone: ext. 47964

Route to Hospital: (Attach map with route to hospital)

Go north on Patrol Road (it will turn west along installation boundary for about 1 mile and then go north again). Turn left (west) on Arnold St. stay on Arnold St. until you reach the hospital.

Distance to hospital < 4 miles

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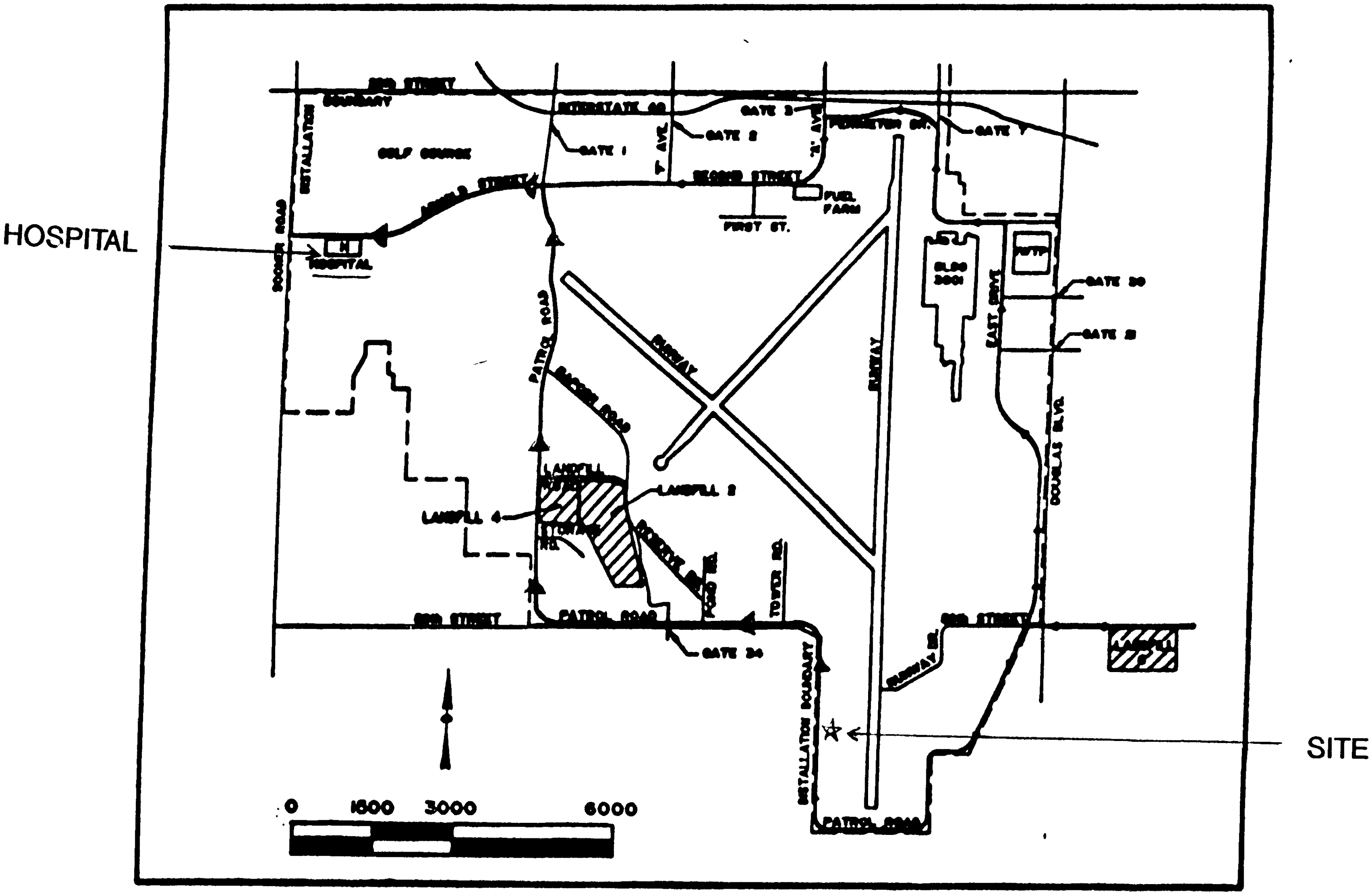

LOCATION PLAN

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PROJECT DOCUMENT #: ____________

PROJECT NAME Tinker RFI Work Plan

JOBSITE ADDRESS Tinker AFB
Oklahoma City, Oklahoma

SITE CONTACT ____________

PHONE # ____________

WORK ASSIGNMENT # ____________ REGION FPC/DEN

CLIENT Battelle Environmental Mgmt. Operations

PROJECT # 7902-025-HS-FPCX

CLIENT CONTACT Steve Kowall

PHONE # 509-376-8322

All the information contained in this form must be updated and HSP must be approved prior to implementation of any field work.

OBJECTIVES: Summarize below

The objective of the RCRA Facility Investigation (RFI) is to characterize the nature, extent, and rate of migration of suspected releases of hazardous chemicals

TYPE: Check as many as applicable

( ) Active	( ) Landfill	( ) Unknown
(x) Inactive	( ) Uncontrolled	( ) Other specify
( ) Secure	(x) Industrial	
( ) Unsecure	( ) Recovery	
( ) Enclosed space	( ) Well Field	

DESCRIPTION AND FEATURES: Summarize below. Include principal operations and unusual features (containers, buildings, dykes, power line, terrain, etc.)

The Old Pesticide Storage Area is located at Building 1005 at the inactive old sanitary sewage treatment plant on the west side of the base. The building is a 30 x 60 foot concrete block structure with a concrete floor.

SURROUNDING POPULATION: ( ) Residential (x) Industrial ( ) Rural ( ) Urban ( ) OTHER:

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THIS PAGE RESERVED FOR MAP

A site reconnaissance will be performed and a site map will be produced by the contractor performing the work prior to implementing other field activites.

HEALTH AND SAFETY PLAN FORM

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HISTORY: Summarize below. In addition to history, include complaints from public, previous agency actions, known exposures or injuries, etc.

The building was reported to have formerly stored and mixed various pesticides, although no pesticides are currently stored or mixed at this location.

WASTE TYPES: (x) Liquid (x) Solid ( ) Sludge ( ) Gas ( ) Unknown ( ) Other specify:

WASTE CHARACTERISTICS: Check as many as applicable.

( ) Corrosive	( ) Flammable	( ) Radioactive	
(x) Toxic	( ) Volatile	( ) Reactive	To be reevaluated
( ) Inert	( ) Unknown	( ) Other specify:	

HAZARDS OF CONCERN:

(x) Heat Stress attach guidelines (Attachment 4)	( ) Noise
(x) Cold Stress attach guidelines (Attachment 4)	(x) Inorganic Chemicals
( ) Explosive/Flammable	(x) Organic Chemicals
( ) Oxygen Deficient	( ) Other specify:
( ) Radiological	To be reevaluated
( ) Biological	

PRINCIPLE DISPOSAL METHODS AND PRACTICES: **Summarize below:**

Various pesticides were reportedly stored and mixed at this location.

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HAZARDOUS MATERIAL SUMMARY: Circle waste type and estimate amounts by category

CHEMICALS: Amount/Units:	SOLIDS: Amounts/Units:	SLUDGES: Amounts/Units:	SOLVENTS: Amounts/Units:	OILS: Amounts/Units:	OTHER: Amounts/Units:
Acids	Flyash	Paint Pigments	Halogenated Solvents	Oily Wastes	Laboratory
Pickling Liquors	Asbestos	Metal Sludges	Non-halogenated Solvents	Other - Specify:	Pharmaceutical
Caustics	Milling/Mine Tailings	POTW Sludge	Other - Specify:		Hospital
Pesticides	Ferrous Smelter	Aluminum			Radiological
Dyes/Inks	Non-ferrous Smelter	Other - Specify:			Municipal
Cyanides	Other - Specify:				Other - Specify:
Phenols					
Halogens					
PCBs					
Metals					
Other - Specify:					

OVERALL HAZARD EVALUATION: ( ) High ( ) Medium ( ) Low ( ) Unknown (Where tasks have different hazards, evaluate each. Attach additional sheets if necessary)

JUSTIFICATION: To be determined prior to field work.

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium ( ) Low ( ) Unknown

BACKGROUND REVIEW: ( ) COMPLETE (x) INCOMPLETE

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KNOWN CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION (specify units and media)	PEL/TLV ppm or mg/m3 (specify)	IDLH ppm or mg/m3 (specify)	WARNING CONCENTRATION ppm	SYMPTOMS/EFFECTS OF ACUTE EXPOSURE	PHOTOIONIZATION POTENTIAL
To be determined prior to field work.						

NA = Not Available   NE = None Established   U = Unknown

S = Soil   SW = Surface Water   T = Tailings   F = Flyash   TK = Tanks
A = Air   GW = Groundwater   SL = Sludge   D = Drums   L = Lagoon

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FIELD ACTIVITIES COVERED UNDER THIS PLAN

TASK DESCRIPTION/SPECIFIC TECHNIQUE-STANDARD OPERATING PROCEDURES/SITE LOCATION (attach additional sheets as necessary)	TYPE	LEVEL OF PROTECTION Primary	LEVEL OF PROTECTION Contingency	SCHEDULE
1 Site reconnaissance	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	To be announced.
2	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	
3	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	
4	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	

PERSONNEL* AND RESPONSIBILITIES (Include subcontractors)

NAME	FIRM/REGION	OSHA TRAINING CERTIFICATION	RESPONSIBILTIES	On site?
PROJECT MANAGER			COORDINATE OVERALL HEALTH AND SAFETY	1 - 2 - 3 - 4
SITE HEALTH AND SAFETY COORDINATOR			COORDINATE HEALTH AND SAFETY FOR THIS SITE	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
STAFF			PERFORM FIELD ACTIVITIES	1 - 2 - 3 - 4 1 - 2 - 3 - 4

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PROTECTIVE EQUIPMENT: Specify by task. Indicate type and/or material as necessary. Uses copies of this sheet if needed.

BLOCK A TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency
To be determined prior to field work.

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ________
( ) APR: ________
( ) Cartridge: ________
( ) Escape Mask: ________
( ) Other: ________

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ________
( ) Face Shield: ________
( ) Goggles: ________
( ) Hard Hat: ________
( ) Other: ________

Boots: ( ) Not Needed
( ) Boots: <u>Leather steel-toed work boots</u>
( ) Overboots: ________

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ________
( ) Splash Suit: ________
( ) Apron: ________
( ) Tyvek Coverall: ________
( ) Saranex Coverall: ________
( ) Coverall: ________
( ) Other: ________

Gloves: ( ) Not Needed
( ) Undergloves: ________
( ) Gloves: ________
( ) Overgloves: ________
( ) Other - **Specify**

BLOCK B TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ________
( ) APR: ________
( ) Cartridge: ________
( ) Escape Mask: ________
( ) Other: ________

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ________
( ) Face Shield: ________
( ) Goggles: ________
( ) Hard Hat: ________
( ) Other: ________
(if necessary)

Boots: ( ) Not Needed
( ) Boots: <u>Leather steel-toed work boots</u>
( ) Overboots: ________

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ________
( ) Splash Suit: ________
( ) Apron: ________
( ) Tyvek Coverall: ________
( ) Saranex Coverall: ________
( ) Coverall: ________
( ) Other: ________

Gloves: ( ) Not Needed
( ) Undergloves: ________
( ) Gloves: ________
( ) Overgloves: ________
( ) Other - **Specify**

BLOCK C TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ________
( ) APR: ________
( ) Cartridge: ________
( ) Escape Mask: ________
( ) Other: ________

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ________
( ) Face Shield: ________
( ) Goggles: ________
( ) Hard Hat: ________
( ) Other: ________

Boots: ( ) Not Needed
( ) Boots: <u>Leather steel-toed work boots</u>
( ) Overboots: ________

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ________
( ) Splash Suit: ________
( ) Apron: ________
( ) Tyvek Coverall: ________
( ) Saranex Coverall: ________
( ) Coverall: ________
( ) Other: ________

Gloves: ( ) Not Needed
( ) Undergloves: ________
( ) Gloves: ________
( ) Overgloves: ________
( ) Other - **Specify**

BLOCK D TASKS: 1 - 2 - 3 - 4 ( ) Primary
LEVEL: A - B - C - D - Modified ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ________
( ) APR: ________
( ) Cartridge: ________
( ) Escape Mask: ________
( ) Other: ________

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ________
( ) Face Shield: ________
( ) Goggles: ________
( ) Hard Hat: ________
( ) Other: ________

Boots: ( ) Not Needed
( ) Boots: <u>Leather steel-toed work boots</u>
( ) Overboots: ________

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ________
( ) Splash Suit: ________
( ) Apron: ________
( ) Tyvek Coverall: ________
( ) Saranex Coverall: ________
( ) Coverall: ________
( ) Other: ________

Gloves: ( ) Not Needed
( ) Undergloves: ________
( ) Gloves: ________
( ) Overgloves: ________
( ) Other - **Specify**

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MONITORING EQUIPMENT: Specify by task. Indicate type as necessary. Attach additional sheets as necessary.

INSTRUMENT	TASK	ACTION GUIDELINES		COMMENTS (Includes schedules of use)
Combustible Gas Indicator	1 - 2 - 3 - 4	0-10% LEL 10-25% LEL >25% LEL 21.0% O_2 <21.0% O_2 <19.5% O_2	No explosion hazard. Potential explosion hazard; notify SHSC. Explosion hazard; interrupt task/evacuate Oxygen normal. Oxygen deficient; notify SHSC. Interrupt task/evacuate	( ) Not Needed Continuous Monitoring.
Radiation Survey Meter	1 - 2 - 3 - 4	3X Background: >2mR/hr:	Notify SHSC Interrupt task/evacuate	( ) Not Needed Note: Annual exposure not to exceed or 50 urem/hr average
Photionization Detector Type ______	1 - 2 - 3 - 4 ( ) 11.7 ev ( ) 10.2 ev ( ) 9.8 ev ( ) ____ ev	0-5 ppm above background - go upwind and evaluate situation > 5 ppm above background - evacuate area until situation is evaluated		( ) Use continuously on site. ( ) Not Needed Continuously monitoring breathing zone.
Flame Ionization Detector Type ______	1 - 2 - 3 - 4	Specify:		( ) Not Needed
Detector Tubes/ Monitox Type ______ Type ______	1 - 2 - 3 - 4	Specify:		( ) Not Needed
Respirable Dust Monitor Type ______ Type ______	1 - 2 - 3 - 4	Specify:		( ) Not Needed
Other Specify	1 - 2 - 3 - 4 To be determined	Specify:		

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DECONTAMINATION PROCEDURES		
ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, AND SUPPORT ZONES		
<u>Personalized Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. See Attachment 2 for Personnel Decontamination Reevaluate when characteristics are known. ( ) Not needed	<u>Sampling Equipment Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. (x) Not needed	<u>Heavy Equipment Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. (x) Not needed
<u>Containment and Disposal Method</u> See Section 4.25 of the SAP Reevaluate when characteristcs are known.	<u>Containment and Disposal Method</u>	<u>Containment and Disposal Method</u> Page 9 of 11

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EMERGENCY CONTACTS

Water Supply — Will be determined prior to the site investigation.

Telephone

Radio

Other (specify)

CONTINGENCY PLANS Summarize below:

HEALTH AND SAFETY PLAN APPROVALS

Prepared by ______________________ Date ________

SHSC Signature ______________________ Date ________

HSM Signature ______________________ Date ________

EMERGENCY CONTACTS	NAME	PHONE:
24-Hour Emergency Line		
Health and Safety Manager		
Project Manager	To be determined prior to field work.	
Site Health and Safety Coordinator		
EMO Contact		
Other (specify)		
State Environmental Agency	N/A	
Base Spill Contractor	Fire Department	ext. 47964
Fire Department		ext. 47964
Base Security		ext. 43768
State Police (Highway Patrol)		405-682-4343
Health Department (State)	Hal Cantwell	405-271-7158
Poison Control Center (Oklahoma City)		405-271-5454

MEDICAL EMERGENCY

Hospital Name: Base Hospital phone: ext 43768

Hospital Address: Bldg 5801

Name of Contact at Hospital:

Name of 24-Hour Ambulance: Base Fire Department phone: ext 47964

Route to Hospital: (Attach map with route to hospital)

Go north on Patrol Road to Arnold Street. Go west (left) on Arnold Street to the hospital.

Distance to hospital <2 miles

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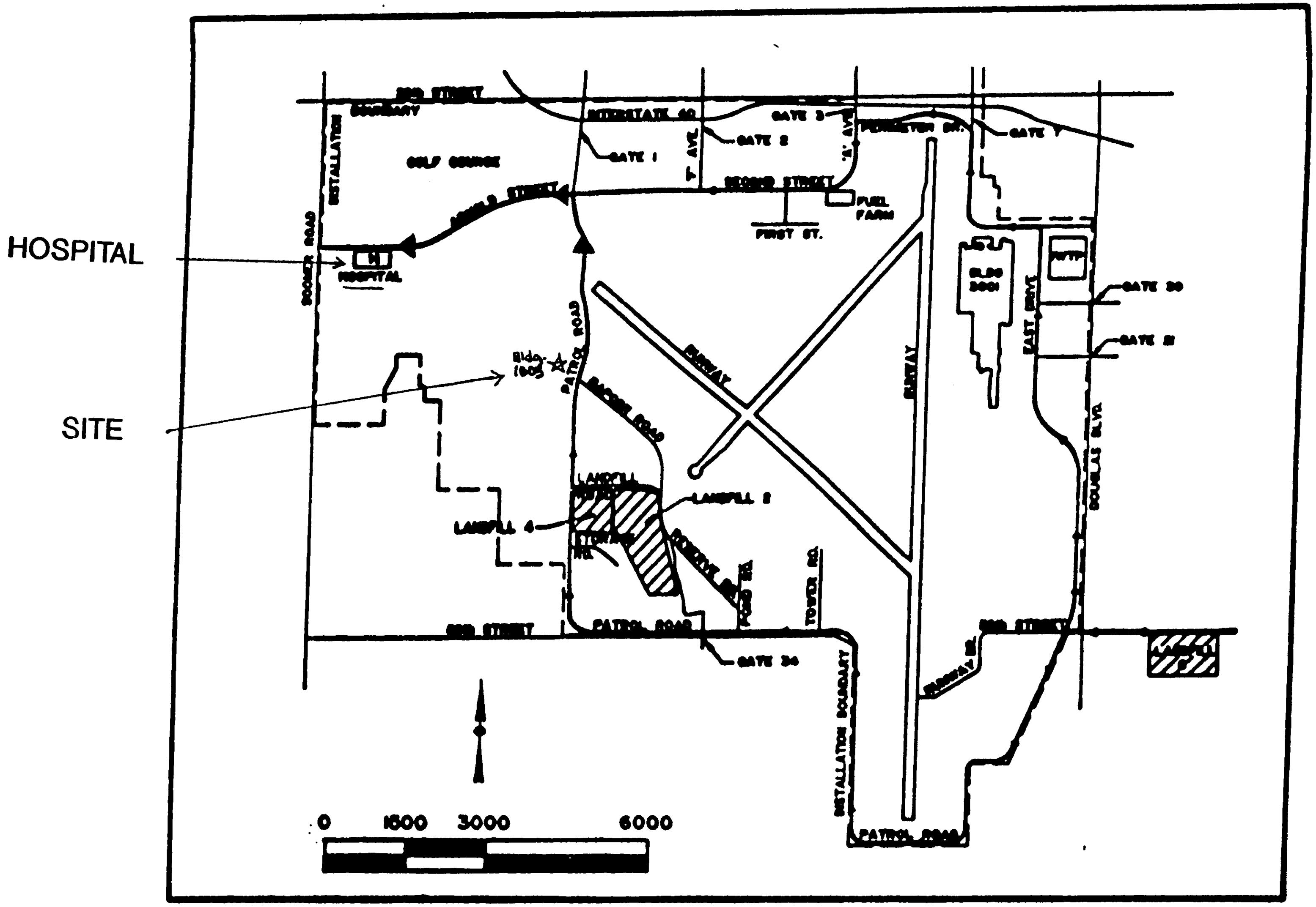

LOCATION PLAN

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PROJECT DOCUMENT #: ____________

PROJECT NAME: Tinker RFI Work Plan	WORK ASSIGNMENT #: ____ REGION: FPC/DEN
JOBSITE ADDRESS: Tinker AFB, Oklahoma City, Oklahoma	CLIENT: Battelle Environmental Mgmt. Operations
	PROJECT #: 7902-025-HS-FPCX
SITE CONTACT: ____	CLIENT CONTACT: Steve Kowall
PHONE #: ____	PHONE #: 509-376-8322

All the information contained in this form must be updated and HSP must be approved prior to implementation of any field work.

OBJECTIVES: Summarize below

The objective of the RCRA Facility Investigation (RFI) is to characterize the nature, extent, and rate of migration of suspected releases of hazardous chemicals.

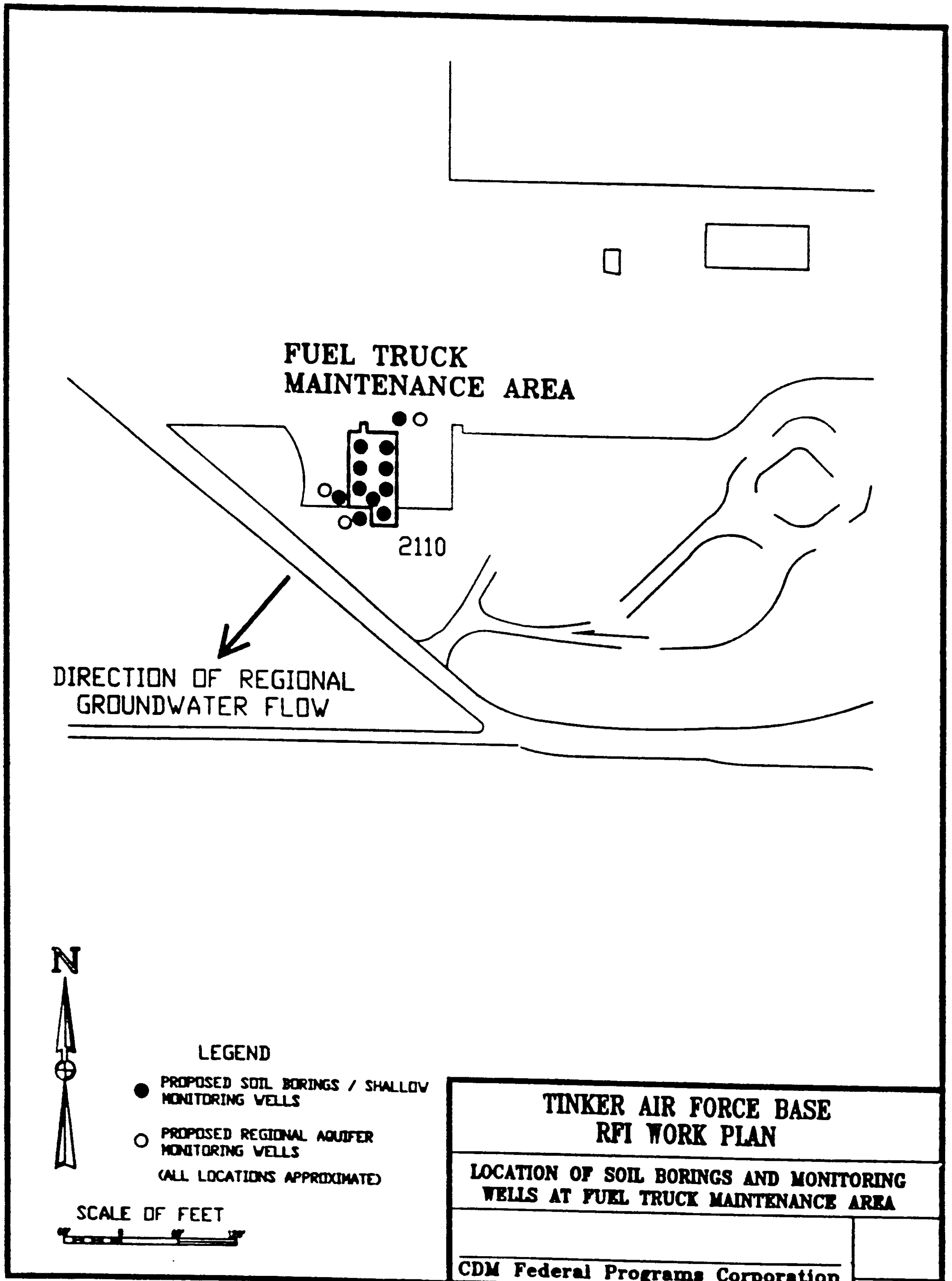
TYPE: Check as many as applicable

(x) Active	( ) Landfill	( ) Unknown
( ) Inactive	( ) Uncontrolled	( ) Other specify
( ) Secure	(x) Industrial	
( ) Unsecure	( ) Recovery	
( ) Enclosed space	( ) Well Field	

DESCRIPTION AND FEATURES: Summarize below. Include principal operations and unusual features (containers, buildings, dykes, power line, terrain, etc.)

The Fuel Truck Maintenance Facility is located at Building 2110 which is east of Industrial Waste Pit 1 and about 980 feet west of Douglas Blvd. Building 2110 is a 40 x 80 foot metal building with a concrete floor which is sloped to a drainage trench running the length of the building. There are separate areas for mechanical repairs and cleaning of fuel tanks.

SURROUNDING POPULATION: ( ) Residential (x) Industrial ( ) Rural ( ) Urban ( ) OTHER:



TINKER AIR FORCE BASE
RFI WORK PLAN

LOCATION OF SOIL BORINGS AND MONITORING WELLS AT FUEL TRUCK MAINTENANCE AREA

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HISTORY: Summarize below. In addition to history, include complaints from public, previous agency actions, known exposures or injuries, etc.

The Fuel Truck Maintenance and Repair Facility has been in operation since at least 1975. In November, 1990, construction operations uncovered contaminated soil and water. Trenches that were dug under the concrete floor began to fill with fuel and water. Water and fuel were removed from the trenches. (See the Site Investigation Plan for additional history.)

WASTE TYPES: (x) Liquid ( ) Solid ( ) Sludge ( ) Gas ( ) Unknown ( ) Other specify:

WASTE CHARACTERISTICS: Check as many as applicable.

( ) Corrosive	(x) Flammable	( ) Radioactive
(x) Toxic	(x) Volatile	( ) Reactive
( ) Inert	( ) Unknown	( ) Other specify:

HAZARDS OF CONCERN:

(x) Heat Stress attach guidelines (Attachment 4)	( ) Noise
(x) Cold Stress attach guidelines (Attachment 4)	( ) Inorganic Chemicals
(x) Explosive/Flammable	(x) Organic Chemicals
( ) Oxygen Deficient	( ) Other specify:
( ) Radiological	
( ) Biological	

PRINCIPLE DISPOSAL METHODS AND PRACTICES: **Summarize below:**

The contents of truck tanks are dumped into the trench in the floor of the building which flows to the lift station. The tank, truck body, engine, etc. are then washed and rinsed with the resulting water flowing over the floor to the trench. At the lift station, oil and fuel are separated from the water, which is pumped to the IWTP. The oil and fuel are later disposed of. Ungrouted cracks in the concrete floor allow contaminants to seep into the soil.

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HAZARDOUS MATERIAL SUMMARY: Circle waste type and estimate amounts by category

CHEMICALS: Amount/Units:	SOLIDS: Amounts/Units:	SLUDGES: Amounts/Units:	SOLVENTS: Amounts/Units:	OILS: Amounts/Units:	OTHER: Amounts/Units:
Acids	Flyash	Paint Pigments	Halogenated Solvents	Oily Wastes	Laboratory
Pickling Liquors	Asbestos	Metal Sludges	Non-halogenated Solvents	Other - Specify: Fuel	Pharmaceutical
Caustics	Milling/Mine Tailings	POTW Sludge	Other - Specify:		Hospital
Pesticides	Ferrous Smelter	Aluminum			Radiological
Dyes/Inks	Non-ferrous Smelter	Other - Specify:			Municipal
Cyanides	Other - Specify:				Other - Specify:
Phenols					
Halogens					
PCBs					
Metals					
Other - Specify:					

OVERALL HAZARD EVALUATION: ( ) High ( ) Medium (x) Low ( ) Unknown (Where tasks have different hazards, evaluate each. Attach additional sheets if necessary)

JUSTIFICATION: Air Force personnel inspecting the area determined hazard and fire/explosion potential to be low.

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium (x) Low ( ) Unknown

BACKGROUND REVIEW: (x) COMPLETE ( ) INCOMPLETE

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KNOWN CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION (specify units and media)	IDLH PEL/TLV ppm or mg/m3 (specify)	IDLH ppm or mg/m3 (specify)	WARNING CONCENTRATION ppm	SYMPTOMS/EFFECTS OF ACUTE EXPOSURE	PHOTOIONIZATION POTENTIAL
Benzene	NA	1 ppm	3000 ppm	4.68 ppm	Irritation of eyes, nose, respiratory system, headaches, staggared gait, derm., depression	9.24 eV
Toluene	NA	100 ppm	2000 ppm	0.17 ppm	Weakness, cont., dizziness, muscle fatigue, derm.	8.82 eV
Xylene	NA	100 ppm	1000 ppm	0.00005-0.08 ppm	Dizziness, excitement, incoherence, irrit. eyes, nose; nausea, vomiting	8.44-8.56 eV
Barium	NA	0.5 mg/m^3	1100 mg/m^3	NA	Upper respiratory irritation, gastro., spasm, slow pulse	NA
Chromium	NA	0.5 mg/m^3	NE	NA	Fibrosis of lungs	NA
Lead	NA	0.05 mg/m^3	700 mg/m^3	NA	Weakness, insomnia, anemia, pal eye, anor., tremor, constipation, abdominal pain	NA
TCE	NA	25 ppm	1000 ppm	21.4 ppm	Vertigo, tremors, vomiting, eyes	9.45 eV

NA = Not Available   NE = None Established   U = Unknown

S = Soil   SW = Surface Water   T = Tailings   F = Flyash   TK = Tanks
A = Air   GW = Groundwater   SL = Sludge   D = Drums   L = Lagoon

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FIELD ACTIVITIES COVERED UNDER THIS PLAN

TASK DESCRIPTION/SPECIFIC TECHNIQUE-STANDARD OPERATING PROCEDURES/SITE LOCATION (attach additional sheets as necessary)	TYPE	LEVEL OF PROTECTION Primary	LEVEL OF PROTECTION Contingency	SCHEDULE
1 Drilling/subsurface soil/groundwater sampling	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	To be announced.
2	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	
3	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	
4	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	

PERSONNEL* AND RESPONSIBILITIES (Include subcontractors)

NAME	FIRM/REGION	OSHA TRAINING CERTIFICATION	RESPONSIBILTIES	On site?
PROJECT MANAGER			COODINATE OVERALL HEALTH AND SAFETY	1 - 2 - 3 - 4
SITE HEALTH AND SAFETY COORDINATOR			COODINATE HEALTH AND SAFETY FOR THIS SITE	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
STAFF			PERFORM FIELD ACTIVITIES	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4

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PROTECTIVE EQUIPMENT: Specify by task. Indicate type and/or material as necessary. Uses copies of this sheet if needed.

BLOCK A TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
( ) Primary
(x) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ______
(x) APR: ______
(x) Cartridge: GMC-H
( ) Escape Mask: ______
( ) Other: ______

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
(x) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
(x) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
(x) Hard Hat: ______
(x) Other: Hearing protection (if necessary)

Gloves: ( ) Not Needed
( ) Undergloves: ______
(x) Gloves: Latex
(x) Overgloves: Neoprene
( ) Other - Specify

Boots: ( ) Not Needed
(x) Boots: Leather steel-toed work boots
( ) Overboots: ______

BLOCK B TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
(x) Primary
( ) Contingency

Respiratory: (x) Not Needed
( ) SCBA, Airline: ______
( ) APR: ______
( ) Cartridge: ______
( ) Escape Mask: ______
( ) Other: ______

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
(x) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
(x) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
(x) Hard Hat: ______
(x) Other: Hearing protection (if necessary)

Gloves: ( ) Not Needed
(x) Undergloves: Latex
(x) Gloves: Neoprene
( ) Overgloves: ______
( ) Other - Specify

Boots: ( ) Not Needed
(x) Boots: Steel-toed
( ) Overboots: ______

BLOCK C TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
( ) Primary
( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ______
( ) APR: ______
( ) Cartridge: ______
( ) Escape Mask: ______
( ) Other: ______

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
( ) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
( ) Hard Hat: ______
( ) Other: ______

Gloves: ( ) Not Needed
( ) Undergloves: ______
( ) Gloves: ______
( ) Overgloves: ______
( ) Other - Specify

Boots: ( ) Not Needed
( ) Boots: ______
( ) Overboots: ______

BLOCK D TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
( ) Primary
( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ______
( ) APR: ______
( ) Cartridge: ______
( ) Escape Mask: ______
( ) Other: ______

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
( ) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
( ) Hard Hat: ______
( ) Other: ______

Gloves: ( ) Not Needed
( ) Undergloves: ______
( ) Gloves: ______
( ) Overgloves: ______
( ) Other - Specify

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ______

HEALTH AND SAFETY PLAN FORM

CDM FPC Health and Safety Program

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MONITORING EQUIPMENT: Specify by task. Indicate type as necessary. Attach additional sheets as necessary.

INSTRUMENT	TASK	ACTION GUIDELINES	COMMENTS (Includes schedules of use)
Combustible Gas Indicator	1 - 2 - 3 - 4	0-10% LEL No explosion hazard. 10-25% LEL Potential explosion hazard; notify SHSC. >25% LEL Explosion hazard; interrupt task/evacuate 21.0% O_2 Oxygen normal. <21.0% O_2 Oxygen deficient; notify SHSC. <19.5% O_2 Interrupt task/evacuate	( ) Not Needed Continuous monitoring.
Radiation Survey Meter	1 - 2 - 3 - 4	3X Background: Notify SHSC >2mR/hr: Interrupt task/evacuate	(x) Not Needed Note: Annual exposure not to exceed or 50 urem/hr average
Photionization Detector Type HNu meter	1 - 2 - 3 - 4 ( ) 11.7 ev (x) 10.2 ev ( ) 9.8 ev ( ) ____ ev	0-1 ppm above background - Level D 1-5 ppm above background - go upwind and evaluate situation > 5 ppm above background - evacuate area until situation is evaluated. Possibly upgrade to Level C before re-entering site.	(x) Use continuously on site. ( ) Not Needed Monitor breathing zone.
Flame Ionization Detector Type ____	1 - 2 - 3 - 4	Specify:	(x) Not Needed
Detector Tubes/ Monitox Type ____ Type ____	1 - 2 - 3 - 4	Specify:	(x) Not Needed
Respirable Dust Monitor Type ____ Type ____	1 - 2 - 3 - 4	Specify:	(x) Not Needed
Other Specify Sensodyne tubes for benzene	1 - 2 - 3 - 4	Specify: < 1 ppm continue monitoring > 1 ppm upgrade to Level C	Check when PID > 1 ppm above background. Check periodically and with every 2 ppm increase thereafter.

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DECONTAMINATION PROCEDURES		
ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, AND SUPPORT ZONES		
Personalized Decontamination Summarize below and/or attach diagram; discuss use of work zones. See Attachment 2 for Personnel Decontamination ( ) Not needed	Sampling Equipment Decontamination Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP ( ) Not needed	Heavy Equipment Decontamination Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP and Attachment 3. ( ) Not needed
Containment and Disposal Method See Section 4.25 of the SAP	Containment and Disposal Method See Section 4.25 of the SAP	Containment and Disposal Method See Section 4.25 of the SAP **Page 9 of 11**

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EMERGENCY CONTACTS

Water Supply	Will be determined prior to the site investigation.
Telephone	
Radio	
Other (specify)	

CONTINGENCY PLANS Summarize below:

HEALTH AND SAFETY PLAN APPROVALS

Prepared by ____________________ Date ________

SHSC Signature ____________________ Date ________

HSM Signature ____________________ Date ________

EMERGENCY CONTACTS	NAME	PHONE:
24-Hour Emergency Line		
Health and Safety Manager		
Project Manager	To be determined prior to field work.	
Site Health and Safety Coordinator		
EMO Contact		
Other (specify)		
State Environmental Agency	N/A	
Base Spill Contractor	Fire Department	ext. 47964
Fire Department		ext. 47964
Base Security		ext. 43768
State Police (Highway Patrol)		405-682-4343
Health Department (State)	Hal Cantwell	405-271-7158
Poison Control Center (Oklahoma City)		405-271-5454

MEDICAL EMERGENCY

Hospital Name: Base Hospital phone: ext. 43768

Hospital Address: Bldg. 5801

Name of Contact at Hospital:

Name of 24-Hour Ambulance: Base Fire Department phone: ext. 47964

Route to Hospital: (Attach map with route to hospital)

Go south to 59th Street. Go east (left) on 59th Street to Patrol Road. Turn right (south) on Patrol Road and follow it around the installation boundary and north to Arnold Street. Go west (left) on Arnold Street to the hospital.

Distance to hospital ~5 miles

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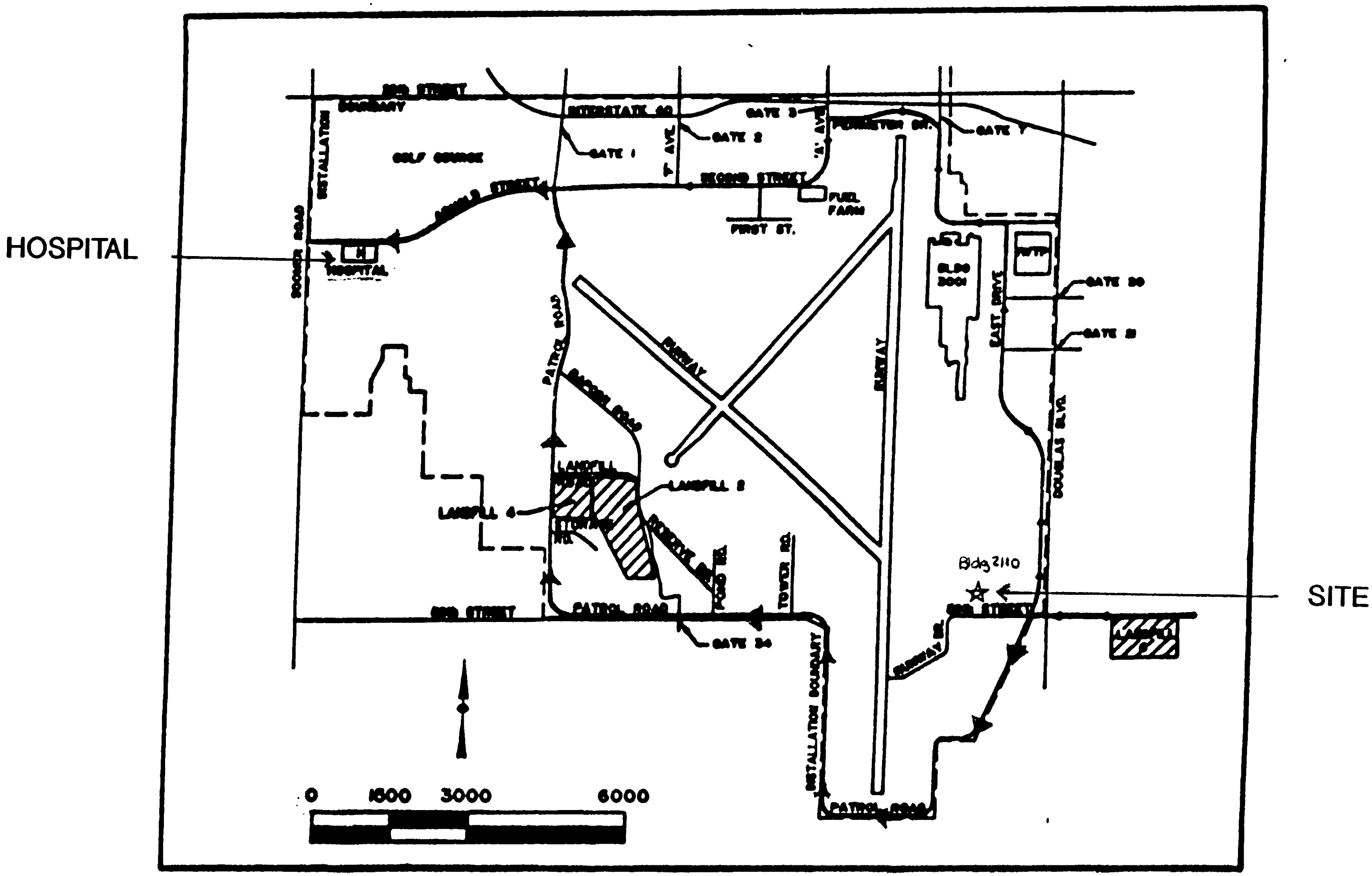

LOCATION PLAN

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PROJECT DOCUMENT #: ____________

PROJECT NAME: RFI Work Plan

WORK ASSIGNMENT #: ____________

REGION: FPC/DEN

JOBSITE ADDRESS: Tinker AFB

CLIENT: Battelle Environmental Operations

PROJECT #: 7902-025-HS-FPCX

SITE CONTACT: ____________

CLIENT CONTACT: Steve Kowall

PHONE #: ____________

PHONE #: (509) 376-8322

All the information contained in this form must be updated and HSP must be approved prior to implementation of any field work.

OBJECTIVES: Summarize below

The objective of the RCRA Facility Investigation (RFI) is to characterize the nature, extent, and rate of migration of suspected releases of hazardous chemicals.

TYPE: Check as many as applicable

(x) Active	( ) Landfill	( ) Unknown
( ) Inactive	( ) Uncontrolled	( ) Other specify
( ) Secure	(x) Industrial	
( ) Unsecure	( ) Recovery	
( ) Enclosed space	( ) Well Field	

DESCRIPTION AND FEATURES: Summarize below. Include principal operations and unusual features (containers, buildings, dykes, power line, terrain, etc.)

The waste fuel dump site is located in the eastern portion of Tinker AFB northwest of IWP 1 (SWMU 12). It is approximately 400 feet southwest of Building 2121 and approximately 2000 feet west of Douglas Blvd. The facility consists of a metal bunker approximately 8 feet by 6 feet by 2 feet deep which sits on metal posts approximately 1½ feet high and was designed to hold jet fuel drained from tanker trucks. The overflow port leads to a 200 foot pipe to two above ground horizontal cylindrical tanks (approx. 1/3 of the pipe is underground). A 60 x 80 ft. asphalt pad with a steel ramp is adjacent to the bunker. (See the Site Investigation Plan for more details).

SURROUNDING POPULATION: ( ) Residential (x) Industrial ( ) Rural ( ) Urban ( ) OTHER:

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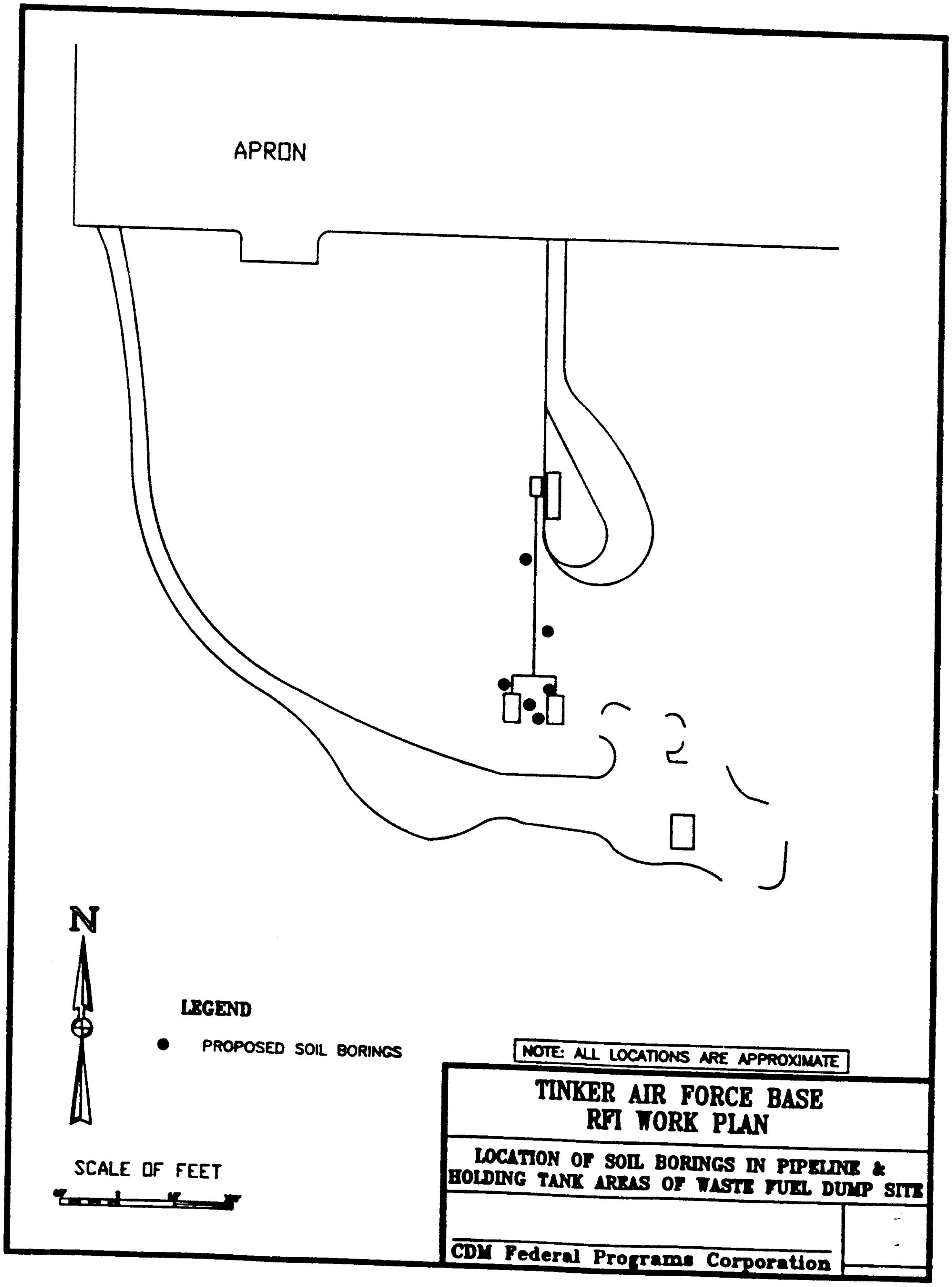

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HISTORY: Summarize below. In addition to history, include complaints from public, previous agency actions, known exposures or injuries, etc.

The facility began operation during 1975 and continued until October 1990 when construction upgrades were to begin. Eleven 10-ft deep boreholes were drilled to determine how much soil to remove. The contamination was more extensive than expected so five more boreholes were drilled and sampled. (See the Site Investigation Plan for more details).

WASTE TYPES: (x) Liquid ( ) Solid ( ) Sludge ( ) Gas ( ) Unknown ( ) Other specify:

WASTE CHARACTERISTICS: Check as many as applicable.

( ) Corrosive	(x) Flammable	( ) Radioactive
( ) Toxic	(x) Volatile	( ) Reactive
( ) Inert	( ) Unknown	( ) Other specify:

HAZARDS OF CONCERN:

(x) Heat Stress (Attachment 4)	( ) Noise
(x) Cold Stress (Attachment 4)	( ) Inorganic Chemicals
(x) Explosive/Flammable	(x) Organic Chemicals
( ) Oxygen Deficient	( ) Other specify:
( ) Radiological	
( ) Biological	

PRINCIPLE DISPOSAL METHODS AND PRACTICES: **Summarize below:**

A truck containing aircraft fuel would be driven onto the ramp and the fuel would be unloaded via a hose to the metal bunker. Sometimes fuel was spilled on the ground around the bunker or on the asphalt pad. Fuel on the asphalt pad would flow off the pad and into the soil.

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HAZARDOUS MATERIAL SUMMARY: Circle waste type and estimate amounts by category

CHEMICALS: Amount/Units:	SOLIDS: Amounts/Units:	SLUDGES: Amounts/Units:	SOLVENTS: Amounts/Units:	OILS: Amounts/Units:	OTHER: Amounts/Units:
Acids	Flyash	Paint Pigments	Halogenated Solvents	Oily Wastes	Laboratory
Pickling Liquors	Asbestos	Metal Sludges	Non-halogenated Solvents	Other - Specify: JP-4 and JP-5 aircraft fuel	Pharmaceutical
Caustics	Milling/Mine Tailings	POTW Sludge	Other - Specify:		Hospital
Pesticides	Ferrous Smelter	Aluminum			Radiological
Dyes/Inks	Non-ferrous Smelter	Other - Specify:			Municipal
Cyanides	Other - Specify:				Other - Specify:
Phenols					
Halogens					
PCBs					
Metals					
Other - Specify:					

OVERALL HAZARD EVALUATION: ( ) High ( ) Medium (x) Low ( ) Unknown (Where tasks have different hazards, evaluate each. Attach additional sheets if necessary)

JUSTIFICATION: This rating is based on the low rating of the Fuel Truck Maintence Area by Air Force Personnel. This site appears to have less contamination and is therefore rated low as well.

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium (x) Low ( ) Unknown

BACKGROUND REVIEW: (x) COMPLETE ( ) INCOMPLETE

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KNOWN CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION (specify units and media)	PEL/TLV ppm or mg/m3 (specify)	IDLH ppm or mg/m3 (specify)	WARNING CONCENTRATION ppm	SYMPTOMS/EFFECTS OF ACUTE EXPOSURE	PHOTOIONIZATION POTENTIAL
Benzene	39 mg/kg S (October 1990)	1 ppm	3000 ppm	4.68 ppm	Irritation of eyes, nose, resp. system; headaches; staggered gait, derm.; depress.	9.25 eV
Toluene	80 mg/kg S (October 1990)	100 ppm	2000 ppm	0.17 ppm	Weakness cont., dizziness, muscle ftg., derm.	8.82 eV
Ethyl Benzene	43 mg/kg S (October 1990)	100 ppm	2000 ppm	0.25-200 ppm	Eye, nose, throat irritation; headache, dermatitis	8.76 eV
Xylene	65 mg/kg S (October 1990)	100 ppm	1000 ppm	0.00005-0.08 ppm	Dizziness, excitement, incoh., Irritation of eyes & nose, nausea, vomiting	8.44 to 8.56 eV
Lead	23 mg/kg S (October 1990)	0.05 mg/m^3	700 mg/m^3	NA	Weakness, insomnia, anemia, anorexia, tremors, constip., abdom. pain.	NA

NA = Not Available　NE = None Established　U = Unknown

S = Soil　SW = Surface Water　T = Tailings　F = Flyash　TK = Tanks
A = Air　GW = Groundwater　SL = Sludge　D = Drums　L = Lagoon

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FIELD ACTIVITIES COVERED UNDER THIS PLAN

TASK DESCRIPTION/SPECIFIC TECHNIQUE-STANDARD OPERATING PROCEDURES/SITE LOCATION (attach additional sheets as necessary)	TYPE	LEVEL OF PROTECTION Primary	LEVEL OF PROTECTION Contingency	SCHEDULE
1 Drilling/subsurface soil & groundwater sampling	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	To be announced.
2	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	
3	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	
4	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	

PERSONNEL* AND RESPONSIBILITIES (Include subcontractors)

NAME	FIRM/REGION	OSHA TRAINING CERTIFICATION	RESPONSIBILTIES	On site?
PROJECT MANAGER			COORDINATE OVERALL HEALTH AND SAFETY	1 - 2 - 3 - 4
SITE HEALTH AND SAFETY COORDINATOR			COORDINATE HEALTH AND SAFETY FOR THIS SITE	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
STAFF			PERFORM FIELD ACTIVITIES	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4

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HEALTH AND SAFETY PLAN FORM

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PROTECTIVE EQUIPMENT: Specify by task. Indicate type and/or material as necessary. Uses copies of this sheet if needed.

BLOCK A TASKS: 1 - 2 - 3 - 4 LEVEL: A - B - C - D - Modified (x) Primary ( ) Contingency

Respiratory: (x) Not Needed
( ) SCBA, Airline: ______
( ) APR: ______
( ) Cartridge: ______
( ) Escape Mask: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
(x) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
(x) Hard Hat: ______
(x) Other: Hearing protection if necessary

Boots: ( ) Not Needed
(x) Boots: Steel toe
( ) Overboots: ______

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
(x) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Gloves: ( ) Not Needed
(x) Undergloves: Latex
(x) Gloves: Neoprene
( ) Overgloves: ______
( ) Other - **Specify**

BLOCK B TASKS: 1 - 2 - 3 - 4 LEVEL: A - B - C - D - Modified ( ) Primary (x) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ______
(x) APR: ______
(x) Cartridge: GMC-H
( ) Escape Mask: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
(x) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
(x) Hard Hat: ______
(x) Other: Hearing protection if necessary

Boots: ( ) Not Needed
(x) Boots: Steel toe
( ) Overboots: ______

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
(x) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Gloves: ( ) Not Needed
(x) Undergloves: Latex
(x) Gloves: Neoprene
( ) Overgloves: ______
( ) Other - **Specify**

BLOCK C TASKS: 1 - 2 - 3 - 4 LEVEL: A - B - C - D - Modified ( ) Primary ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ______
( ) APR: ______
( ) Cartridge: ______
( ) Escape Mask: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
( ) Hard Hat: ______
( ) Other: ______

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ______

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
( ) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Gloves: ( ) Not Needed
( ) Undergloves: ______
( ) Gloves: ______
( ) Overgloves: ______
( ) Other - **Specify**

BLOCK D TASKS: 1 - 2 - 3 - 4 LEVEL: A - B - C - D - Modified ( ) Primary ( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ______
( ) APR: ______
( ) Cartridge: ______
( ) Escape Mask: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
( ) Hard Hat: ______
( ) Other: ______

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ______

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
( ) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Gloves: ( ) Not Needed
( ) Undergloves: ______
( ) Gloves: ______
( ) Overgloves: ______
( ) Other - **Specify**

HEALTH AND SAFETY PLAN FORM

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MONITORING EQUIPMENT: Specify by task. Indicate type as necessary. Attach additional sheets as necessary.

INSTRUMENT	TASK	ACTION GUIDELINES	COMMENTS (Includes schedules of use)
Combustible Gas Indicator	1 - 2 - 3 - 4	0-10% LEL No explosion hazard. 10-25% LEL Potential explosion hazard; notify SHSC. >25% LEL Explosion hazard; interrupt task/evacuate 21.0% O_2 Oxygen normal. <21.0% O_2 Oxygen deficient; notify SHSC. <19.5% O_2 Interrupt task/evacuate	( ) Not Needed Continuous monitoring.
Radiation Survey Meter	1 - 2 - 3 - 4	3X Background: Notify SHSC >2mR/hr: Interrupt task/evacuate	(x) Not Needed Note: Annual exposure not to exceed or 50 urem/hr average
Photionization Detector Type ______	1 - 2 - 3 - 4 ( ) 11.7 ev (x) 10.2 ev ( ) 9.8 ev ( ) ___ ev	Specify: 0-1 ppm above background - Level D 1-5 ppm above background - go upwind and evaluate the situation > 5 ppm above background - evacuate area until situation is evaluated and proper PPE determined.	(x) Use continuously on site. ( ) Not Needed Continuously monitor breathing zone.
Flame Ionization Detector Type ______	1 - 2 - 3 - 4	Specify:	(x) Not Needed
Detector Tubes/ Monitox Type ______ Type ______	1 - 2 - 3 - 4	Specify:	(x) Not Needed
Respirable Dust Monitor Type ______ Type ______	1 - 2 - 3 - 4	Specify:	(x) Not Needed
Other Specify Sensodyne tubes for benzene	1 - 2 - 3 - 4	Specify: < 1 ppm continue monitoring > 1 ppm upgrade to Level C	Check when PID > 1 ppm above backgoround. Check periodically and with every 2 ppm increase thereafter. Page 8 of 11

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DECONTAMINATION PROCEDURES		
ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, AND SUPPORT ZONES		
<u>Personalized Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. See Attachment 2 for Personnel Decontamination. ( ) Not needed	<u>Sampling Equipment Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP. ( ) Not needed	<u>Heavy Equipment Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP and Attachment 3. ( ) Not needed
<u>Containment and Disposal Method</u> See Section 4.25 of the SAP.	<u>Containment and Disposal Method</u> See Section 4.25 of the SAP.	<u>Containment and Disposal Method</u> See Section 4.25 of the SAP. Page 9 of 11

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EMERGENCY CONTACTS

Water Supply	Will be determined prior to the site investigation.
Telephone	
Radio	
Other (specify)	

CONTINGENCY PLANS Summarize below:

HEALTH AND SAFETY PLAN APPROVALS

Prepared by ______________________ Date ________

SHSC Signature ______________________ Date ________

HSM Signature ______________________ Date ________

EMERGENCY CONTACTS	NAME	PHONE:
24-Hour Emergency Line		
Health and Safety Manager		
Project Manager	To be determined prior to field work.	
Site Health and Safety Coordinator		
EMO Contact		
Other (specify)		
State Environmental Agency	N/A	
Base Spill Contractor	Fire Department	ext. 47964
Fire Department		ext. 47964
Base Security		ext. 43768
State Police (Highway Patrol)		405-682-4343
Health Department (State)	Hal Cantwell	405-271-7158
Poison Control Center (Oklahoma City)		405-271-5454

MEDICAL EMERGENCY

Hospital Name: Base Hospital phone: ext. 43768

Hospital Address: Bldg. 5801

Name of Contact at Hospital:

Name of 24-Hour Ambulance: Base Fire Department phone: ext. 47964

Route to Hospital: (Attach map with route to hospital)

Go south to 59th Street. Go east (left) on 59th Street to Patrol Rd. Turn right (south) on Patrol Rd. and follow it around the installation boundary and north to Arnold St. Go west (left) on Arnold Street to the hopital.

Distance to hospital 5 miles

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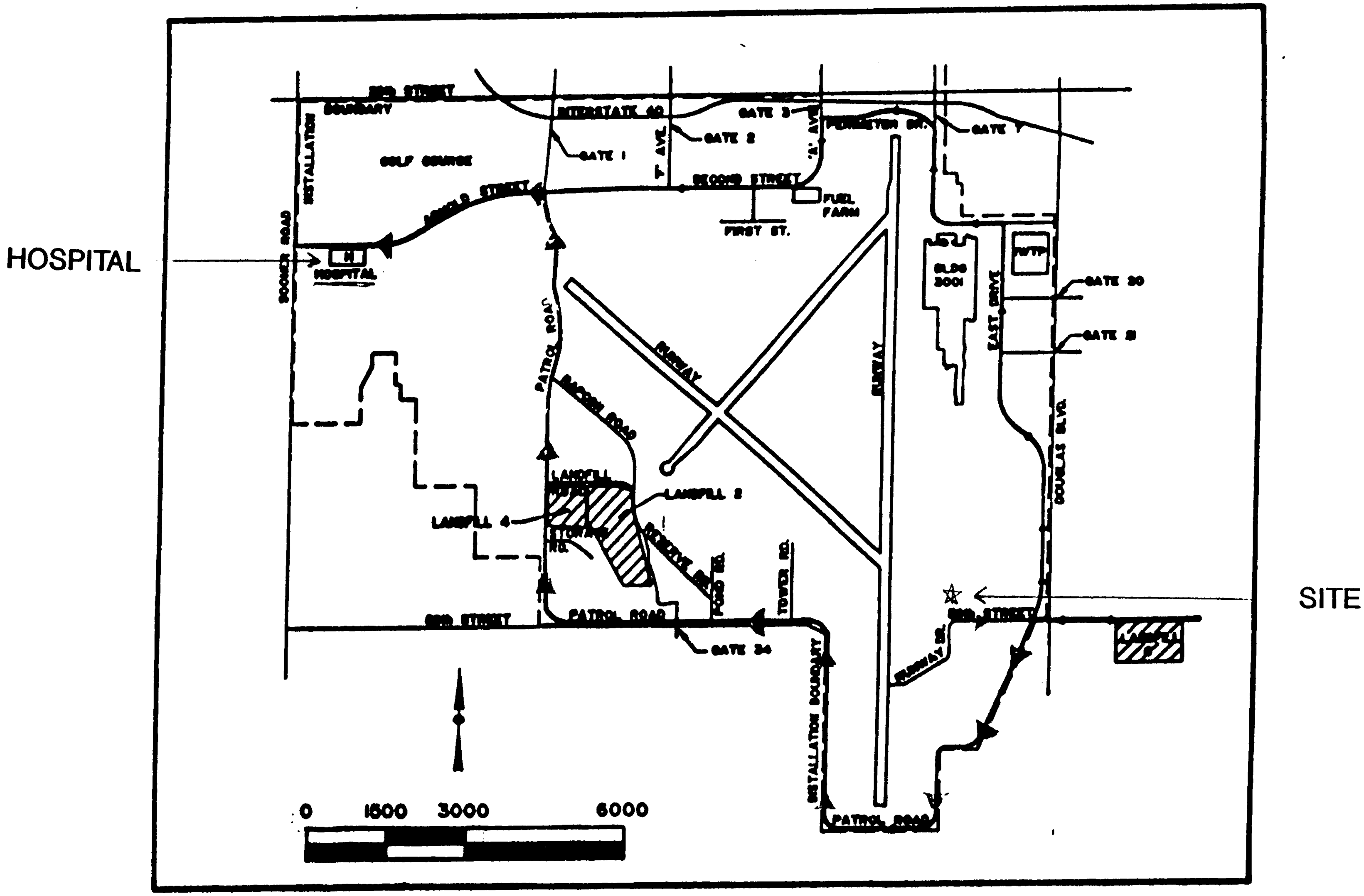

LOCATION PLAN

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PROJECT DOCUMENT #: ________

PROJECT NAME RFI Work Plan

JOBSITE ADDRESS Tinker AFB

SITE CONTACT ________

PHONE # ________

WORK ASSIGNMENT # WBS 0401

REGION FPC/DEN

CLIENT Battelle Environmental Management Operations

PROJECT # 7902-025-HS-FPCX

CLIENT CONTACT Steve Kowall

PHONE # (509) 376-8322

All the information contained in this form must be updated and HSP must be approved prior to implementation of any field work.

OBJECTIVES: Summarize below

The objective of the RCRA Facility Investigation (RFI) is to characterize the nature, extent, and rate of migration of suspected releases of hazardous chemicals.

TYPE: Check as many as applicable

(x) Active	( ) Landfill	( ) Unknown
( ) Inactive	( ) Uncontrolled	( ) Other specify
(x) Secure	(x) Industrial	
( ) Unsecure	( ) Recovery	
( ) Enclosed space	( ) Well Field	

DESCRIPTION AND FEATURES: Summarize below. Include principal operations and unusual features (containers, buildings, dykes, power line, terrain, etc.)

The HCl Tank is located inside the western portion of Building 3001 in the Electroplating Facility. It is a 4,000 gal tank which contained aqueous hydrochloric acid (HCl) which sits on a concrete floor. Apparently a small portion of concrete is eroded. Just south of the tank is an electrical tunnel or vault. See the Site Investigation Plan for more details.

SURROUNDING POPULATION: ( ) Residential (x) Industrial ( ) Rural ( ) Urban ( ) OTHER:

Page 1 of 11

THIS PAGE RESERVED FOR MAP

A site reconnaissance will be performed and a site map will be produced by the contractor performing the work prior to implementing other field activities.

HEALTH AND SAFETY PLAN FORM

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HISTORY: Summarize below. In addition to history, include complaints from public, previous agency actions, known exposures or injuries, etc.

On December 12, 1990 a rupture in a check plate on the tank was discovered. Approximately 540 gallons of HCl was released into the electrical conduit and an unknown amount was released into surrounding soil. A mild sodium bicarbonate solution was put into manholes and allowed to sit for a few days. The manholes were the flushed daily with fresh water. On February 6, 1991 eight barrels of soil were removed from the spill area and disposed of. See the Site Investigation Plan for more details.

WASTE TYPES: (x) Liquid ( ) Solid ( ) Sludge ( ) Gas ( ) Unknown ( ) Other specify:

WASTE CHARACTERISTICS: Check as many as applicable.

(x) Corrosive	( ) Flammable	( ) Radioactive
( ) Toxic	( ) Volatile	( ) Reactive
( ) Inert	( ) Unknown	( ) Other specify:

HAZARDS OF CONCERN:

( ) Heat Stress attach guidelines	( ) Noise
( ) Cold Stress attach guidelines	(x) Inorganic Chemicals
( ) Explosive/Flammable	( ) Organic Chemicals
( ) Oxygen Deficient	( ) Other specify:
( ) Radiological	
( ) Biological	

PRINCIPLE DISPOSAL METHODS AND PRACTICES: **Summarize below:**

A ruptured check plate allowed hydrochloric acid to leak out. The acid leaked through eroded concrete and into the soil.

HEALTH AND SAFETY PLAN FORM

CDM FPC Health and Safety Program

This document is for the exclusive use of CDM FPC, U.S. EPA, TES/ARCS/HAZWRAP team firms, and their subcontractors.

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HAZARDOUS MATERIAL SUMMARY: Circle waste type and estimate amounts by category

CHEMICALS: Amount/Units:	SOLIDS: Amounts/Units:	SLUDGES: Amounts/Units:	SOLVENTS: Amounts/Units:	OILS: Amounts/Units:	OTHER: Amounts/Units:
Acids	Flyash	Paint Pigments	Halogenated Solvents	Oily Wastes	Laboratory
Pickling Liquors	Asbestos	Metal Sludges	Non-halogenated Solvents	Other - Specify:	Pharmaceutical
Caustics	Milling/Mine Tailings	POTW Sludge	Other - Specify:		Hospital
Pesticides	Ferrous Smelter	Aluminum			Radiological
Dyes/Inks	Non-ferrous Smelter	Other - Specify:			Municipal
Cyanides	Other - Specify:				Other - Specify:
Phenols					
Halogens					
PCBs					
Metals					
Other - Specify:					

OVERALL HAZARD EVALUATION: ( ) High ( ) Medium (x) Low ( ) Unknown (Where tasks have different hazards, evaluate each. Attach additional sheets if necessary)

JUSTIFICATION: The spill of December 1990 has been neutralized and cleaned up by base personnel, only residual soil contamination remains.

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium (x) Low ( ) Unknown

BACKGROUND REVIEW: (x) COMPLETE ( ) INCOMPLETE

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KNOWN CONTAMINANTS	HIGHEST OBSERVED CONCENTRATION (specify units and media)	PEL/TLV ppm or mg/m3 (specify)	IDLH ppm or mg/m3 (specify)	WARNING CONCENTRATION ppm	SYMPTOMS/EFFECTS OF ACUTE EXPOSURE	PHOTOIONIZATION POTENTIAL
HCL	26 ppm on 02/12/91 (water from manhole 308A)	5 ppm (ceiling)	100 ppm	10 ppm	Inflamm nose, throat, cough, burns throat, choking; burns eyes, skin; derm.	12.74 eV

NA = Not Available NE = None Established U = Unknown

S = Soil SW = Surface Water T = Tailings F = Flyash TK = Tanks
A = Air GW = Groundwater SL = Sludge D = Drums L = Lagoon

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FIELD ACTIVITIES COVERED UNDER THIS PLAN

TASK DESCRIPTION/SPECIFIC TECHNIQUE-STANDARD OPERATING PROCEDURES/SITE LOCATION (attach additional sheets as necessary)	TYPE	LEVEL OF PROTECTION Primary	LEVEL OF PROTECTION Contingency	SCHEDULE
1 Drilling/subsurface soil sampling	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	To be announced.
2	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	
3	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	
4	Intrusive Non-Intrusive	A B C D Modified	A B C D Modified	

PERSONNEL* AND RESPONSIBILITIES (Include subcontractors)

NAME	FIRM/REGION	OSHA TRAINING CERTIFICATION	RESPONSIBILTIES	On site?
PROJECT MANAGER			COORDIANTE OVERALL HEALTH AND SAFETY	1 - 2 - 3 - 4
SITE HEALTH AND SAFETY COORDINATOR			COORDINATE HEALTH AND SAFETY FOR THIS SITE	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
STAFF			PERFORM FIELD ACTIVITIES	1 - 2 - 3 - 4
				1 - 2 - 3 - 4
				1 - 2 - 3 - 4

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PROTECTIVE EQUIPMENT: Specify by task. Indicate type and/or material as necessary. Uses copies of this sheet if needed.

BLOCK A TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
(x) Primary
( ) Contingency

Respiratory: (X) Not Needed
( ) SCBA, Airline: ______
( ) APR: ______
( ) Cartridge: ______
( ) Escape Mask: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
(x) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
(x) Hard Hat: ______
(x) Other: Hearing protection if necessary

Boots: ( ) Not Needed
(x) Boots: Leather steel-toed work boots
( ) Overboots: ______

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
( ) Tyvek Coverall: ______
( ) Saranex Coverall: ______
(x) Coverall: Polyethylene coated
( ) Other: ______

Gloves: ( ) Not Needed
(x) Undergloves: Latex
(x) Gloves: Neoprene
( ) Overgloves: ______
( ) Other - Specify

BLOCK B TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
( ) Primary
(x) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ______
(x) APR: ______
(x) Cartridge: ______
( ) Escape Mask: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
(x) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
(x) Hard Hat: ______
(x) Other: Hearing protection if necessary

Boots: ( ) Not Needed
(x) Boots: steel-toe
( ) Overboots: ______

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
( ) Tyvek Coverall: ______
( ) Saranex Coverall: ______
(x) Coverall: Polyethylene coated
( ) Other: ______

Gloves: ( ) Not Needed
(x) Undergloves: Latex
(x) Gloves: Neoprene
( ) Overgloves: ______
( ) Other - Specify

BLOCK C TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
( ) Primary
( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ______
( ) APR: ______
( ) Cartridge: ______
( ) Escape Mask: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
( ) Hard Hat: ______
( ) Other: ______

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ______

Prot. Clothing ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
( ) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Gloves: ( ) Not Needed
( ) Undergloves: ______
( ) Gloves: ______
( ) Overgloves: ______
( ) Other - Specify

BLOCK D TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
( ) Primary
( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline: ______
( ) APR: ______
( ) Cartridge: ______
( ) Escape Mask: ______
( ) Other: ______

Head and Eye: ( ) Not Needed
( ) Safety Glasses: ______
( ) Face Shield: ______
( ) Goggles: ______
( ) Hard Hat: ______
( ) Other: ______

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed work boots
( ) Overboots: ______

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit: ______
( ) Splash Suit: ______
( ) Apron: ______
( ) Tyvek Coverall: ______
( ) Saranex Coverall: ______
( ) Coverall: ______
( ) Other: ______

Gloves: ( ) Not Needed
( ) Undergloves: ______
( ) Gloves: ______
( ) Overgloves: ______
( ) Other - Specify

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MONITORING EQUIPMENT: Specify by task. Indicate type as necessary. Attach additional sheets as necessary.

INSTRUMENT	TASK	ACTION GUIDELINES		COMMENTS (Includes schedules of use)
Combustible Gas Indicator	1 - 2 - 3 - 4	0-10% LEL 10-25% LEL >25% LEL 21.0% O_2 <21.0% O_2 <19.5% O_2	No explosion hazard. Potential explosion hazard; notify SHSC. Explosion hazard; interrupt task/evacuate Oxygen normal. Oxygen deficient; notify SHSC. Interrupt task/evacuate	(x) Not Needed
Radiation Survey Meter	1 - 2 - 3 - 4	3X Background: >2mR/hr:	Notify SHSC Interrupt task/evacuate	(x) Not Needed Note: Annual exposure not to exceed or 50 urem/hr average
Photionization Detector Type ______	1 - 2 - 3 - 4 ( ) 11.7 ev ( ) 10.2 ev ( ) 9.8 ev ( ) ____ ev	Level D: Level C:	Background Greater than background but less than 5 ppm above background If reading is greater than 5 ppm above background, exit area.	( ) Use continuously on site. (x) Not Needed
Flame Ionization Detector Type ______	1 - 2 - 3 - 4	Specify:		(x) Not Needed
Detector Tubes/ Monitox Type HCl Type ______	1 - 2 - 3 - 4	Specify: > 3 ppm evacuate area and evaluate the situation		( ) Not Needed
Respirable Dust Monitor Type ______ Type ______	1 - 2 - 3 - 4	Specify:		(x) Not Needed
Other Specify	1 - 2 - 3 - 4	Specify:		

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DECONTAMINATION PROCEDURES		
ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, AND SUPPORT ZONES		
<u>Personalized Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. See Attachment 2 for Personnel Decontamination ( ) Not needed	<u>Sampling Equipment Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP. ( ) Not needed	<u>Heavy Equipment Decontamination</u> Summarize below and/or attach diagram; discuss use of work zones. See Section 4.24 of the SAP and Attachment 3. ( ) Not needed
<u>Containment and Disposal Method</u> See Section 4.25 of the SAP.	<u>Containment and Disposal Method</u> See Section 4.25 of the SAP.	<u>Containment and Disposal Method</u> See Section 4.25 of the SAP. **Page 9 of 11**

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EMERGENCY CONTACTS

Water Supply	Will be determined prior to the site investigation.
Telephone	
Radio	
Other (specify)	

CONTINGENCY PLANS Summarize below:

HEALTH AND SAFETY PLAN APPROVALS

Prepared by ______________________ Date ________

SHSC Signature ______________________ Date ________

HSM Signature ______________________ Date ________

EMERGENCY CONTACTS	NAME	PHONE:
24-Hour Emergency Line		
Health and Safety Manager		
Project Manager	To be determined prior to field work.	
Site Health and Safety Coordinator		
EMO Contact		
Other (specify)		
State Environmental Agency	N/A	
Base Spill Contractor	Fire Department	ext. 47964
Fire Department		ext. 47964
Base Security		ext. 43768
State Police (Highway Patrol)		405-682-4343
Health Department (State)	Hal Cantwell	405-271-7158
Poison Control Center (Oklahoma City)		405-271-5454

MEDICAL EMERGENCY

Hospital Name: Base Hospital phone: ext. 43768

Hospital Address: Bldg. 5801

Name of Contact at Hospital:

Name of 24-Hour Ambulance: Base Fire Department phone: ext. 47964

Route to Hospital: (Attach map with route to hospital)

Go north on East Drive until it ends, then turn left (west). Turn right (north) on Industrial Blvd., then turn left (west) on Perimeter Drive, left (south) on "A" Avenue, and right (west) on Second St. Go west on Second Street (it turns into Arnold Street at Patrol Rd) until you reach the hospital.

Distance to hospital < 4 miles

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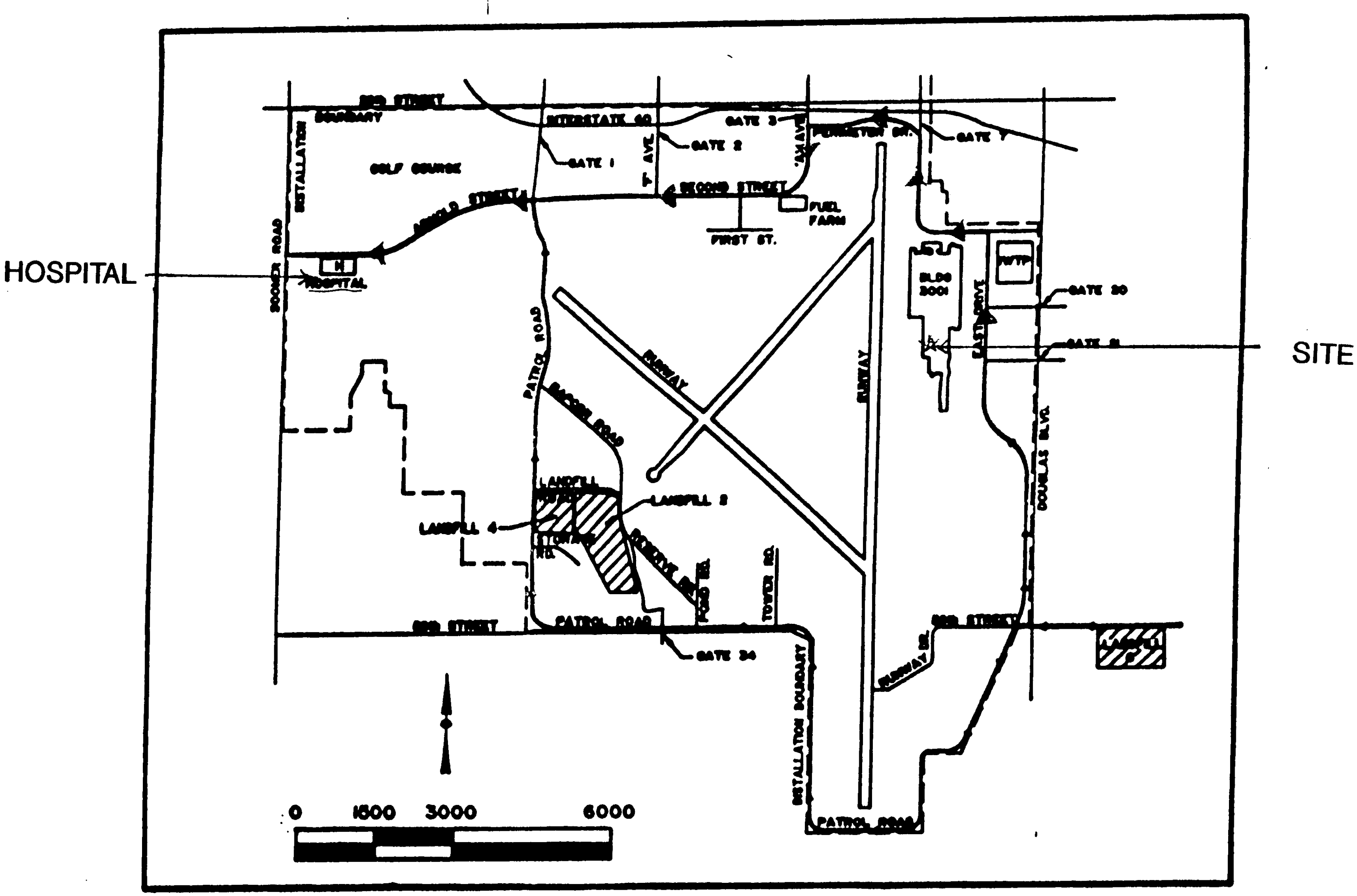

LOCATION PLAN

ATTACHMENT 1

SAMPLE LYME DISEASE POLICY

Gene Czyzewski

CDM FEDERAL PROGRAMS CORPORATION

MAY 1 3 REC'D

MEMORANDUM

TO:	Office Health and Safety Officers
FROM:	Jonathan G. Curtis/Andrew P. Szilagyi
AUTHORIZED:	Peter W. Tunnicliffe
DATE:	10 May 1991
SUBJECT:	LYME DISEASE (INTERIM POLICY) (Version F-1)
CC:	C. Braun, M. Malloy, S. Paquette

The purpose of this memorandum and attachments regarding Lyme disease is to increase awareness of the potential dangers associated with Lyme disease, and to establish interim policy for all CDM Federal Programs Corporation (FPC) field personnel. Because of the increase in field activities during early spring, summer, and fall months, the potential for contacting this disease becomes a significant concern.

In addition to the information contained herein, FPC Health and Safety has a 13-minute video on the hazards of Lyme disease which will shortly be sent to each office. All field personnel should view the tape. Additionally, Tick Identification Cards are enclosed. Please ensure that all field personnel receive a copy of this card.

Lyme disease is a multisystem bacterial infection transmitted by the bite of the deer tick in the northeastern and central states, by the mouse tick on the Pacific coast, and by the black-legged tick in the southeastern states. Caused by a bacteria, Lyme disease has three clinical stages that can overlap or occur alone, including: Stage One -- early disease includes a characteristic expanding skin lesion and constitutional flu-like symptoms; Stage Two -- cardiac and neurological disease; and Stage Three -- arthritis and chronic neurological syndromes. As in other bacterial infections, antibiotic therapy is most effective early in the illness.

Lyme disease is currently the most prevalent tick-borne illness in the United States. In 1987, 2,368 cases were reported to the Centers for Disease Control (CDC), a number that nearly doubled in 1988, rising to 4,572. In 1989, another significant increase in the reported cases was noted with over 7,000 new cases. Recent best estimates indicate as many as 5,000 to 15,000 new cases occurring annually in the United States.

Based on 1987 and 1988 data from CDC, transmission of Lyme disease has been reported in 43 states, with more than half of all reported cases occurring in New York. Two suburban counties of New York City (Westchester and Suffolk) accounted for 77.5% of the state's cases and approximately 44% of cases nationwide. In the interior of the nation, only Wisconsin and Minnesota reported large numbers of cases. Lyme disease is rare in areas west of the central plains, except on the Pacific coast. The seven states where Lyme disease has not been recognized all lie in the great plains, mountain, and Pacific regions and include: Nebraska, Montana, Wyoming, New Mexico, Arizona, Hawaii, and Alaska. The lack of documented cases in any state or location must be used with caution however; nationwide surveillance statistics show a progressive increase in reported cases.

The seasonal distribution of cases differs between regions. In the northeast and north central regions, 78% of patients with Lyme disease had an onset of illness from May through August (these are general incident distributions; CDM has had three documented cases occuring during February and March). In the Pacific region, only 46% of patients had an onset of illness in these months, with the remaining majority of cases occurring from September through April. Additionally, in the north-central region, a significantly higher percentage of cases had onsets in May than was observed in the northeast region.

As determined by the FPC Health and Safety Manager, on a case-by-case basis and as identified in each Site Health and Safety Plan, the procedures specified in Attachment A, are applicable to all FPC field personnel working on appropriate and designated sites. Attachment A, is provided in a format consistent with its inclusion in Site Health and Safety Plans. Attachment B provides Environmental Medicine Resource's Policy statement regarding Lyme disease, and Attachment C presents a general overview of Lyme disease.

Should you have any questions or comments concerning this information, please do not hesitate to contact Andrew Szilagyi at FPC HDQs (703) 968 0900.

10 May 1991

ATTACHMENT A

FPC PROCEDURES FOR THE MINIMIZATION/PREVENTION OF LYME DISEASE

INTERIM POLICY

To minimize/prevent the occurrence of Lyme disease, the following mandatory protocols have been developed, and shall normally be used on a case-by-case basis by all FPC field personnel working in, or near, areas of high grass (defined here as reaching past the ankle), or in brush (defined as any area where the leaves of trees or shrubs are present at heights between 6 inches and 8 feet), and as specified in each site specific Site Health and Safety Plan.

1) Wear light colored clothes and underclothes to help you see ticks easier; Look for a "freckle that moves".

2) If you have any contact with grass or brush, wear a disposable coverall (Tyvek, Saranex, or Kleen-Guard), taped at the ankles and wrists, even when no chemical hazards exist.

3) Spray your clothing and coverall with "Permanone"[1] a commercially available tick repellent [Safety Tech Co. (904) 282 1200)] containing permethrin (avoid inhaling the vapors). DO NOT USE PERMANONE DIRECTLY ON SKIN. Currently available insect repellents for application to the skin ("Off!", "Deep Woods", and others), contain N,N-diethyl-m-toluamide, commonly called DEET[2]. Material Safety Data Sheets (MSDSs) for both DEET and Permanone are provided as Exhibits A-1 and A-2. Repellents containing less than 50% DEET can be used directly on the skin; formulations containing high concentrations of DEET should be used sparingly, if at all, on the skin, but can be used on outer

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1. Permanone, actually a pesticide rather than a repellent, is an aerosol spray; non-staining; nearly odorless; and resistant to degradation by light, heat, or immersion in water. The chemical ingredient, permethrin, is toxic to the nervous system of insects, but is poorly absorbed by humans and then rapidly inactivated by ester hydrolysis. Objective signs of skin toxicity such as edema, erythema, and rash have been uncommon but reported; adverse systemic effects have not been reported.

2. DEET repels ticks but does not kill them. It is absorbed through the skin into the systemic circulation. Toxic and allergic reactions have been reported. DEET has been associated with blistery eruptions in the antecubital fossa (area below and in front of the elbow) and contact urticaria (eruption of hives characterized by severe itching). Toxic encephalopathy has occurred with excessive or prolonged use, especially in children. It is important to note that these symptoms are rare and have occurred only at high concentrations and after repeated use.

clothing alone or together with Permanone. Be sure to apply any tick repellent to the shoe tops, socks, and pants cuffs, the areas most accessible to ticks. Prior to use of either repellent, personnel must read any literature accompanying the sprays, and follow all directions.

4) After use, remove, wash (at a high temperature), and dry clothing worn under Tyveks.

5) Immediately after site work, check yourself and other team members for ticks which may have crawled on your clothes and skin several hours prior to biting.

6) Remove attached ticks with fine tweezers by gently, repeatedly, and patiently tugging at the point where their mouth parts entered the skin. Pull the tick straight out; do not jerk, twist, or burn the tick off since the head may remain embedded. **DO NOT GRASP OR SQUEEZE THE TICK BY ITS BODY BECAUSE THIS MAY FORCE ANY FLUID FROM THE TICK INTO THE PERSON'S BODY.** After removal, disinfect the bite with rubbing alcohol, povidone iodine (Betadine), or other disinfectant contained in the FPC first aid kit.

7) Capture any tick you find on your clothes and/or skin for examination by medical personnel. If the tick is still alive, put it in a small jar with a moist paper towel inside, screw on the cover, and put it in the refrigerator. If the tick is dead, preserve it in a small jar of alcohol for identification in case symptoms develop later. (At a minimum and if time/supplies are limited, affix any tick to a piece of paper with clear tape, or place it in a tightly sealed jar in the refrigerator.) DO NOT HANDLE TICKS; SPIROCHETES CAN ENTER THE BODY THROUGH BREAKS IN THE SKIN.

8) Contact Andrew Szilagyi at FPC HDQ, who will in turn contact Dr. Barnes (EMR) for a recommendation on performing a Lyme titer (test). If Andrew Szilagyi is not available, contact Dr. Barnes directly (1-800-229-3674).

9) Whether you detect a tick bite or not, check your skin (and especially the bite area, if detected) for at least 4 weeks after you work in a Lyme-suspect area, to see if a rash develops.

10) Report all tick bites and work in Lyme-suspect areas on your monthly incident/exposure report.

EXHIBIT A-1

MSDS FOR DEET

SUBSTANCE IDENTIFICATION

CAS-NUMBER 134-62-3
RTEC-NUMBER XS3675000

SUBSTANCE: DEET

TRADE NAMES/SYNONYMS:
BENZAMIDE, N,N-DIETHYL-3-METHYL-: M-TOLUAMIDE, N,N-DIETHYL-: N,N-DIETHYL-3-METHYLBENZAMIDE: N,N-DIETHYL-M-TOLUAMIDE: DIETHYL-M-TOLUAMIDE: M-TOLUIC ACID DIETHYLAMIDE: DIETHYLTOLUAMIDE: DET: M-DETA: DELTA: AUTAN: M-DELPHENE: DETAMIDE: DIELTAMID: FLYPEL: METADELPHENE: OFF (FORMULATION): ENT 20218: C12H17NO: OHS84230

CHEMICAL FAMILY:
AMIDE, AROMATIC

MOLECULAR FORMULA: C-H3-C6-H4-C-O-N-(C2-H5)2 MOLECULAR WEIGHT: 191.27

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=1 REACTIVITY=0 PERSISTENCE=1
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=1 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: DEET CAS# 134-62-3 PERCENT: 100.0

EXPOSURE LIMIT:
NO OCCUPATIONAL EXPOSURE LIMITS ESTABLISHED BY OSHA, ACGIH, OR NIOSH.

PHYSICAL DATA

DESCRIPTION: COLORLESS TO AMBER, HYGROSCOPIC, OILY LIQUID WITH A MILD CHARACTERISTIC ODOR.

BOILING POINT: 320 F (160 C) @ 19 MMHG
SPECIFIC GRAVITY: 0.996 @ 25 C

EVAPORATION RATE: (BUTYL ACETATE=1) <1
SOLUBILITY IN WATER: PRACTICALLY INSOLUBLE

VAPOR DENSITY: 6.7
VAPOR PRESSURE: 0.0019 MMHG @ 160 C

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ETHANOL, ETHER, ISOPROPANOL, CHLOROFORM, CARBON DISULFIDE, ALCOHOL, BENZENE, PROPYLENE GLYCOL, COTTONSEED OIL, KETONES, PETROLEUM DISTILLATES; SPARINGLY SOLUBLE IN PETROLEUM ETHER AND GLYCERIN.

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD
SLIGHT FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

FLASH POINT: 311 F (155 C) (OC)   FLAMMABILITY CLASS (OSHA): IIIB

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY OR REGULAR FOAM (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR REGULAR FOAM (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF YOU CAN DO IT WITHOUT RISK. DO NOT SCATTER SPILLED MATERIAL WITH HIGH-PRESSURE WATER STREAMS. DIKE FIRE-CONTROL WATER FOR LATER DISPOSAL (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5, GUIDE PAGE 31).

USE AGENTS SUITABLE FOR TYPE OF SURROUNDING FIRE. AVOID BREATHING HAZARDOUS VAPORS, KEEP UPWIND.

TOXICITY

DEET:
IRRITATION DATA: 500 MG SKIN-RABBIT MODERATE; 100 MG EYE-RABBIT; 10 MG EYE-RABBIT MODERATE.
TOXICITY DATA: 5950 MG/M3 INHALATION-RAT LC50; 35 MG/KG/5 DAYS SKIN-HUMAN TDLO; 3180 MG/KG SKIN-RABBIT LD50; 5000 MG/KG SKIN-RAT LD50; 3170 MG/KG SKIN-MOUSE LD50; 4750 MG/KG ORAL-CHILD TDLO; 950 MG/KG ORAL-WOMAN LDLO; 950 MG/KG ORAL-WOMAN TDLO; 679 MG/KG ORAL-MAN LDLO; 1950 MG/KG ORAL-RAT LD50; 1584 MG/KG ORAL-RABBIT LD50; 75 MG/KG INTRAVENOUS-RABBIT LDLO; 1170 UG/KG UNREPORTED-MOUSE LD50; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS).
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: IRRITANT- EYE.
ACUTE TOXICITY LEVEL: TOXIC BY INHALATION; MODERATELY TOXIC BY INGESTION; SLIGHTLY TOXIC BY DERMAL ABSORPTION.
TARGET EFFECTS: POISONING MAY AFFECT THE CENTRAL NERVOUS SYSTEM.
ADDITIONAL DATA: MAY BE EXCRETED IN BREAST MILK.

HEALTH EFFECTS AND FIRST AID

INHALATION:
DEET:
TOXIC.
ACUTE EXPOSURE- TEMPORARY IRRITATION AND BEHAVIORAL CHANGES WERE NOTED IN ANIMALS EXPOSED TO DEET. THE LC50 REPORTED IN RATS WAS 5950 MG/M3.
CHRONIC EXPOSURE- AN INCREASED INCIDENCE OF SPERM HEAD ABNORMALITIES AND PERIODIC NAUSEA, VOMITING, AND NASAL EXUDATE WERE OBSERVED IN ANIMALS FOLLOWING CHRONIC EXPOSURE.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
DEET:
ACUTE EXPOSURE- APPLICATION OF UNDILUTED MATERIAL AND 50% SOLUTION TO HUMAN SKIN CAUSED NO PRIMARY IRRITATION OR SENSITIZATION. CENTRAL NERVOUS SYSTEM DISORDERS OF EXCITATION, STIFFNESS OF MOVEMENT AND LACK OF COORDINATION WERE OBSERVED IN MICE FOLLOWING APPLICATION OF DEET.
CHRONIC EXPOSURE- REPEATED APPLICATION TO HUMAN SKIN RESULTED IN SLIGHT IRRITATION AND DRYNESS OF THE FACE, DESQUAMATION AROUND THE NOSE, AND A SLIGHT TINGLING SENSATION. RARE INCIDENCES OF SPORADIC ALLERGIC REACTIONS AND DERMATITIS INCLUDING ANAPHYLAXIS AND SCARRING BULLOUS DERMATITIS HAVE OCCURRED. ENCEPHALOPATHY AND NEUROLOGIAL SYMPTOMS OF MUSCLE CRAMPS, URINARY HESITATION, INSOMIA, ABNORMAL SWEATING, IRRITABILITY, DEPRESSION, PARANOIA, EPISODES OF CONFUSION, AND AGRRESSIVE BEHAVIOR HAVE OCCURRED AMONG INDIVIDUALS REPEATEDLY EXPOSED TO DEET. THREE CASES OF POISONING IN CHILDREN RESULTED IN DEATH. MARKED HISTOPATHOLOGICAL CHANGES IN THE KIDNEY WERE OBSERVED IN RABBITS AFTER A 90-DAY EXPOSURE TO 1.3 GM/KG. EMBRYOTOXICITY FOLLOWING DERMAL APPLICATIONS OF LARGE AMOUNTS TO RABBITS WAS REPORTED IN RUSSIAN LITERATURE.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
DEET:
IRRITANT.
ACUTE EXPOSURE- UNDILUTED MATERIAL IN THE EYE MAY CAUSE MODERATE TO SEVERE IRRITATION. INSTILLATION OF DEET INTO THE EYES OF RABBITS PRODUCED EDEMA OF THE CONJUNCTIVA, LACRIMATION, CONJUNCTIVITIS, AND SOME CORNEAL INJURY; THE EYES APPEARED NORMAL AFTER FIVE DAYS.
CHRONIC EXPOSURE- IN RABBITS, REPEATED EXPOSURE TO A 71% AEROSOL OR CONCENTRATED MATERIAL RESULTED IN IRRITATION OF THE CONJUNCTIVAL EPITHELIUM AND CORNEAL OPACIFICATION.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL

REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
DEET:

ACUTE EXPOSURE- EFFECTS OF IRRITABILITY, BIZARRE MOVEMENT, DEPRESSED MUSCLE STRETCH REFLEXES, HYPOTENSION, SEIZURES AND COMA WERE REPORTED FROM CASES OF HUMAN INGESTION. IN SOME INSTANCES, THESE EFFECTS WERE RAPID AND RESULTED IN DEATH. INGESTION IN ANIMALS PRODUCED LACRIMATION, CHROMODACRYORRHEA, CENTRAL NERVOUS SYSTEM DEPRESSION, LOSS OF RIGHTING REFLEXES, LABORED RESPIRATION, TREMORS, COMA AND TERMINAL CONVULSIONS. RESPIRATORY FAILURE USUALLY PRECEDED CARDIAC FAILURE.

CHRONIC EXPOSURE- HYPERTROPHY OF THE KIDNEYS AND LIVER AND EFFECTS OF MILD CENTRAL NERVOUS SYSTEM STIMULATION INCLUDING TREMORS AND HYPERACTIVITY WERE NOTED IN ANIMALS FOLLOWING REPEATED EXPOSURE. SIGNIFICANT TESTICULAR HYPERTROPHY WAS OBSERVED IN MALE RATS REPEATEDLY FED A DIET CONTAINING FROM 48 TO 531 MG/KG/DAY.

FIRST AID- IF THE PERSON IS CONSCIOUS AND NOT CONVULSING, REMOVE BY GASTRIC LAVAGE AND FOLLOW WITH A CATHARTIC (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GASTRIC LAVAGE SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES. SLOWLY HYDROLYZES IN CONTACT WITH WATER.

INCOMPATIBILITIES:
DEET:

OXIDIZERS (STRONG): MAY CAUSE FIRE AND EXPLOSION HAZARD.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON AND NITROGEN.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN ACCORDANCE WITH 40 CFR 165 RECOMMENDED PROCEDURES FOR THE DISPOSAL AND STORAGE OF PESTICIDES AND PESTICIDE CONTAINERS.

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH 40 CFR 165 RECOMMENDED PROCEDURES FOR THE DISPOSAL AND STORAGE OF PESTICIDES AND PESTICIDE CONTAINERS.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. AVOID CONTACT WITH STRONG OXIDIZERS, EXCESSIVE HEAT, SPARKS, OR OPEN FLAME.

SPILLS AND LEAKS

OCCUPATIONAL-SPILL:
STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CLEAN, DRY CONTAINERS FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST VENTILATION SYSTEM.

RESPIRATOR:
THE FOLLOWING RESPIRATORS ARE RECOMMENDED BASED ON INFORMATION FOUND IN THE PHYSICAL DATA, TOXICITY AND HEALTH EFFECTS SECTIONS. THEY ARE RANKED IN ORDER FROM MINIMUM TO MAXIMUM RESPIRATORY PROTECTION.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST BE BASED ON THE SPECIFIC OPERATION, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND MUST BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY

AND HEALTH ADMINISTRATION (NIOSH-MSHA).

ANY CHEMICAL CARTRIDGE RESPIRATOR WITH PESTICIDE CARTRIDGE.

ANY GAS MASK WITH A PESTICIDE CANISTER (CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER).

ANY TYPE 'C' SUPPLIED-AIR RESPIRATOR OPERATED IN THE PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE OR CONTINUOUS-FLOW MODE.

ANY SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

ANY SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

ANY SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE.

EMERGENCY EYE WASH: WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 04/07/87 REVISION DATE: 12/03/90

****

EXHIBIT A-2

MSDS FOR PERMANONE

MATERIAL SAFETY DATA SHEET

I. PRODUCT IDENTIFICATION

MANUFACTURED FOR:

SAFETY TECH CO.
P.O. Box 869
MIDDLEBURG, FLORIDA 32068
(904) 282-1200

DATE OF LATEST REVISION: June 4, 1987

EMERGENCY TELEPHONE NO: 215-253-0167
BUSINESS TELEPHONE NO: 215-253-0167

TRADE NAME:
PERMANONE(R) Tick Repellent

CODE NO: 80812-00101

EPA REGISTRATION NO:
SEE SECTION IX, LABELING

EPA ESTABLISHMENT NO:
10900-OH-1

CHEMICAL NAME: NA

COMMON NAME: NA

II. HAZARDOUS INGREDIENTS

CHEMICAL NAME	CAS NO.	PERCENT	EXPOSURE LIMITS IN AIR ACGIH(TLV)	OSHA(PEL)
*Permethrin	52645-53-1	0.50	NE	NE
Inert Ingredients	NA	99.50	NA	NA

*(3-phenoxyphenyl)methyl (±) cis/trans 3-(2,2-dimethyl cyclopropanecarboxylate. Cis/trans ratio: min.35% (±) cis and max.65% (±) trans.

PERMANONE - Reg. TM Fairfield American Corporation

III. PHYSICAL PROPERTIES

Vapor Density (air=1): NA
Specific Gravity: 0.792
Solubility (water): NA
Vapor Pressure,mmHg@20°C: NA
Appearance: NA
Flame Extension: Negative
Bulk Density;Settled: NA
;Fluffed: NA

Melting Pt.(or range), °F: NA
Boiling Pt.(or range), °F: NA
Solubility (oil): NA
Pounds/Gallon: NA
Odor: Pleasant, dried flower-like
Particle Size: NA
Evap. Rate (butyl acetate=1): NA
Shelf Life: 2 years

IV. FIRE AND EXPLOSION

Flash Point, (TCC), °F: NA
Autoignition Temperature, °F: NA
Flammable Limits In Air, Volume %: Lower NE Upper NE
Fire Extinguishing Materials:

___ Water Spray   x Carbon Dioxide   ___ Other
x Foam   x Dry Chemical

Special Firefighting Procedures: None

Unusual Fire and Explosion Hazards: Contents under pressure; exposure to temperatures in excess of 130°F may cause bursting.

V. HEALTH HAZARD INFORMATION

Symptoms Of Overexposure For Each Potential Route of Exposure:
Inhaled: None

Contact With Skin Or Eyes: None

Absorbed Through Skin: None

Swallowed: None

Health Effects or Risks From Exposure:
Acute: NE

Chronic: NE

First Aid; Emergency Procedures:
Eye Contact: Flush eyes with plenty of water. Contact a physician if irritation persists.

Skin Contact: Wash affected areas with soap and warm water.

If Swallowed: Contact a physician or Poison Control Center.

Suspected Cancer Agent?

x No: This product's ingredients are not found in the lists below.

___Yes: ___Federal OSHA ___NTP ___IARC ___Cal/OSHA

Notes:

VI. REACTIVITY DATA

Stability: x Stable ___Unstable
Conditions To Avoid: Do not store when Temperatures exceed 130°F.

Incompatibility (materials to avoid): None

Hazardous Decomposition Products (including combustion products):
None

Hazardous Polymerization: ___May Occur x Will Not Occur
Conditions To Avoid: None

VII. SPILL, LEAK AND DISPOSAL

Spill Response Procedures (include employee protection measures):
NA

Preparing Wastes For Disposal (container types, neutralization):
Replace cap and discard container in trash. Do not incinerate or puncture.

NOTE: Dispose Of All Wastes In Accordance With Federal, State And Local Regulations.

VIII. SPECIAL HANDLING INFORMATION

Ventilation And Engineering Controls: None

Respiratory Protection: None

Eye Protection (type): Safety glasses, goggles or face shield.
Gloves (specify material): Rubber or impervious.
Other Cothing And Equipment: Plastic apron.

Work Practices, Hygienic Practices: Follow label directions.

Other Handling And Storage Requirements: Do not puncture, incinerate or store where temperatures exceed 130°F.

IX. LABELING

Labeling; Precautionary Statements: KEEP OUT OF REACH OF CHILDREN. Do not allow children or pets to contact treated surfaces until spray has dried. Do not allow spray to contact food food, feedstuffs, or water supplies. Thoroughly wash dishes and food handling utensils contaminated with this product. Do not retreat clothing within 48 hours unless the clothing has been laundered between treatments.

Other Precautions: None

EPA SLN NO.: AR-81-0058, MO-82-0002, TN-820005, KY-820003, OK-82-0006, TX-820013, VA-820021, SC-820008, AL-820025, NE-820010, OH-820020, FL-820093, MD-830006, CO-830004, GA-830005, ND-830009, NJ-830009, WV-840003, NM-840004, MS-840018, DE-840008, LA-840016, NC-850002

X. KEY AND COMMENTS

NA = Not Applicable
NE = None (not) Established

THE INFORMATION CONTAINED HEREIN IS BELIEVED TO BE ACCURATE WHETHER ORIGINATING WITH COULSTON INTERNATIONAL CORPORATION OR NOT. COULSTON INTERNATIONAL CORPORATION PROVIDES NO WARRANTY EITHER EXPRESS OR IMPLIED, AND ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THE DATA. RECIPIENTS ARE ADVISED TO CONFIRM ANY DATA, IN ADVANCE OF NEED, THAT IT IS CURRENT, APPLICABLE AND SUITABLE TO THEIR CIRCUMSTANCES.

Material Safety Data Sheet Prepared By:

Lawrence P. Fuller

Director of Product Development
and Regulatory Affairs

04 June 1987

10 May 1991

ATTACHMENT B

ENVIRONMENTAL MEDICINE RESOURCES POLICY FOR LYME DISEASE

Environmental Medicine Resources (FPC's medical consultant) has issued the following statement regarding Lyme disease:

- The routine screening of nonsymptomatic individuals is considered inappropriate.
- All potentially exposed individuals should be advised to wear impervious clothing, use insect repellent, and examine their skin for ticks. Any tick found should be removed (see procedures summarized earlier) and kept for later identification.
- All individuals should be alerted to and be made aware of the signs and symptoms of Lyme disease. Any individual who manifests symptoms suggesting this disease should be advised to seek medical attention at once.
- The signs and symptoms of acute Lyme disease are:
  1) An expanding red ring, beginning at the point of the bite which may exceed 6-inches in diameter
  2) Localized burning sensation rather than an itching
  3) Subsequent rings may appear inside the original ring
  4) These symptoms generally appear 3 days to 3 weeks after the bite.
- Flu-like symptoms lasting 3 to 5 days include:
  1) Fever of 100 to 103 degrees Fahrenheit
  2) Headache
  3) Sore throat
  4) Nausea and vomiting
  5) Backache.

- A Lyme disease titer (test) should be done only when symptoms suggest disease and then using the protocol recommended by the Center for Disease Control

- The use of prophylactic antibiotics is not recommended, appropriate, or indicated.

10 May 1991

ATTACHMENT C

GENERAL OVERVIEW OF LYME DISEASE

Lyme disease is the geographically derived medical term for the multisystem inflammatory disorder communicated by the deer tick or *Ixodes dammini* (and two closely related species, i.e., *I. pacificus*, and possibly *I. scapularis*) also known as the bear tick in Midwestern states. Of the 800 species of ticks worldwide, only a dozen or so tick varieties exist in the Washington, Virginia, Maryland area; unfortunately one of these ticks is the deer tick. *I. dammini* is prevalent in the Midwest and Northeast as far south as Virginia, with *I. scapularis* common in the South and Southwest, and *I. pacificus* dominant on the West Coast. One further arthropod, the Lone Star tick *Ambylomma americanum*, was identified in New Jersey as a vector of Lyme disease, and the wide distribution of this tick in the South suggests that the disease will spread to locations beyond the range of its recognized *Ixodes*-species vectors.

Originating in New England around 1975 (Lyme, Connecticut, where 39 children and 12 adults were afflicted), reports now confirm cases of the disease in 32 states, including the Washington, D.C. metropolitan area and as far west as California and Oregon.

The deer tick has a 2-, or 3-year life cycle (Exhibit A), but the nymph stage in the second year is when the disease is most often transmitted. To stay alive, the nymph must take a blood meal from three separate hosts. In most cases, the tick is attracted to whitetail deer, white-footed mice, and birds. Researchers believe that the tick does not originate the disease, but rather picks it up when it alights on the white-footed mouse, and passes the disease on to the animal or person from whom it takes the next blood meal. The disease is actually caused by bacteria (spirochete) known as *Borrelia burgdorferi*.

The schematic view of the life cycle of *I. dammini*, as shown in Exhibit A, helps in understanding why Lyme disease primarily presents itself clinically in midsummer. The tick deposits its eggs in the winter and early spring, with the larvae emerging and feeding in the late summer. Its blood meal is obtained from the mouse that is the prime reservoir of the Lyme disease agent. The next immature stage of the tick, the nymph, appears the following spring. This stage carryies a complement of the disease-causing agent, ready to be transmitted to the nymph's own blood meal source, whether a mouse or a human. The nymphs become adults in the late fall and select deer as their final host and providers of a blood meal. After being inseminated while on these deer, the engorged female ticks drop to the ground, discharging their eggs, thus completing the arthropod's 2-year life cycle. Newly hatched larvae are usually not

The Life Cycle of *Ixodes dammini*

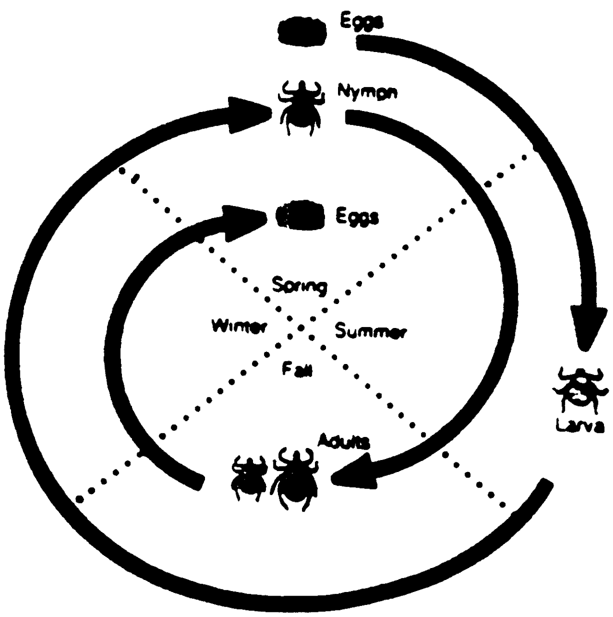

Exhibit A The life cycle of *Ixodes dammini* spans two years. Adult ticks lay their eggs in the spring. Several weeks later, the larvae emerge and feed during the summer on the blood of a small animal, often the white-footed mouse. The following spring, they molt into nymphs. The nymphs feed for a couple of days during the summer, usually on mice or larger animals such as deer or humans. By fall, they molt into adults. The adults attach themselves to animals, usually white-tailed deer, where they feed and mate. The males soon die, but the females feed in order to obtain the protein needed for egg development. Females lay their eggs and die, and the cycle is repeated. Up to 90% of Lyme disease in humans is caused by ticks in the nymphal stage. *(Based on a diagram by Tom Prentiss,* Scientific American, *July 1987.)*

infected because transovarial transmission of the spirochete appears to be minimal. The larvae become infected by feeding on infected rodents, and the spirochetes are maintained through each subsequent developmental stage. Although both female and male tick may contain spirochetes, it is only the female that has been reported to transmit the disease.

The adult deer tick is tiny, only about one-tenth of an inch long, and has an orange-red area on its back. Similar to dog ticks, the deer tick swells dramatically in size as it feeds and becomes engorged with blood.

Deer ticks usually cling to vertical stalks of brush and tall grasses, most often at the edge of wooded areas (where deer and mice congregate). Ticks are most populous on stalks 2 to 3 feet high because they can attach themselves to anything that passes by (be it cat, deer, dog, horse, person, or whatever).

Lyme disease is unlikely to be a problem in urban areas, but suburban and rural landscapes are prime candidates because of the animal populations. For this reason, the following steps should be considered to reduce potential animal and tick populations:

- Starting in early spring and continuing to early October, all brush and tall grass should be cut to the ground.

- Meadows are a prime attraction for mice because of the tall vegetation.

- If mice droppings are found around your property, locate and eliminate the nesting area and the mice will seek refuge elsewhere. Woodpiles and compost heaps are prime attractions for mice. Mothballs scattered liberally in these areas will repel rodents.

- Spilled bird seed from bird feeders is another attraction for mice. The grass or brush under bird feeders should be cut low at all times.

Personal hygiene is important when venturing outdoors, particularly from early spring to early October. Some of the basics associated with Lyme disease avoidance include:

- Avoid going barefoot except in the water at the beach; Even at the beach, avoid venturing into brushy areas unless your legs, feet, and arms are completely covered;

- Around rural and suburban gardens, wear long socks and pull them over the bottom of the pants leg.

- Wear light colored clothing if at all possible, because it will be easier to detect ticks.

- When hiking through brush or in the woods, wear long pants with the tops of the socks pulled over the bottom of the pants, long sleeve shirts, and perhaps a hat or cap.

Consider treating outer apparel with "Permanone"[3] a commercially available tick repellent [Safety Tech Co. (904) 282 1200)] containing permethrin, which will kill ticks that adhere to your clothing (avoid breathing vapors during spraying). Even after repeated washings, Permethrin treated clothing still kills ticks. PERMANONE SHOULD NOT BE USED DIRECTLY ON SKIN. Currently available insect repellents for application to the skin ("Off!", "Deep Woods", and others), contain N,N-diethyl-m-toluamide, commonly called DEET[4]. Repellents containing less than 50% DEET can normally be used directly on the skin; formulations containing high concentrations of DEET should be used sparingly, if at all, on the skin, but can be used on outer clothing alone or together with Permanone. Be sure to apply any tick repellent to the shoe tops, socks, and pants cuffs, the areas most accessible to ticks. Prior to use of any repellent, personnel must read the literature accompanying the sprays, and follow all directions. Campers should follow these same precautions.

- Check children for ticks every night before bedtime, especially if on vacation in a rural area. Check all parts of the body, especially the head and hair. If you encounter a tick, take a sturdy pair of tweezers, grip it with the prongs where the mouth parts of the tick enter the skin, and pull gently but firmly and repeatedly until it releases its hold. **Do not pull the other end of the tick because you will force any fluid from the tick into the person's body.** The barbed mouthparts of the tick will not let go easily, so take your time and be patient. If the tick is still alive, put it in a small jar with a moist paper tower inside, screw on the cover, and put it in the refrigerator. If the tick is dead, preserve it in a small jar of alcohol for identification if symptoms develop later. After removal, disinfect the bite with rubbing alcohol, povidone iodine (Betadine), or other disinfectant.

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3. Permanone, actually a pesticide rather than a repellent, is an aerosol spray; non-staining; nearly odorless; and resistant to degradation by light, heat, or immersion in water. The chemical ingredient, permethrin, is toxic to the nervous system of insects, but is poorly absorbed by humans and then rapidly inactivated by ester hydrolysis. Objective signs of skin toxicity such as edema, erythema, and rash have been uncommon but reported; adverse systemic effects have not been reported.

4. DEET repels ticks but does not kill them. It can be absorbed through a person's skin into the systemic circulation. Toxic and allergic reactions have been reported. DEET has been associated with blistery eruptions in the antecubital fossa (area below and in front of the elbow) and contact urticaria (eruption of hives characterized by severe itching). Toxic encephalopathy has occurred with excessive or prolonged use, especially in children. It is important to note that these symptoms are rare and have occurred only at high concentrations and after repeated use.

hovever, the risks posed by this chemical far outveigh the advantages. As discussed, personal hygiene, modification of outdoor habits, and eliminating the things that attract mice and ticks is the best control.

Because the tick is so tiny, most people never remember being bitten. The first visual clue of Lyme disease may be the ring-like rash at the site of the bite and flue-like symptoms as summarized above. Since the rash occurs only about 60% of the time, and the other flue symptoms may be very mild, many people are not properly diagnosed and treated at this stage. One of the biggest problems in diagnosing Lyme disease is thinking about it in the first place; someone vho goes to the doctor vith vague, all over the place symptoms may not be tested for it unless the physician has a "high index of suspicion" for the disease -- meaning that he/she is on the lookout for it. Even vhen Lyme is suspected, the blood tests nov available are believed to identify only about half of all confirmed cases, especially early in the course of the disease, and routine isolation and/or culture of the spirochete may take several veeks to months, making them unsuitable for routine use. Tests for detection of the antigen are still in the research stage, and as such, immunoassays are commonly used; hovever these assays are subject to the same clinical variables of immune response and sample timing as any other antibody assay.

The diagnosis of Lyme disease is still based on clinical evidence, and the blood tests currently available do not actually look for <u>Borrelia burgdorferi</u>, the bacteria that cause Lyme disease, but are designed to seek out the antibodies that a healthy person's body vill produce to fight it. Tvo types of blood tests are used: an IFA -- Immunofluorescence Assay, and an ELISA -- Enzyme-Linked Immunosorbent Assay. In an IFA, dead Borrelia bacteria are mixed vith the patient's blood sample and a special chemical that recognizes the antibodies and fluoresces under ultraviolet light. If the blood contains antibodies to Borrelia, they vill stick to the dead bacteria, fluorescence, vhich can be seen (under an ultraviolet microscope). The ELISA test is based on similar principles. A mixture of proteins from Borrelia germs is put into a special plate vith 96 tiny vells; some of the proteins attach themselves to the valls of the vells. A blood sample from a patient is then added, and the antibodies vill stick to the Borrelia proteins. To make the attachments visible, chemicals are added to reveal a color change -- usually to yellov -- vhich indicates the presence of antibodies.

A far simpler type of antibody test, a hemaglutination test, is under development at Nev York Medical College. First, red blood cells of healthy sheep are precoated vith Borrelia proteins and antigens. Then a blood sample is added: if there are Borrelia antibodies in the patients blood, the sheep cells vill clump together in a predictable pattern. This procedure requires no fancy equipment (unlike both the IFA and ELISA) and appears to be as accurate. (Research is currently ongoing using different methodologies, including vhite blood cell analysis, Borrelia culturing, and Borrelia antigen detection.)

There are hovever, dravbacks reported for all three of these antibody tests. It takes the human body at least 2 veeks, and sometimes up to a month, to mount a detectable antibody response. Until then, even if someone has the disease, these tests are unable to diagnose it.

Statistical analysis indicates that in New York, up to 60% of cases are missed by labs using these techniques. An accurate diagnosis currently requires a physical exam and a detailed clinical history-taking to establish the occurrence of a tick bite. The presence of an ECM lesion on a person in an "endemic area" is sufficient, according to the new CDC recommended case definition, to establish a case. A positive serology -- while supportive -- cannot establish a case without accompanying clinical evidence.

Treatment of Lyme disease is most successful when given early. Tetracycline, doxycyline, penicillin, and amoxicillin are among the oral antibiotics that have been used to shorten the duration of early symptoms and prevent later disease.

Recent developments are paving the road to better detection and possibly a vaccine against Lyme disease. Researchers at Brookhaven National Laboratories and the University of Texas Health Science Center have engineered the gene for one of the proteins (OspA) of the bacterium that causes Lyme disease. OspA is a major protein on the Lyme disease spirochete's outer surface. It is an antigen, which means it can stimulate the production of antibodies in the body, which may help destroy the invading Lyme spirochete. Researchers have cloned an abbreviated version of the OspA gene which they believe could lead to more sensitive tests for the disease, leading to earlier detection and more efficient treatment.

The information presented here has been compiled from numerous sources, including the Centers for Disease Control (CDC), scientific literature, newspaper and magazine articles, as well as information provided by product manufacturers. It must be understood that medical knowledge of Lyme disease is still incomplete, and as such, any information contained in the literature and recommendations made by CDC and other organizations are subject to change as medical research provides new information.

ATTACHMENT 2

PERSONNEL DECONTAMINATION

LEVEL C PERSONNEL DECONTAMINATION

A decontamination unit will be placed at the upwind exit from the exclusion zone (within the contamination reduction zone). It will be placed on an impervious surface (ie. visqueen sheeting) and will include a boot wash, boot rinse, PPE disposal bags, and respirator wash and rinse. The decontamination solution will be alconox or liquinox with a clear water rinse. The following steps will be used for personnel decontamination:

STEP 1 Personnel will exit the exclusion zone directly into the decontamination unit. Gross contamination will be removed using the boot wash and rinse. This includes all exterior PPE surfaces (boots, gloves, tyvek).

STEP 2 Remove tape from wrists and ankles and dispose it in the PPE bag.

STEP 3 Remove outer gloves and dispose.

STEP 4 Remove tyvek coveralls by rolling inside out as they are removed and dispose.

STEP 5 Remove boot covers (if used) by rolling inside out and dispose.

STEP 6 Remove respirator, wash and rinse in accordance with manufacturer's instructions.

STEP 7 Remove inner gloves and dispose

STEP 8 Exit decontamination unit and proceed upwind to support zone.

STEP 9 Wash hands and face as soon as possible after entering support zone.

LEVEL D PERSONNEL DECONTAMINATION

A decontamination unit will be placed at the upwind exit from the exclusion zone (within the contamination reduction zone). It will be placed on an impervious surface (ie. visqueen sheeting) and will include a boot wash, boot rinse, PPE disposal bags, and respirator wash and rinse. The decontamination solution will be alconox or liquinox with a clear water rinse. The following steps will be used for personnel decontamination:

STEP 1 Personnel will exit the exclusion zone directly into the decontamination unit. Gross contamination will be removed as necessary using the boot wash and rinse. This includes all exterior PPE surfaces (boots, gloves, tyvek).

STEP 2 Remove tape from wrists and ankles and dispose it in the PPE bag.

STEP 3 Remove gloves and dispose.

STEP 4 Remove tyvek coveralls by rolling inside out as they are removed and dispose.

STEP 5 Remove boot covers (if used) by rolling inside out and dispose.

STEP 6 Exit decontamination unit and proceed upwind to support zone.

STEP 7 Wash hands and face as soon as possible after entering support zone.

ATTACHMENT 3

HEAVY EQUIPMENT SAFETY AND DECONTAMINATION STEPS

Heavy equipment operations have inherent danger of workers being run over and/or crushed. This danger is increased when heavy equipment is not maintained properly and inspected regularly. Equipment contractors will be required to provide documentation of a safety inspection prior to implementation of site activities. At a minimum, safety inspections should include checking and/or visual inspection of the brakes, lights, backup alarms, hydraulic systems, controls, cables, and any safety devices which are an inherent part of the equipment (eg. mechanical locks or safety catches). Weekly inspections are required thereafter and will include the above. Documentation of the weekly inspection will be submitted to the site Health and Safety Officer.

Other hazards of heavy equipment include noise, hot surfaces, moving parts (augers, booms, cables, shafts, etc.), high pressure hoses, and discharges such as sparks, exhaust, steam, etc. Personnel working on or around heavy equipment shall follow these basic safety measures:

* Remain constantly aware of the location, position, or movement of all heavy equipment.

* Use appropriate ear protection when working around heavy equipment. (Note that noise does not need to seem loud to cause hearing loss)

* Use hand signals, as necessary, to communicate around loud equipment or machinery. These signals shall be agreed upon in advance and reviewed daily to ensure all personnel understand them.

* Keep hands, feet, and head out of machinery and away from any moving parts.

* Do not wear loose clothing around machinery or equipment with moving parts as it may become entangled in the moving parts and cause personnel to be pulled into the machine.

* Do not walk, stand, or work under suspended equipment.

* Wear appropriate safety equipment at all times around heavy equipment. At a minimum this will include hard hat, steel-toed footwear, and safety glasses.

Heavy equipment used on hazardous waste or radiologically contaminated sites may potentially become contaminated with one or more of the contaminants onsite. Before removing the equipment from site decontamination may be necessary. Visual and instrument surveys will be made to determine the extent of decontamination required before equipment is released from the site.

STEP 1 Equipment should be placed or driven onto an approved decontamination pad.

STEP 2 Equipment will be steam cleaned with a solution of hot water and approved detergent (i.e. Alconox, Liquinox, TSP). Special care should be devoted to areas having contact with potentially contaminated soils or material.

STEP 3 Equipment will be rinsed thoroughly with steam.

STEP 4 Equipment will be allowed to air dry for not less than 10 minutes.

STEP 5 Resurvey the equipment to determine effectiveness of the decontamination procedure.

STEP 6 Repeat steps 1 through 5 if necessary. Release equipment from site when contamination levels are below background or the release level determined by the Sampling and Analysis Plan.

ATTACHMENT 4

HEAT AND COLD STRESS

Introduction

Stress can contribute significantly to accidents or harm workers in other ways.

The term stress denotes the physical (gravity, mechanical force, heat, cold, pathogen, injury) and psychological (fear, anxiety, crises, joy) forces that are experienced by individuals.

The body's response to stress occurs in three stages:

- **Alarm reaction** in which the body recognizes the stressor and the pituitary-adreno-cortical system responds by increasing the heart rate and blood sugar level, decreasing digestive activity and dilating the pupils.
- **Adaptive stage** in which the body repairs effect of stimulation and the stress symptoms disappear.
- **Exhaustion stage** in which the body can no longer adapt to stress and individual may develop emotional disturbances, and cardiovascular and renal diseases.

The most common types of stress that affect field personnel are heat stress and cold stress. Current thinking is that heat and cold stress may be the most serious hazard to workers at waste sites.

Heat Stress

For field workers, heat stress usually is a result of protective clothing decreasing natural body ventilation, although it may occur at any time work is being performed at elevated temperatures.

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur ranging from mild (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement) to fatal. Because heat stress is one of the most common and potentially serious illnesses at hazardous waste sites, regular monitoring and other preventative measures are vital.

Site workers must learn to recognize and treat the various forms of heat stress.

The best approach is preventative heat stress management. In general:

- **Have workers drink 16 ounces of water before beginning work,** such as in the morning or after lunch. Provide disposible, 4 ounce cups, and water that is maintained at 50 - 60° F. Urge workers to drink 1 - 2 of these cups water every 20-minutes, for a total of 1 -2 gallons per day. Provide a cool, preferably air conditioned area for rest breaks. Discourage the use of alcohol in non-working hours, and discourage the intake of coffee during working hours. Monitor for signs of heat stress.

- **Acclimate workers** to site work conditions by slowly increasing workloads, ie., do not begin site work activities with extremely demanding activities.
- **Provide cooling devices** to aid natural body ventilation. These devices, however, add weight, and their use should be balanced against worker efficiency. An example of a cooling aid is long cotton underwear which acts as a wick to help absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing.
- **Install mobile showers** and/or hose-down facilities to reduce body temperature and cool protective clothing.
- In hot weather, **conduct field activities** in the early morning or evening.
- **Ensure that adequate shelter is available** to protect personnel against heat, as well as cold, rain, snow, etc., which can decrease physical efficiency and increase the probability of both heat and cold stress. If possible, set up the command post in the shade.
- In hot weather, **rotate shifts of workers** wearing impervious clothing.
- **Good hygienic standards must be maintained** by frequent changes of clothing and showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of heat regulating mechanisms of the body - the individual's temperature control system that causes sweating stops working correctly. Body temperature rises so high that brain damage and death will result if the person is not cooled quickly.

- **Symptoms:** Red, hot, dry skin, although person may have been sweating earlier; nausea; dizziness; confusion; extremely *high* body temperature, rapid respiratory and pulse rate; unconsciousness or coma.
- **Treatment:** Cool the victim quickly. If the body temperature is not brought down fast, permanent brain damage or death will result. Soak the victim in cool but not cold water, sponge the body with cool water, or pour water on the body to reduce the temperature to a safe level (102° F). Observe the victim and obtain medical help. Do not give coffee, tea or alcoholic beverages.

Heat Exhaustion

Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. This condition is much less dangerous than heat stroke, but it nonetheless must be treated.

- **Symptoms:** Pale, clammy, moist skin, profuse perspiration and extreme weakness. Body temperature is normal, pulse is weak and rapid, breathing is shallow. The person may have a headache, may vomit, and may be dizzy.
- **Treatment:** Remove the person to a cool, air conditioned place, loosen clothing, place in a head-low position, and provide bed rest. Consult physician, especially in severe cases. The normal thirst mechanism is not sensitive enough to ensure body fluid replacement. Have patient drink 1 - 2 cups water immediately, and every 20-minutes thereafter, until symptoms subside. Total water consumption should be about 1 - 2 gallons per day.

Heat Cramps

Heat cramps are caused by perspiration that is not balanced by adequate fluid intake. Heat cramps are often the first sign of a condition that can lead to heat stroke.

- **Symptoms:** Acute painful spasms of voluntary muscles; e.g., abdomen and extremities.
- **Treatment:** Remove victim to a cool area and loosen clothing. Have patient drink 1 - 2 cups water immediately, and every 20-minutes thereafter, until symptoms subside. Total water consumption should be 1 - 2 gallons per day. Consult with physician.

Heat Rash

Heat rash is caused by continuous exposure to heat and humid air and aggravated by chafing clothes. The condition decreases ability to tolerate heat.

- **Symptoms:** Mild red rash, especially in areas of the body in contact with protective gear.
- **Treatment:** Decrease amount of time in protective gear, and provide powder to help absorb mositure and decrease chafing.

Heat Stress Monitoring and Work Cycle Management

For strenuous field activities that are part of on-going site work activities in hot weather, the following procedures shall be used to monitor the body's physiological response to heat, and to manage the work cycle, even if workers are not wearing impervious clothing.

These procedures are to be instituted when the temperature exceeds 70° F.

- **Measure Heart Rate (HR).** Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 33%, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats/minute at the beginning of the next rest period, the following work cycle should be further shortened by 33%. The procedure is continued until the rate is maintained below 110 beats/minute.
- **Measure Body Temperature.** Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99.6° F. If it does, the next work period should be shortened by 33%, while the length of the rest period stays the same. If the OT exceeds 99.6° F at the beginning of the next period, the following work cycle should be further shortened by 33%. The procedure is continued until the body temperature is maintained below 99.6° F.
- **Manage Work/Rest Schedule.** The following work/rest schedule shall be used as a guideline:

Adjusted Temperature (°F)	*Active Work Time (min/hr) Using Level B/C Protective Gear*
75 or less	50
80	40
85	30
90	20
95	10
100	0

Calculate the adjusted temperature:

T (adjusted) = T (actual) + (13 x fraction sunshine)

Measure the air temperature with standard thermometer. Estimate fraction of sunshine by judging what percent the sun is out: 100% sunshine = no cloud cover = 1.0; 50% sunshine = 50% cloud cover = 0.5; 0% sunshine = full cloud cover = 0.0).

Reduce or increase the work cycle according to the guidelines under heart rate and body temperature.

Cold Stress

Persons working outdoors in low temperatures, especially at or below freezing are subject to cold stress. Exposure to extreme cold for a short time causes severe injury to the surface of the body, or results in profound generalized cooling, causing death. Areas of the body which have high surface area-to-volume ratio such as fingers, toes, and ears, are the most susceptible.

Protective clothing generally does not afford protection against cold stress. In many instances, it *increases* susceptability.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked.

Frostbite

Local injury resulting from cold is included in the generic term frostbite. Frostbite of the extremities can be categorized into:

- **Frost nip or incipent frostbite** is characterized by sudden blanching or whitening of skin.
- **Superficial frostbite** is characterized by skin with a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- **Deep frostbite** is characterized by tissues that are cold, pale, and solid.

To administer first aid for frostbite: Take the victim indoors and rewarm the areas *quickly* in water that is between 39° C and 41° C (102° F-105° F). Give a warm drink - not coffee, tea or alcohol. The victim must not smoke. Keep the frozen parts in warm water or covered with warm clothes for 30 minutes, even though the tissue will be very painful as it thaws. Then elevate the injured area and protect it from injury. Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep victim warm and get immediate medical care.

After thawing, the victim should try to move the injured areas a little, but no more than can be done alone, without help.

Note:

- Do *not* rub the frostbitten part (this may cause gangrene).
- Do *not* use ice, snow, gasoline or anything cold on the frostbitten area.
- Do *not* use heat lamps or hot water bottles to rewarm the part.
- Do *not* place the part near a hot stove.

Hypothermia

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

- Shivering
- Apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95° F
- Unconsciousness, glassy stare, slow pulse, and slow respiratory rate
- Freezing of the extremities
- Death

As a general rule field activities shall be curtailed if equivalent chill temperature (°F) as defined in Exhibit 9-1 is below zero (0° F) unless the activity is of an emergency nature.

EXHIBIT 1: Cooling Power On Exposed Flesh Expressed As An Equivalent Temperature Under Calm Conditions

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In <hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.				
Trenchfoot and immersion foot may occur at any point on this chart.												

*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

SOURCE: ACGIH, Threshold Limit Values for Chemical Substances in the Work Environment for 1984-1985.

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NOTE: This list will be updated by the contractor preparing the final Health and Safety Plans.